

USER'S MANUAL

SHB250R

**Intel® LGA1151 Coffee Lake Refresh
processor
PICMG 1.3 Half-size board**

User's Manual



www.axiomtek.com

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CAUTION

If you replace wrong batteries, it causes the danger of explosion. It is recommended by the manufacturer that you follow the manufacturer's instructions to only replace the same or equivalent type of battery, and dispose of used ones.

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ESD Precautions

Computer boards have integrated circuits sensitive to static electricity. To prevent chipsets from electrostatic discharge damage, please take care of the following jobs with precautions:

- Do not remove boards or integrated circuits from their anti-static packaging until you are ready to install them.
- Before holding the board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. It discharges static electricity from your body.
- Wear a wrist-grounding strap, available from most electronic component stores, when handling boards and components.

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Section 1

Introduction



The SHB250R PICMG® v1.3 Half-size Single Board Computer supports an LGA1151 socket for Intel® Core™ i7/ i5/ i3 desktop processors with 14nm technology and transfer rate 2400/2666 MHz. The board integrates an Intel® Q370/H310/C246 chipset that delivers outstanding system performance through high-bandwidth interfaces, multiple I/O functions for interactive applications and various embedded computing solutions. There are two 260-pin DDR4 SO-DIMM sockets for sing channel DDR4 2400/2666MHz with maximum memory capacity up to 64GB. The board also features dual Gigabit Ethernet, SATA 6Gbps with SATA RAID 0/1(Q370/C246) by PCH, USB 2.0, and USB 3.1 Gen1 high speed compliant ports and built-in Intel® HD Audio Digital Header to achieve the best stability and reliability for industrial applications.

1.1 Features

- **LGA1151 socket 9th/8th Generation Intel® Core™ processors up to 95W (9th TDP up to 35W)**
- **Intel® Q370/H310/C246 PCH**
- **2 DDR4 SO-DIMM supports up to 64 GB memory capacity**
- **2 USB 3.0 ports (Rear I/O)**
- **SATA 6Gbs with RAID 0,1**
- **Dual Display(DVI-I/DP++)**
- **ATX DC-in 12V**
- **Supports iAMT9.0**

1.2 Specifications

- **CPU**
 - Intel® Core™ i7 desktop processor.
 - Intel® Core™ i5 desktop processor.
 - Intel® Core™ i3 desktop processor.
 - CPU TDP up to 95W(9th TDP up to 35W)
- **System Chipset**
 - Intel® Q370/H310/C246
- **BIOS**
 - AMI BIOS via SPI interface with socket
- **System Memory**
 - Two 260-pin DDR4 2666/2400MHz SO-DIMM sockets
 - Maximum up to 64GB DDR4 memory
- **Onboard Multi I/O**
 - Serial ports: two RS-232/422/485 ports with 20-pin, 1.27 pitch box-header (COM 1/2)
- **L1, L2, L3 Cache: Integrated in CPU**
- **USB Interface**
 - Four USB3.1 ports
 - 2* USB 3.1 GEN1 via double deck connector on the rear I/O
 - 2* USB 3.1 GEN1 via 20 pin box header with 5V powered
 - Four USB2.0 ports
 - 2* USB 2.0 via 2*5 2.00mm box header with 5VDual powered
- **Onboard Graphic**
 - Integrated Intel® HD graphics supporting DVI-I
 - DVI/VGA: Max. resolution is 1920x1200
 - Internal DP1.4 Connector: Max resolution is 4096x2304. Must use with Axiomtek DP kit
- **Ethernet**
 - LAN1 / LAN2: Intel® i219LM with iAMT(H310 not support) / Intel® i211AT Ethernet controller
 - Support 1000/100/10Mb/s Gigabit/Fast Ethernet
- **Storage**
 - Serial ATA:
 - Two SATA 3.0 ports (6Gb/s performance) (Q370/C246 support SATA RAID 0/1)
 - One M.2 2242 Key M Socket(Q370/C246 support PCIe 3.0 x4 or SATA-3, H310 support SATA-3)
- **Audio**
 - 10-pin 2.0 box-header (Intel® HD Audio Digital Header)
- **Hardware Monitoring**
 - Monitoring temperatures, voltages and cooling fan status
- **Watchdog Timer**
 - 1~255 seconds or minutes; up to 255 levels

- **Power Management**
 - ACPI(Advanced Configuration and Power Interface)

- **Expansion Interface**
 - One PCIe x16, PCI Express* 3.0 Port via SHB connector-A & B
 - One PCIe x4 PCI Express* 3.0 Port
(or 4 x PCIe x1 PCI Express* 3.0 Port) via SHB Connector-A

- **Form Factor**
 - PICMG 1.3 Half-size, 185 x 126 mm



Note: All specifications and images are subject to change without notice.

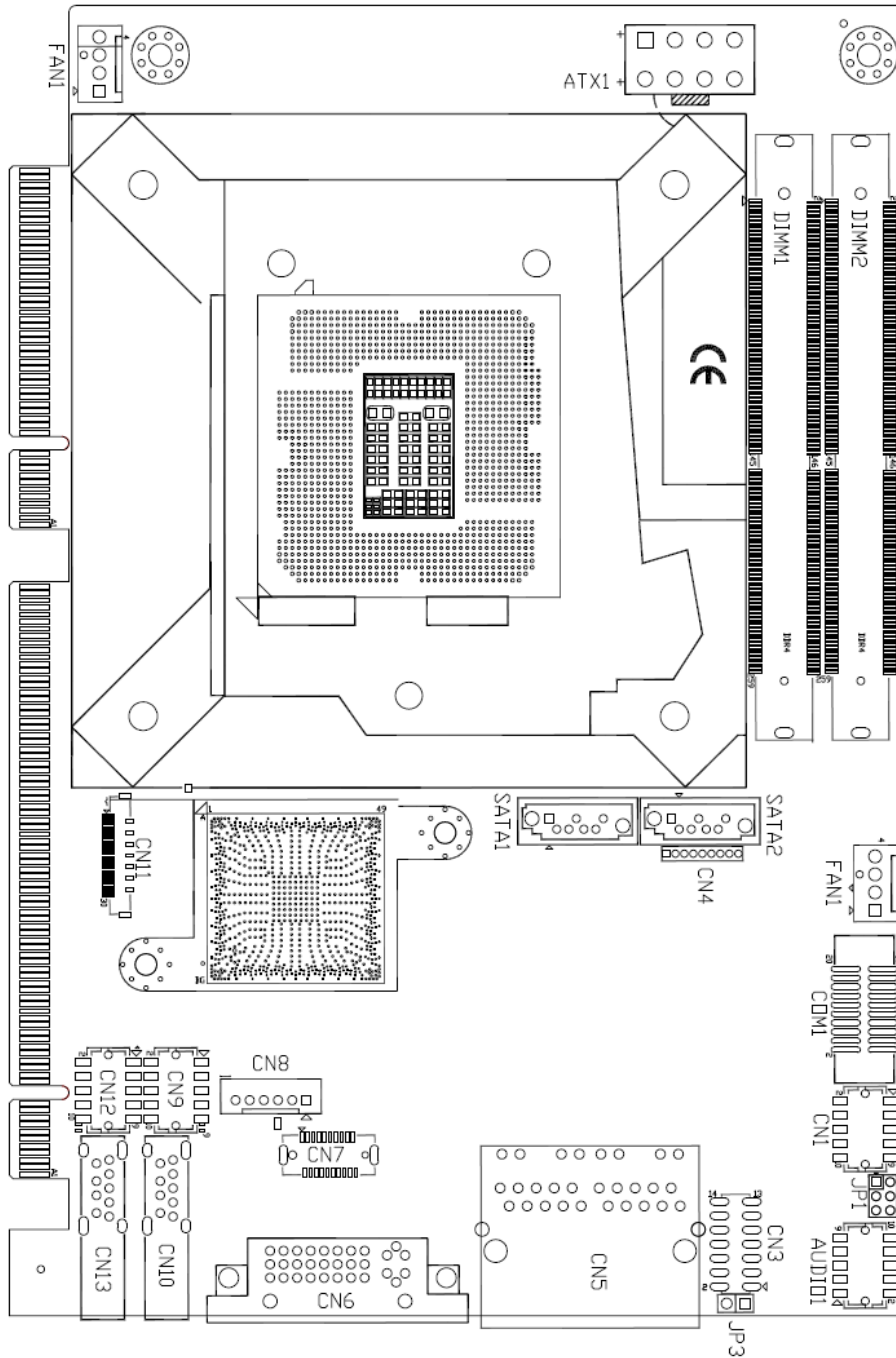
1.3 Utilities Supported

- Intel® Q370/H310/C246 utility and drivers
- Graphic drivers
- Audio utility and drivers
- Ethernet utility and drivers
- RAID utility
- iAMT utility and drivers

Section 2

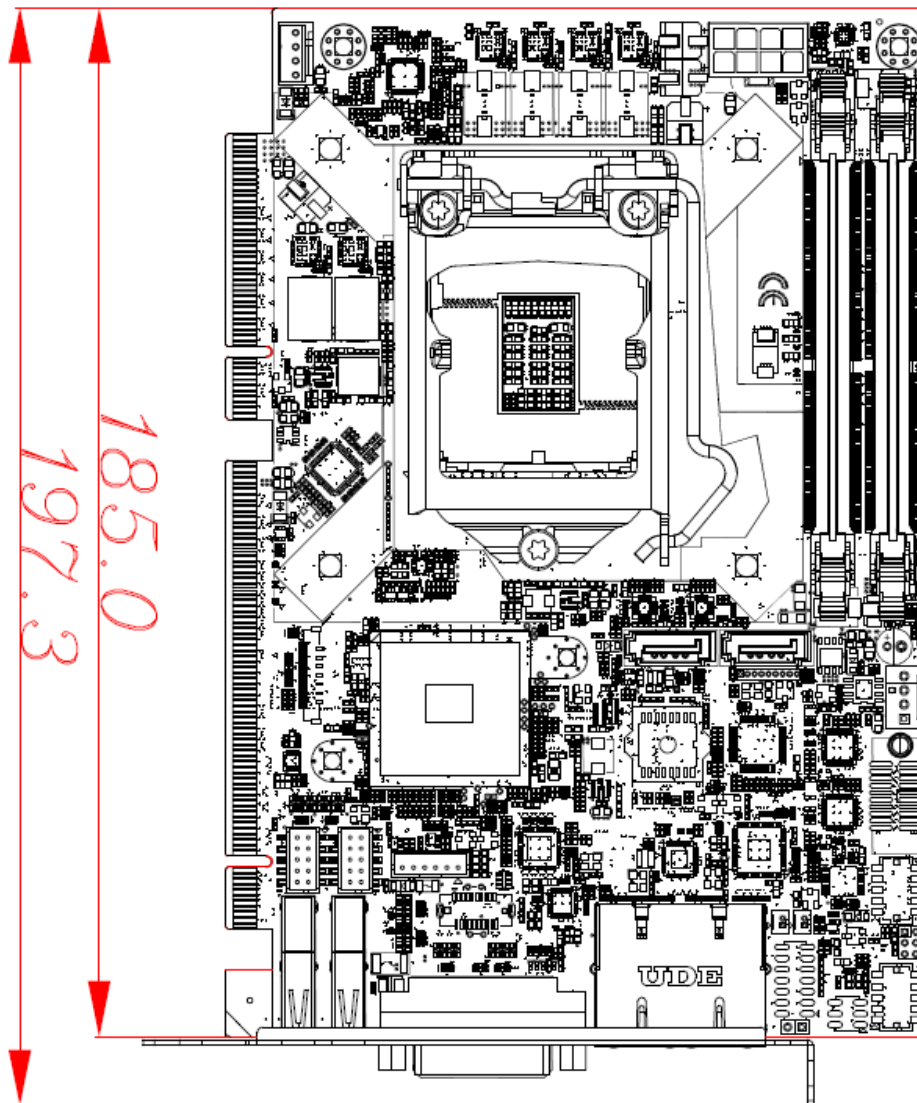
Board Layout and Pin Assignments

2.1 Board Dimensions and Fixing Holes

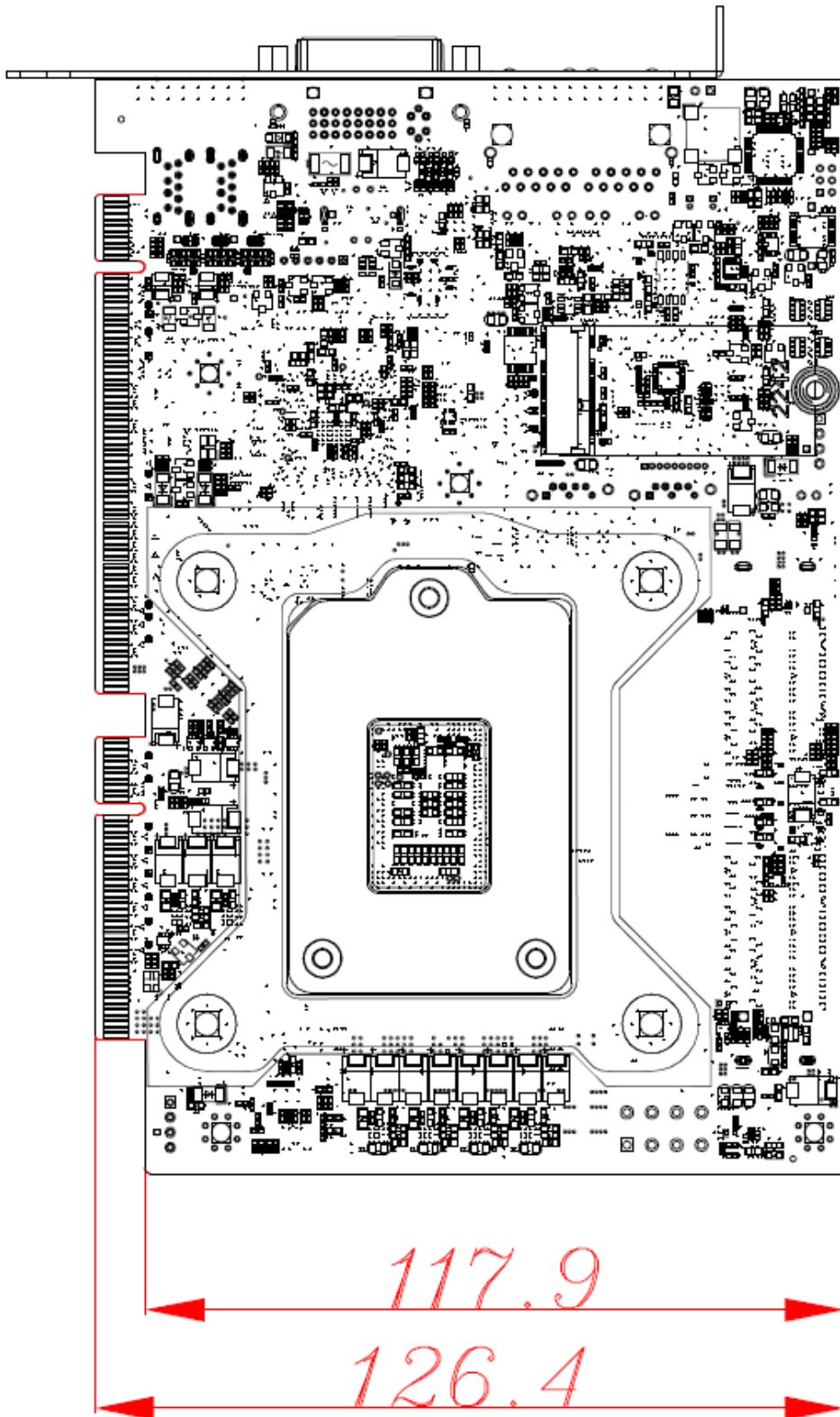


2.2 Board Layout

Top Side



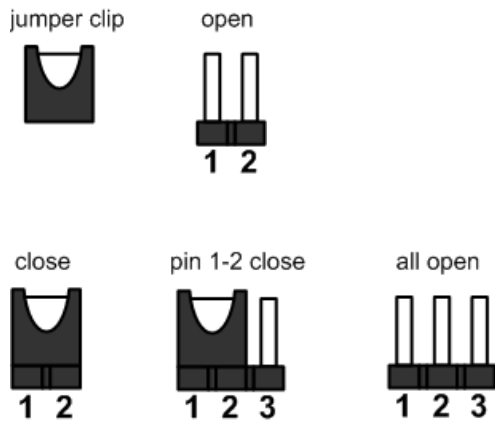
Button Side



2.3 Jumper Settings

Properly configure jumper settings on the SHB250R to meet your application purpose. Below you can find a summary table of all jumpers and onboard default settings.

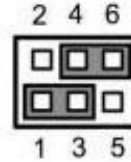
Proper jumper settings configure the SHB250R to meet your application purpose. We are herewith listing a summary table of all jumpers and default settings for onboard devices, respectively.



2.3.1 Restore BIOS Optimal Defaults (JP1)

Put jumper clip to pin 3-5 for a few seconds then move it back to pin 1-1. Doing this procedure can restore BIOS optimal defaults.

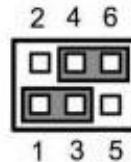
Function	Setting
Normal operation (Default)	1-3 close
Restore BIOS optimal defaults	3-5 close



2.3.2 Auto Power On (JP1)

If JP1 is enabled for AC power input, the system will be automatically power on without pressing soft power button. If JP1 is disabled for AC power input, it is necessary to manually press soft power button to power on the system.

Function	Setting
Enable auto power on (Default)	4-6 close
Disable auto power on	2-4 close



2.4 Connectors

Connectors connect this board with other parts of the system. Loose or improper connection might cause problems. Make sure all connectors are properly and firmly connected.

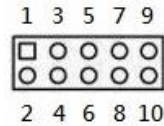
Here is a summary table shows you all connectors on the board.

Connector	Label
Digital I/O Connector	CN1
External Temperature Sensor Connector (Optional)	CN2
Front Panel	CN3
Internal USB3.0 connector	CN7
Internal Keyboard and Mouse Connectors	CN8
Internal USB2.0 connectors	CN9, CN12
Display Port 1.4 Connector	CN11
ATX Power Connector (ATX1)	ATX1
CPU FAN	FAN1
SYS FAN	FAN2
Intel® HD Audio Digital Header	AUDIO1
RJ45 (i219LM)	LAN1
RJ45 (i210AT)	LAN2
SATA 1 ~ 2 6Gb(SATA3)	SATA1~SATA2
COM1 ~ COM2 Connecters	COM1
M.2 2242 Key M NVMe SSD	SNGFF1

2.4.1 Digital I/O Connector (CN1)

The board is equipped with an 8-channel digital I/O connector that meets requirements for a system customary automation control which is compliant with CST Master Electronic CSI-2211-101R. The digital I/O can be configured to control cash drawers and sense warning signals from an Uninterrupted Power System (UPS), or perform store security control. You may use software programming to control these digital signals.

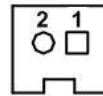
Pin	Signal	Pin	Signal
1	DIO 1	2	DIO 8
3	DIO 2	4	DIO 7
5	DIO 3	6	DIO 6
7	DIO 4	8	DIO 5
9	NC	10	GND



2.4.2 External Temperature Sensor Connector (CN2) (Optional)

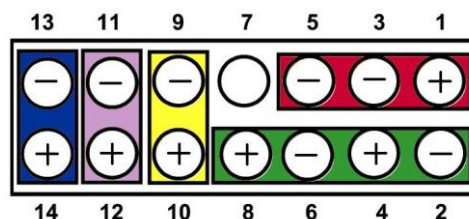
This is a 2-pin connector for external thermal diode/transistor temperature sensor interface.

Pin	Signal
1	Sensor Input
2	GND



2.4.3 Front Panel Connector (CN3)

Pin	Signal
1	PWRLED+
2	EXT SPK-
3	GND
4	Buzzer
5	PWRLED-
6	N.C.
7	N.C.
8	EXT SPK+
9	PWRSW-
10	PWRSW+
11	HW RST-
12	HW RST+
13	HDDLED-
14	HDDLED+



- **Power LED**

This 3-pin connector denoted as Pin 1 and Pin 5 connects the system power LED indicator to such a switch on the case. Pin 1 is assigned as +, and Pin 5 as -. The Power LED lights up when the system is powered ON. Pin 3 is defined as GND.

- **External Speaker and Internal Buzzer Connector**

Pin 2, 4, 6 and 8 can be connected to the case-mounted speaker unit or internal buzzer. While connecting the CPU card to an internal buzzer, please short pins 2-4; while connecting to an external speaker, you need to set pins 2-4 to Open and connect the speaker cable to pin 8 (+) and pin 2 (-).

- **ATX Power On/Off Button**

This 2-pin connector denoted as Pin 9 and 10 connects the front panel's ATX power button to the CPU card, which allows users to control ATX power supply to be power on/off.

- **System Reset Switch**

Pin 11 and 12 can be connected to the case-mounted reset switch that reboots your computer instead of turning OFF the power switch. It is a better way to reboot your system for a longer life of the system's power supply.

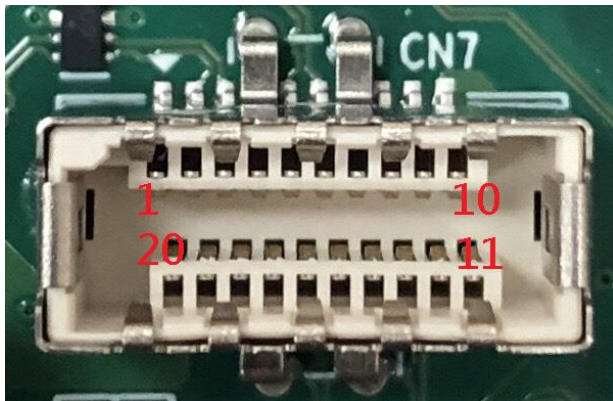
- **HDD Activity LED**

This connection is linked to hard drive activity LED on the control panel. LED flashes when HDD is being accessed. Pin 13 and 14 connect the hard disk drive to the front panel HDD LED, Pin 13 assigned as -, and Pin 14 as +.

2.4.4 Internal USB 3.1 Gen2 Connector (CN7)

The CN7 is an internal box connector for installing versatile USB 3.1 Gen2 compliant peripherals with LOTES AUSB0418-P001A.

Pin	Signal	Pin	Signal
1	GND	11	GND
2	SSTX3+	12	SSTX4-
3	SSTX3-	13	SSTX4+
4	GND	14	GND
5	SSRX3+	15	SSRX4-
6	SSRX3-	16	SSRX4+
7	GND	17	GND
8	USBP3P_C	18	USBP4P_C
9	USBP3N_C	19	USBP4N_C
10	+3.3.VS	20	+3.3VS

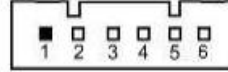


 **Note:** The speed is USB3.1 Gen1.

2.4.5 Internal Keyboard and mouse Connectors (CN8)

The board comes with keyboard and mouse interfaces which is compliant with CATCH 1192-7XX-XXX(GP).

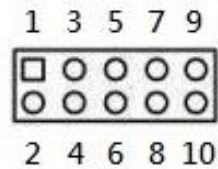
Pin	Signal
1	Mouse Data
2	Mouse Clock
3	Keyboard Data
4	Keyboard Clock
5	GND
6	5VSBY



2.4.6 Internal USB 2.0 Connectors (CN9, CN12)

These are internal connectors for USB 2.0 interfaces which is compliant with CST Master Electronic CSI-2211-101R.

Pin	Signal	Pin	Signal
1	USB_PWR	2	USB_PWR
3	USB -	4	USB -
5	USB +	6	USB +
7	GND	8	GND
9	GND	10	GND



2.4.7 Display Port 1.4 Connector (CN11)

The CN11 is an internal box connector which is defined by Axiomtek for installing Display Port 1.4 Connector peripherals with KEL USL00-30L. The Display Port 1.4 Connector peripherals are available as an optional kit.

Pin	Signal	Pin	Signal
1	GND	16	DPC_AUX_D+
2	DDSP_TX_0_D+	17	DPC_AUX_D-
3	DDSP_TX_0_D-	18	+5VS
4	GND	19	DDPD_HPD_C
5	DDSP_TX_1_D+	20	+3.3VS
6	DDSP_TX_1_D-	21	+3.3VS
7	GND	22	+3.3VS
8	DDSP_TX_2_D+	23	+3.3VS
9	DDSP_TX_2_D-	24	GND
10	GND	25	GND
11	DDSP_TX_3_D+	26	GND
12	DDSP_TX_3_D-	27	GND
13	GND	28	+5VS
14	HDMI_C_DNG_DETECT	29	+5VS
15	GND	30	+5VS



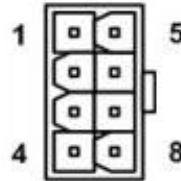
2.4.8 ATX Power Connector (ATX1)

Steady and sufficient power can be supplied to all components on the board by connecting the power connector. Please make sure all components and devices are properly installed before connecting the power connector.

The external power supply plug fits into this connector in only one orientation. Properly press down the power supply plug until it completely and firmly fits into this connector. Loose connection may cause system instability.

The ATX1 is an 8-pin ATX power connector. Its pin assignments are given in table below.

Pin	Signal	Pin	Signal
1	GND	5	+12V
2	GND	6	+12V
3	GND	7	+12V
4	GND	8	+12V

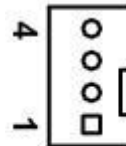


2.4.9 FAN Connectors (FAN1, FAN2)

Fans are needed for cooling down CPU and system temperature. The board has three fan connectors. You can find fan speed option(s) at BIOS Setup Utility if either fan is installed. For further information, see BIOS Setup Utility: Advanced\HW Monitor\PC Health Status.

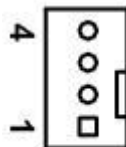
Auxiliary and system fan interfaces are available through FAN1 and FAN2. See the table below.

Pin	Signal
1	GND
2	+12V level
3	Rotation detection
4	Speed Control



CPU fan interface is available through FAN2, see table below.

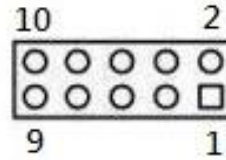
Pin	Signal
1	Ground
2	+12V
3	Rotation Detection
4	Speed Control



2.4.10 Intel® HD Audio Digital Header (AUDIO1)

This is a pin header which is compliant with CST Master Electronic CSI-2211-101R.

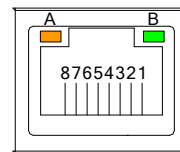
Pin	Signal	Pin	Signal
1	MIC IN	2	GND
3	LINE_IN_L	4	GND
5	LINE_IN_R	6	GND
7	LINE_OUT_L	8	GND
9	LINE_OUT_R	10	GND



2.4.11 Ethernet Ports (LAN1 and LAN2)

The board has two RJ-45 connectors; LAN1 (for i219LM) and LAN2 (for i211AT). Ethernet connection can be established by plugging one end of the Ethernet cable into this RJ-45 connector and the other end (phone jack) to a 1000/100/10-Base-T hub.

