



AXIOMTEK

IMB523 / 524 / 525

**Intel® Socket 1151 Core™ i7/ i5/ i3 /
Pentium® / Celeron®
Processors ATX Industrial
Motherboard**

User's Manual



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Wrong type of batteries may cause explosion. It is recommended that users only replace with the same or equivalent type of batteries as suggested by the manufacturer once properly disposing of any used ones.

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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. To discharge static electricity from your body.
- Wear a grounding wrist strap, available from most electronic component stores, when handling boards and components.

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Table of Contents

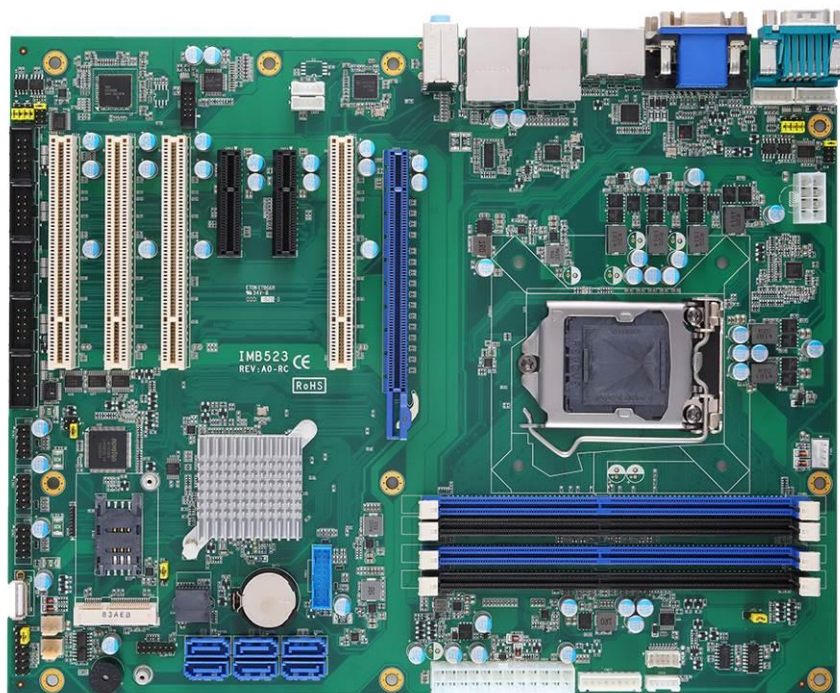
| | |
|---|----------|
| Disclaimers | ii |
| ESD Precautions..... | iii |
| Chapter 1 Introduction..... | 1 |
| 1.1 Features..... | 2 |
| 1.2 Specifications | 2 |
| 1.3 Packing list..... | 4 |
| Chapter 2 Board and Pin Assignments..... | 5 |
| 2.1 Board Layout..... | 5 |
| 2.2 Rear I/O..... | 7 |
| 2.3 Block Diagram..... | 8 |
| 2.4 Jumper Settings | 10 |
| 2.4.1 Clear CMOS (JP8) | 11 |
| 2.4.2 AT/ATX Mode Select (JP9)..... | 11 |
| 2.4.3 COM1 Mode Select (JP4, JP5, JP6)..... | 12 |
| 2.4.4 COM2 Mode Select (JP1, JP2, JP3)..... | 12 |
| 2.4.5 Temperature Sensor Source Select | 12 |
| 2.5 Connectors..... | 13 |
| 2.5.1 Mini PCI-Express Connector (CN22) (Optional) | 14 |
| 2.5.2 Keyboard and PS/2 Mouse Connector (CN1)..... | 14 |
| 2.5.3 Front Panel Header (CN24) | 15 |
| 2.5.4 GPIO Header (CN25)..... | 15 |
| 2.5.5 COM1 Connector (COM1) | 16 |
| 2.5.6 LAN and USB 3.1 Connectors (CN5 and CN6) | 17 |
| 2.5.7 Audio Jack (CN4) | 17 |
| 2.5.8 Front Audio Header (CN11)..... | 18 |
| 2.5.9 COM Headers (COM2 ~ COM6) | 18 |
| 2.5.10 External Sensor Header (CN15) | 18 |
| 2.5.11 DisplayPort and HDMI Connector (CN2) | 19 |
| 2.5.12 Internal USB Headers (CN16~CN17, CN20, USB1) | 19 |
| 2.5.13 SATA 3.0 Connectors (SATA1 ~ SATA6)..... | 20 |
| 2.5.14 SMBus Header (CN28) | 20 |
| 2.5.15 Voltage Monitor Header (CN27)..... | 20 |
| 2.5.16 Power Input Connectors (ATX1 and CN26) | 21 |
| 2.5.17 PCI-Express x4 Slots (CN12 and CN13) | 22 |
| 2.5.18 Fan Connectors (FAN1~FAN3) | 23 |
| 2.5.19 Internal USB 3.1 Gen1 Connector (CN21)..... | 24 |
| 2.5.20 SIM Card Slots (CN19) (Optional)..... | 24 |

| | | |
|--|--|-----------|
| 2.5.21 | VGA and DVI-D Connector (CN3)..... | 25 |
| 2.5.22 | TPM Pin Header (CN23) | 26 |
| 2.5.23 | Internal Mouse Connector (CN9) | 26 |
| 2.5.24 | Internal Keyboard Connector (CN8)..... | 26 |
| Chapter 3 Hardware Description | | 27 |
| 3.1 | Microprocessors..... | 27 |
| 3.2 | BIOS..... | 27 |
| 3.3 | System Memory | 27 |
| Chapter 4 AMI BIOS Setup Utility | | 29 |
| 4.1 | Starting..... | 29 |
| 4.2 | Navigation Keys | 29 |
| 4.3 | Main Menu | 31 |
| 4.4 | Advanced Menu | 32 |
| 4.5 | Chipset Menu | 45 |
| 4.6 | Security Menu | 54 |
| 4.7 | Boot Menu..... | 55 |
| 4.8 | Save & Exit Menu..... | 56 |
| Appendix A Watchdog Timer | | 59 |
| | About Watchdog Timer..... | 59 |
| | How to Use Watchdog Timer | 59 |
| Appendix B TPM Module Installation | | 61 |
| Appendix C iAMT Settings..... | | 65 |
| | Entering Management Engine BIOS Extension (MEBx) | 65 |
| | Set and Change Password | 65 |
| | iAMT Settings..... | 67 |
| | iAMT Web Console | 70 |
| Appendix D Configuring SATA for RAID..... | | 73 |
| | Configuring SATA Hard Drive(s) for RAID Function | 73 |
| Appendix E Digital I/O..... | | 81 |
| | Digital I/O Software Programming..... | 81 |

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Chapter 1

Introduction



The IMB523 / 524 / 525 is an advanced ATX industrial motherboard based on the 8th Generation Intel® Core™ i7/ i5/ i3/ Pentium® and Celeron® processors (Coffeelake) in an LGA1151 socket and comes with an Intel® Q370 / H310 / C246 chipset. Specially designed for optimal computing and visual performance, the IMB523 / 524 / 525 motherboard is an ideal solution for major industry applications ranging from financial modeling to designing complex buildings and vehicles. With its built-in Intel® HD Graphics GFX, this industrial grade motherboard delivers superb 3D visual performance and supports triple display through DVI-D, HDMI and VGA ports to meet professional-grade CAD and media/entertainment needs.