Pin	Signal
1	Tx+ (Data transmission positive)
2	Tx- (Data transmission negative)
3	Rx+ (Data reception positive)
4	RJ-1 (For 1000-Base-T only)
5	RJ-1 (For 1000-Base-T only)
6	Rx- (Data reception negative)
7	RJ-1 (For 1000-Base-T only)
8	RJ-1 (For 1000-Base-T only)
A	Active LED
B	Speed LED



2.4.12 Serial ATA Connectors (SATA1~SATA2)

These Serial Advanced Technology Attachment (Serial ATA or SATA) connectors are for high-speed SATA interfaces. They are computer bus interfaces for connecting to devices such as hard disk drives.

This board has two SATA 3.0 ports with 6Gb/s performance.

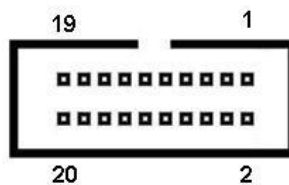
Pin	Signal
1	GND
2	SATA_TX+
3	SATA_TX-
4	GND
5	SATA_RX-
6	SATA_RX+
7	GND



2.4.13 COM Connectors (COM1~COM2)

This pin header which is compliant with CATCH 1167-010-20MR. The COM port supports RS-232/RS-422/RS-485 mode operation, see table below for its pin assignments. You can change the transmission mode via BIOS setting.

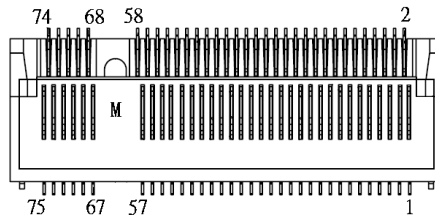
Pin	RS-232	RS-422	RS-485
1	Data Carrier Detect (DCD1)	TX1-	DATA1-
2	Data Set Ready (DSR1)	NC	NC
3	Receive Data (RXD1)	TX1+	DATA1+
4	Request to Send (RTS1)	NC	NC
5	Transmit Data (TXD1)	RX1+	NC
6	Clear to Send (CTS1)	NC	NC
7	Data Terminal Ready (DTR1)	RX1-	NC
8	Ring Indicator (RI1)	NC	NC
9	Ground (GND)	GND	GND
10	Disconnect (NI)	NI	NI
11	Data Carrier Detect (DCD2)	TX2-	DATA2-
12	Data Set Ready (DSR2)	NC	NC
13	Receive Data (RXD2)	TX2+	DATA2+
14	Request to Send (RTS2)	NC	NC
15	Transmit Data (TXD2)	RX2+	NC
16	Clear to Send (CTS2)	NC	NC
17	Data Terminal Ready (DTR2)	RX2-	NC
18	Ring Indicator (RI2)	NC	NC
19	Ground (GND)	GND	GND
20	Disconnect (NI)	NI	NI



2.4.14 M.2 2242 Key M

The M.2 2242 Key M.

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	GND	2	+3.3V	3	GND	4	+3.3V
5	PERn3	6	NC	7	PERp3	8	NC
9	GND	10	LED_1#	11	PETn3	12	+3.3V
13	PETp3	14	+3.3V	15	GND	16	+3.3V
17	PERn2	18	+3.3V	19	PERp2	20	NC
21	GND	22	NC	23	PETn2	24	NC
25	PETp2	26	NC	27	GND	28	NC
29	PERn1	30	NC	31	PERp1	32	NC
33	GND	34	NC	35	PETn1	36	NC
37	PETp1	38	NC	39	GND	40	NC
41	PERn0	42	NC	43	PERp0	44	NC
45	GND	46	NC	47	PETn0	48	NC
49	PETp0	50	PERST#	51	GND	52	CLKREQ#
53	REFCLKn	54	PEWAKE#	55	REFCLKp	56	NC
57	GND	58	NC	59	CONNECTOR Key M	60	CONNECTOR Key M
61	CONNECTOR Key M	62	CONNECTOR Key M	63	CONNECTOR Key M	64	CONNECTOR Key M
65	CONNECTOR Key M	66	CONNECTOR Key M	67	NC	68	NC
69	NC	70	+3.3V	71	GND	72	+3.3V
73	GND	74	+3.3V	75	GND		



Note: M.2 2242 Key M (Q370/C246 support PCIe 3.0 x4 or SATA-3, H310 support SATA-3)

Section 3

Hardware Installation

3.1 Installing the Processor

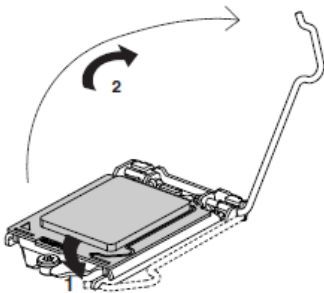
The LGA1151 processor socket comes with a cover to protect the processor. Please install the processor into the CPU socket step by step as below:



Note: *Make sure that you install the correct CPU designed for LGA1151 socket only. DO NOT install a CPU designed for LGA1155 or LGA1156 sockets on LGA1151 socket.*

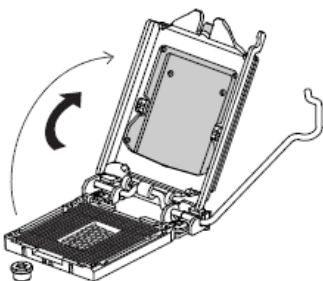
Step 1 Opening the socket:

- Disengage load lever by releasing down and out on the hook. This will clear retention tab.
- Rotate load lever to open position at approximately 135°.
- Rotate load plate to open position at approximately 150°.



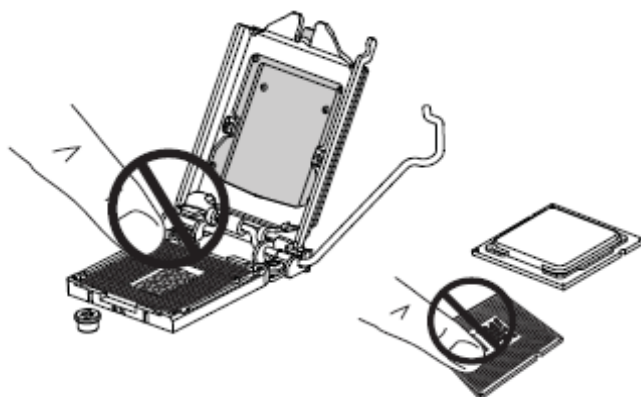
Step 2 Removing the socket protective cover:

- Place thumb against the front edge of the protective cover and rest index finger on the rear grip to maintain control of the cover.
- Lift the front edge of the protective cover to disengage from the socket. Keep control of the cover by holding the rear grip with index finger.
- Lift protective cover away from the socket, being careful not to touch the electrical contacts.



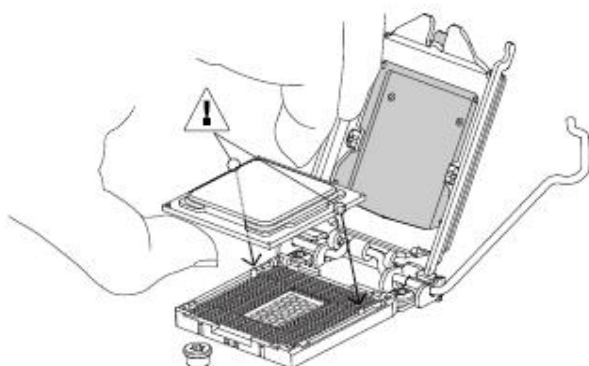
Step3 Processor installation:

- Lift processor package from shipping media by grasping the substrate edges.
- Scan the processor package gold pads for any presence of foreign material. If necessary, the gold pads can be wiped clean with a soft lint-free cloth and isopropyl alcohol.
- Locate connection 1 indicator on the processor which aligns with connection 1 indicator chamfer on the socket, and notice processor keying features that line up with posts along socket walls.



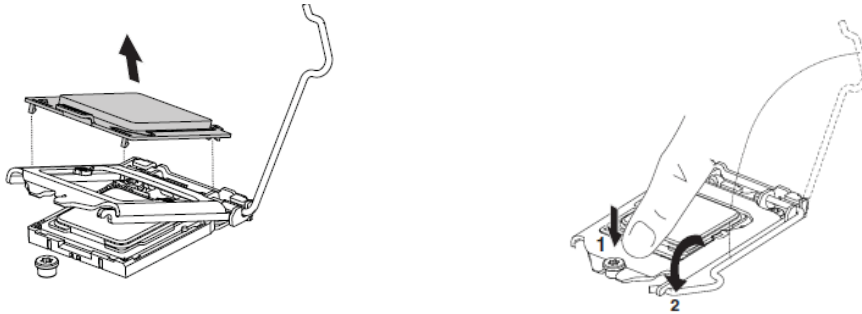
Note: *Never touch fragile socket contacts to avoid damage and do not touch processor sensitive contacts at any time during Installation.*

- Carefully place the processor into the socket body vertically (see image below).



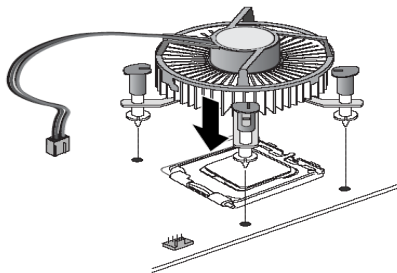
Step4 Close the socket (see image below):

- Gently lower the load plate.
- Make sure load plate's front edge slides under the shoulder screw cap as the lever is lowered.
- Latch the lever under the top plate's corner tab, being cautious not to damage the motherboard with the tip of the lever.

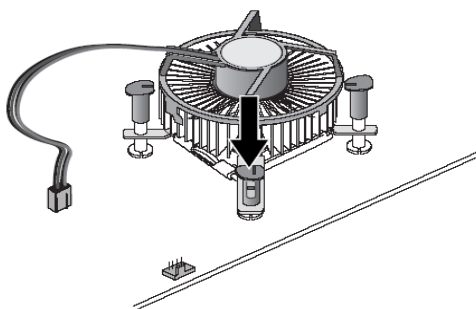


Step 5 Fan heat sink handling:

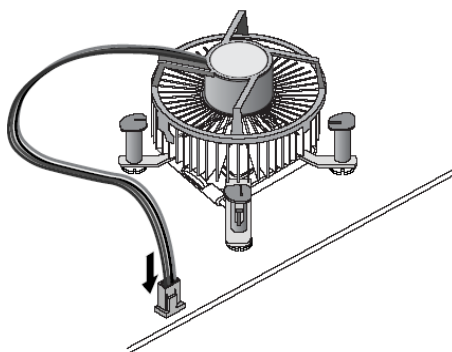
1. Orientate the CPU cooling fan to fixing holes on the board.



2. Screw the CPU cooling fan onto the board.



3. Make sure the CPU fan is plugged to the CPU fan connector.



 CAUTION

Axiomtek strongly recommends that you choose our verified heat sink or cooler from the optional list on datasheets; we DO NOT recommend that you use the heat sink or cooler without verification, since it may cause damage or bend to the PCBA. Axiomtek's heat sink or cooler has passed our testing including heat dissipation capacity.

For SHB250R series

Cooler list:

For 2U /4U /Shoebox chassis: 50787861200E

Heatsink list:

For 1U Chassis: 5076E510000E

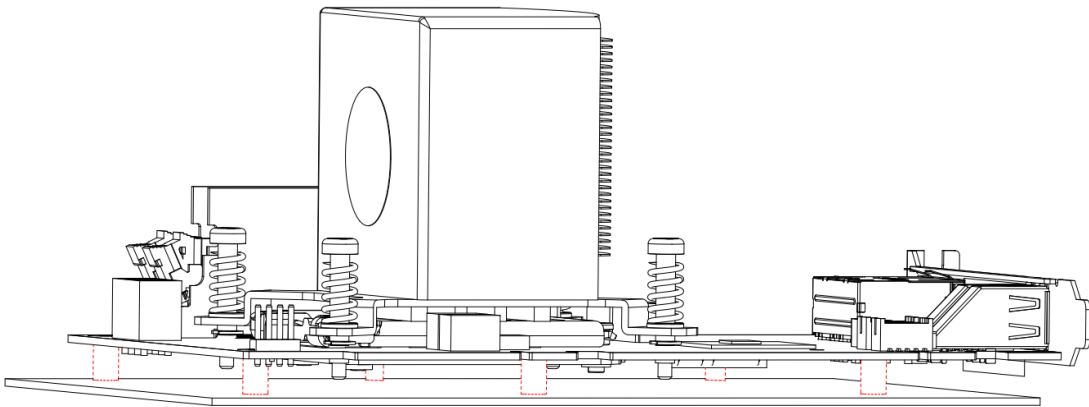
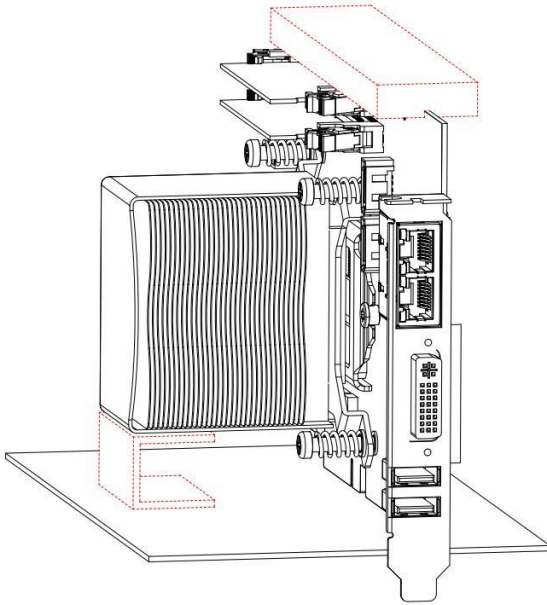
 CAUTION

Please always hold the PCBA with two hands by card edges when you install the cooler or heatsink to avoid bending or breaking it; Careless or improper installation of the cooler or heatsink can result in damage and components may snap or come off from the PCBA.

 CAUTION

Due to the weight of the cooler may cause the PCBA damage or unexpected issues. In addition, some applications highly require stability and Axiomtek suggests customer use a stand (as the red parts below) to support the cooler to prevent such issues.

If you have any technical problems, please contact our technical window; if there are any requirements for system integration, Axiomtek can provide evaluation and customized services.

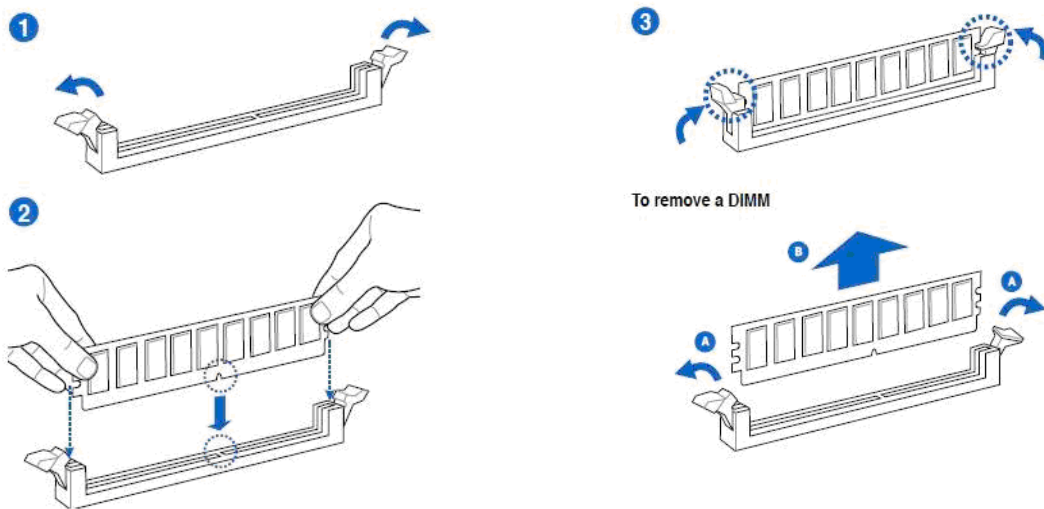


3.2 Installing the Memory

The board supports two 260-pin DDR4 SO-DIMM memory sockets with maximum memory capacity up to 64GB.

Please follow steps below to install the memory modules:

- Push down latches on each side of the DIMM socket.
- Align the memory module with the socket that notches of memory module must match the socket keys for a correct installation.
- Install the memory module into the socket and push it firmly down until it is fully seated. The socket latches are levered upwards and clipped on to the edges of the DIMM.
- Install any remaining DIMM modules.



Section 4

Hardware Description

4.1 Microprocessors

The SHB250R Series supports Intel® Core™ i7 / Core™ i5 / Core™ i3 processors, which enable your system to operate under Windows® 10 and Linux environments. The system performance depends on the microprocessor. Make sure all correct settings are arranged for your installed microprocessor to prevent the CPU from damages.

4.2 BIOS

The SHB250R Series uses AMI Plug and Play BIOS with a single 64Mbit SPI Flash.






























4.3 System Memory

The SHB250R Series supports two 260-pin DDR4 SODIMM sockets for a maximum memory of 64GB DDR4 SDRAMs. The memory module comes in sizes of 2GB, 4GB, 8GB, 16GB and 32GB.

4.4 I/O Port Address Map

The Intel® Core™ i7 / Core™ i5 / Core™ i3 processors communicate via I/O ports. Total 1KB port addresses are available for assigning to other devices via I/O expansion cards.




















































Input/output (IO)		
[000000300000C000 - 000000003000001F]	Direct memory access controller	
[000000300000C000 - 00000000300000C7F]	PCI bus	
[000000300000C010 - 000000003000001F]	Motherboard resources	
[000000300000C020 - 0000000030000021F]	Programmable interrupt controller	
[000000300000C022 - 000000003000003F]	Motherboard resources	
[000000300000C024 - 0000000030000025F]	Programmable interrupt controller	
[000000300000C028 - 0000000030000029F]	Programmable interrupt controller	
[000000300000C02C - 000000003000002DF]	Programmable interrupt controller	
[000000300000C02E - 000000003000002FF]	Motherboard resources	
[000000300000C030 - 0000000030000031F]	Programmable interrupt controller	
[000000300000C034 - 0000000030000035F]	Programmable interrupt controller	
[000000300000C038 - 0000000030000039F]	Programmable interrupt controller	
[000000300000C03C - 000000003000003DF]	Programmable interrupt controller	
[000000300000C040 - 0000000030000043F]	System timer	
[000000300000C044 - 000000003000005FF]	Motherboard resources	
[000000300000C04E - 000000003000004FF]	Motherboard resources	
[000000300000C050 - 0000000030000053F]	System timer	
[000000300000C060 - 0000000030000060F]	Standard PS/2 Keyboard	
[000000300000C061 - 0000000030000061F]	Motherboard resources	
[000000300000C062 - 0000000030000063F]	Motherboard resources	
[000000300000C063 - 0000000030000063F]	Motherboard resources	
[000000300000C064 - 0000000030000064F]	Standard PS/2 Keyboard	
[000000300000C065 - 0000000030000065F]	Motherboard resources	
[000000300000C065 - 0000000030000066F]	Motherboard resources	
[000000300000C067 - 0000000030000067F]	Motherboard resources	
[000000300000C070 - 0000000030000070F]	Motherboard resources	
[000000300000C070 - 0000000030000077F]	System CMOS/real time clock	
[000000300000C072 - 000000003000007FF]	Motherboard resources	
[000000300000C080 - 0000000030000080F]	Motherboard resources	
[000000300000C080 - 0000000030000080F]	Motherboard resources	
[000000300000C081 - 0000000030000091F]	Direct memory access controller	
[000000300000C084 - 0000000030000086F]	Motherboard resources	
[000000300000C088 - 0000000030000088F]	Motherboard resources	
[000000300000C08C - 000000003000008EF]	Motherboard resources	
[000000300000C090 - 000000003000009FF]	Motherboard resources	
[000000300000C092 - 0000000030000092F]	Motherboard resources	
[000000300000C093 - 000000003000009FF]	Direct memory access controller	
[000000300000C0A0 - 00000000300000A1F]	Programmable interrupt controller	
[000000300000C0A2 - 000000003000003FF]	Motherboard resources	
[000000300000C0A4 - 00000000300000A5F]	Programmable interrupt controller	
[000000300000C0A8 - 00000000300000A9F]	Programmable interrupt controller	
[000000300000C0AC - 00000000300000ADF]	Programmable interrupt controller	
[000000300000C0B0 - 00000000300000B1F]	Programmable interrupt controller	
[000000300000C0B2 - 00000000300000B3F]	Motherboard resources	
[000000300000C0B4 - 00000000300000B5F]	Programmable interrupt controller	
[000000300000C0B8 - 00000000300000B9F]	Programmable interrupt controller	
[000000300000C0BC - 00000000300000BDF]	Programmable interrupt controller	
[000000300000C0C0 - 00000000300000C0FF]	Direct memory access controller	
[000000300000C0E0 - 00000000300000E0F]	Motherboard resources	

	[00000000000000F0 - 00000000000000F0]	Numeric data processor
	[0000000000000285 - 0000000000000294]	Motherboard resources
	[00000000000002F8 - 00000000000002FF]	Communications Port (COM2)
	[00000000000003B0 - 00000000000003BB]	Intel(R) HD Graphics
	[00000000000003C0 - 00000000000003DF]	Intel(R) HD Graphics
	[00000000000003F8 - 00000000000003FF]	Communications Port (COM1)
	[00000000000004D0 - 00000000000004D1]	Motherboard resources
	[00000000000004D0 - 00000000000004D1]	Programmable interrupt controller
	[0000000000000680 - 000000000000069F]	Motherboard resources
	[0000000000000A00 - 0000000000000A0F]	Motherboard resources
	[0000000000000D00 - 0000000000000FFF]	PCI bus
	[000000000000164E - 000000000000164F]	Motherboard resources
	[0000000000001800 - 00000000000018FE]	Motherboard resources
	[0000000000001854 - 0000000000001857]	Motherboard resources
	[0000000000001C00 - 0000000000001CFE]	Motherboard resources
	[0000000000001D00 - 0000000000001DFE]	Motherboard resources
	[0000000000001E00 - 0000000000001EFE]	Motherboard resources
	[0000000000001F00 - 0000000000001FFE]	Motherboard resources
	[000000000000E000 - 000000000000EFFF]	Intel(R) 8 Series/C220 Series PCI Express Root Port #5 - 8C18
	[000000000000F000 - 000000000000F03F]	Intel(R) HD Graphics
	[000000000000F040 - 000000000000F05F]	Intel(R) 8 Series/C220 Series SMBus Controller - 8C22
	[000000000000F060 - 000000000000F07F]	Intel(R) 8 Series/C220 Series SATA AHCI Controller - 8C02
	[000000000000F0A0 - 000000000000F0A3]	Intel(R) 8 Series/C220 Series SATA AHCI Controller - 8C02
	[000000000000F0B0 - 000000000000F0B7]	Intel(R) 8 Series/C220 Series SATA AHCI Controller - 8C02
	[000000000000F0C0 - 000000000000F0C3]	Intel(R) 8 Series/C220 Series SATA AHCI Controller - 8C02
	[000000000000F0D0 - 000000000000F0D7]	Intel(R) 8 Series/C220 Series SATA AHCI Controller - 8C02
	[000000000000FFFF - 000000000000FFFF]	Motherboard resources
	[000000000000FFFF - 000000000000FFFF]	Motherboard resources
	[000000000000FFFF - 000000000000FFFF]	Motherboard resources


































4.5 Interrupt Controller (IRQ) Map

The interrupt controller (IRQ) mapping list is shown as follows:

Interrupt request (IRQ)		
(ISA) 0x00000000 (00)		System timer
(ISA) 0x00000001 (01)		Standard PS/2 Keyboard
(ISA) 0x00000003 (03)		Communications Port (COM2)
(ISA) 0x00000004 (04)		Communications Port (COM1)
(ISA) 0x00000008 (08)		System CMOS/real time clock
(ISA) 0x0000000C (12)		Microsoft PS/2 Mouse
(ISA) 0x0000000D (13)		Numeric data processor
(ISA) 0x00000051 (81)		Microsoft ACPI-Compliant System
(ISA) 0x00000052 (82)		Microsoft ACPI-Compliant System
(ISA) 0x00000053 (83)		Microsoft ACPI-Compliant System
(ISA) 0x00000054 (84)		Microsoft ACPI-Compliant System
(ISA) 0x00000055 (85)		Microsoft ACPI-Compliant System
(ISA) 0x00000056 (86)		Microsoft ACPI-Compliant System
(ISA) 0x00000057 (87)		Microsoft ACPI-Compliant System
(ISA) 0x00000058 (88)		Microsoft ACPI-Compliant System
(ISA) 0x00000059 (89)		Microsoft ACPI-Compliant System
(ISA) 0x0000005A (90)		Microsoft ACPI-Compliant System
(ISA) 0x0000005B (91)		Microsoft ACPI-Compliant System
(ISA) 0x0000005C (92)		Microsoft ACPI-Compliant System
(ISA) 0x0000005D (93)		Microsoft ACPI-Compliant System
(ISA) 0x0000005E (94)		Microsoft ACPI-Compliant System
(ISA) 0x0000005F (95)		Microsoft ACPI-Compliant System
(ISA) 0x00000060 (96)		Microsoft ACPI-Compliant System
(ISA) 0x00000061 (97)		Microsoft ACPI-Compliant System
(ISA) 0x00000062 (98)		Microsoft ACPI-Compliant System
(ISA) 0x00000063 (99)		Microsoft ACPI-Compliant System
(ISA) 0x00000064 (100)		Microsoft ACPI-Compliant System
(ISA) 0x00000065 (101)		Microsoft ACPI-Compliant System
(ISA) 0x00000066 (102)		Microsoft ACPI-Compliant System
(ISA) 0x00000067 (103)		Microsoft ACPI-Compliant System
(ISA) 0x00000068 (104)		Microsoft ACPI-Compliant System
(ISA) 0x00000069 (105)		Microsoft ACPI-Compliant System
(ISA) 0x0000006A (106)		Microsoft ACPI-Compliant System
(ISA) 0x0000006B (107)		Microsoft ACPI-Compliant System
(ISA) 0x0000006C (108)		Microsoft ACPI-Compliant System
(ISA) 0x0000006D (109)		Microsoft ACPI-Compliant System
(ISA) 0x0000006E (110)		Microsoft ACPI-Compliant System
(ISA) 0x0000006F (111)		Microsoft ACPI-Compliant System
(ISA) 0x00000070 (112)		Microsoft ACPI-Compliant System
(ISA) 0x00000071 (113)		Microsoft ACPI-Compliant System
(ISA) 0x00000072 (114)		Microsoft ACPI-Compliant System
(ISA) 0x00000073 (115)		Microsoft ACPI-Compliant System
(ISA) 0x00000074 (116)		Microsoft ACPI-Compliant System
(ISA) 0x00000075 (117)		Microsoft ACPI-Compliant System
(ISA) 0x00000076 (118)		Microsoft ACPI-Compliant System
(ISA) 0x00000077 (119)		Microsoft ACPI-Compliant System
(ISA) 0x00000078 (120)		Microsoft ACPI-Compliant System
(ISA) 0x00000079 (121)		Microsoft ACPI-Compliant System
(ISA) 0x0000007A (122)		Microsoft ACPI-Compliant System
(ISA) 0x0000007B (123)		Microsoft ACPI-Compliant System
(ISA) 0x0000007C (124)		Microsoft ACPI-Compliant System