In addition, the IMB523 / 524 / 525 supports Intel® Turbo Boost 2.0 technology, Intel® Hyper-Threading technology, Intel® HD Graphics with DX11, 64GB DDR4 2400/2666MHz memory (Q370 / C246), 32 GB DDR4 2400/2666MHz memory (H310), and a PCI-Express 3.0 x16 slot. It also features Intel® Active Management Technology 12 (iAMT) (Q370 / C246), SATA RAID, as well as PCI Express expansion interfaces, making it specifically suited for applications with added security features.

1.1 Features

- LGA1151 socket 8th Generation Intel® Core™ i7/i5/i3, Pentium® and Celeron® processors (Coffeelake) up to 95W
- 4 x DDR4 2400/2666MHz DIMM with maximum memory capacity up to 64GB (max. 16GB per slot) (Q370 / C246)
- 2 x DDR4 2400/2666MHz DIMM with maximum memory capacity up to 32GB (max. 16GB per slot) (H310)
- DVI-D, HDMI, Displayport and VGA with triple view support (Q370 / C246)
- DVI-D, HDMI, Displayport and VGA with double view support (H310)
- 6 x SATA-600 RAID 0/1/5/10 (Q370 / C246)
- 4 x SATA-600 (H310)
- 2 x USB3.1 (Gen2), 4 x USB 3.1 (Gen1) and 7 x USB 2.0 ports (Q370 / C246)
- 4 x USB 3.1 (Gen1) and 5 x USB 2.0 ports (H310)
- 1 x SIM slot (Optional)
- PCI Express Mini Card support (Optional)

1.2 Specifications

- **CPU**
 - LGA1151 Socket 8th Generation Intel® Core™ i7/ i5/ i3, Pentium® and Celeron® processor.
- **Chipset**
 - Intel® Q370. (IMB523)
 - Intel® H310. (IMB524)
 - Intel® C246. (IMB525)
- **BIOS**
 - AMI BIOS.
- **System Memory**
 - Q370:
 - 4 x 288-pin DIMM sockets.
 - Maximum 64GB DDR4 memory (max. 16GB per slot).
 - Supports 2400/2666MHz.
 - H310:
 - 2 x 288-pin DIMM sockets.
 - Maximum 64GB DDR4 memory (max. 16GB per slot).
 - Supports 2400/2666MHz.
 - C246:
 - 4 x 288-pin DIMM sockets.
 - Maximum 64GB DDR4 memory (max. 16GB per slot).
 - Supports 2400/2666MHz.
 - Supports the memory with ECC function.
- **Onboard Multi I/O**
 - 1 x PS/2 keyboard and mouse.
 - Six serial ports:
 - 4 x RS-232 (internal box headers).
 - 2 x RS-232/422/485 (one in rear I/O, and the other in internal box header).

- **USB Interface**
 - Q370 / C246:
 - 2 x USB3.1(Gen2) ports.
 - 4 x USB 3.1(Gen1) ports.
 - 7 x USB 2.0 ports.
 - H310:
 - 4 x USB 3.1(Gen1) ports.
 - 5 x USB 2.0 ports.

- **Ethernet**
 - LAN1: 1000/100/10Mbps Gigabit/Fast Ethernet supports Wake-on-LAN, PXE Boot ROM, iAMT (Q370 / C246) with Intel® i219LM.
 - LAN2: 1000/100/10Mbps Gigabit/Fast Ethernet supports Wake-on-LAN, PXE Boot ROM with Intel® i211AT.

- **Serial ATA**
 - Q370 / C246:
 - 6 x SATAIII with RAID 0/1/5/10.
 - H310:
 - 4 x SATAIII.

- **Audio**
 - Realtek ALC662 HDA Codec.
 - Supports MIC-in/line-in/line-out.

- **Display**
 - 1 x 15-pin D-Sub as VGA connector. Resolution max. up to 1920x1200 @60Hz.
 - 1 x HDMI 1.4b with max. resolution up to 4096x2160 @24Hz.
 - 1 x Displayport with max. resolution up to 4096 x 2304 @60Hz, Do not supports DP++.
 - 1 x DVI-D with resolution max. up to 1920x1200 @60Hz.

- **Expansion Interface**
 - Q370 / C246:
 - 1 x PCI-Express x16 slot.
 - 2 x PCI-Express x4 slots.
 - 4 x PCI slots.
 - 1 x Mini PCIe connector w/ SIM slot (Optional).
 - H310:
 - 1 x PCI-Express x16 slot.
 - 2 x PCI-Express x4 slots.(with PCIe x1 signal)
 - 4 x PCI slots.

- **Power Input**
 - One ATX power input connector.
 - One 12V ATX power input connector for CPU Power.

- **Operating Temperature**
 - 0°C ~ 60°C.

- **Storage Temperature**
 - -20°C ~ 75°C.

- **Form Factor**
 - 305 x 244mm.



Note

All specifications and images are subject to change without notice.

1.3 Packing list

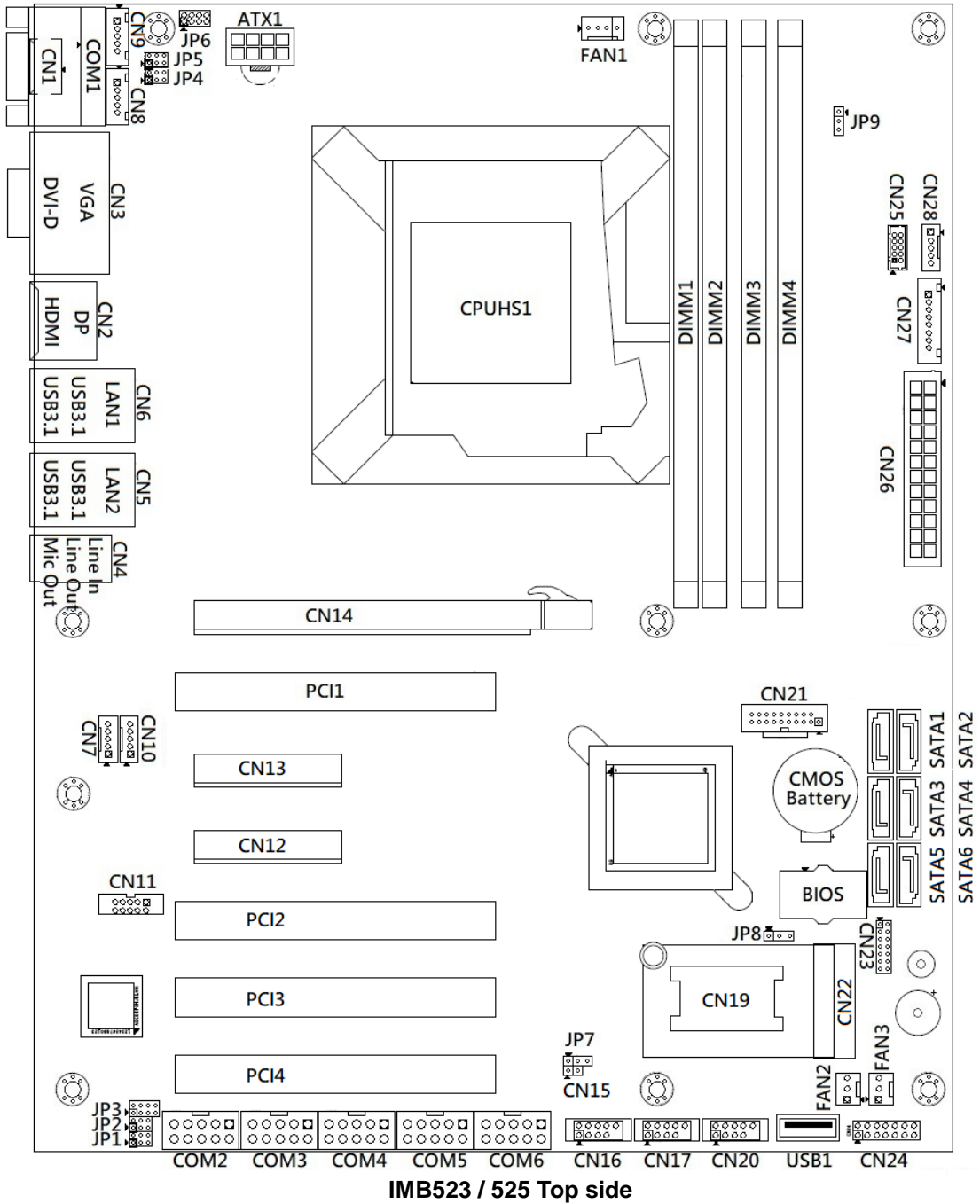
- **Bulk packing**
 - 1 x Motherboard
 - 1 x I/O bracket

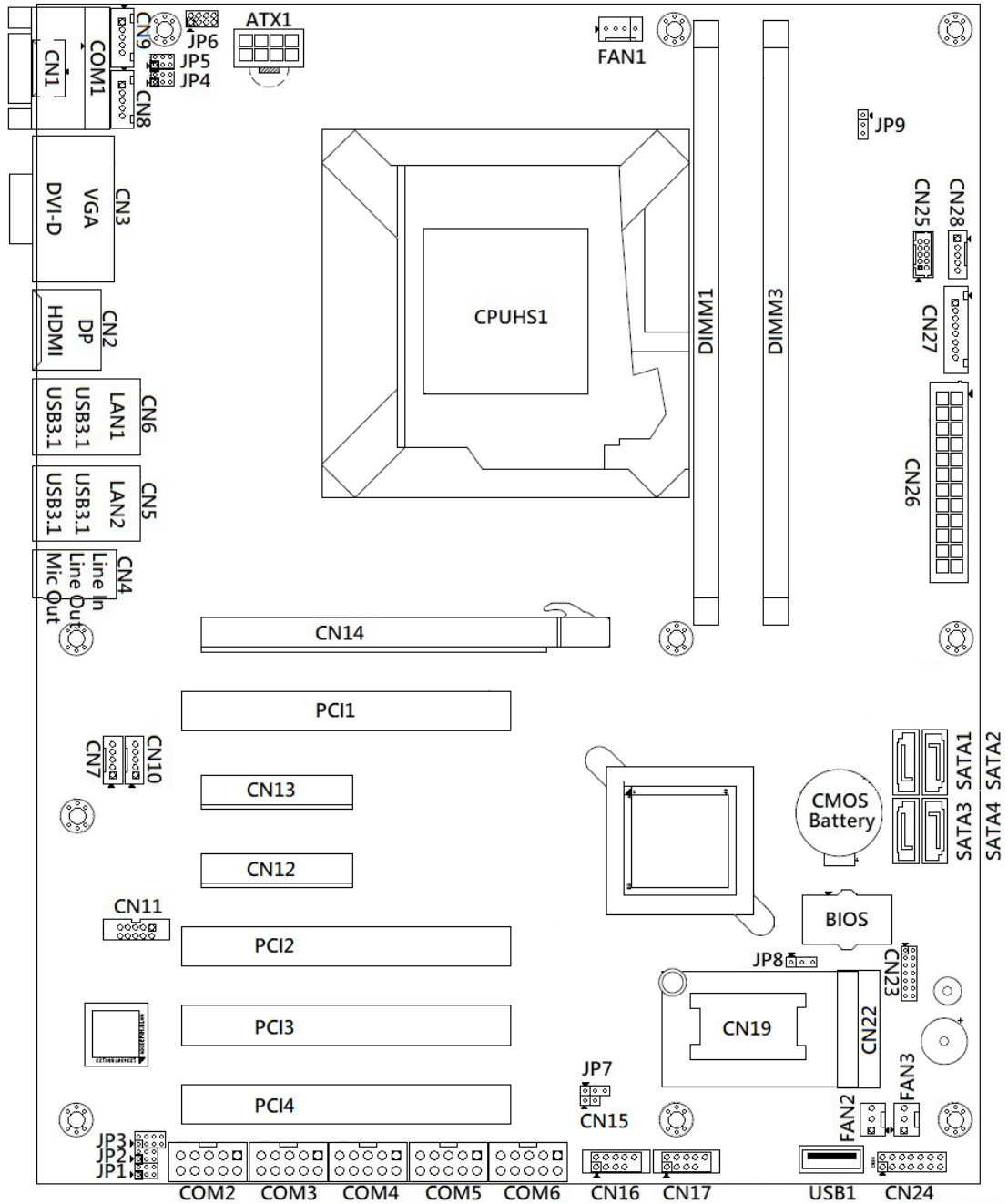
- **Gift box**
 - 1 x Motherboard
 - 1 x I/O bracket
 - 1 x Driver DVD