...		(ISA) 0x0000007D (125)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000007E (126)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000007F (127)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000080 (128)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000081 (129)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000082 (130)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000083 (131)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000084 (132)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000085 (133)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000086 (134)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000087 (135)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000088 (136)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000089 (137)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000008A (138)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000008B (139)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000008C (140)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000008D (141)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000008E (142)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000008F (143)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000090 (144)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000091 (145)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000092 (146)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000093 (147)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000094 (148)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000095 (149)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000096 (150)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000097 (151)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000098 (152)	Microsoft ACPI-Compliant System
...		(ISA) 0x00000099 (153)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000009A (154)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000009B (155)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000009C (156)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000009D (157)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000009E (158)	Microsoft ACPI-Compliant System
...		(ISA) 0x0000009F (159)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000A0 (160)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000A1 (161)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000A2 (162)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000A3 (163)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000A4 (164)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000A5 (165)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000A6 (166)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000A7 (167)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000A8 (168)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000A9 (169)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000AA (170)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000AB (171)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000AC (172)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000AD (173)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000AE (174)	Microsoft ACPI-Compliant System
...		(ISA) 0x000000AF (175)	Microsoft ACPI-Compliant System

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	(ISA) 0x000000B0 (176)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B1 (177)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B2 (178)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B3 (179)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B4 (180)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B5 (181)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B6 (182)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B7 (183)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B8 (184)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B9 (185)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BA (186)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BB (187)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BC (188)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BD (189)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BE (190)	Microsoft ACPI-Compliant System
	(PCI) 0x00000005 (05)	Intel(R) 8 Series/C220 Series SMBus Controller - 8C22
	(PCI) 0x00000010 (16)	High Definition Audio Controller
	(PCI) 0x00000010 (16)	Intel(R) 8 Series/C220 Series USB Enhanced Host Controller #2 - 8C2D
	(PCI) 0x00000010 (16)	Intel(R) Management Engine Interface
	(PCI) 0x00000013 (19)	Intel(R) 8 Series/C220 Series SATA AHCI Controller - 8C02
	(PCI) 0x00000016 (22)	High Definition Audio Controller
	(PCI) 0x00000017 (23)	Intel(R) 8 Series/C220 Series USB Enhanced Host Controller #1 - 8C26
	(PCI) 0xFFFFFFF4 (-12)	Intel(R) I210 Gigabit Network Connection
	(PCI) 0xFFFFFFF5 (-11)	Intel(R) I210 Gigabit Network Connection
	(PCI) 0xFFFFFFF6 (-10)	Intel(R) I210 Gigabit Network Connection
	(PCI) 0xFFFFFFF7 (-9)	Intel(R) I210 Gigabit Network Connection
	(PCI) 0xFFFFFFF8 (-8)	Intel(R) I210 Gigabit Network Connection
	(PCI) 0xFFFFFFF9 (-7)	Intel(R) I210 Gigabit Network Connection
	(PCI) 0xFFFFFFFA (-6)	Intel(R) Ethernet Connection I217-LM
	(PCI) 0xFFFFFFF8 (-5)	Intel(R) USB 3.0 eXtensible Host Controller
	(PCI) 0xFFFFFFFC (-4)	Intel(R) HD Graphics
	(PCI) 0xFFFFFFF3 (-3)	Intel(R) 8 Series/C220 Series PCI Express Root Port #5 - 8C18
	(PCI) 0xFFFFFFF2 (-2)	Intel(R) 8 Series/C220 Series PCI Express Root Port #1 - 8C10

4.6 Memory Map

The memory mapping list is shown as follows:

Address Range	Device Name
[0000000000A0000 - 0000000000BFFFF]	Intel(R) HD Graphics 4600
[0000000000A0000 - 0000000000BFFFF]	PCI bus
[0000000000D0000 - 0000000000D3FFF]	PCI bus
[0000000000D4000 - 0000000000D7FFF]	PCI bus
[0000000000D8000 - 0000000000DBFFF]	PCI bus
[0000000000DC000 - 0000000000DFFFF]	PCI bus
[0000000000E0000 - 0000000000E3FFF]	PCI bus
[0000000000E4000 - 0000000000E7FFF]	PCI bus
[00000000DF20000 - 00000000FEAFFFF]	PCI bus
[00000000E000000 - 00000000EFFFFFF]	Intel(R) HD Graphics 4600
[00000000F780000 - 00000000F7BFFFF]	Intel(R) HD Graphics 4600
[00000000F7C0000 - 00000000F7CFFFF]	Intel(R) I210 Gigabit Network Connection
[00000000F7C0000 - 00000000F7DFFFF]	Intel(R) 8 Series/C220 Series PCI Express Root Port #5 - 8C18
[00000000F7D0000 - 00000000F7D03FF]	Intel(R) I210 Gigabit Network Connection
[00000000F7E0000 - 00000000F7E1FFF]	PCI Express standard Upstream Switch Port
[00000000F7E0000 - 00000000F7EFFFF]	Intel(R) 8 Series/C220 Series PCI Express Root Port #4 - 8C16
[00000000F7F0000 - 00000000F7F1FFF]	Intel(R) Ethernet Connection I217-LM
[00000000F7F2000 - 00000000F7F2FFF]	Intel(R) USB 3.0 eXtensible Host Controller
[00000000F7F3000 - 00000000F7F33FF]	High Definition Audio Controller
[00000000F7F3400 - 00000000F7F37FF]	High Definition Audio Controller
[00000000F7F3900 - 00000000F7F39FF]	Intel(R) 8 Series/C220 Series SMBus Controller - 8C22
[00000000F7F3A00 - 00000000F7F3A7F]	Intel(R) 8 Series/C220 Series SATA AHCI Controller - 8C02
[00000000F7F3B00 - 00000000F7F3B3F]	Intel(R) 8 Series/C220 Series USB Enhanced Host Controller #1 - 8C26
[00000000F7F3C00 - 00000000F7F3C3F]	Intel(R) 8 Series/C220 Series USB Enhanced Host Controller #2 - 8C2D
[00000000F7F3D00 - 00000000F7F3DFF]	Intel(R) Ethernet Connection I217-LM
[00000000F7F3E00 - 00000000F7F3EFF]	Intel(R) Active Management Technology - SOL (COM6)
[00000000F7F4000 - 00000000F7F400F]	Intel(R) Management Engine Interface
[00000000F7FEF00 - 00000000F7FEFFF]	Motherboard resources
[00000000F7FF000 - 00000000F7FF0FF]	Motherboard resources
[00000000F800000 - 00000000FBFFFFFF]	Motherboard resources
[00000000FED0000 - 00000000FED003F]	High precision event timer
[00000000FED1000 - 00000000FED17FF]	Motherboard resources
[00000000FED1800 - 00000000FED18FF]	Motherboard resources
[00000000FED1900 - 00000000FED19FF]	Motherboard resources
[00000000FED1C00 - 00000000FED1FFFF]	Motherboard resources
[00000000FED2000 - 00000000FED3FFF]	Motherboard resources
[00000000FED4000 - 00000000FED44FF]	Infineon Trusted Platform Module
[00000000FED4500 - 00000000FED8FFF]	Motherboard resources
[00000000FED9000 - 00000000FED93FF]	Motherboard resources
[00000000FEE0000 - 00000000FEEFFFF]	Motherboard resources
[00000000FF00000 - 00000000FFFFFFF]	Intel(R) 82802 Firmware Hub Device
[00000000FF00000 - 00000000FFFFFFF]	Motherboard resources

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Section 5

AMI BIOS Setup Utility

The AMI UEFI BIOS provides users with a built-in setup program to modify basic system configuration. All configured parameters are stored in a flash chip to save the setup information whenever the power is turned off. This chapter provides users with detailed description about how to set up basic system configuration through the AMI BIOS setup utility.

5.1 Starting

To enter the setup screens, follow the steps below:

1. Turn on the computer and press during the Power On Self Test (POST) to enter BIOS setup, otherwise, POST will continue with its test routines.
2. Once you enter the BIOS, the main BIOS setup menu displays. You can access the other setup screens from the main BIOS setup menu, such as the Advanced and Chipset menus.



Note: *If your computer cannot boot after making and saving system changes with BIOS setup, you can restore BIOS optimal defaults by setting JP1 (see section 2.3.1).*

It is strongly recommended that you should avoid changing the chipset's defaults. Both AMI and your system manufacturer have carefully set up these defaults that provide the best performance and reliability.

5.2 Navigation Keys

The BIOS setup/utility uses a key-based navigation system called hot keys. Most of the BIOS setup utility hot keys can be used at any time during the setup navigation process. These keys include <F1>, <F2>, <Enter>, <ESC>, <Arrow> keys, and so on.



Note: *Some of the navigation keys differ from one screen to another.*

Hot Keys	Description
→← Left/Right	The Left and Right <Arrow> keys allow you to select a setup screen.
↑↓ Up/Down	The Up and Down <Arrow> keys allow you to select a setup screen or sub screen.
Enter	The <Enter> key allows you to display or change the setup option listed for a particular setup item. The <Enter> key can also allow you to display the setup sub screens.
+– Plus/Minus	The Plus and Minus <Arrow> keys allow you to change the field value of a particular setup item.
F1	The <F1> key allows you to display the General Help screen.
F2	The <F2> key allows you to Load Previous Values.
F3	The <F3> key allows you to Load Optimized Defaults.
F4	The <F4> key allows you to save any changes you have made and exit Setup. Press the <F4> key to save your changes.
Esc	The <Esc> key allows you to discard any changes you have made and exit the Setup. Press the <Esc> key to exit the setup without saving your changes.

5.3 Main Menu

When you first enter the setup utility, you will enter the Main setup screen. You can always return to the Main setup screen by selecting the Main tab. System Time/Date can be set up as described below. The Main BIOS setup screen is shown below.



BIOS Information

Display the BIOS information.

System Date/Time

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

Access Level

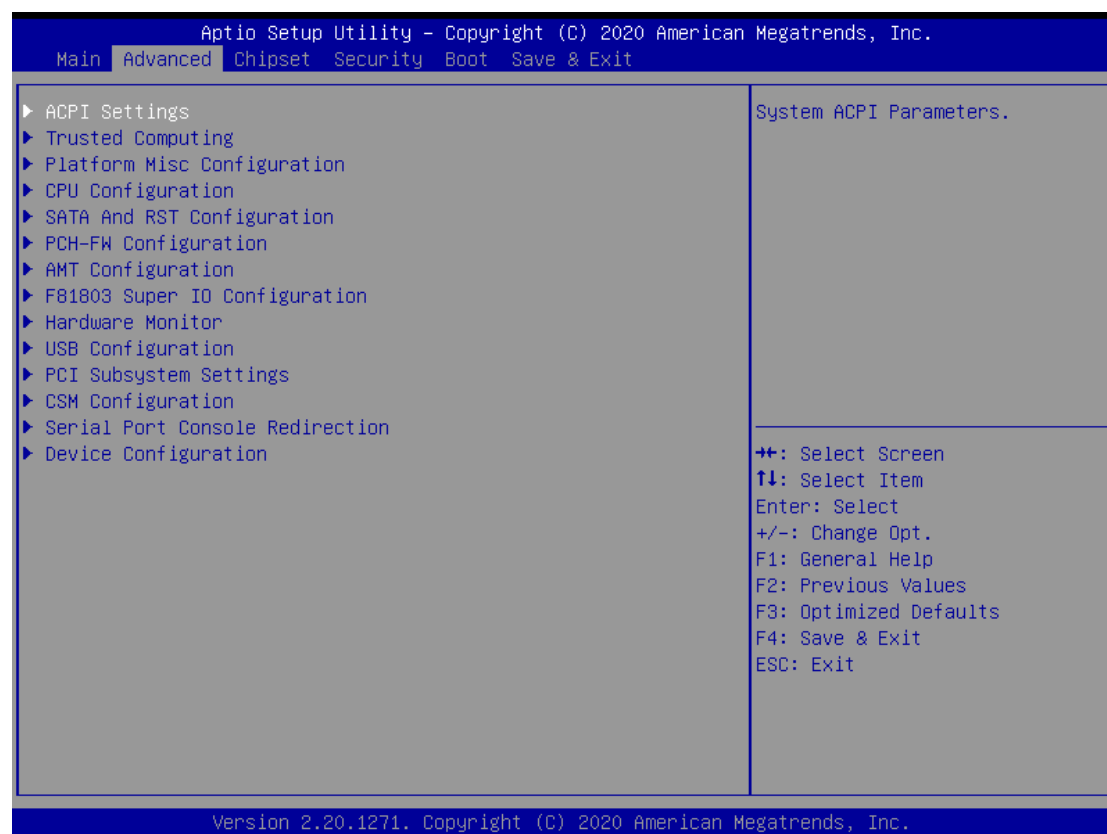
Display the access level of current user. Display the access level of current user.

5.4 Advanced Menu

The Advanced menu also allows users to set configuration of the CPU and other system devices. You can select any of the items in the left frame of the screen to go to the sub menus:

- ▶ ACPI Settings
- ▶ Trusted Computing
- ▶ Platform Misc Configuration
- ▶ CPU Configuration
- ▶ SATA And RST Configuration
- ▶ PCH-FW configuration
- ▶ AMT Configuration
- ▶ F81803 Super IO Configuration
- ▶ Hardware Monitor
- ▶ USB Configuration
- ▶ PCI Subsystem Settings
- ▶ CSM Configuration
- ▶ Serial Port Configuration
- ▶ Device Configuration

For items marked with “▶”, please press <Enter> for more options.



➤ **ACPI Settings**

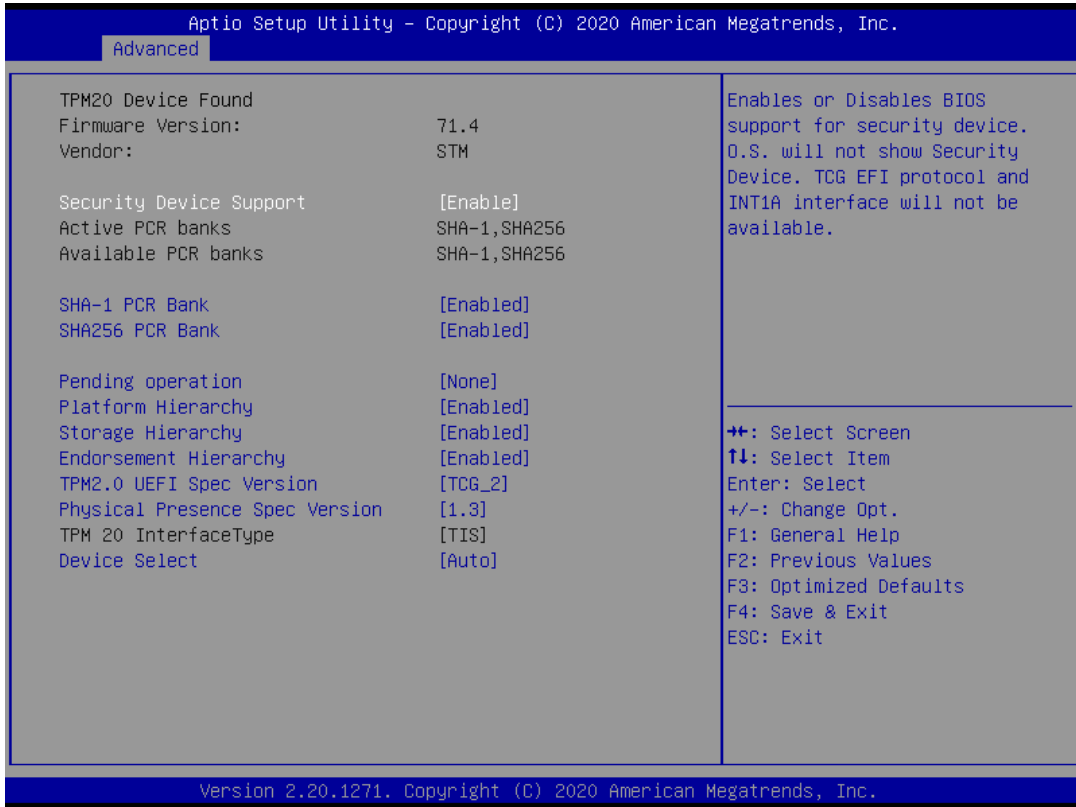


ACPI Sleep State

Select the ACPI (Advanced Configuration and Power Interface) sleep state. Configuration options are Suspend Disabled and S3 (Suspend to RAM). The default is S3 (Suspend to RAM); this option selects ACPI sleep state the system will enter when suspend button is pressed.

➤ **Trusted Computing**

This screen provides function for specifying the Trusted Computing.



Security Device Support

Enable or disable BIOS support for the security device. The default setting is Disabled.

TPM State

Once the Security Device Support is enabled, TPM (Trusted Platform Module) can be used by the operating system.

Current Status Information

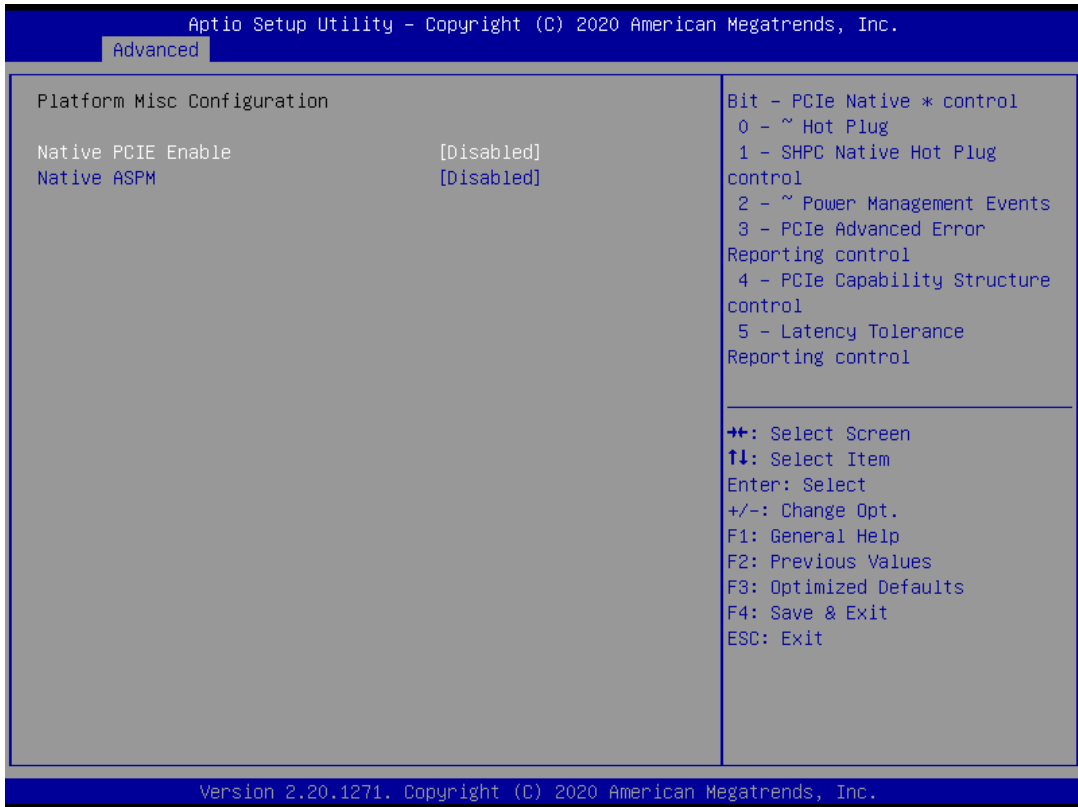
Display current TPM status information.

Pending Operation

Schedule a TPM operation which will take effect at the next bootup process.

➤ **Platform Misc Configuration**

This screen allows you to set Platform Mics Configuration.



Native PCIE Enable

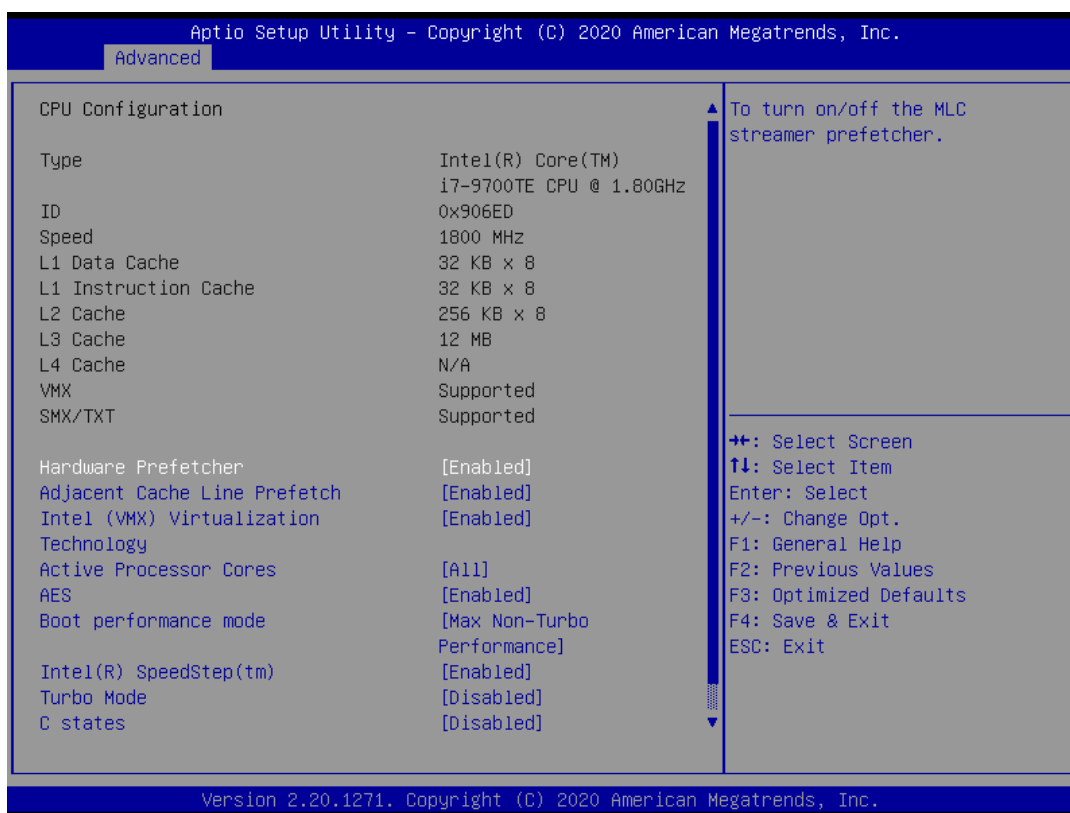
Bit - PCIe Native * control\n 0 - ~ Hot Plug\n 1 - SHPC Native Hot Plug control\n 2 - ~ Power Management Events\n 3 - PCIe Advanced Error Reporting control\n 4 - PCIe Capability Structure control\n 5 - Latency Tolerance Reporting control.

Native ASPM

Enabled - OS Controlled ASPM, Disabled - BIOS Controlled ASPM.

➤ **CPU Configuration**

This screen shows CPU information, and you can change the value of the selected option.

**Hyper-threading**

Enable or disable Hyper-threading Technology, which allows a single physical processor to multitask as multiple logical processors. When disabled, only one thread per enabled core is enabled.

Intel Virtualization Technology

Enable or disable Intel Virtualization Technology. When enabled, a VMM (Virtual Machine Mode) can utilize the additional hardware capabilities. It allows a platform to run multiple operating systems and applications independently, hence enabling a single computer system to work as several virtual systems.

Hardware Prefetcher

To turn on/off the MLC streamer prefetcher.

Adjacent Cache Line Prefetch

To turn on/off prefetching of adjacent cache lines.

Active Processor Cores

Number of cores to enable in each processor package.

AES

Enabled / Disable AES (Advanced Encryption Standard)

Boot performance mode

Select the performance state that the BIOS will set starting from reset vector.

Intel (R) SpeedStep(tm)

Allows more than two frequency ranges to be supported.

Turbo Mode

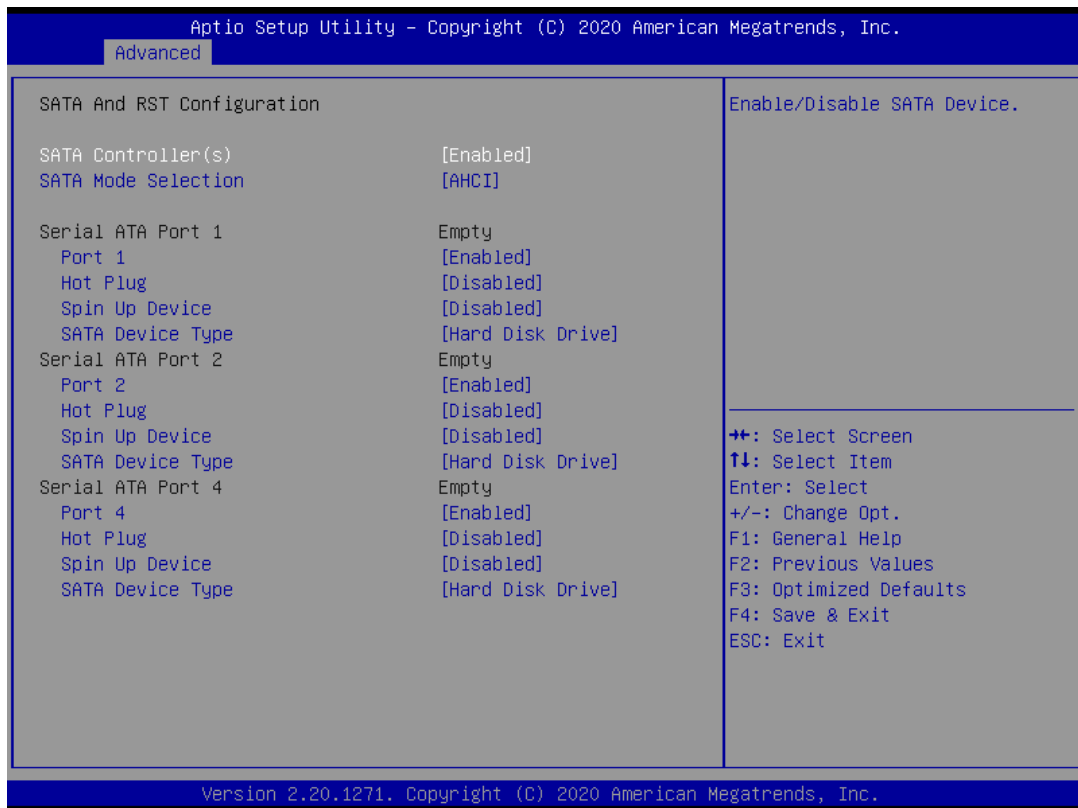
Enable/Disable processor Turbo Mode (requires EMTTM enabled too). AUTO means enabled, unless max turbo ratio is bigger than 16 - SKL A0 W/A.