Chapter 2

Board and Pin Assignments

2.1 Board Layout



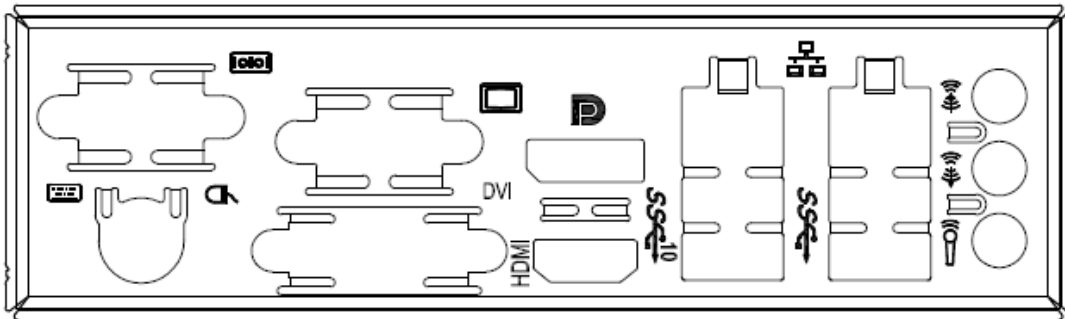


IMB524 Top side

2.2 Rear I/O

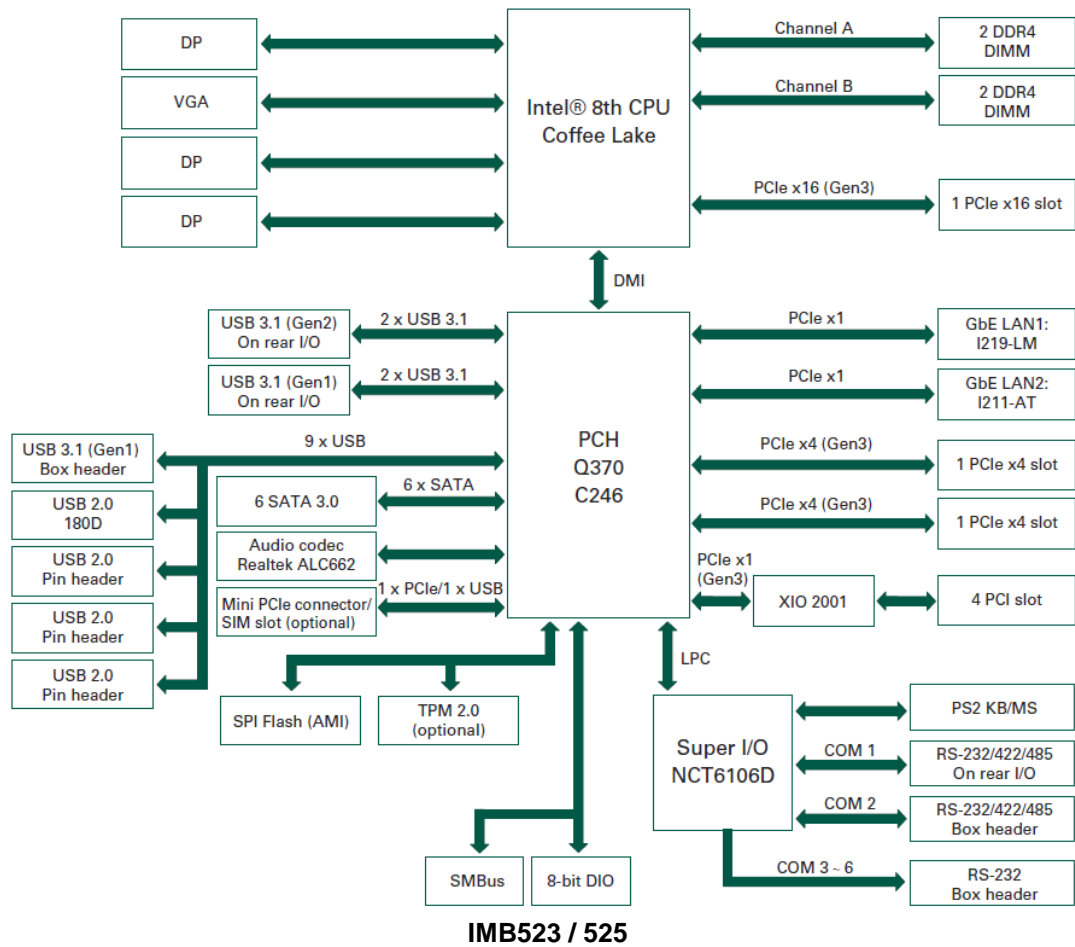


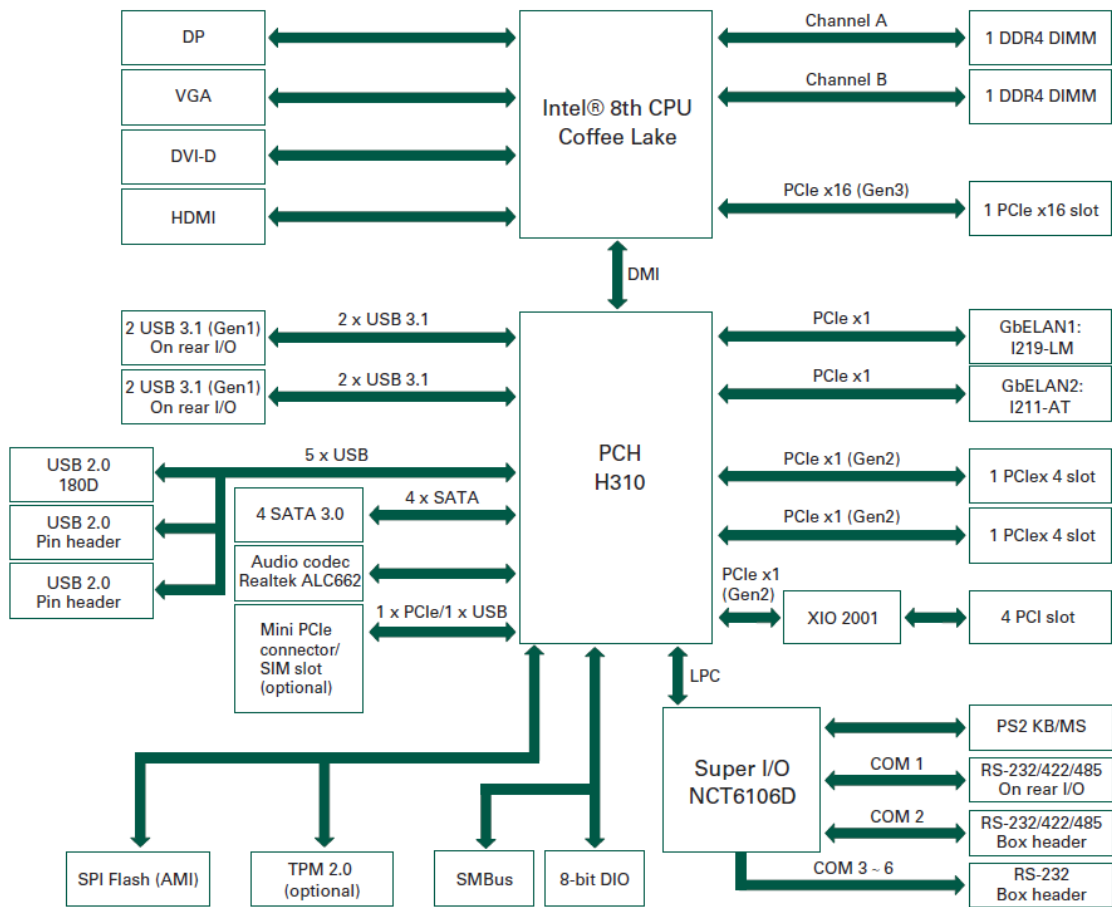
I/O side



I/O bracket

2.3 Block Diagram



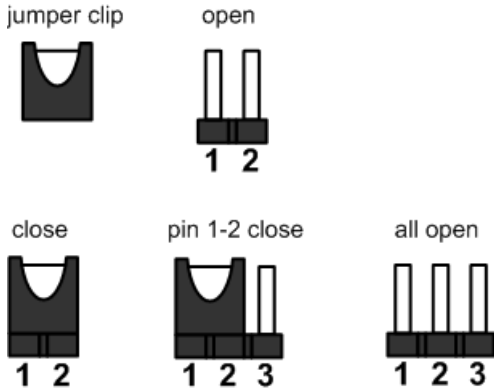


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2.4 Jumper Settings

Pin description

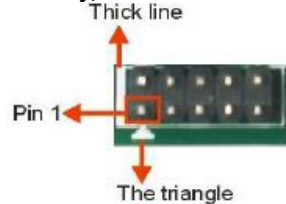
A jumper is a small component consisting of a jumper clip and jumper pins. Install a jumper clip on two jumper pins to close the jumper pins. Remove the jumper clip from two jumper pins to open the jumper pins. The following illustration shows how to set up a jumper.



Note

To identify the first pin of a header or jumper, please refer to the following information:

- Usually, there is a thick line or a triangle near the header or jumper pin 1.



- A square pad, which you can find on the back of the motherboard, is usually used for pin 1.



Before applying power to the IMB523 / 524 / 525 series, make sure all of the jumpers are in factory default position. Below you can find a summary table of all jumpers and onboard default settings.



Note

Turn off power before changing any default jumper settings.

| Jumper | Description | Setting |
|----------|---|----------------|
| JP8 | Clear CMOS Default: Normal Operation | 1-2 Close |
| JP9 | AT/ATX Power Mode Select Default: ATX Mode | 2-3 Close |
| JP3, JP6 | COM1/2 RS-232/422/485 Mode Select Default: RS-232 | 1-2 Close |
| JP1, JP2 | | 3-5, 4-6 Close |
| JP4, JP5 | | 3-5, 4-6 Close |
| JP7 | System Temperature Sensor Source Select Default: Internal Sensor External Sensor can be installed on CN15 | 2-3 Close |

2.4.1 Clear CMOS (JP8)

This jumper (3x1-pin p=2.54mm) allows you to clear the Real Time Clock (RTC) RAM in CMOS. You can clear the CMOS memory of date, time, and system setup parameters by erasing the CMOS RTC RAM data. The onboard button cell battery powers the RAM data in CMOS, which includes system setup information such as system passwords.

To erase the RTC RAM:

1. Turn OFF the computer and unplug the power cord.
2. Remove the onboard battery.
3. Move the jumper clip from pins 1-2 (default) to pins 2-3. Keep the clip on pins 2-3 for about 5~10 seconds, then move the clip back to pins 1-2.
4. Re-install the battery.
5. Plug the power cord and turn ON the computer.
6. Hold down the key during the boot process and enter BIOS setup to re-enter data.

| Function | Setting |
|----------------------------|-----------|
| Normal operation (Default) | 1-2 close |
| Clear CMOS | 2-3 close |



2.4.2 AT/ATX Mode Select (JP9)

This 3x1-pin p=2.54mm jumper allows you to select AT or ATX power mode.

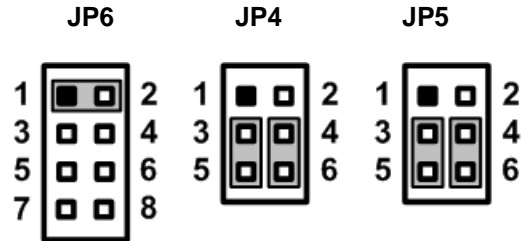
| Function | Setting |
|--------------------|-----------|
| AT mode | 1-2 close |
| ATX mode (Default) | 2-3 close |



2.4.3 COM1 Mode Select (JP4, JP5, JP6)

Use these jumpers (3x2-pin p=2.54mm) to set COM1 port to operate in RS-232, RS-422 or RS-485 communication mode.

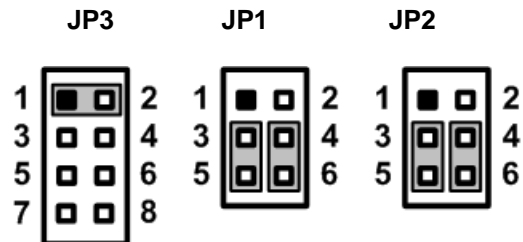
| Function | Setting |
|-----------------------|--|
| RS-232 mode (Default) | JP6 1-2 close JP4 3-5, 4-6 close JP5 3-5, 4-6 close |
| RS-422 mode | JP6 3-4, 7-8 close JP4 1-3, 2-4 close JP5 1-3, 2-4 close |
| RS-485 mode | JP6 5-6, 7-8 close JP4 1-3, 2-4 close JP5 1-3, 2-4 close |



2.4.4 COM2 Mode Select (JP1, JP2, JP3)

Use these jumpers (3x2-pin p=2.54mm) to set COM2 port to operate in RS-232, RS-422 or RS-485 communication mode.

| Function | Setting |
|-----------------------|--|
| RS-232 mode (Default) | JP3 1-2 close JP1 3-5, 4-6 close JP2 3-5, 4-6 close |
| RS-422 mode | JP3 3-4, 7-8 close JP1 1-3, 2-4 close JP2 1-3, 2-4 close |
| RS-485 mode | JP3 5-6, 7-8 close JP1 1-3, 2-4 close JP2 1-3, 2-4 close |



2.4.5 Temperature Sensor Source Select

Use these jumpers (3x1-pin p=2.54mm) to set temperature sensor source to operate form external or onboard mode.

| Function | Setting |
|-------------------------|-----------|
| External Sensor | 1-2 close |
| Onboard Sensor(Default) | 2-3 close |



Note

An external sensor can be installed at CN15.

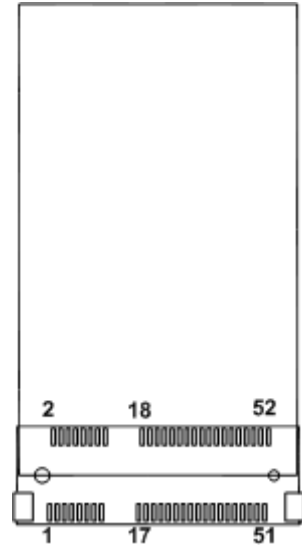
2.5 Connectors

Signals go to other parts of the system through connectors. Loose or improper connection might cause problems, Make sure all connectors are properly and firmly connected. Here is a summary table showing the connectors on the hardware.

| Connector | Description |
|------------------|---------------------------------------|
| CN1 | PS/2 KB/MS Connector |
| CN2 | DP/HDMI Connector |
| CN3 | DVI-D/ VGA Connector |
| CN4 | Audio Jack |
| CN5 | RJ45 + USB3.1 GEN1 Connector |
| CN6 | RJ45 (iAMT)+ USB3.1 GEN2 Connector |
| CN8, CN9 | Internal PS/2 KB/MS Connector |
| CN11 | Front Audio Header |
| CN12, CN13 | PCI-Express x4 Slots |
| CN14 | PCI-Express x16 Slots |
| CN15 | External Sensor Connector |
| CN16, CN17, CN20 | Internal USB2.0 Headers |
| CN19 | SIM Slot (Optional) |
| CN21 | Internal USB3.1 GEN1 Connector |
| CN22 | Mini PCI-Express Connector (Optional) |
| CN23 | TPM 2.0 Connector (Optional) |
| CN24 | Front Panel Header |
| CN25 | DIO Connector |
| CN26 | 24-pin Power Input Connector |
| CN27 | Voltage Monitor Header |
| CN28 | SMBus Header |
| ATX1 | CPU Power Input Connector |
| COM1 | Comport Connector |
| COM2 ~ COM6 | Comport Box Header |
| FAN1 | CPU Fan Connector |
| FAN2, FAN3 | System Fan Connectors |
| PCI1 ~ PCI4 | PCI Slots |
| SATA1 ~ SATA6 | SATA III Connector |

2.5.1 Mini PCI-Express Connector (CN22) (Optional)

| Pin | Signal | Pin | Signal |
|-----|------------|-----|-----------------|
| 1 | WAKE# | 2 | +3.3V_DUAL |
| 3 | N/C | 4 | GND |
| 5 | N/C | 6 | +1.5V |
| 7 | CLKREQ# | 8 | UIM_PWR |
| 9 | GND | 10 | UIM_DATA |
| 11 | REFCLK- | 12 | UIM_CLK |
| 13 | REFCLK+ | 14 | UIM_RESET |
| 15 | GND | 16 | UIM_VPP |
| 17 | N/C | 18 | GND |
| 19 | N/C | 20 | W_DISABLE# |
| 21 | GND | 22 | PERST# |
| 23 | PE_RXN7 | 24 | +3.3V_DUAL |
| 25 | PE_RXP7 | 26 | GND |
| 27 | GND | 28 | +1.5V |
| 29 | GND | 30 | SMB_CLK_RESUME |
| 31 | PE_TXN7 | 32 | SMB_DATA_RESUME |
| 33 | PE_TXP7 | 34 | GND |
| 35 | GND | 36 | USB3- |
| 37 | GND | 38 | USB3+ |
| 39 | +3.3V_DUAL | 40 | GND |
| 41 | +3.3V_DUAL | 42 | N/C |
| 43 | GND | 44 | N/C |
| 45 | N/C | 46 | N/C |
| 47 | N/C | 48 | +1.5V |
| 49 | N/C | 50 | GND |
| 51 | N/C | 52 | +3.3V_DUAL |



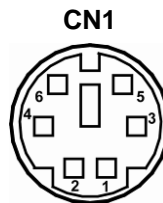
Screw type is M2*0.4.