C states

Enable/Disable CPU Power Management. Allows CPU to go to C states when it's not 100% utilized.

➤ SATA And RST Configuration

During system boot up, the BIOS automatically detects the presence of SATA devices. In the SATA Configuration menu, you can see the currently installed hardware in the SATA ports.



SATA Controller(s)

Enable or disable the SATA Controller feature. The default is Enabled.

SATA Mode Selection

Determine how SATA controller(s) operate. Operation mode options are RAID and AHCI (Advanced Host Controller Interface) Mode. The default is AHCI Mode.

SATA Controller Speed

Indicates the maximum speed the SATA controller can support.

Hot Plug

Designates this port as Hot Pluggable.

Spin Up Device

If enabled for any of ports Staggered Spin Up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise all drives spin up at boot..

SATA Device Type

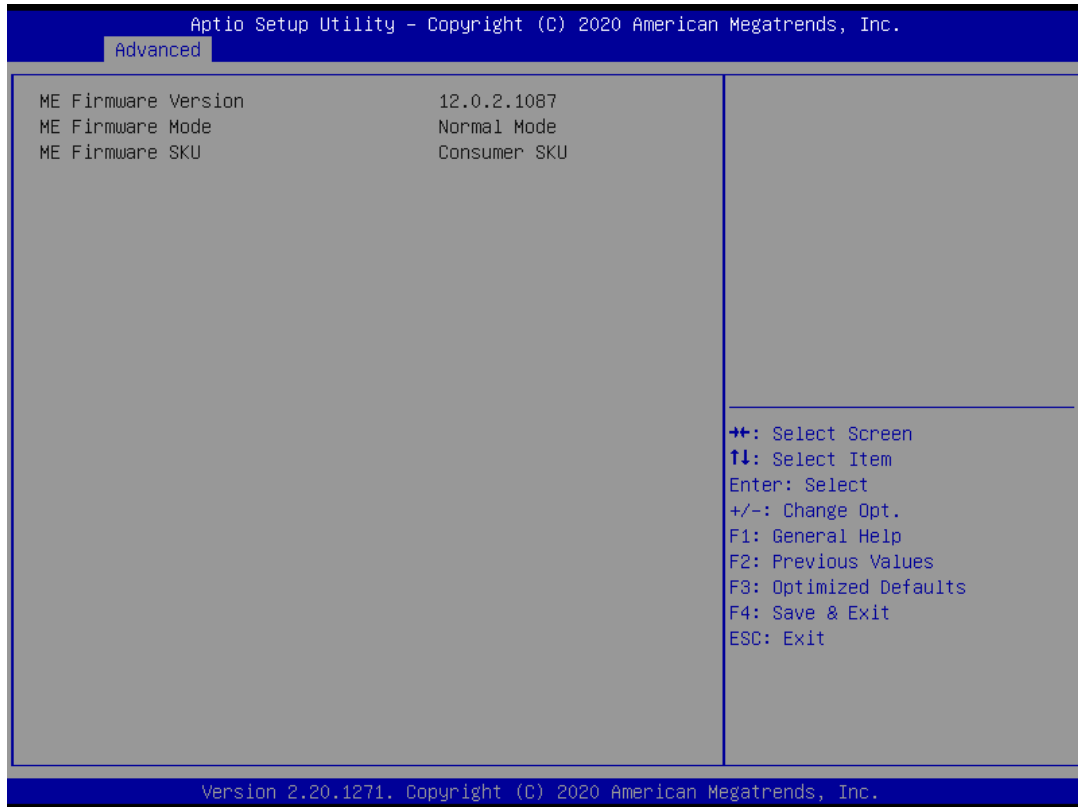
Identify the SATA port is connected to Solid State Drive or Hard Disk Drive



Note: Serial ATA Port 4 is M.2 device.

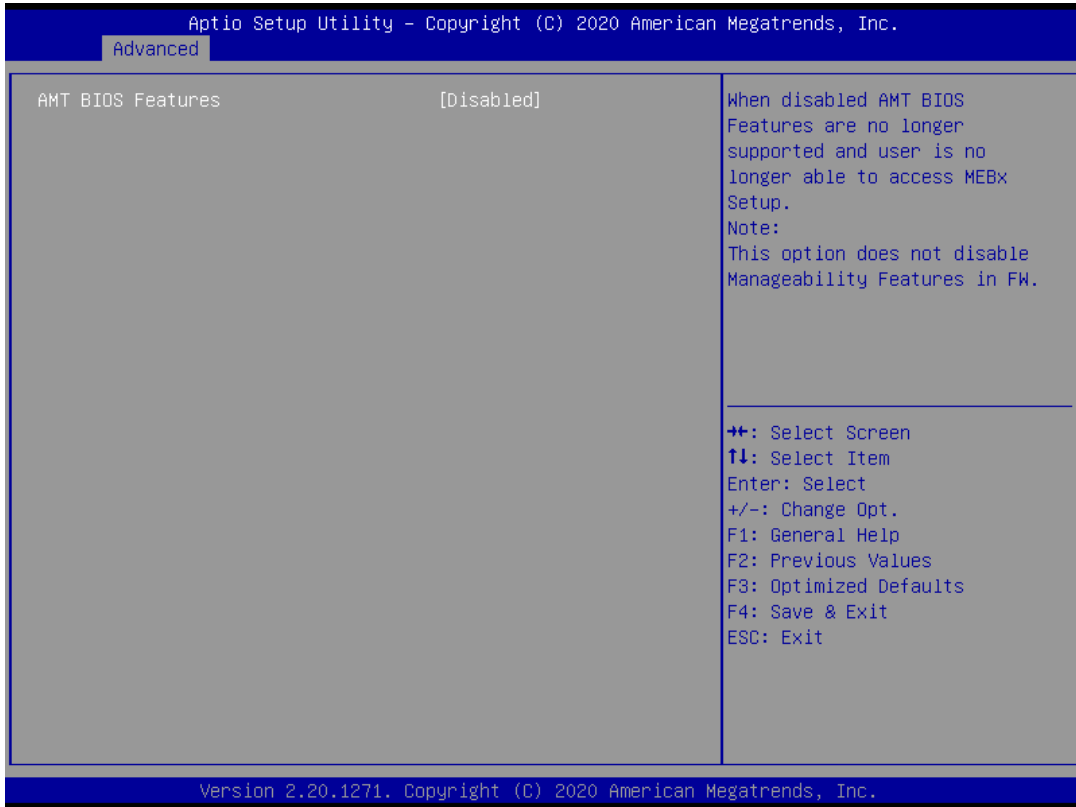
➤ **PCH-FW Configuration**

This screen displays ME Firmware information.



➤ **AMT Configuration**

Use this screen to configure AMT parameters.

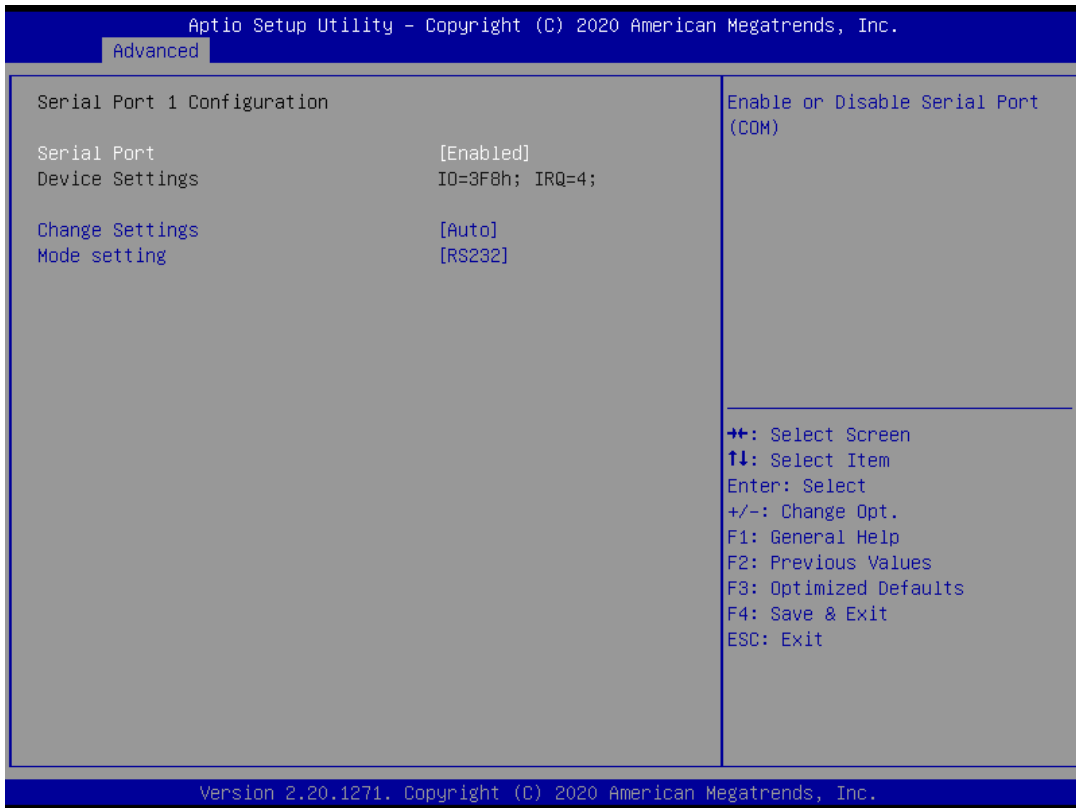


AMT BIOS Features

Enable or disable Active Management Technology BIOS features. The default is Enabled.

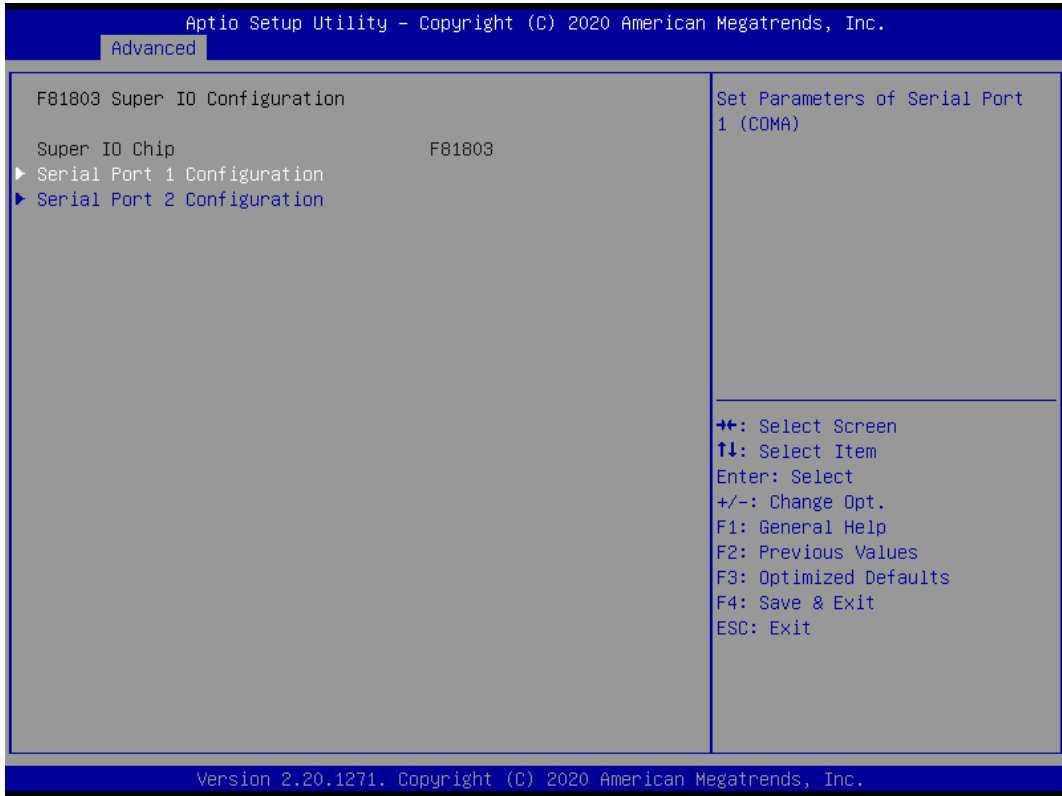
➤ **F81803 Super IO Configuration**

You can use this screen to select options for the Super IO Configuration, and change the value of the selected option. A description of the selected item appears on the right side of the screen. For items marked with “▶”, please press <Enter> for more options.



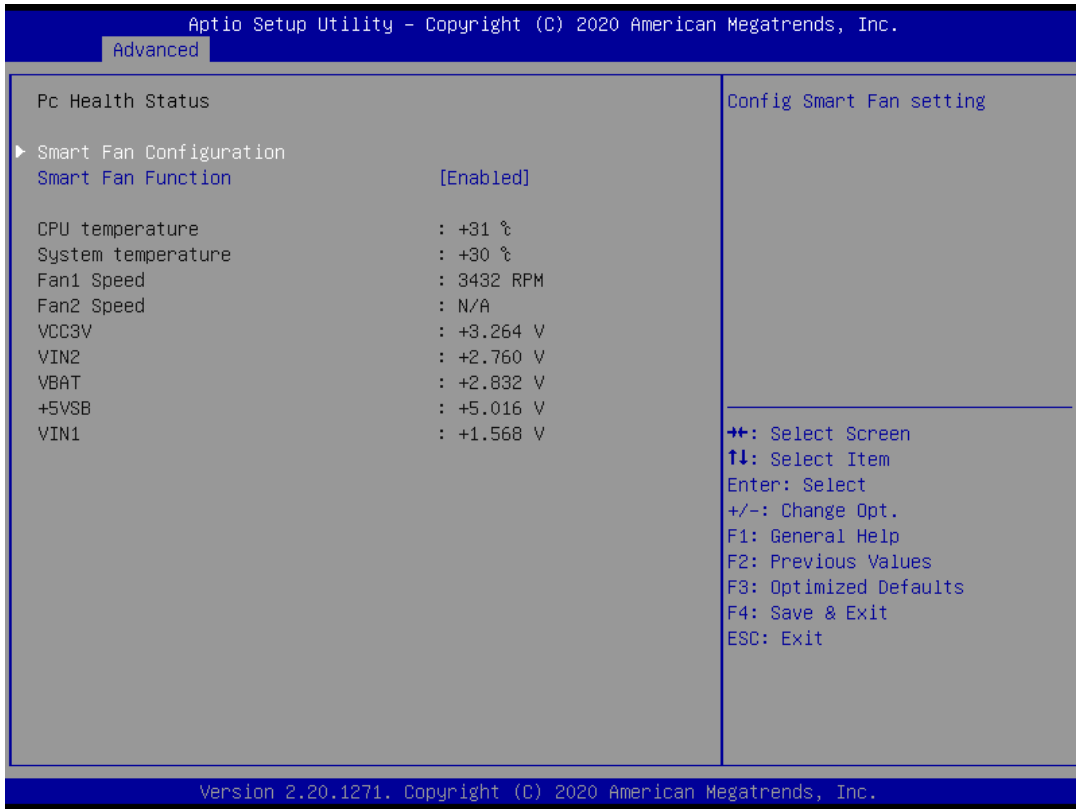
➤ **Serial Port 1~2 Configuration**

Use these items to set parameters related to serial port 1~2.

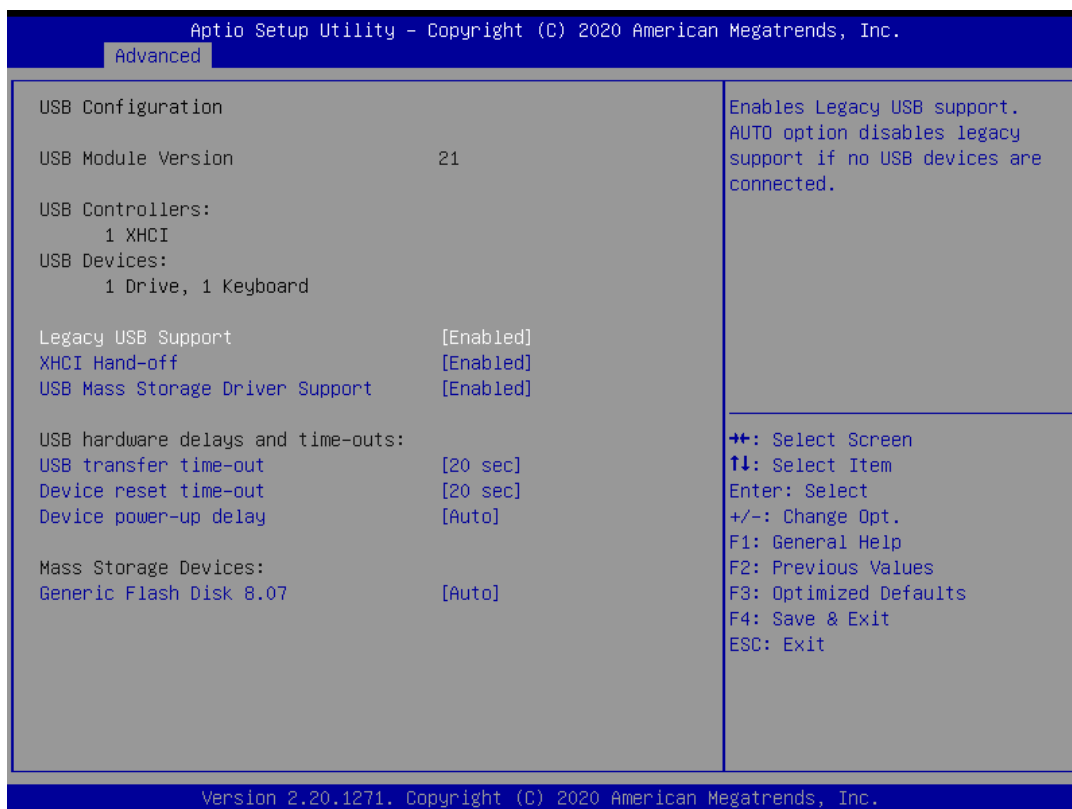


➤ **Hardware Monitor**

This screen monitors hardware health status.



This screen displays the temperature of system and CPU, cooling fans speed in RPM and system voltages (VCC_CPU, DDR, +12V, +5V and +3.3V).

➤ **USB Configuration****USB Devices**

Display all detected USB devices.

Legacy USB Support

Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected.

XHCI Hand-off

This is a workaround for OSES without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.

USB Mass Storage Driver Support

Enable/Disable USB Mass Storage Driver Support.

USB transfer time-out

The time-out value for Control, Bulk, and Interrupt transfers.

Device reset time-out

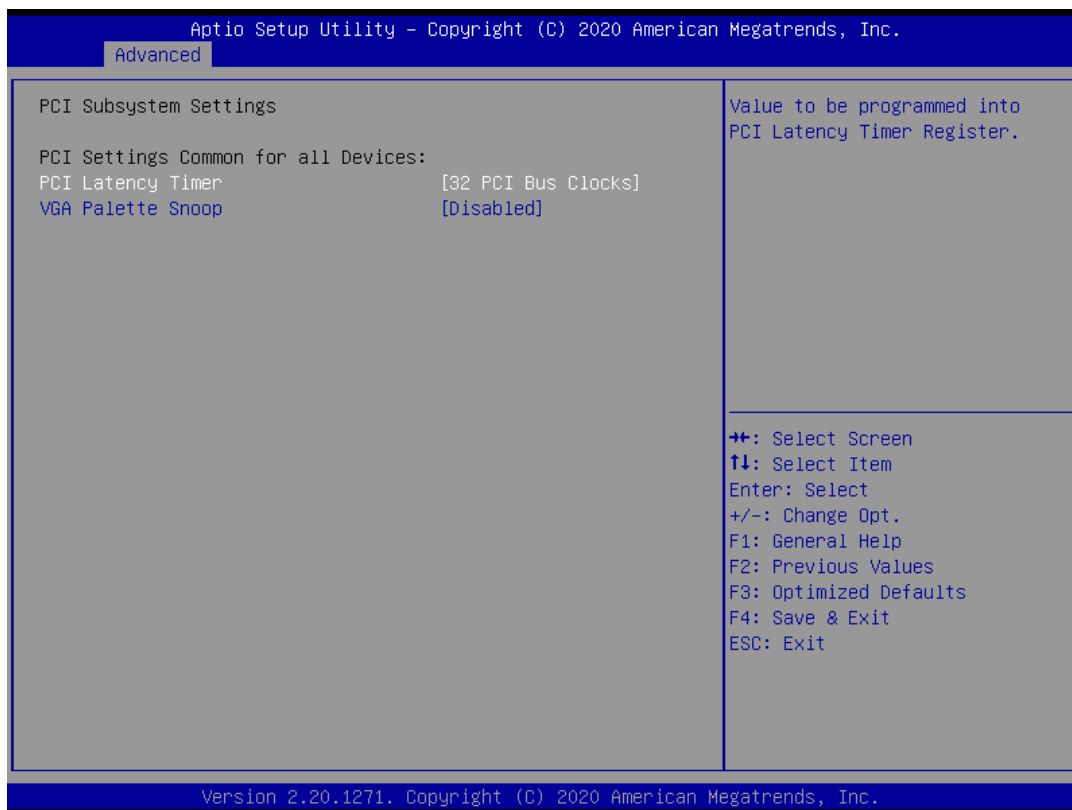
USB mass storage device Start Unit command time-out.

Device power-up delay

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.

➤ **PCI Subsystem settings**

This screen allows you to set PCI Subsystem mode.



PCI Latency Timer

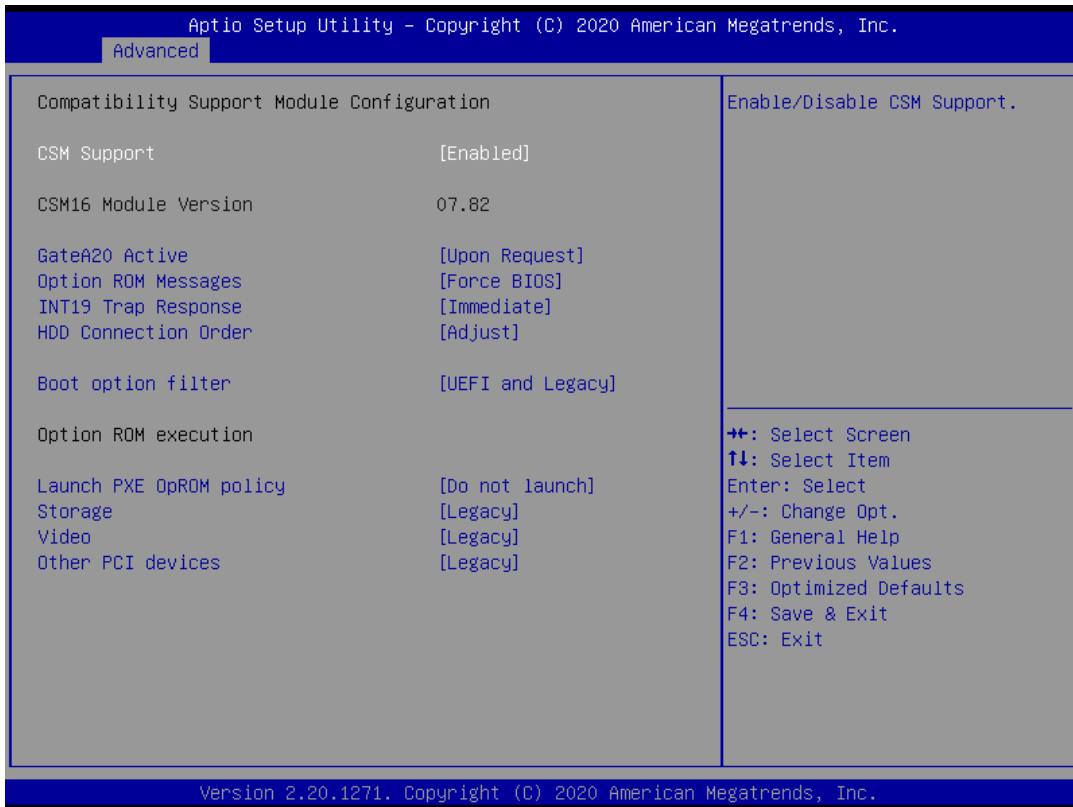
Value to be programmed into PCI Latency Timer Register.

VGA Palette Snoop

Enables or Disables VGA Palette Registers Snooping.

➤ **CSM Configuration**

This screen displays CSM information.



CSM Support

Enabled / Disable CSM Support.

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.

Option ROM Messages

Set display mode for Option ROM.

INT19 Trap Response

BIOS reaction on INT19 trapping by Option ROM: IMMEDIATE - execute the trap right away; POSTPONED - execute the trap during legacy boot.

Boot option filter

This option controls Legacy/UEFI ROMs priority.