Note

2.5.2 Keyboard and PS/2 Mouse Connector (CN1)

The board supports a keyboard and mouse interface. Connector CN1 is a DIN connector for PS/2 keyboard connection via a Y-Cable.

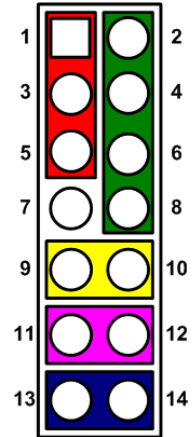
| Pin | Signal |
|-----|----------------|
| 1 | Keyboard Data |
| 2 | Mouse Data |
| 3 | GND |
| 4 | VCC |
| 5 | Keyboard Clock |
| 6 | Mouse Clock |



2.5.3 Front Panel Header (CN24)

This is a front panel header (7x2-pin p=2.54mm).

| Pin | Signal |
|-----|---------------------|
| 1 | Power LED+ |
| 2 | SPK- ^[1] |
| 3 | GND |
| 4 | BUZZER |
| 5 | Power LED- |
| 6 | N/C |
| 7 | N/C |
| 8 | SPK+ ^[1] |
| 9 | PWR- |
| 10 | PWR+ |
| 11 | RESET- |
| 12 | RESET+ |
| 13 | HD LED- |
| 14 | HD LED+ |



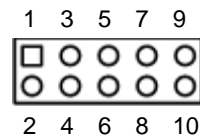
Note

^[1]: The buzzer on the motherboard will be active when pin 2 and pin 4 are connected; the external speaker on the chassis will be active when pin 2 and pin 4 are open.

2.5.4 GPIO Header (CN25)

This header (5x2-pin p=2.00mm) is for digital I/O interface.

| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1 | DIO1 | 2 | DIO8 |
| 3 | DIO2 | 4 | DIO7 |
| 5 | DIO3 | 6 | DIO6 |
| 7 | DIO4 | 8 | DIO5 |
| 9 | NC | 10 | GND |



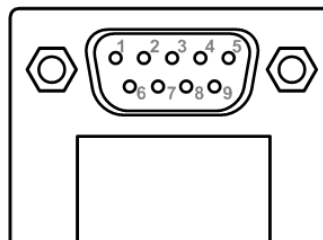
Note

The default value of DIO1 to DIO8 is set as GPI with high level.

2.5.5 COM1 Connector (COM1)

This is a high rise 9-pin D-Sub connector for COM1 serial port interface. The pin assignments of RS-232/422/485 are listed in the table below.

| Pin | RS-232 ^[*] | RS-422 ^[*] | RS-485 ^[*] |
|-----|-----------------------|-----------------------|-----------------------|
| 1 | DCD# | TX- | 485- |
| 2 | RXD | TX+ | 485+ |
| 3 | TXD | RX+ | N/C |
| 4 | DTR# | RX- | N/C |
| 5 | GND | GND | GND |
| 6 | DSR# | N/C | N/C |
| 7 | RTS# | N/C | N/C |
| 8 | CTS# | N/C | N/C |
| 9 | RI# | N/C | N/C |



Note

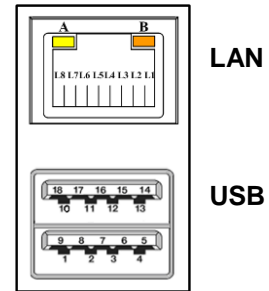
^[*]: Signals of COM1 can be RS-232/422/485 by selecting JP4, JP5 and JP6 (see section 2.4.3).

2.5.6 LAN and USB 3.1 Connectors (CN5 and CN6)

The motherboard comes with two high performance plug and play Ethernet interfaces (RJ-45) which are fully compliant with the IEEE 802.3 standard. Connection can be established by plugging one end of the Ethernet cable into this RJ-45 connector and the other end to a 1000/100/10 Base-T hub.

The Universal Serial Bus (compliant with USB 3.1 Gen2 (CN6) or USB3.1 Gen1 (CN5) connectors on the rear I/O are for installing USB peripherals such as a keyboard, mouse, scanner, etc.

| Pin | LAN Signal | Pin | LAN Signal |
|-----|---|-----|----------------------------------|
| L1 | Tx+ (Data transmission positive) | L2 | Tx- (Data transmission negative) |
| L3 | Rx+ (Data reception positive) | L4 | RJ-1 (For 1000 Base-T only) |
| L5 | RJ-1 (For 1000 Base-T only) | L6 | Rx- (Data reception negative) |
| L7 | RJ-1 (For 1000 Base-T only) | L8 | RJ-1 (For 1000 Base-T only) |
| A | 100 LAN LED (Green) / 1000 LAN LED (Orange) | B | Active LED |



Note

- Speed LED turns orange for 1000Mbps or green for 100Mbps. The light is off for 10Mbps.
- CN6 supports AMT and USB3.1 GEN 2 when the chipset is customized into Intel® Q370 & C246. Both CN5 and CN6 support Wake-on-LAN.

| Pin | USB Signal | Pin | USB Signal |
|-----|-------------|-----|-------------|
| 1 | USB3_POWER | 2 | USB1 - |
| 3 | USB1 + | 4 | GND |
| 5 | USB3_SSRX1- | 6 | USB3_SSRX1+ |
| 7 | GND | 8 | USB3_SSTX1- |
| 9 | USB3_SSTX1+ | 10 | USB3_POWER |
| 11 | USB2 - | 12 | USB2 + |
| 13 | GND | 14 | USB3_SSRX2- |
| 15 | USB3_SSRX2+ | 16 | GND |
| 17 | USB3_SSTX2- | 18 | USB3_SSTX2+ |

2.5.7 Audio Jack (CN4)

Install an audio driver, and then attach audio devices to CN4.

| Pin Color | Signal |
|-----------|----------|
| Blue | Line-in |
| Green | Line-out |
| Pink | MIC-in |



2.5.8 Front Audio Header (CN11)

This is a front audio header (5x2-pin p=2.00mm) for convenient connection and control of audio devices.

| Pin | Signal | Pin | Signal |
|-----|-----------|-----|--------|
| 1 | MIC_IN | 2 | GND |
| 3 | LINE_IN_L | 4 | GND |
| 5 | LINE_IN_R | 6 | GND |
| 7 | AUD_OUT_L | 8 | GND |
| 9 | AUD_OUT_R | 10 | GND |



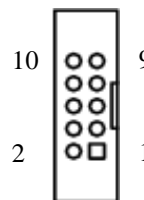
2.5.9 COM Headers (COM2 ~ COM6)

The motherboard comes with 5x2-pin p=2.54mm headers for COM2~COM6 serial port interfaces.

COM2~COM6:

| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1 | DCD# | 2 | DSR# |
| 3 | RXD# | 4 | RTS# |
| 5 | TXD# | 6 | CTS# |
| 7 | DTR# | 8 | RI# |
| 9 | GND | 10 | N/C |

COM2 ~ COM6



2.5.10 External Sensor Header (CN15)

The external sensor header is an 1x2-pin p=2.54mm header. The function of CN15 is to connect an external sensor.

| Pin | Signal |
|-----|----------|
| 1 | Sys_Temp |
| 2 | GND |



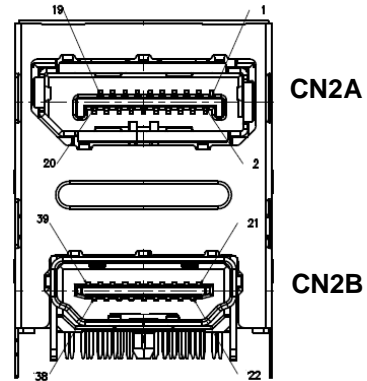
Note

JP7 should be 1-2 closed for the external sensor on CN15.

2.5.11 DisplayPort and HDMI Connector (CN2)

CN2 is a double-deck connector comprising an upper connector for DisplayPort (CN2A) and a lower connector for HDMI (CN2B).

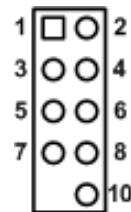
| Pin | Signal | Pin | Signal |
|-----|-----------------|-----|-----------------|
| 1 | LANE 0 | 21 | DATA2 |
| 2 | GND | 22 | GND |
| 3 | LANE 0# | 23 | DATA2# |
| 4 | LANE 1 | 24 | DATA1 |
| 5 | GND | 25 | GND |
| 6 | LANE 1# | 26 | DATA1# |
| 7 | LANE 2 | 27 | DATA0 |
| 8 | GND | 28 | GND |
| 9 | LANE 2# | 29 | DATA1# |
| 10 | LANE 3 | 30 | Clock |
| 11 | GND | 31 | GND |
| 12 | LANE 3# | 32 | Clock# |
| 13 | Detect Pin | 33 | NC |
| 14 | GND | 34 | NC |
| 15 | AUX CH | 35 | SCL |
| 16 | GND | 36 | SDA |
| 17 | AUX CH# | 37 | GND |
| 18 | Hot Plug Detect | 38 | +5V POWER |
| 19 | GND | 39 | Hot Plug Detect |
| 20 | DP_PWR(3.3V) | | |



2.5.12 Internal USB Headers (CN16~CN17, CN20, USB1)

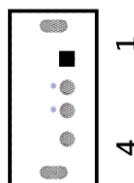
These are 5x2-pin p=2.54mm headers for USB 2.0 interface.

| Pin | Signal | Pin | Signal |
|-----|---------------|-----|---------------|
| 1 | +5 V_DUAL | 2 | +5 V_DUAL |
| 3 | USB 5, 7, 12- | 4 | USB 6, 8, 13- |
| 5 | USB 5, 7, 12+ | 6 | USB 6, 8, 13+ |
| 7 | GND | 8 | GND |
| | | 10 | GND |



The USB1 is a Type-A 180D connector for USB2.0 signal.

| Pin | Signal |
|-----|----------|
| 1 | +5V_DUAL |
| 2 | USB- |
| 3 | USB+ |
| 4 | GND |

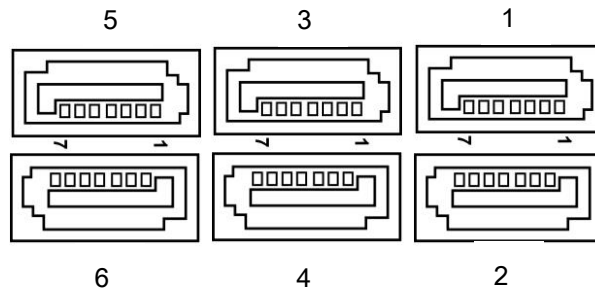


2.5.13 SATA 3.0 Connectors (SATA1 ~ SATA6)

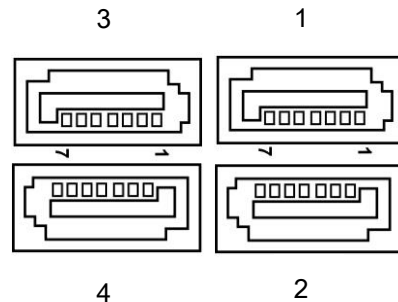
These Serial Advanced Technology Attachment (Serial ATA or SATA) connectors are for SATA 3.0 interface allowing up to 6.0Gb/s data transfer rate. It is a computer bus interface for connecting to devices such as hard disk drive.

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

Q370 / C246:



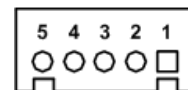
H310:



2.5.14 SMBus Header (CN28)

The CN28 (5x1-pin p=2.00mm) is for SMBus (System Management Bus) interface.

| Pin | Signal | Pin | Signal |
|-----|---------|-----|---------|
| 1 | SMB_SCL | 2 | N/C |
| 3 | GND | 4 | SMB_SDA |
| 5 | +5V | | |



2.5.15 Voltage Monitor Header (CN27)

The function of CN27 (8x1-pin p=2.54mm) is for voltage monitoring. It doesn't supply power.

| Pin | Signal | Pin | Signal |
|-----|---------|-----|--------|
| 1 | GND | 2 | GND |
| 3 | VCC5_SB | 4 | +3.3V |
| 5 | -5V | 6 | +5V |
| 7 | -12V | 8 | +12V |



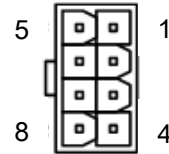
2.5.16 Power Input Connectors (ATX1 and CN26)

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

An external power supply plug fits into ATX1 and CN26 in only one orientation. Properly press down power supply plug until it completely and firmly fits into the connector. Loose connection may cause system instability.

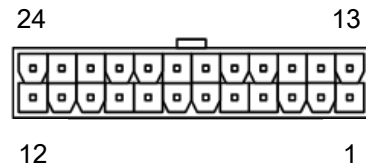
ATX1 CPU power input connector:

| Pin | ATX1 Signal | Pin | ATX1 Signal |
|-----|-------------|-----|-------------|
| 1 | GND | 5 | +12V |
| 2 | GND | 6 | +12V |
| 3 | GND | 7 | +12V |
| 4 | GND | 8 | +12V |



CN26 24-pin power input connector:

| Pin | CN26 Signal | Pin | CN26 Signal |
|-----|-------------|-----|-------------|
| 1 | 3.3V | 13 | 3.3V |
| 2 | 3.3V | 14 | -12V |
| 3 | GND | 15 | GND |
| 4 | +5V | 16 | PS_ON |
| 5 | GND | 17 | GND |
| 6 | +5V | 18 | GND |
| 7 | GND | 19 | GND |
| 8 | PWR OK | 20 | -5V |
| 9 | 5VSB | 21 | +5V |
| 10 | +12V | 22 | +5V |
| 11 | +12V | 23 | +5V |
| 12 | 3.3V | 24 | GND |



2.5.17 PCI-Express x4 Slots (CN12 and CN13)

This motherboard has two PCI-Express x4 slots.

| Pin | Signal | Pin | Signal |
|-----|------------------------|-----|---------------------|
| B1 | +12V_PS | A1 | GND |
| B2 | +12V_PS | A2 | +12V_PS |
| B3 | +12V_PS | A3 | +12V_PS |
| B4 | GND | A4 | GND |
| B5 | SMB_CLK_RESUME | A5 | N/C |
| B6 | SMB_DATA_RESUME | A6 | N/C |
| B7 | GND | A7 | N/C |
| B8 | +3.3V_PS | A8 | N/C |
| B9 | N/C | A9 | +3.3V_PS |
| B10 | +3.3V_SB | A10 | +3.3V_PS |
| B11 | PCH_WAKE_N | A11 | PWRGD |
| B12 | N/C | A12 | GND |
| B13 | GND | A13 | CLKOUT_PCIE_P5 |
| B14 | PCIE1_SLOT1_TX_DP_C | A14 | CLKOUT_PCIE_N5 |
| B15 | PCIE1_SLOT1_TX_DN_C | A15 | GND |
| B16 | GND | A16 | PCIE1_SLOT1_RX_DP_C |
| B17 | PCIEX4_SLOT1_PRSENT2_N | A17 | PCIE1_SLOT1_RX_DN_C |
| B18 | GND | A18 | GND |
| B19 | PCIE2_TX_DP | A19 | N/C |
| B20 | PCIE2_TX_DN | A20 | GND |
| B21 | GND | A21 | PCIE2_RX_DP |
| B22 | GND | A22 | PCIE2_RX_DN |
| B23 | PCIE3_TX_DP | A23 | GND |
| B24 | PCIE3_TX_DN | A24 | GND |
| B25 | GND | A25 | PCIE3_RX_DP |
| B26 | GND | A26 | PCIE3_RX_DN |
| B27 | PCIE4_TX_DP | A27 | GND |
| B28 | PCIE4_TX_DN | A28 | GND |
| B29 | GND | A29 | PCIE4_RX_DP |
| B30 | N/C | A30 | PCIE4_RX_DN |
| B31 | N/C | A31 | GND |
| B32 | GND | A32 | N/C |