Storage

Controls the execution of UEFI and Legacy Storage OpROM

Video

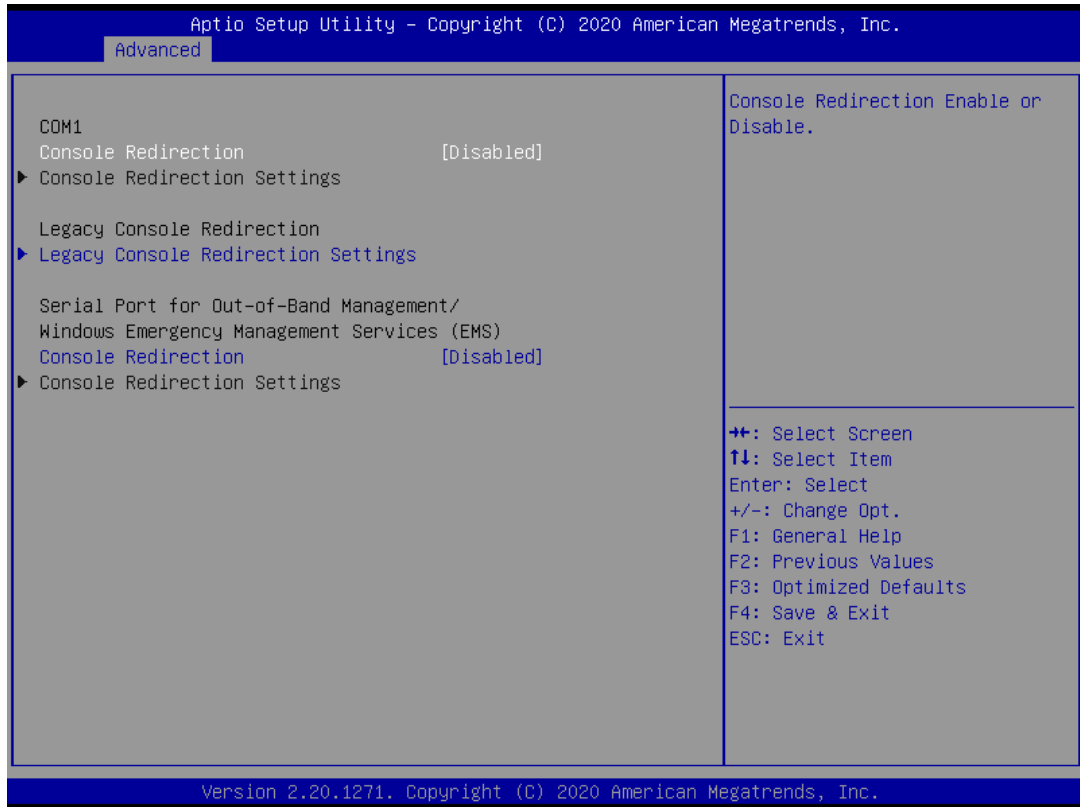
Controls the execution of UEFI and Legacy Video OpROM.

Other PCI devices

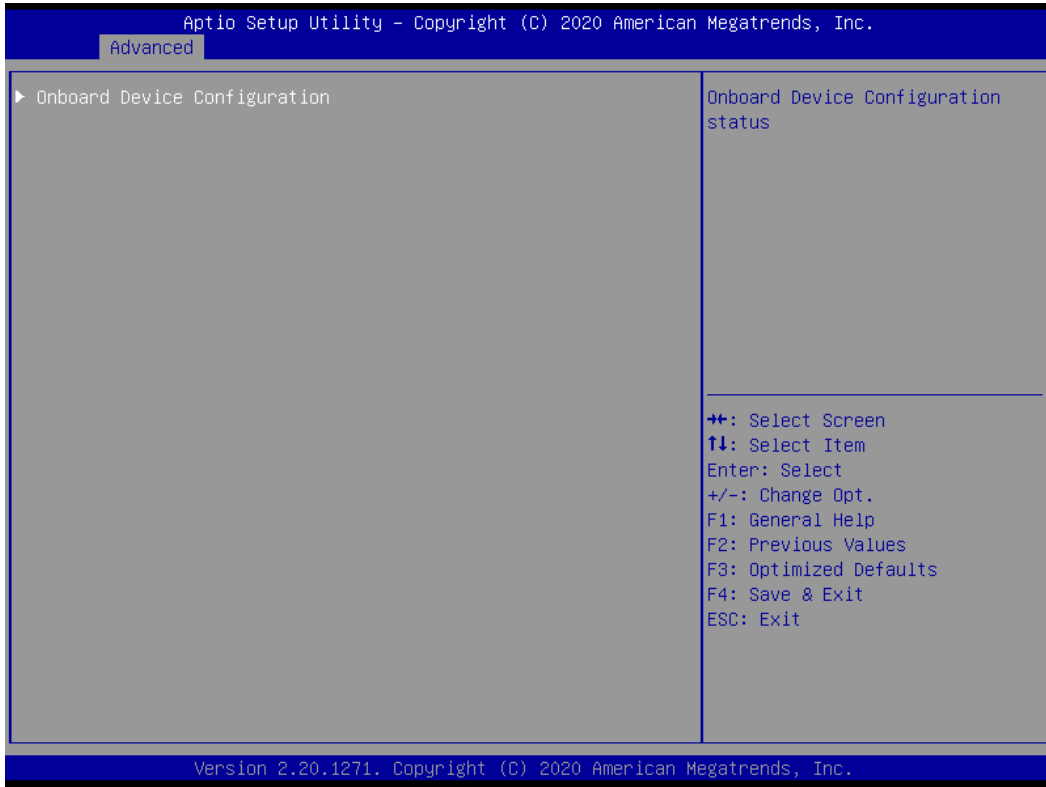
Determines OpROM execution policy for devices other than Network, Storage, or Video.

➤ **Serial Port Configuration**

This screen allows you to set Serial Port Configuration.



➤ **Device Configuration**

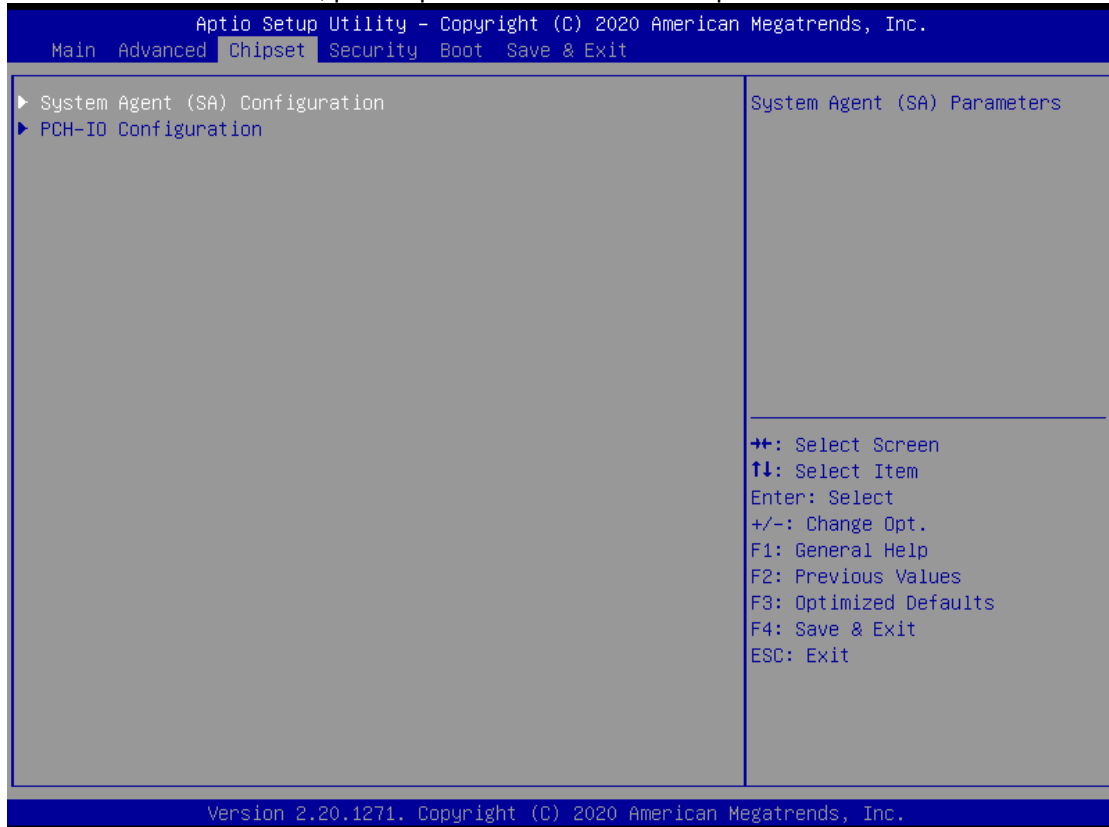


5.5 Chipset Menu

The Chipset menu allows users to change the advanced chipset settings. You can select any of the items in the left frame of the screen to go to the sub menus:

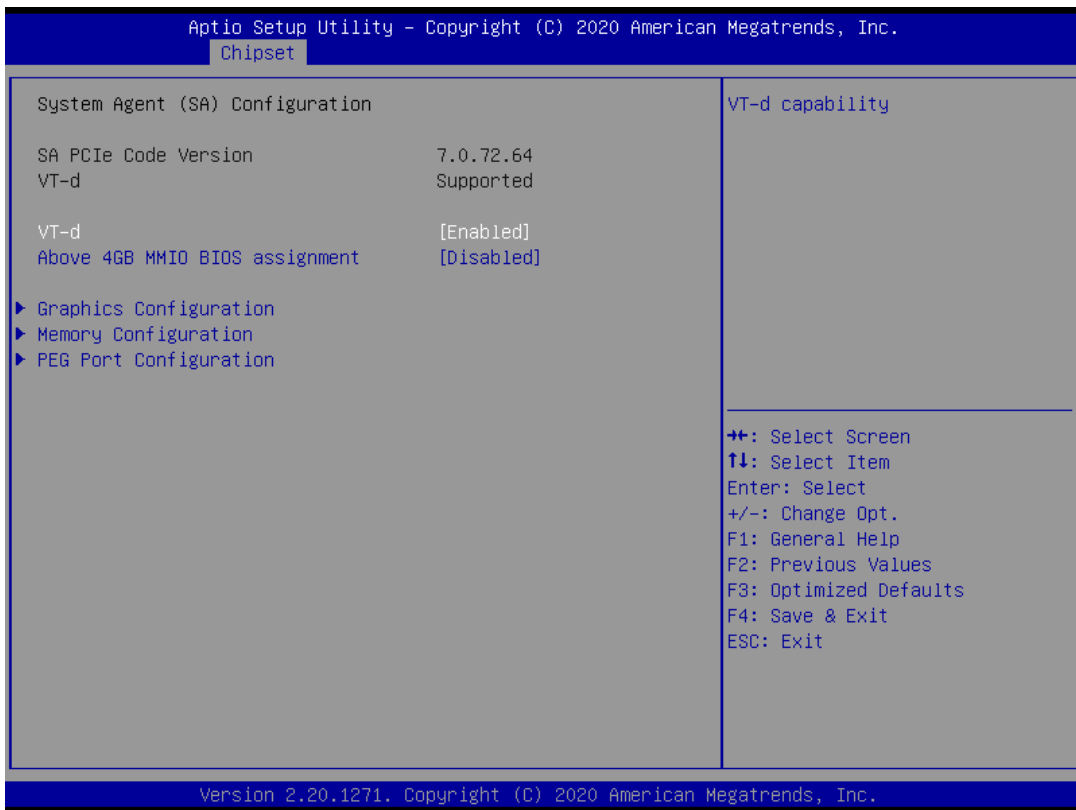
- ▶ System Agent (SA) Configuration
- ▶ PCH-IO Configuration

For items marked with “▶”, please press <Enter> for more options.



➤ **System Agent (SA) Configuration**

This screen allows users to configure System Agent (SA) parameters. For items marked with “▶”, please press <Enter> for more options.



Graphics Configuration

Open sub menu for parameters related to graphics configuration.

Memory Configuration

Open sub menu for information related to system memory.

PEG Port Configuration

Open sub menu for parameters related to graphics configuration.

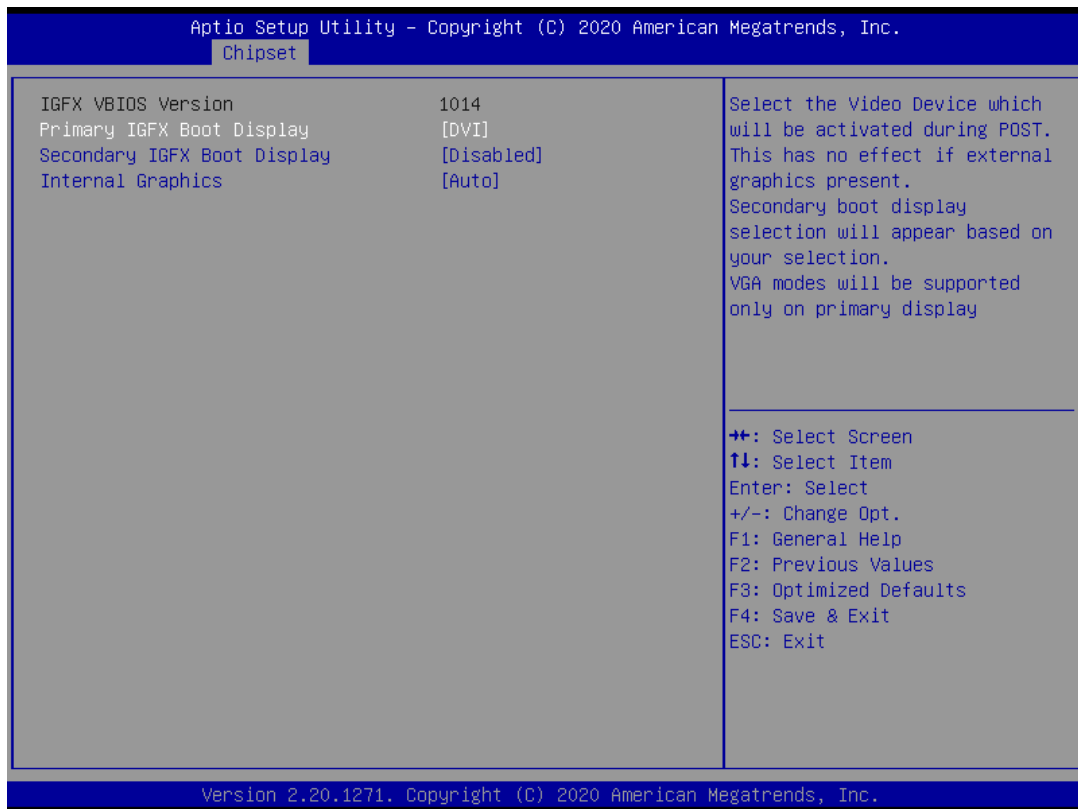
VT-d

VT-d capability.

Above 4GB MMIO BIOS assignment

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

➤ **Graphics Configuration**



Primary IGFX Boot Display

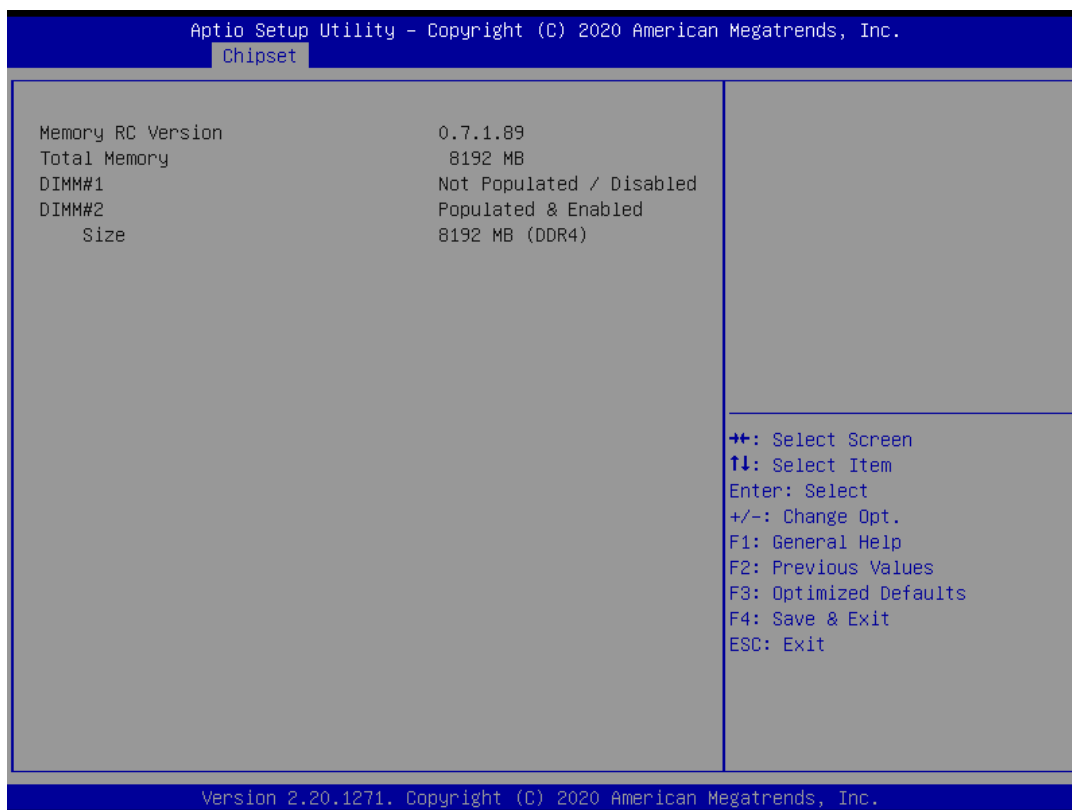
Select the video device which will be activated during POST (Power-On Self Test). The default is Auto.

Internal Graphics

Keep IGFX enabled based on the setup options.

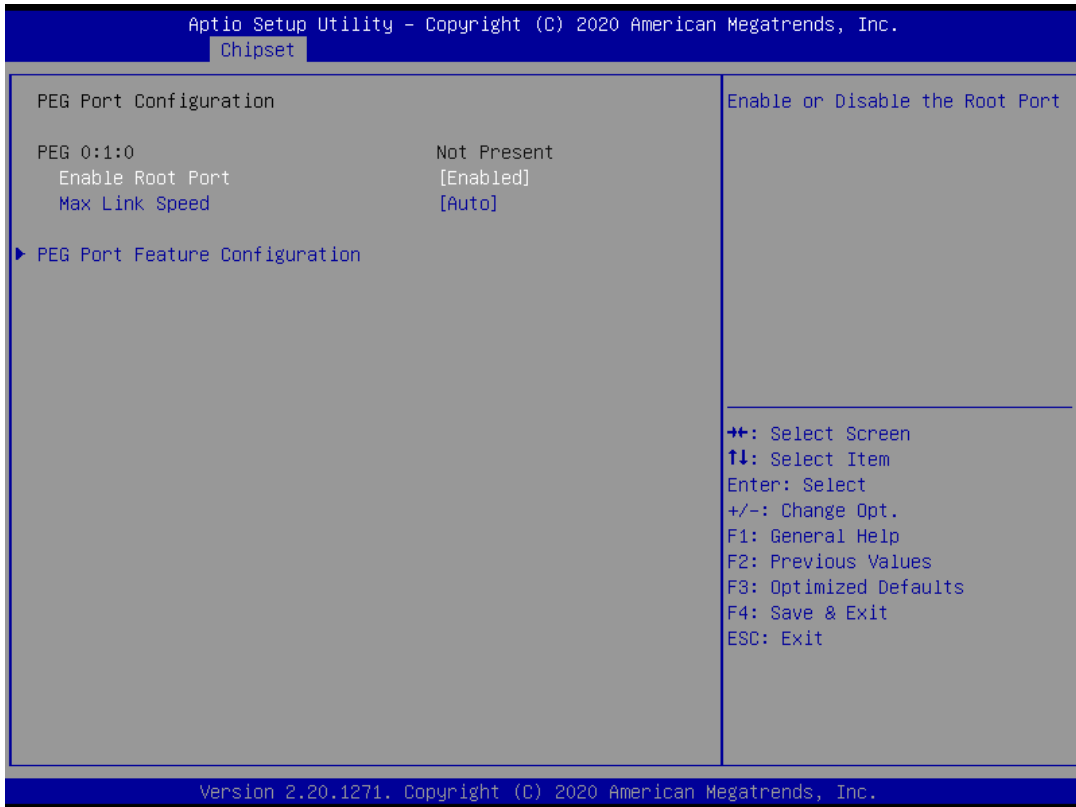
➤ **Memory Configuration**

This screen shows system memory information.



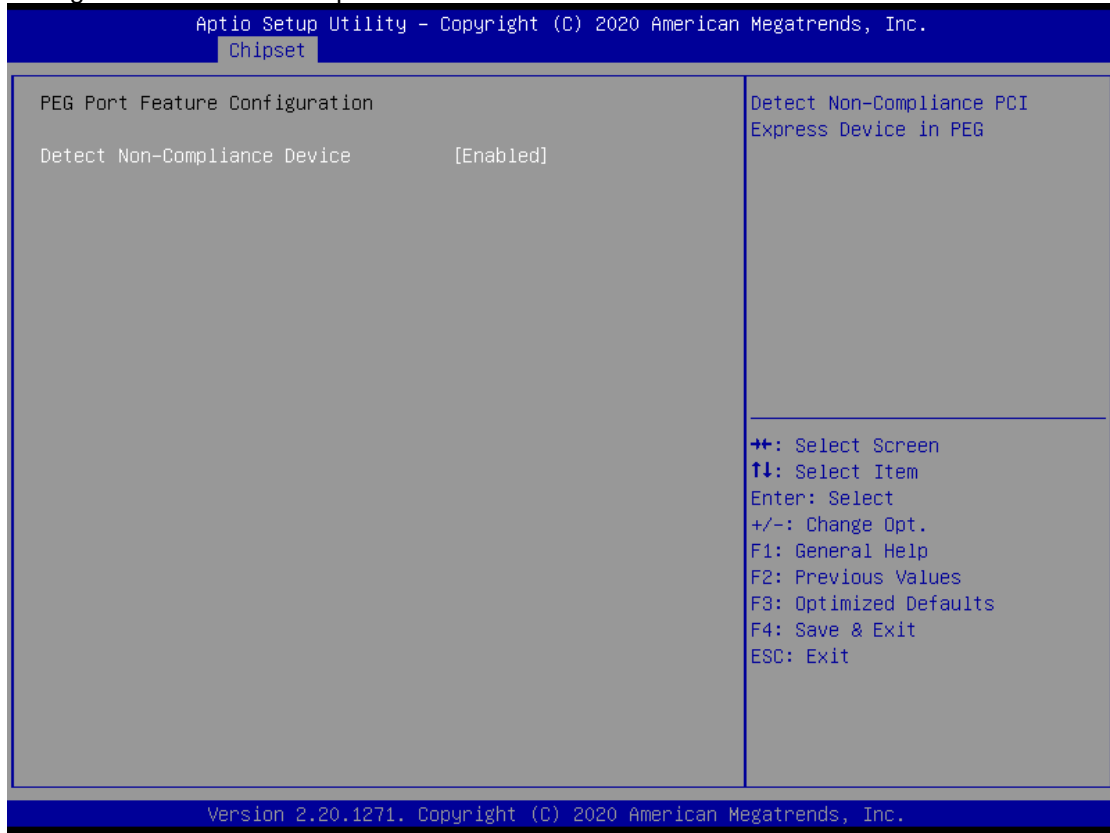
➤ **PEG Port Configuration**

This screen shows PEG Port/POE Port feature information.



Max Link Speed

Configure PEG 0:1:0 Max Speed.

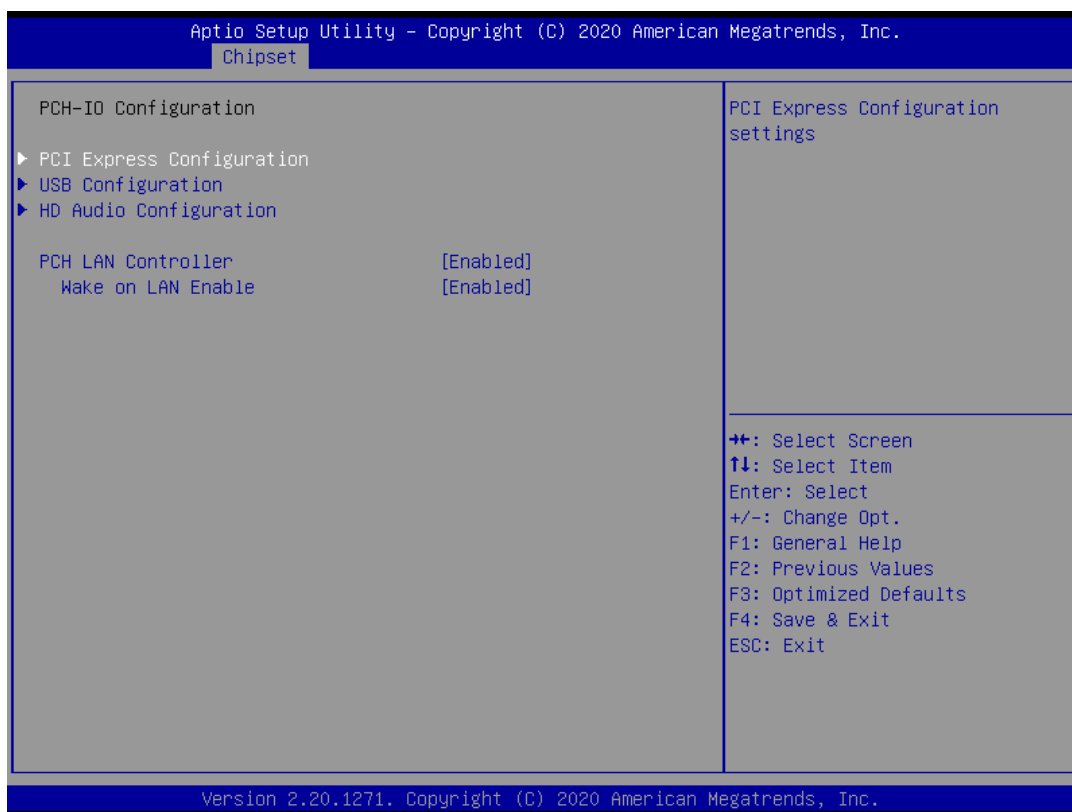


Detect Non-Compliance Device

Detect Non-Compliance PCI Express Device in PEG.

➤ **PCH-IO Configuration**

This screen allows you to set PCH parameters.



PCH LAN Controller

Enable or disable onboard PCH LAN controller.

Wake on LAN Enable

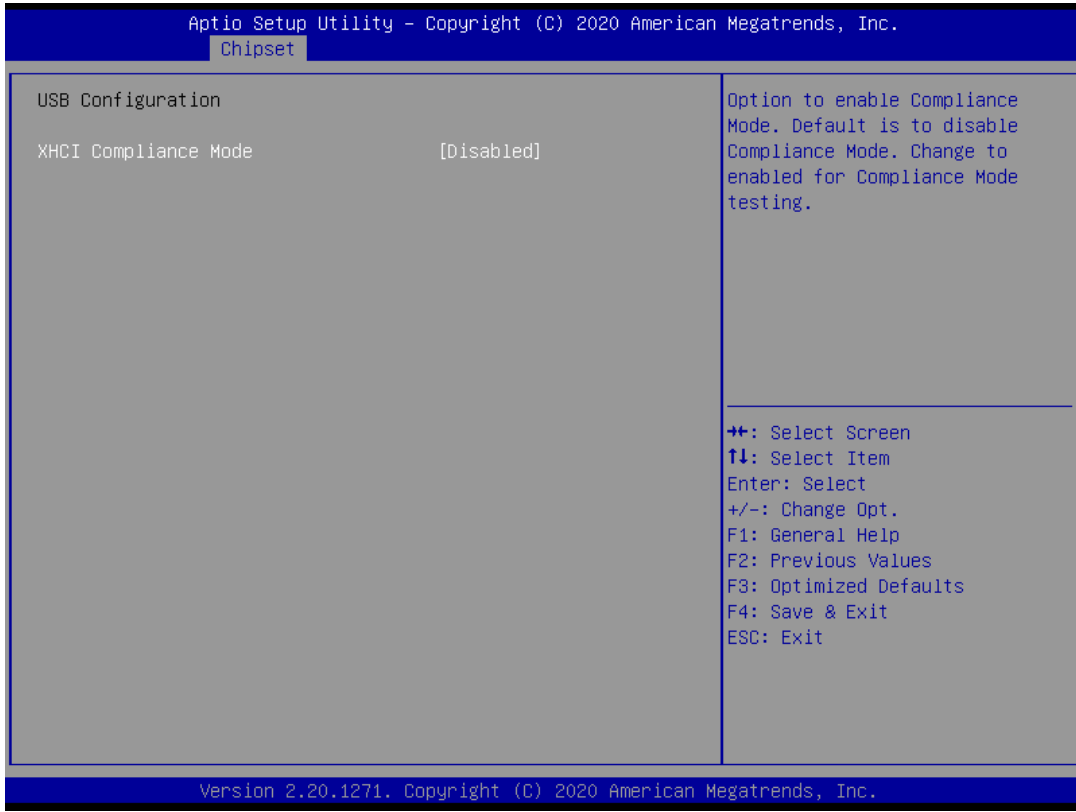
Enable or disable integrated LAN to wake the system.

Restore AC Power Loss

Specify what state to go to when power is re-applied after a power failure (G3 state).

➤ **USB Configuration**

This screen shows USB configuration.

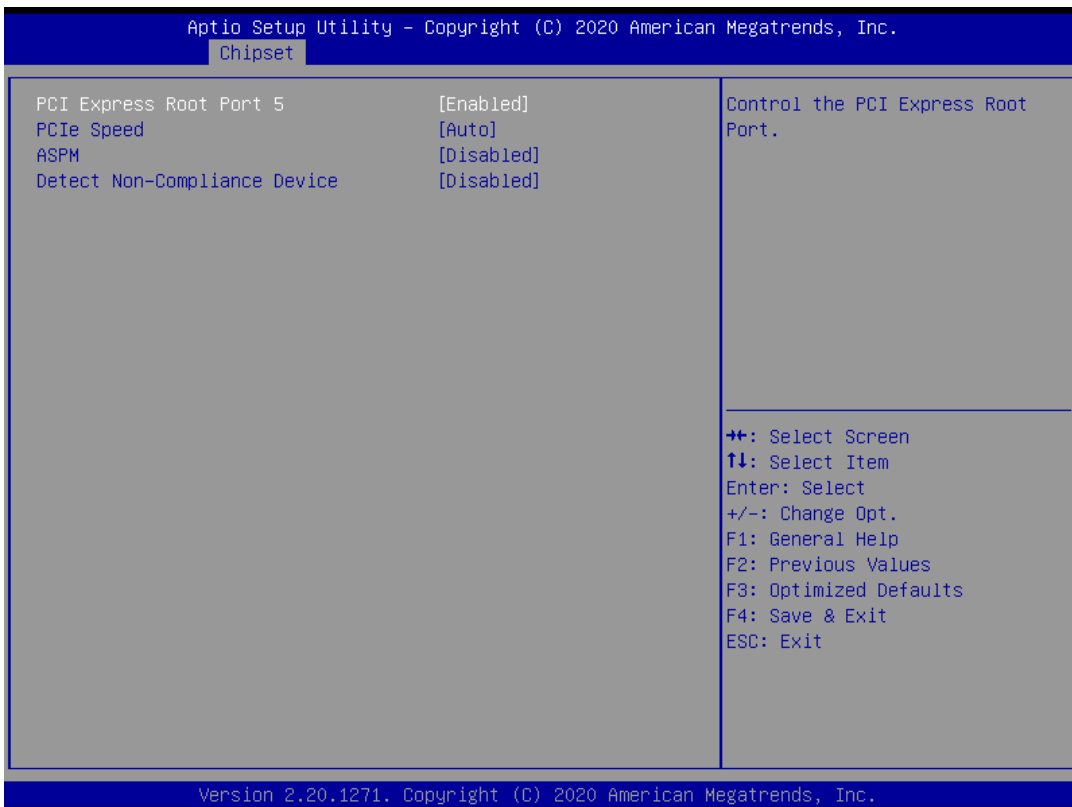
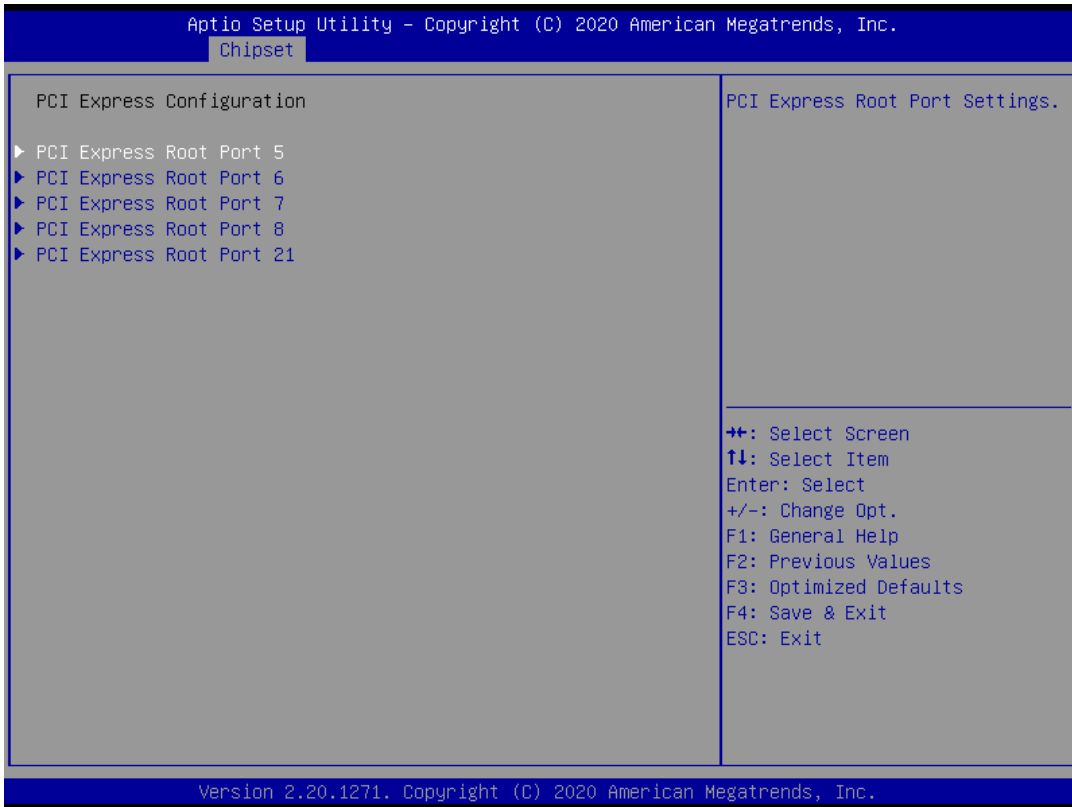


XHCI Disable Compliance Mode

Options to disable Compliance Mode. Default is FALSE to not disable Compliance Mode. Set TRUE to disable Compliance Mode.

➤ **PCI Express Configuration**

This screen shows PCI Express configuration.



PCIe Speed

Configure PCIe Speed.

ASPM

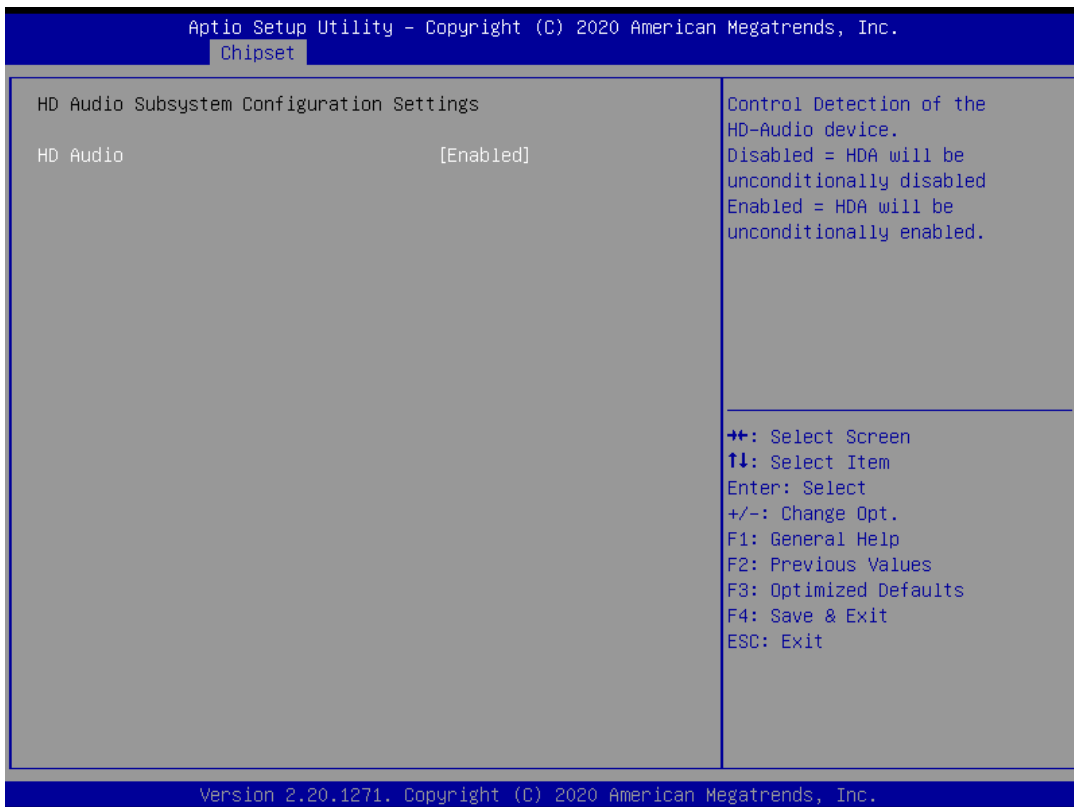
Set the ASPM Level:\nForce L0s - Force all links to L0s State\nAUTO - BIOS auto configure\nDISABLE - Disables ASPM.

Detect Non-Compliance Device

Detect Non-Compliance PCI Express Device. If enable, it will take more time at POST time.

➤ **HD Audio Configuration**

This screen shows HD Audio information



5.6 Security Menu

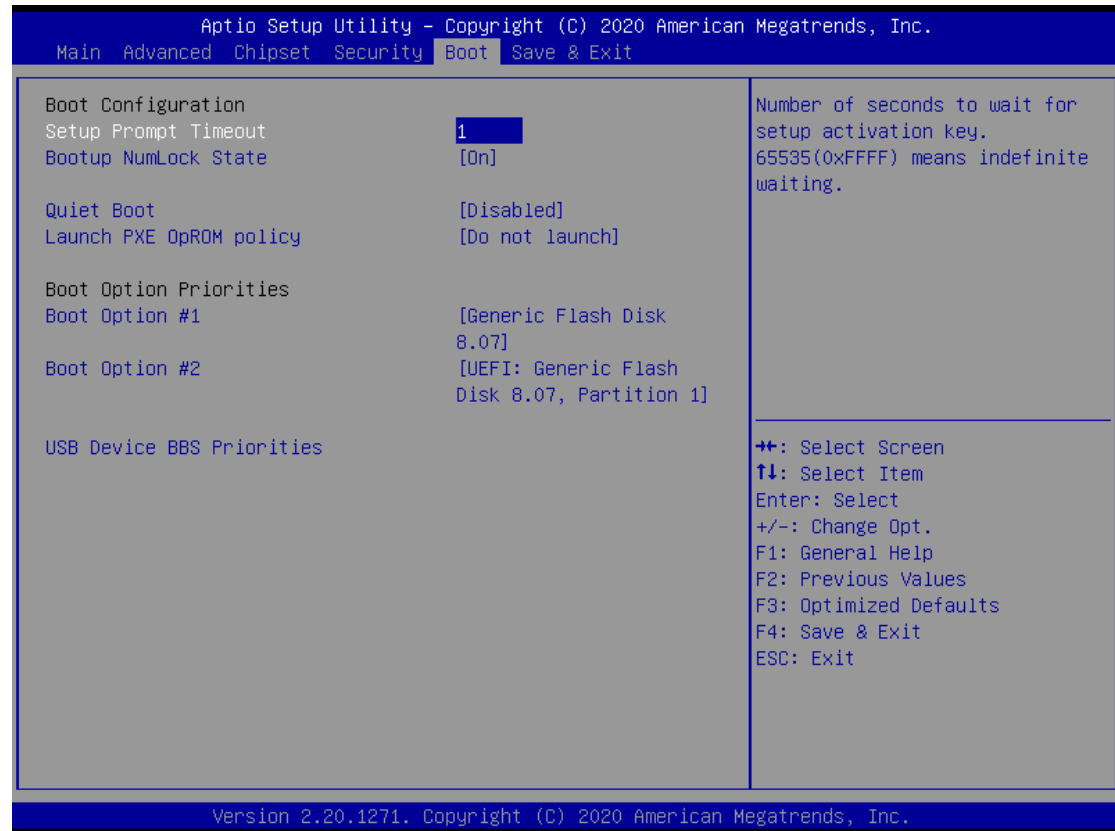
The Security menu allows users to change the security settings for the system.



- **Administrator Password**
This item indicates whether an administrator password has been set (installed or uninstalled).
- **User Password**
This item indicates whether a user password has been set (installed or uninstalled).

5.7 Boot Menu

The Boot menu allows users to change boot options of the system.



- **Setup Prompt Timeout**
Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
- **Bootup NumLock State**
Use this item to select the power-on state for the keyboard NumLock.
- **Quiet Boot**
Select to display either POST output messages or a splash screen during boot-up.
- **Launch PXE OpROM policy**
Use this item to enable or disable the boot ROM function of the onboard LAN chip when the system boots up.
- **Boot Option Priorities**
These are settings for boot priority. Specify the boot device priority sequence from the available devices.

5.8 Save & Exit Menu

The Save & Exit menu allows users to load your system configuration with optimal or fail-safe default values.



- **Save Changes and Exit**
When you have completed the system configuration changes, select this option to leave Setup and return to Main Menu. Select Save Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to save changes and exit.
- **Discard Changes and Exit**
Select this option to quit Setup without making any permanent changes to the system configuration and return to Main Menu. Select Discard Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to discard changes and exit.
- **Save Changes and Reset**
When you have completed the system configuration changes, select this option to leave Setup and reboot the computer so the new system configuration parameters can take effect. Select Save Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to save changes and reset.
- **Discard Changes and Reset**
Select this option to quit Setup without making any permanent changes to the system configuration and reboot the computer. Select Discard Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to discard changes and reset.

- **Save Changes**
When you have completed the system configuration changes, select this option to save changes. Select Save Changes from the Save & Exit menu and press <Enter>. Select Yes to save changes.
- **Discard Changes**
Select this option to quit Setup without making any permanent changes to the system configuration. Select Discard Changes from the Save & Exit menu and press <Enter>. Select Yes to discard changes.
- **Restore Defaults**
It automatically sets all Setup options to a complete set of default settings when you select this option. Select Restore Defaults from the Save & Exit menu and press <Enter>.
- **Save as User Defaults**
Select this option to save system configuration changes done so far as User Defaults. Select Save as User Defaults from the Save & Exit menu and press <Enter>.
- **Restore User Defaults**
It automatically sets all Setup options to a complete set of User Defaults when you select this option. Select Restore User Defaults from the Save & Exit menu and press <Enter>.
- **Boot Override**
Select a drive to immediately boot that device regardless of the current boot order.

Appendix A

Watchdog Timer

About Watchdog Timer

After the system stops working for a while, it can be auto-reset by the watchdog timer. The integrated watchdog timer can be set up in the system reset mode by program.

How to Use Watchdog Timer

Start

↓

1. Enable Configuration:

-O 2E 87
-O 2E 87

↓

2. Select Logic device:

-O 2E 07
-O 2F 07

↓

3. Enable WDT:

-O 2E 30
-O 2F 01

↓

4. Activate WDT:

-O 2E F0
-O 2F 80

↓

5. Set base timer:

-O 2E F6
-O 2F 0A ; Set reset time. Ex: A->reset time=10sec

↓

6. Set timer unit (second or minute):

-O 2E F5
-O 2F 71 ; Set timer unit.
; Ex: 1->timer unit=second, 9->timer unit=minute

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Appendix B

Digital I/O

Digital I/O Software Programming

- I2C to GPIO PCA9554PW GPIO[3:0] is input, GPIO[7:4] is output.
- I2C address: 0b0100100x.
- IOBASE: 0xF040
- Registers:

Command byte

Command	Protocol	Function
0	Read byte	Input port register
1	Read/write byte	Output port register
2	Read/write byte	Polarity inversion register
3	Read/write byte	Configuration register

The command byte is the first byte to follow the address byte during a write transmission. It is used as a pointer to determine which of the following registers will be written or read.

Register 0: Input port register.

This register is a read-only port. It reflects the incoming logic levels of the pins, regardless of whether the pin is defined as an input or an output by Register 3. Writes to this register have no effect.

The default 'X' is determined by the externally applied logic level, normally '1' when no external signal externally applied because of the internal pull-up resistors.

Bit	Symbol	Access	Value	Description
7	I7	Read only	X	Determined by externally applied logic level.
6	I6	Read only	X	
5	I5	Read only	X	
4	I4	Read only	X	
3	I3	Read only	X	
2	I2	Read only	X	
1	I1	Read only	X	
0	I0	Read only	X	

Register 1: Output port register.

This register reflects the outgoing logic levels of the pins defined as outputs by Register 3. Bit values in this register have no effect on pins defined as inputs. Reads from this register return the value that is in the flip-flop controlling the output selection, not the actual pin value.

Bit	Symbol	Access	Value	Description
7	O7	R	1*	Reflects outgoing logic levels of pins defined as outputs by Register 3.
6	O6	R	1*	
5	O5	R	1*	
4	O4	R	1*	
3	O3	R	1*	
2	O2	R	1*	
1	O1	R	1*	
0	O0	R	1*	

* : Default value

Register 3: Configuration register.

This register configures the directions of the I/O pins. If a bit in this register is set, the corresponding port pin is enabled as an input with high-impedance output driver. If a bit in this register is cleared, the corresponding port pin is enabled as an output. At reset, the I/Os are configured as inputs with a weak pull-up to V_{DD} .

Bit	Symbol	Access	Value	Description
7	C7	R/W	1*	Configure the directions of the I/O pins. 0 = Corresponding port pin enabled as an output. 1 = Corresponding port pin configured as input (default value).
6	C6	R/W	1*	
5	C5	R/W	1*	
4	C4	R/W	1*	
3	C3	R/W	1*	
2	C2	R/W	1*	
1	C1	R/W	1*	
0	C0	R/W	1*	

* : Default value

Appendix C

Configuring SATA for RAID

Configuring SATA Hard Drive(s) for RAID (Controller: Intel® Q87)

Before you begin the SATA configuration, please prepare:

- Two SATA hard drives (to ensure optimal performance, it is recommended that you use two hard drives with identical model and capacity). If you do not want to create RAID with the SATA controller, you may prepare only one hard drive.

Please follow up the steps below to configure SATA hard drive(s):

1. Install SATA hard drive(s) in your system.
2. Enter the BIOS Setup to configure SATA controller mode and boot sequence.
3. Configure RAID by the RAID BIOS.

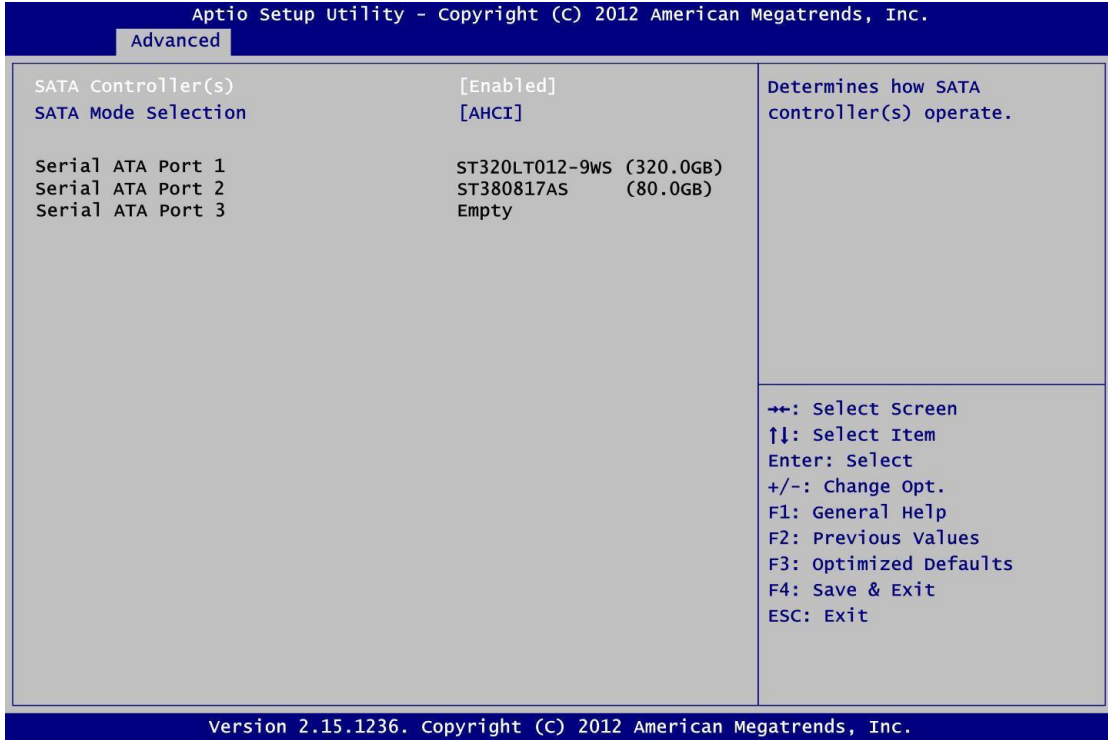
1. Installing SATA hard drive(s) in your system.

Connect one end of the SATA signal cable to the rear of the SATA hard drive, and the other end to available SATA port(s) on the board. Then, connect the power connector of power supply to the hard drive.

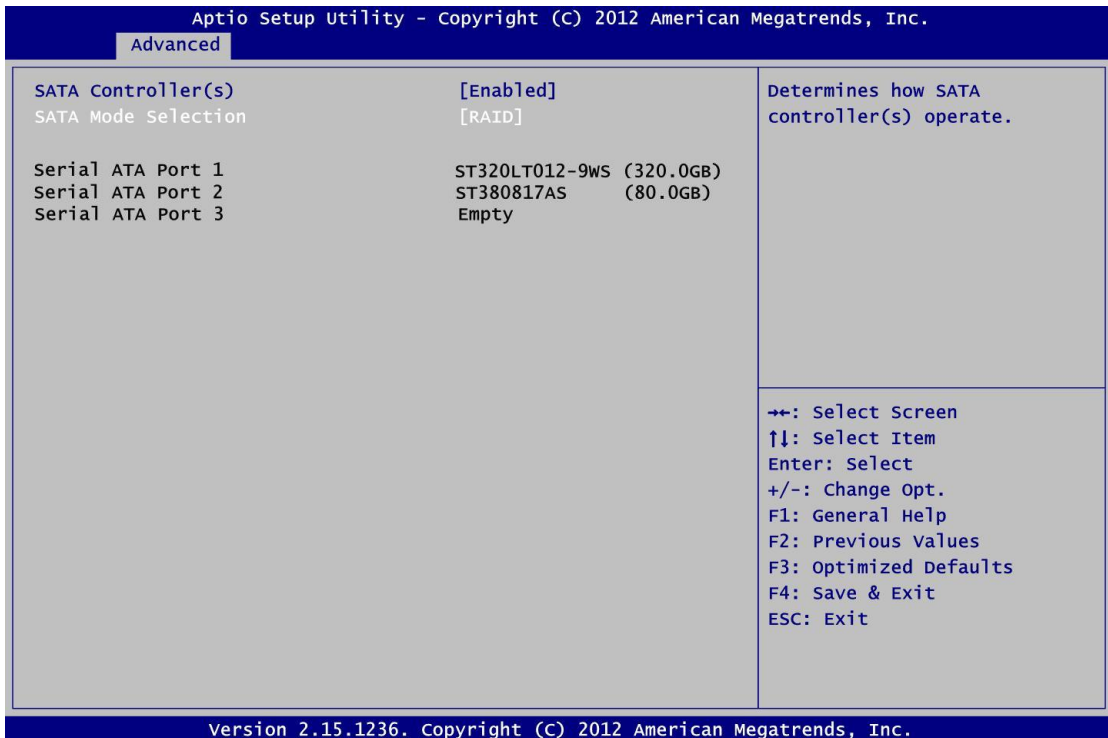
2. Configuring SATA controller mode and boot sequence by the BIOS Setup.

You have to make sure whether the SATA controller is configured correctly by system BIOS Setup and set up BIOS boot sequence for the SATA hard drive(s).

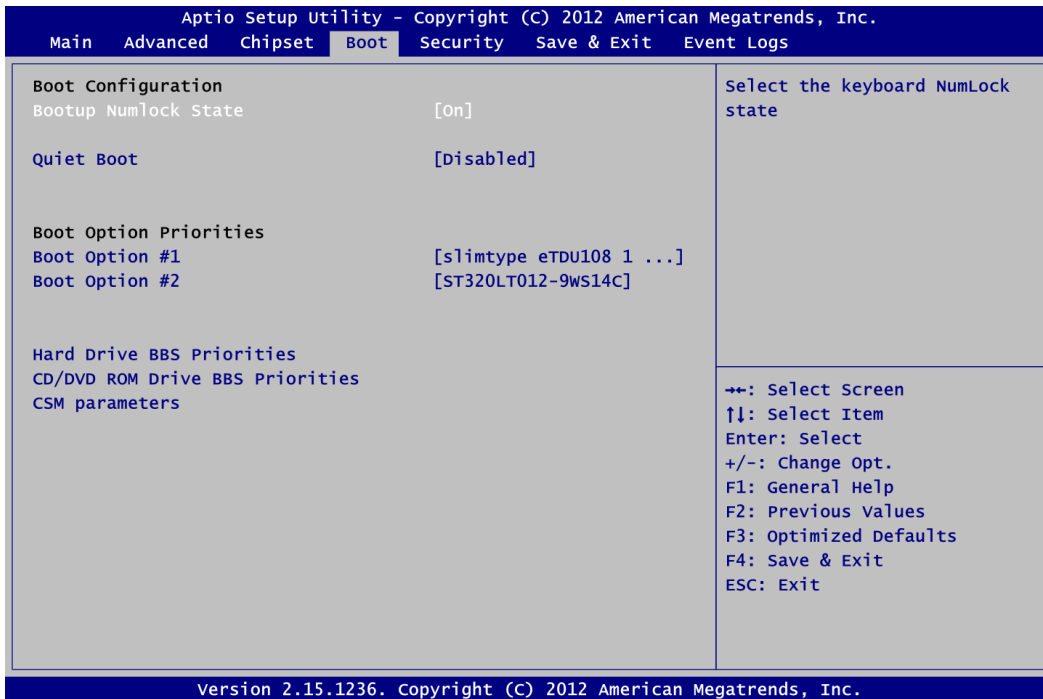
- 2.1. Turn on your system, and then press the button to enter BIOS Setup during running POST (Power-On Self Test). If you want to create RAID, just go to the Advanced Settings menu/SATA Configuration, select the "SATA Mode Selection", and press <Enter> for more options.



A list of options appears, please select "RAID".



2.2. Set DVD-ROM for First Boot Option under the Boot Settings menu to boot DVD-ROM after system restarts.



2.3. Save and exit the BIOS Setup.

3. Configuring RAID by the RAID BIOS.

Enter the RAID BIOS setup utility to configure a RAID array. Skip this step and proceed if you do not want to create a RAID.

- 3.1. After the POST memory testing and before the operating system booting, a message "Press <Ctrl-I> to enter Configuration Utility" shows up, accordingly, press <Ctrl + I> to enter the RAID BIOS setup utility.

```

Intel(R) Rapid Storage Technology - Option ROM - 12.5.0.1815
Copyright(C) 2003-13 Intel Corporation. All Rights Reserved.

RAID Volumes:
ID      Name          Level          Strip      Size  Status  Bootable
0       Volume1         RAID0(Stripe) 128KB     149.1GB Normal  Yes

Physical Devices:
ID      Device Model   Serial #      Size  Type/Status(Vol ID)
4       ST320LT012-9WS14  WOV20YPA    298.0GB Member Disk(0)
5       ST380817AS      5MR1BSS7    74.5GB Member Disk(0)
Press <CTRL-I> to enter Configuration Utility...
    
```

- 3.2. After you press <Ctrl + I>, the Create RAID Volume screen will appear. If you want to create a RAID array, select the Create RAID Volume option in the Main Menu and press <Enter>.

```

Intel(R) Rapid Storage Technology - Option ROM - 12.5.0.1815
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[ MAIN MENU ]
1. Create RAID Volume
2. Delete RAID Volume
3. Reset Disks to Non-RAID
4. Recovery Volume Options
5. Acceleration Options
6. Exit

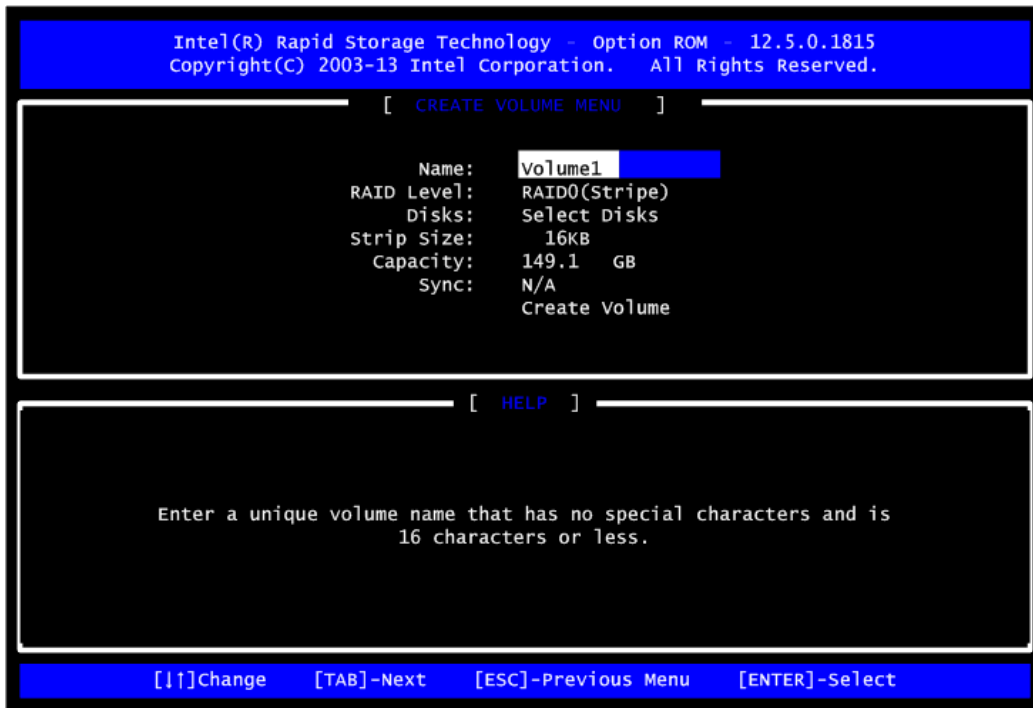
[ DISK/VOLUME INFORMATION ]

RAID Volumes:
None Defined.

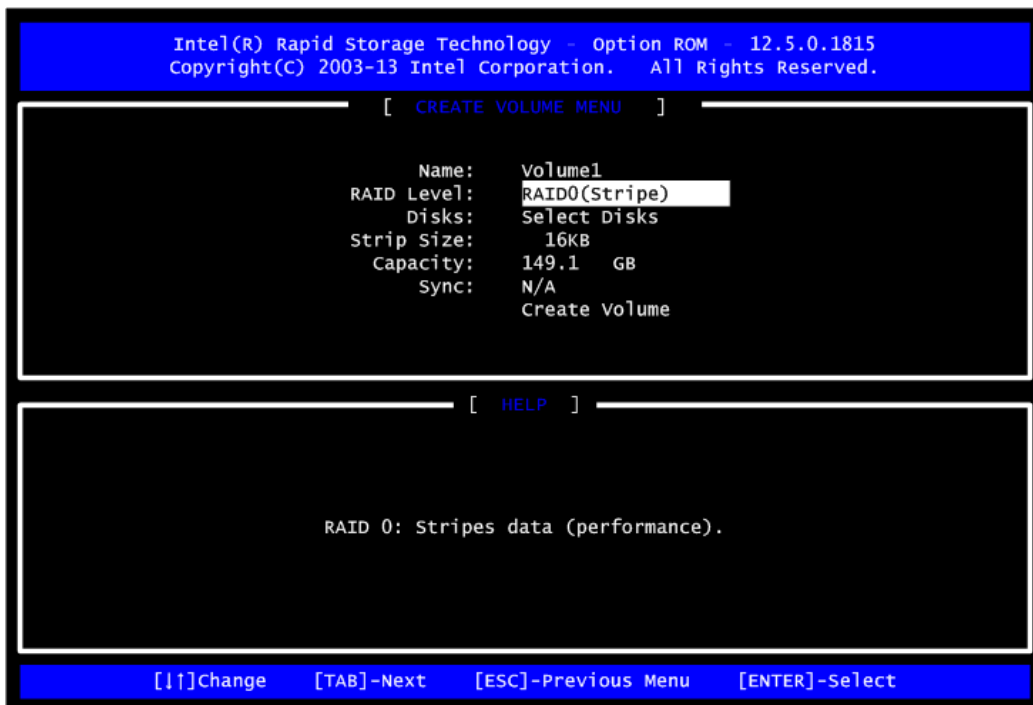
Physical Devices:
ID      Device Model   Serial #      Size  Type/Status(Vol ID)
4       ST320LT012-9WS14  WOV20YPA    298.0GB Non-RAID Disk
5       ST380817AS      5MR1BSS7    74.5GB Non-RAID Disk

[↑↓]-Select      [ESC]-Exit      [Enter]-Select Menu
    
```

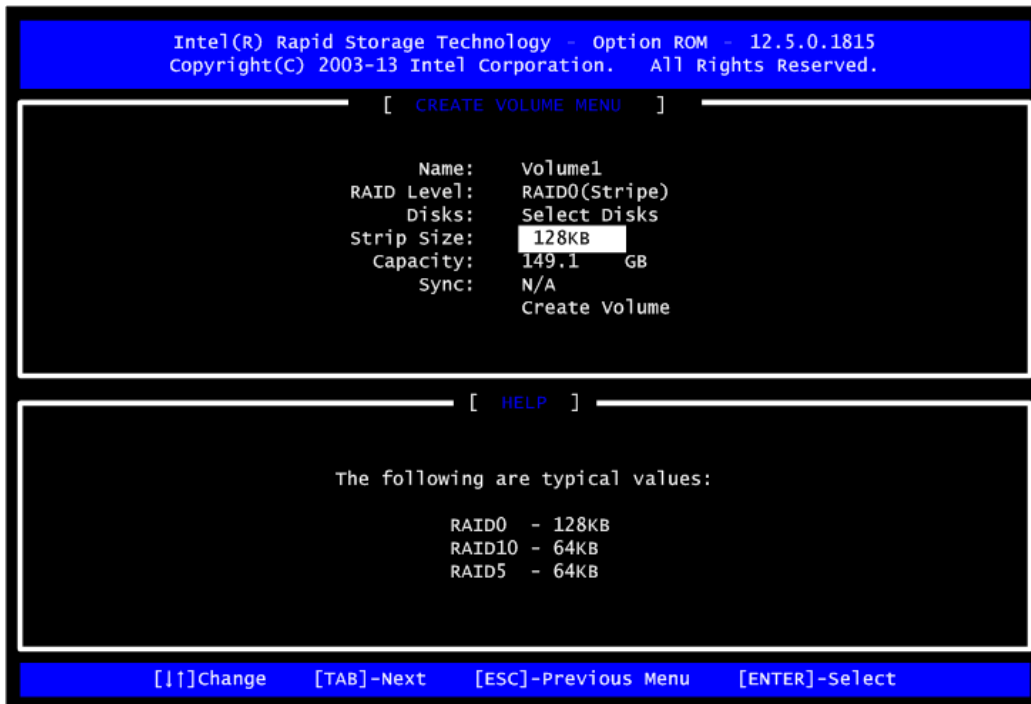
3.3. After entering the Create Volume Menu screen, you can type the disk array name with 1~16 letters (letters cannot be special characters) in the item "Name".



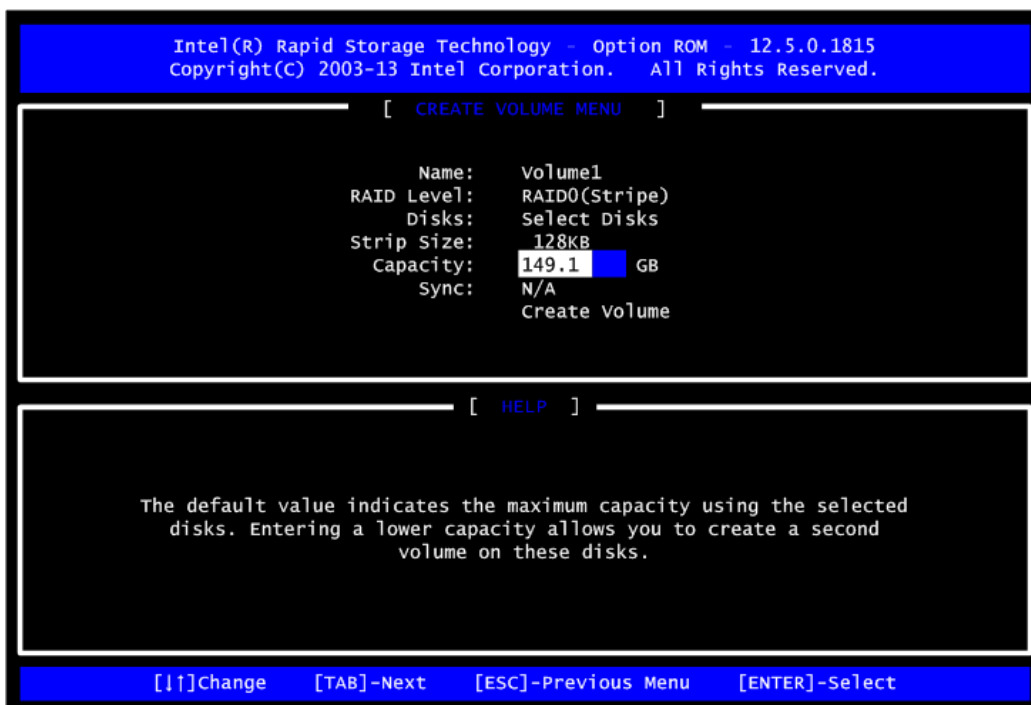
3.4. When finished, press <Enter> to select a RAID level. There are three RAID levels: RAID0, RAID1 and RAID5 and RAID10. Select a RAID level and press <Enter>.



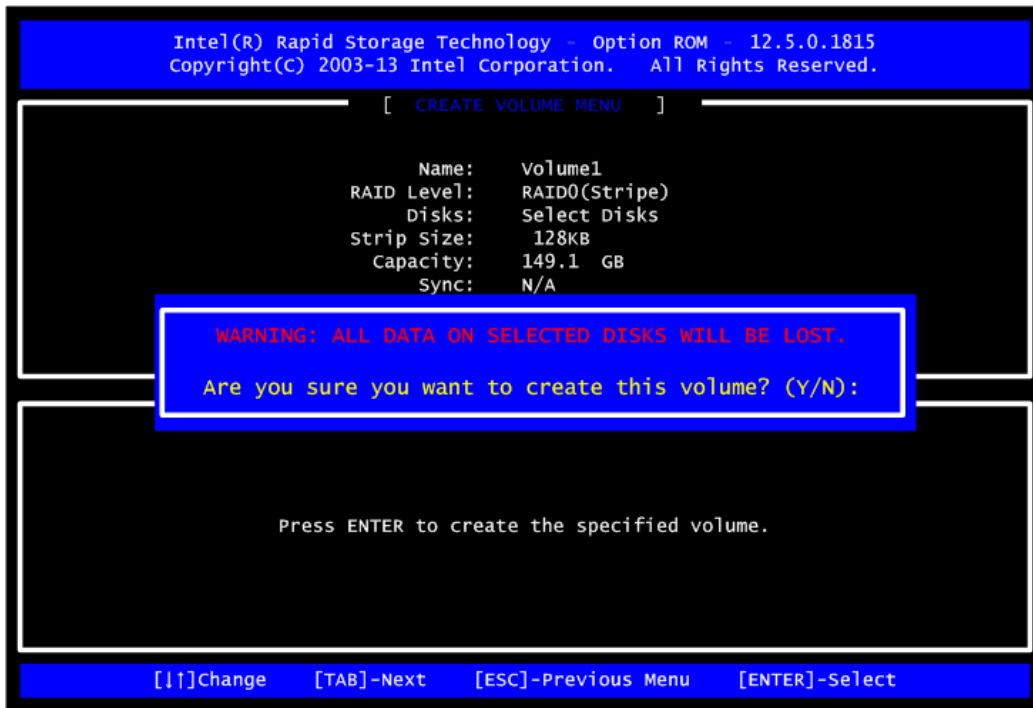
- 3.5. Set the stripe block size. The KB is the standard unit of stripe block size. The stripe block size can be 4KB to 128KB. After the setting, press <Enter> for the array capacity.



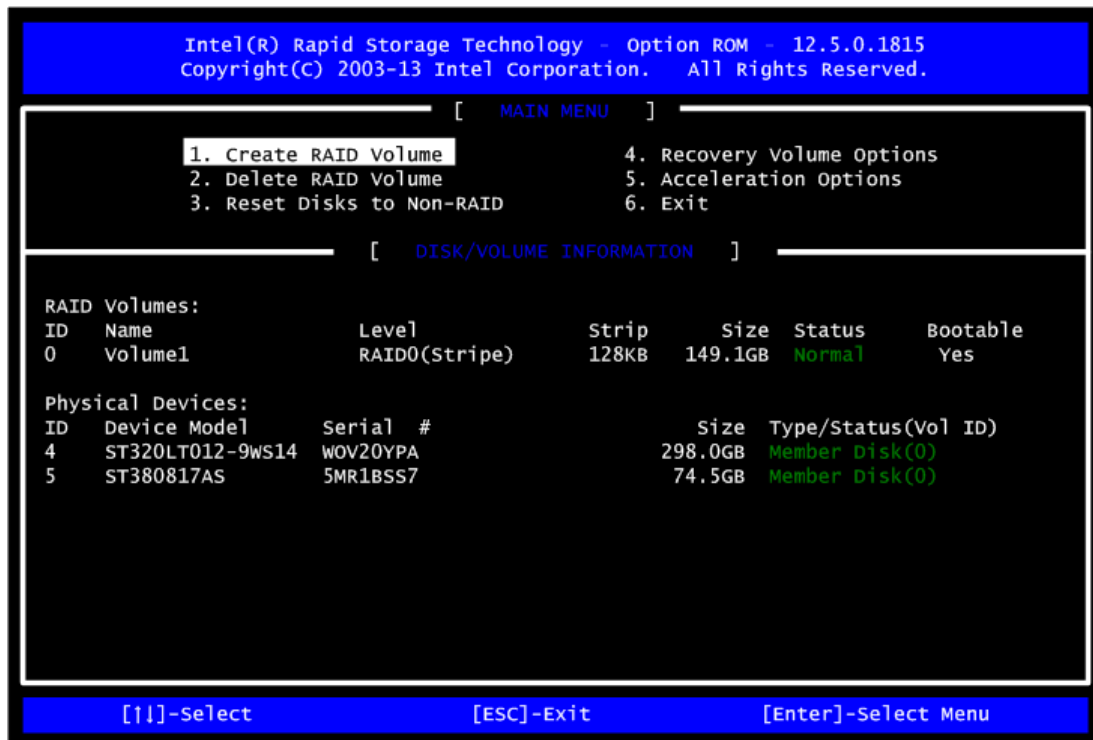
- 3.6. After setting all the items on the menu, select Create Volume and press <Enter> to start creating the RAID array.



3.7. When prompting the confirmation, press <Y> to create this volume, or <N> to cancel the creation.

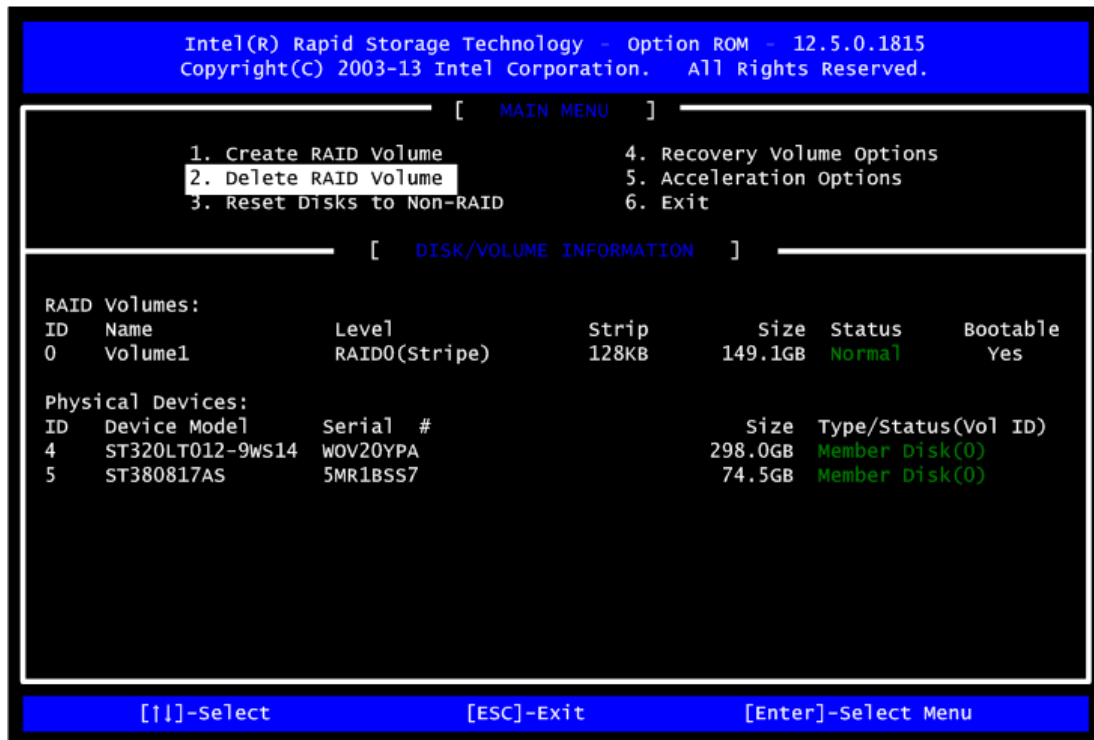


After the creation is completed, you can see detailed information about the RAID Array in the Disk/Volume Information section, including RAID mode, disk block size, disk name, and disk capacity, etc.



Delete RAID volume

If you want to delete a RAID volume, select the Delete RAID Volume option in Main Menu. Press <Enter> and follow on-screen instructions.



Please press <Esc> to exit the RAID BIOS utility. Now, you can proceed to install a SATA driver controller and the operating system.

Appendix D

iAMT Settings

The Intel® Active Management Technology (Intel® iAMT) has decreased a major barrier to IT efficiency that uses built-in platform capabilities and popular third-party management and security applications to allow IT a better discovering, healing, and protection their networked computing assets.

In order to utilize Intel® iAMT you must enter the ME BIOS (<Ctrl + P> during system startup), change the ME BIOS password, and then select “Intel® iAMT” as the manageability feature.

Entering MEBx

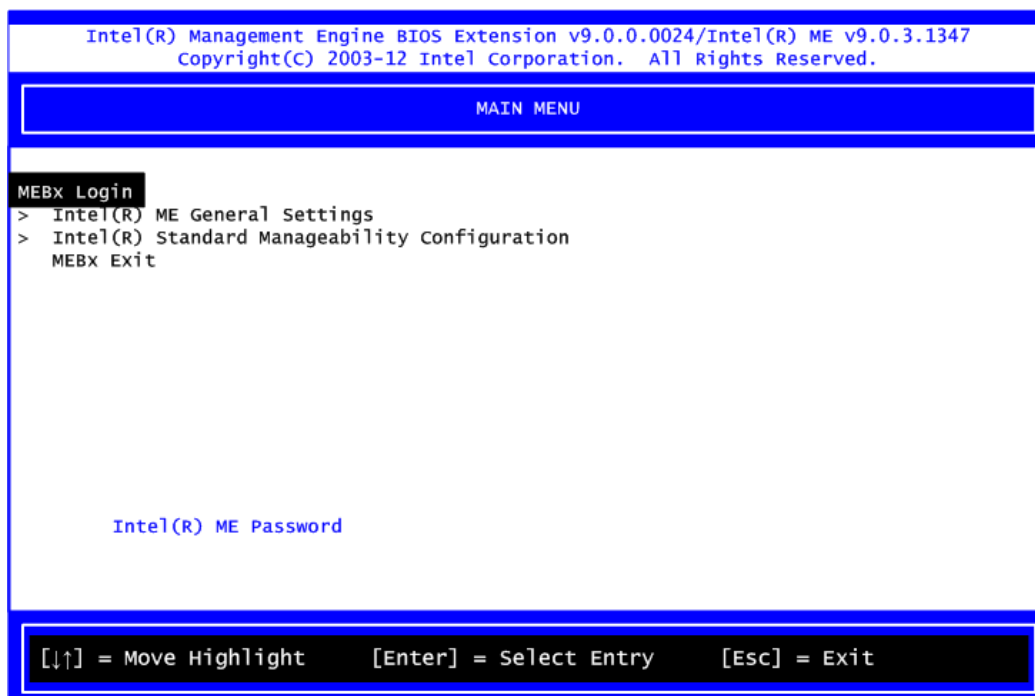
1. You must go to BIOS to enable iAMT function.
2. Exit from BIOS after starting iAMT, and press <Ctrl + P> to enter MEBx Setting.



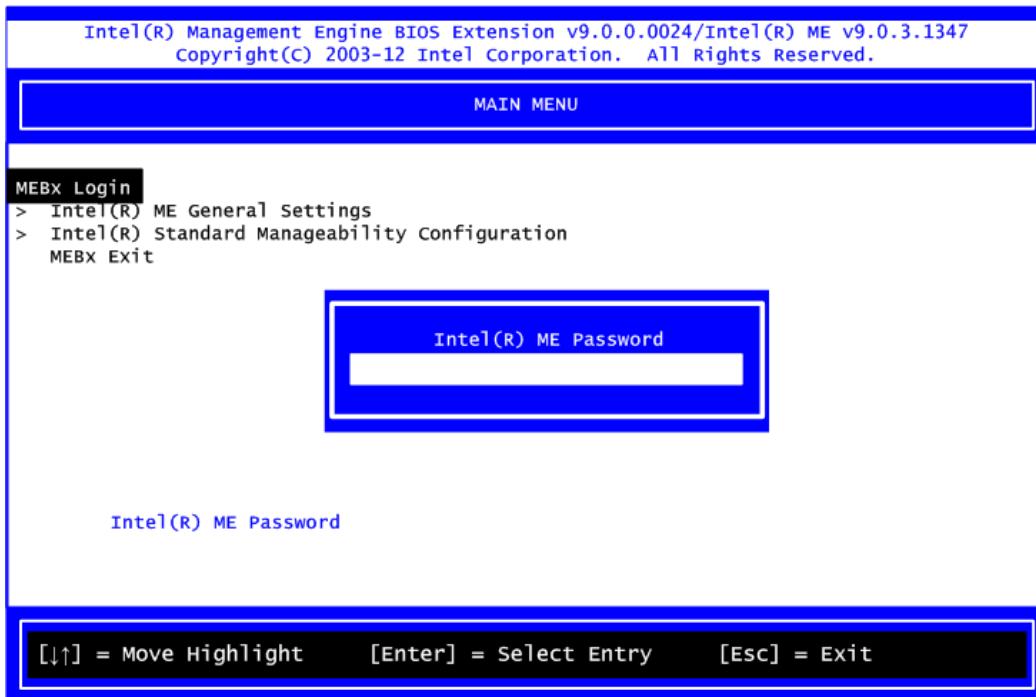
Note: It is better to press <Ctrl + P> before the screen popping out.

Set and Change Password

1. You will be asked to set a password when first log in. The default password is “admin”.



- You will be asked to change the password before setting ME.

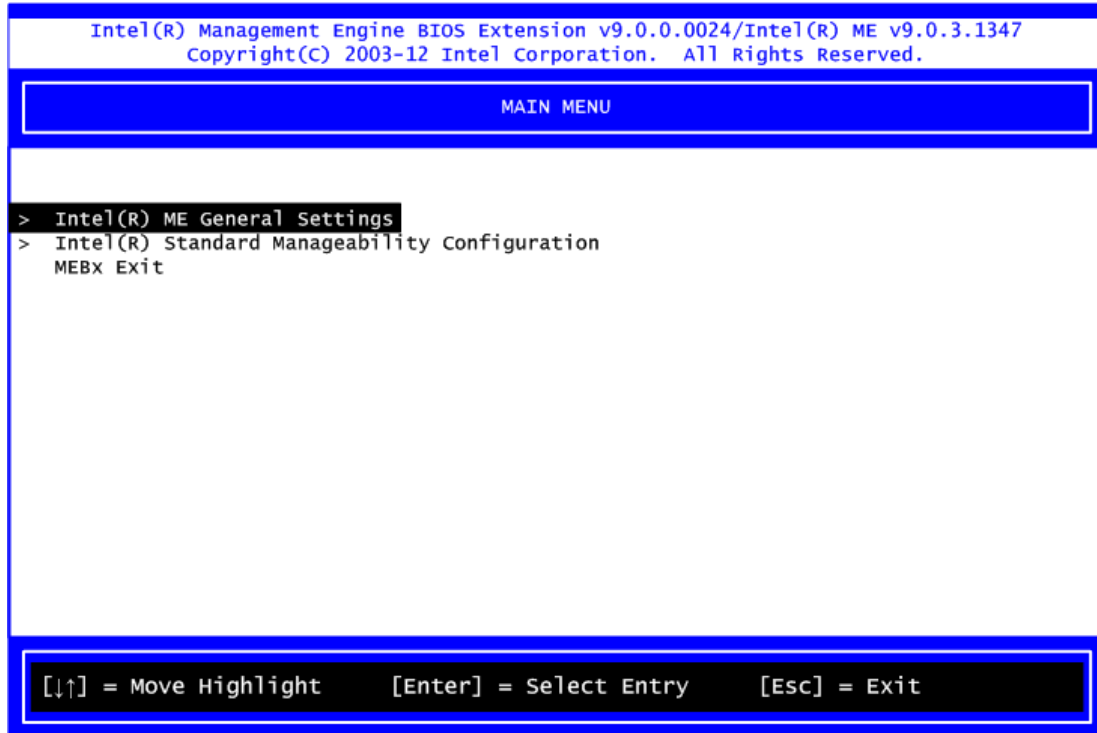


- You must confirm your new password while revising. The new password must contain: (example: **!!11qqQQ**) (default value).
 - Eight characters
 - One upper case
 - One lower case
 - One number
 - One special symbol, such as ! , ` \$ or ; , (, " , , excepted)

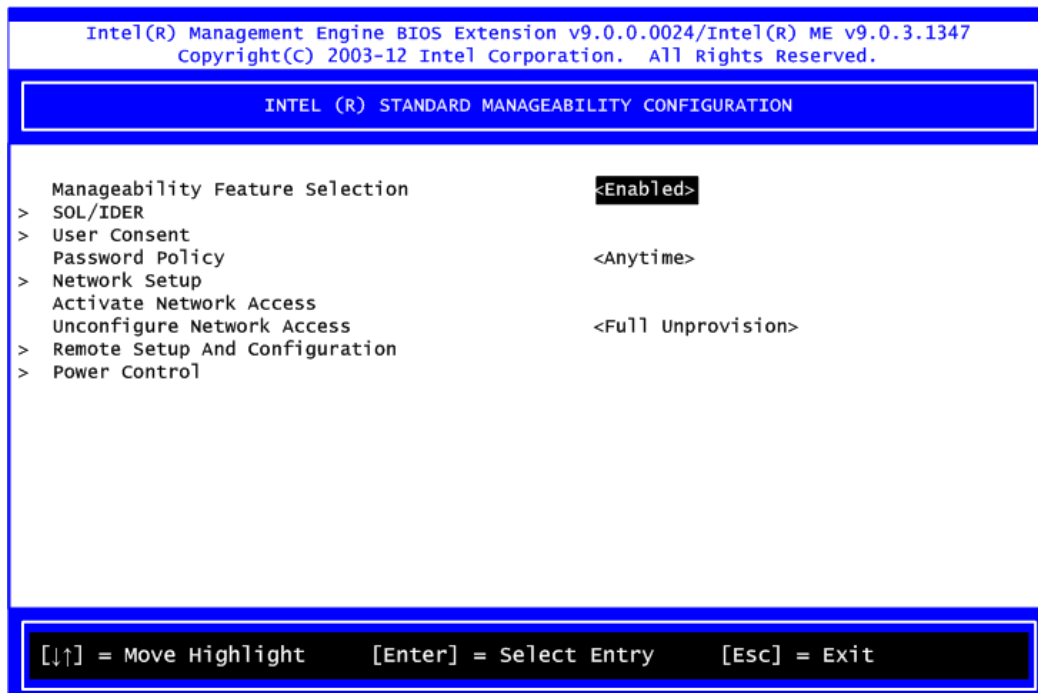
Underline (_) and space are valid characters for password, but they won't make higher complexity.

iAMT Settings

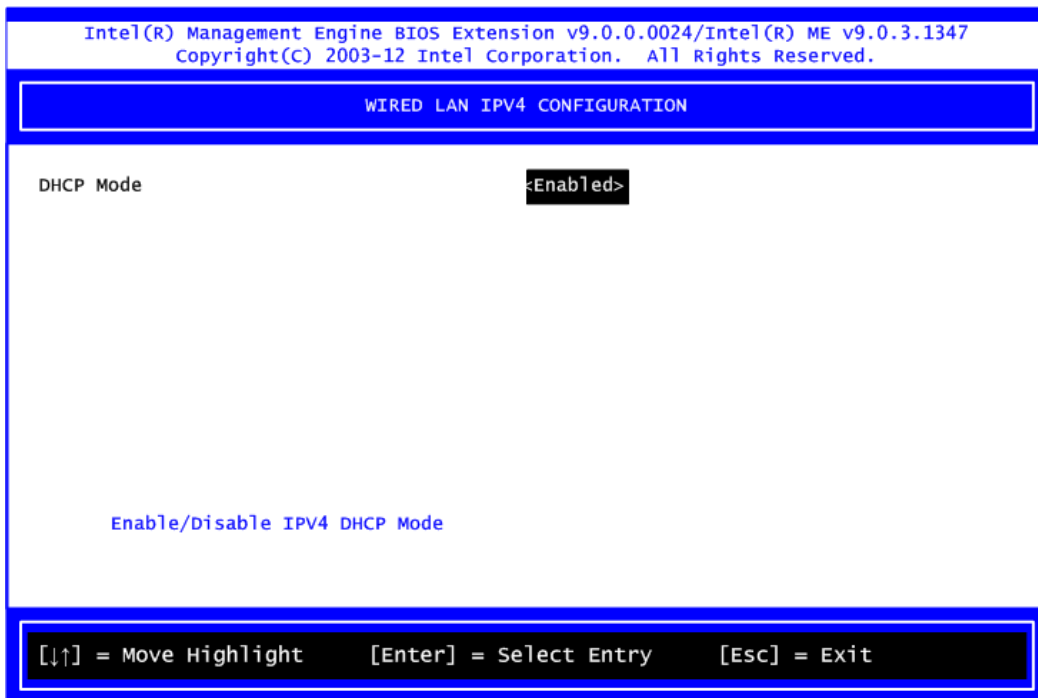
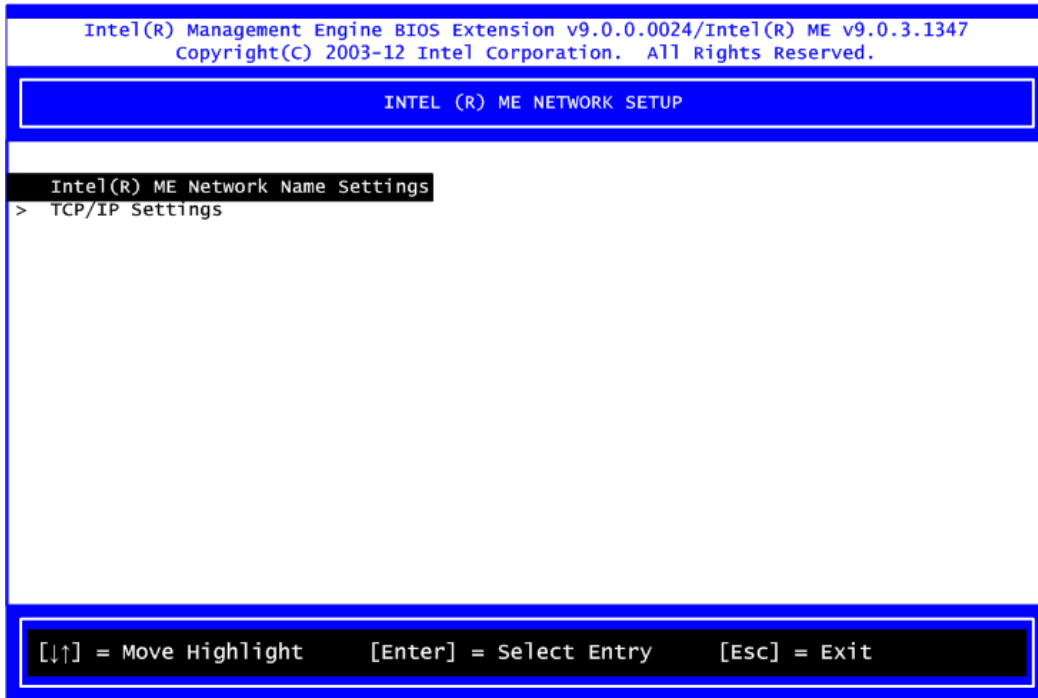
Select Intel® iAMT configuration and press <Enter>.



1. Select Network Setup to configure iAMT.

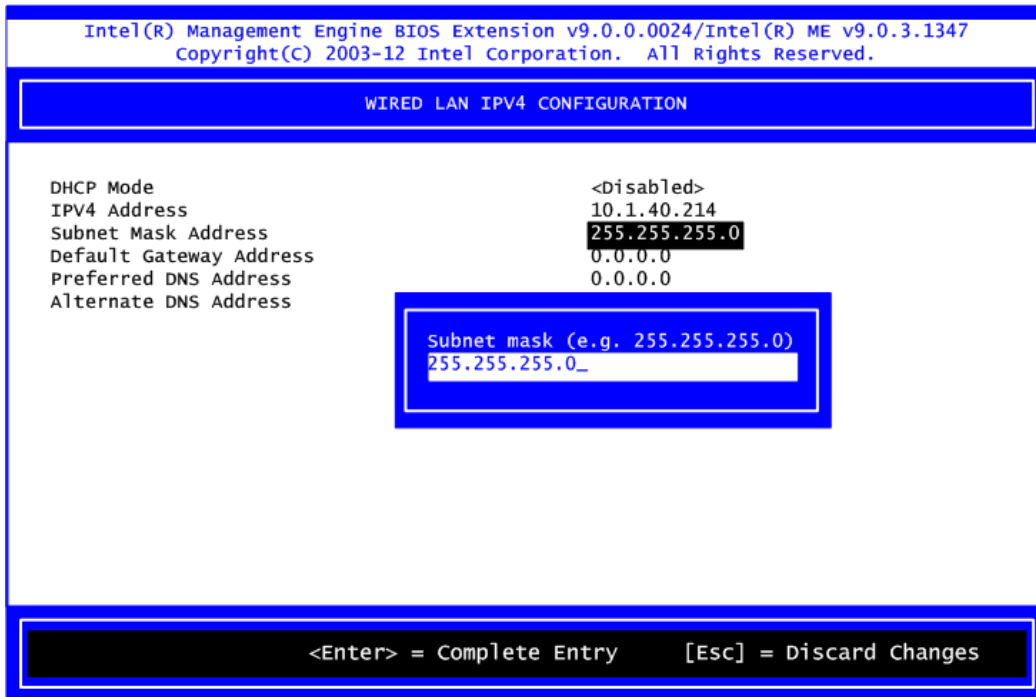


2. Select TCP/IP to get into Network interface and set it to Enabled. Get into DHCP Mode and set it to Disabled.

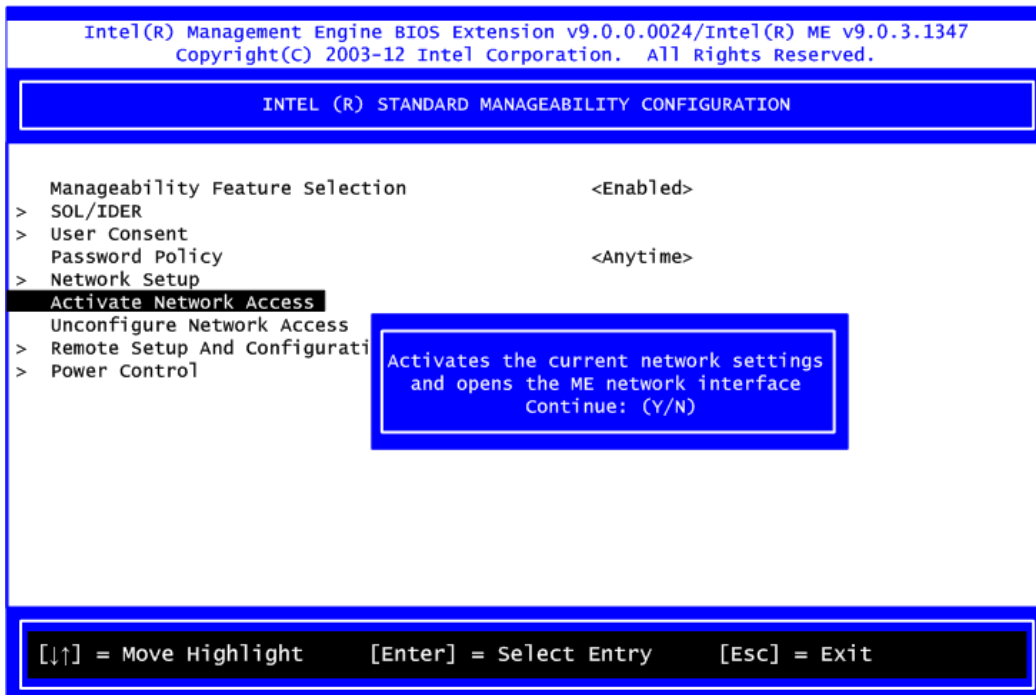


3. If DHCP Mode is disabled, set the following settings:

- IP address
- Subnet mask



4. Go back to Intel® iAMT Configuration, then select Activate Network Access and press <Enter>.

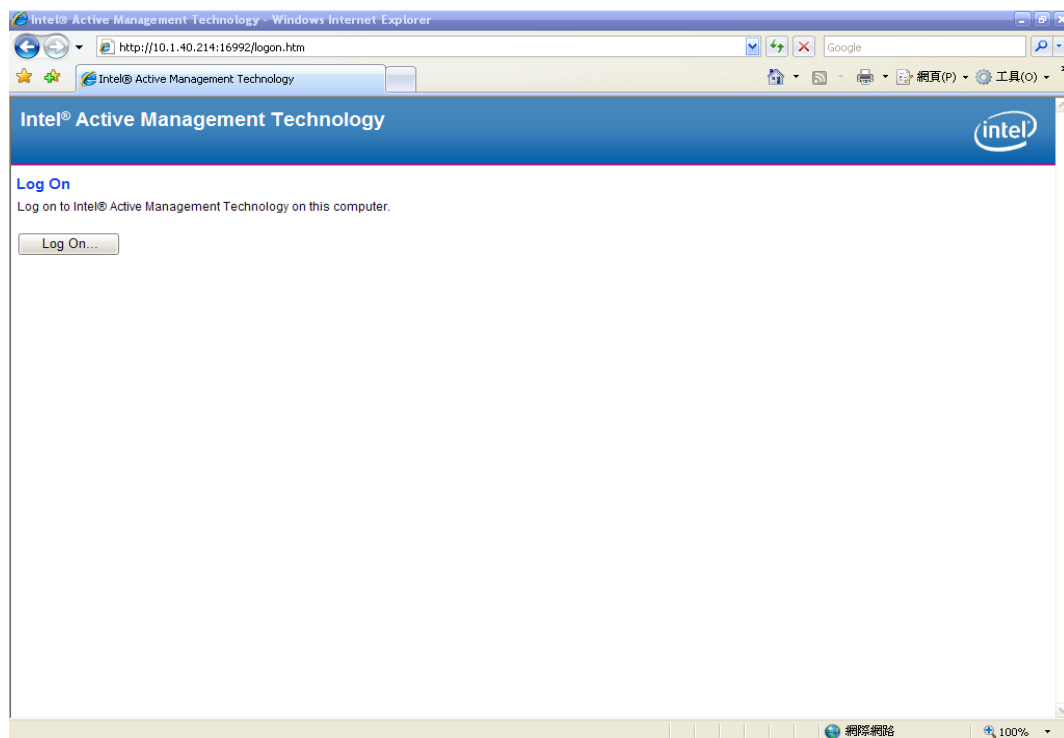


5. Exit from MEBx after completing the iAMT settings.

iAMT Web Console

1. From a web browser, please type [http://\(IP ADDRESS\):16992](http://(IP ADDRESS):16992), which connects to iAMT Web.

Example: <http://10.1.40.214:16992>

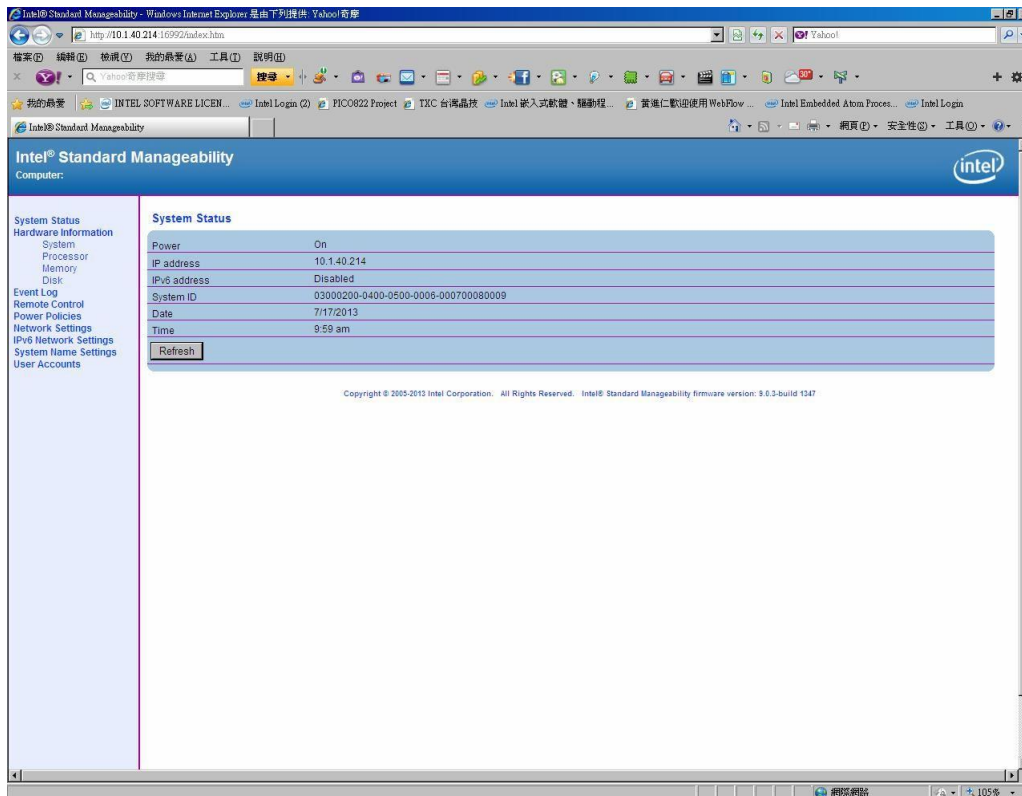


2. To log on, you will be required to type in username and password for access to the Web.

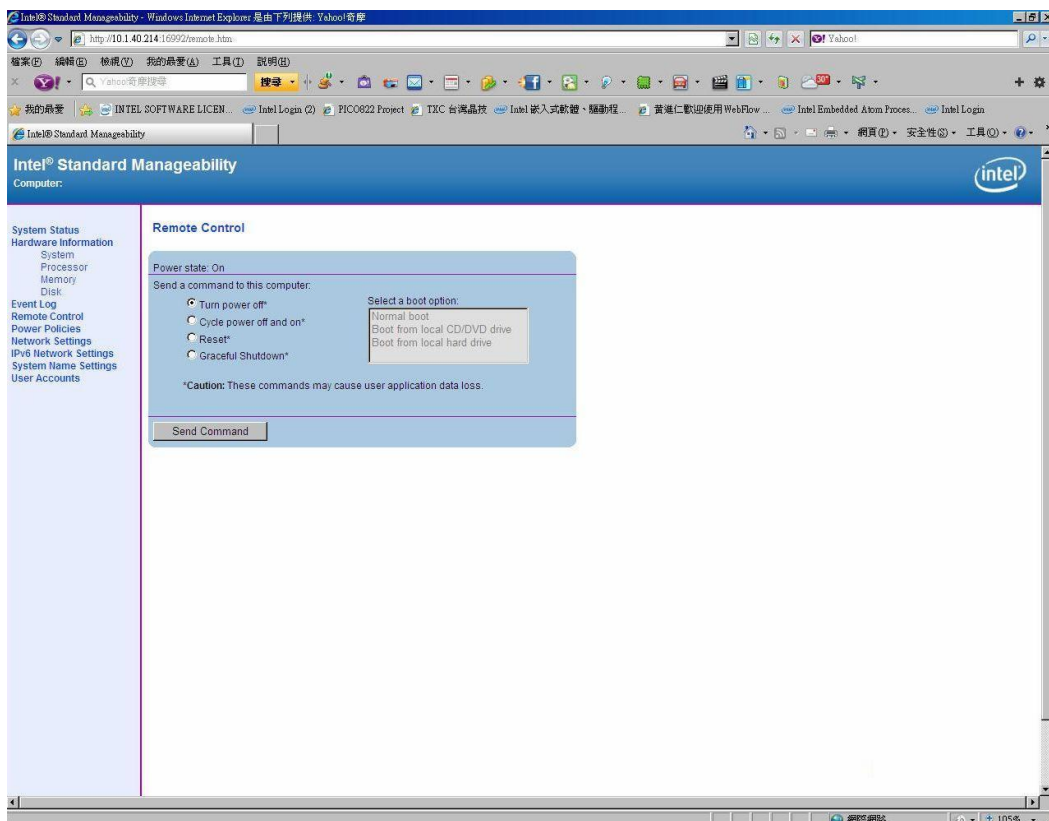
USER: admin (default value)

PASS: (MEBx password)

3. Enter the iAMT Web.



4. Click Remote Control, and select commands on the right side.



5. When you have finished using the iAMT Web console, close the Web browser.

Appendix E

PICMG[®] v1.3 Interface Definition

x16 PCIe Connector A			X8 PCIe Connector B		
No.	Side B	Side A	No.	Side B	Side A
1	N.C	N.C	1	+5Vaux	+5Vaux
2	GND	GND	2	GND	N.C
3	N.C	N.C	3	a_PETp8	GND
4	N.C	N.C	4	a_PETn8	GND
5	N.C	WAKE#	5	GND	a_PERp8
6	PWRBT#	PME#	6	GND	a_PERn8
7	PWRGD	PSON#	7	a_PETp9	GND
8	SHB_RST#	PERST#	8	a_PETn9	GND
9	CFG0	CFG1	9	GND	a_PERp9
10	CFG2	CFG3	10	GND	a_PERn9
11	RSVD	GND	11	N.C	GND
Mechanical Key			Mechanical Key		
12	GND	N.C	12	GND	N.C
13	b_PETp0	GND	13	a_PETp10	GND
14	b_PETn0	GND	14	a_PETn10	GND
15	GND	b_PERp0	15	GND	a_PERp10
16	GND	b_PERn0	16	GND	a_PERn10
17	b_PETp1	GND	17	a_PETp11	GND
18	b_PETn1	GND	18	a_PETn11	GND
19	GND	b_PERp1	19	GND	a_PERp11
20	GND	b_PERn1	20	GND	a_PERn11
21	b_PETp2	GND	21	a_PETp12	GND
22	b_PETn2	GND	22	a_PETn12	GND
23	GND	b_PERp2	23	GND	a_PERp12
24	GND	b_PERn2	24	GND	a_PERn12
25	b_PETp3	GND	25	a_PETp13	GND
26	b_PETn3	GND	26	a_PETn13	GND

Mechanical Key			27	GND	a_PERp13
27	GND	b_PERp3	28	GND	a_PERn13
28	GND	b_PERn3	Mechanical Key		
29	REFCLK0+	GND	29	a_PETp14	GND
30	REFCLK0-	GND	30	a_PETn14	GND
31	GND	REFCLK1+	31	GND	a_PERp14
32	RSVD	REFCLK1-	32	GND	a_PERn14
33	REFCLK2+	GND	33	a_PETp15	GND
34	REFCLK2-	GND	34	a_PETn15	GND
35	GND	REFCLK3+	35	GND	a_PERp15
36	RSVD	REFCLK3-	36	GND	a_PERn15
37	REFCLK4+	GND	37	N.C	GND
38	REFCLK4-	GND	38	N.C	N.C
39	GND	N.C	39	GND	GND
40	RSVD	N.C	40	GND	GND
41	N.C	GND	41	GND	GND
42	N.C	GND	42	GND	GND
43	GND	N.C	43	GND	GND
44	GND	N.C	44	+12V	+12V
45	a_PETp0	GND	45	+12V	+12V
46	a_PETn0	GND	46	+12V	+12V
47	GND	a_PERp0	47	+12V	+12V
48	GND	a_PERn0	48	+12V	+12V
49	a_PETp1	GND	49	+12V	+12V
50	a_PETn1	GND			
51	GND	a_PERp1			
52	GND	a_PERn1			
53	a_PETp2	GND			
54	a_PETn2	GND			
55	GND	a_PERp2			
56	GND	a_PERn2			
57	a_PETp3	GND			

Mechanical Key		
58	a_PETn3	GND
59	GND	a_PERp3
60	GND	a_PERn3
61	a_PETp4	GND
62	a_PETn4	GND
63	GND	a_PERp4
64	GND	a_PERn4
65	a_PETp5	GND
66	a_PETn5	GND
67	GND	a_PERp5
68	GND	a_PERn5
69	a_PETp6	GND
70	a_PETn6	GND
71	GND	a_PERp6
72	GND	a_PERn6
73	a_PETp7	GND
74	a_PETn7	GND
75	GND	a_PERp7
76	GND	a_PERn7
77	N.C	GND
78	+3.3V	+3.3V
79	+3.3V	+3.3V
80	+3.3V	+3.3V
81	+3.3V	+3.3V
82	RSVD	RSVD



Note: Please contact your vendor to get the backplane design guide if it's required. The backplane design guide is NDA required.

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