2.5.18 Fan Connectors (FAN1~FAN3)

This motherboard has three fan connectors. Find fan speed option(s) at BIOS Setup Utility: Advanced\HW Monitor\PC Health Status.

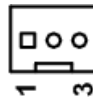
The FAN1 (4x1-pin p=2.54mm) is for the the CPU fan connector.

| Pin | Signal |
|-----|---------------------|
| 1 | GND |
| 2 | +12V |
| 3 | FAN Speed Detection |
| 4 | FAN Speed Control |



The FAN2 and FAN3 (4x1-pin p=2.54mm) are for system fan connectors.

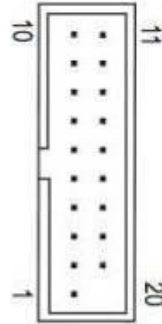
| Pin | Signal |
|-----|---------------------|
| 1 | GND |
| 2 | +12V |
| 3 | FAN Speed Detection |



2.5.19 Internal USB 3.1 Gen1 Connector (CN21)

The CN21 is a 19-pin internal connector for installing versatile USB 3.1 compliant peripherals.

| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1 | VBUS0 | | |
| 2 | SSRX5- | 19 | VBUS1 |
| 3 | SSRX5+ | 18 | SSRX6- |
| 4 | GND | 17 | SSRX6+ |
| 5 | SSTX5- | 16 | GND |
| 6 | SSTX5+ | 15 | SSTX6- |
| 7 | GND | 14 | SSTX6+ |
| 8 | USB10- | 13 | GND |
| 9 | USB10+ | 12 | USB11- |
| 10 | ID | 11 | USB11+ |



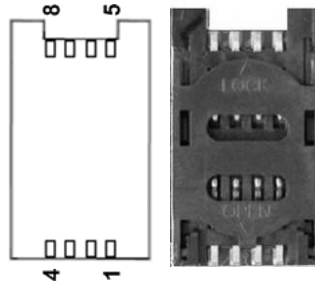
Note

- CN21 supports USB3.1 GEN 1 when the chipset is customized into Intel® Q370 & C246.

2.5.20 SIM Card Slots (CN19) (Optional)

The motherboard includes one SIM slot on the bottom side of the system for inserting a SIM card. It is mainly used in 3G/4G wireless network applications.

| Pin | Signal |
|-----|--------|
| 1 | PWR |
| 2 | RST |
| 3 | CLK |
| 4 | NC |
| 5 | GND |
| 6 | VPP |
| 7 | I/O |
| 8 | NC |

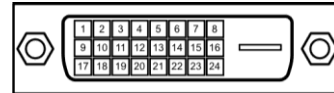


2.5.21 VGA and DVI-D Connector (CN3)

CN3 is a double-deck connector comprising an lower connector for DVI-D port and a upper connector for VGA port.

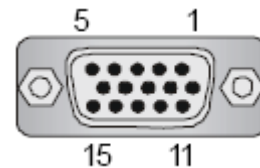
The high rise DVI-D connector provides transmission of fast and high quality video signals between a source device (graphic card) and a display device (monitor).

| Pin | Signal | Pin | Signal |
|-----|--------------|-----|-------------|
| 1 | TX2- | 2 | TX2+ |
| 3 | Ground | 4 | NC |
| 5 | NC | 6 | DVI_SPD_CLK |
| 7 | DVI_SPD DATA | 8 | NC |
| 9 | TX1- | 10 | TX1+ |
| 11 | Ground | 12 | NC |
| 13 | NC | 14 | VGAVCC |
| 15 | Ground | 16 | HPDETECT |
| 17 | TX0- | 18 | TX0+ |
| 19 | Ground | 20 | NC |
| 21 | NC | 22 | Ground |
| 23 | TXC+ | 24 | TXC- |



The 15-pin D-Sub connector is commonly used for VGA display.

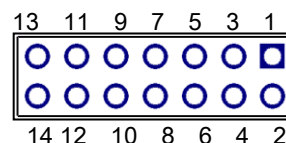
| Pin | Signal | Pin | Signal |
|-----|-----------------|-----|---------------|
| 1 | Red | 2 | Green |
| 3 | Blue | 4 | NC |
| 5 | GND | 6 | GND |
| 7 | GND | 8 | GND |
| 9 | VCC | 10 | GND |
| 11 | NC | 12 | DDC DATA |
| 13 | Horizontal Sync | 14 | Vertical Sync |
| 15 | DDC CLK | | |



2.5.22 TPM Pin Header (CN23)

These are 7x2-pin p=2.0mm headers for SPI interface with an AX93515 TPM module.

| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1 | VCC3P3 | 2 | GND |
| 3 | MOSI | 4 | MISO |
| 5 | CLK | 6 | CS2 |
| 7 | RST | 8 | PIRQ |
| 9 | PP | 10 | NC |
| 11 | NC | 12 | NC |
| 13 | NC | 14 | MC |



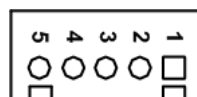
Note

The screw type is M2*0.4.

2.5.23 Internal Mouse Connector (CN9)

The internal mouse interface is available through a 5-pin connector.

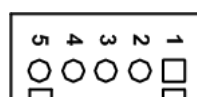
| Pin | Signal |
|-----|-------------|
| 1 | Mouse Clock |
| 2 | Mouse Data |
| 3 | NC |
| 4 | GND |
| 5 | +5V level |



2.5.24 Internal Keyboard Connector (CN8)

The internal keyboard interface is available through a 5-pin connector.

| Pin | Signal |
|-----|----------------|
| 1 | Keyboard Clock |
| 2 | Keyboard Data |
| 3 | NC |
| 4 | GND |
| 5 | +5V level |



Chapter 3

Hardware Description

3.1 Microprocessors

The IMB523 / 524 / 525 series supports Intel® Core™ i7/ i5/ i3, Pentium® and Celeron® 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.



Note

Caution: Make sure turnoff power supply, before you install the processor into the CPU socket.

3.2 BIOS

The IMB523 / 524 / 525 series uses AMI Plug and Play BIOS.

3.3 System Memory

The IMB523 / 525 supports four 288-pin DDR4 DIMM sockets for maximum memory capacity up to 64GB DDR4 SDRAMs. The memory module comes in sizes of 2GB, 4GB, 8GB and 16GB.

The IMB524 supports two 288-pin DDR4 DIMM sockets for maximum memory capacity up to 32GB DDR4 SDRAMs. The memory module comes in sizes of 2GB, 4GB, 8GB and 16GB.

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Chapter 4

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.

4.1 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 JP8 (see section 2.4.1).

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.

4.2 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.



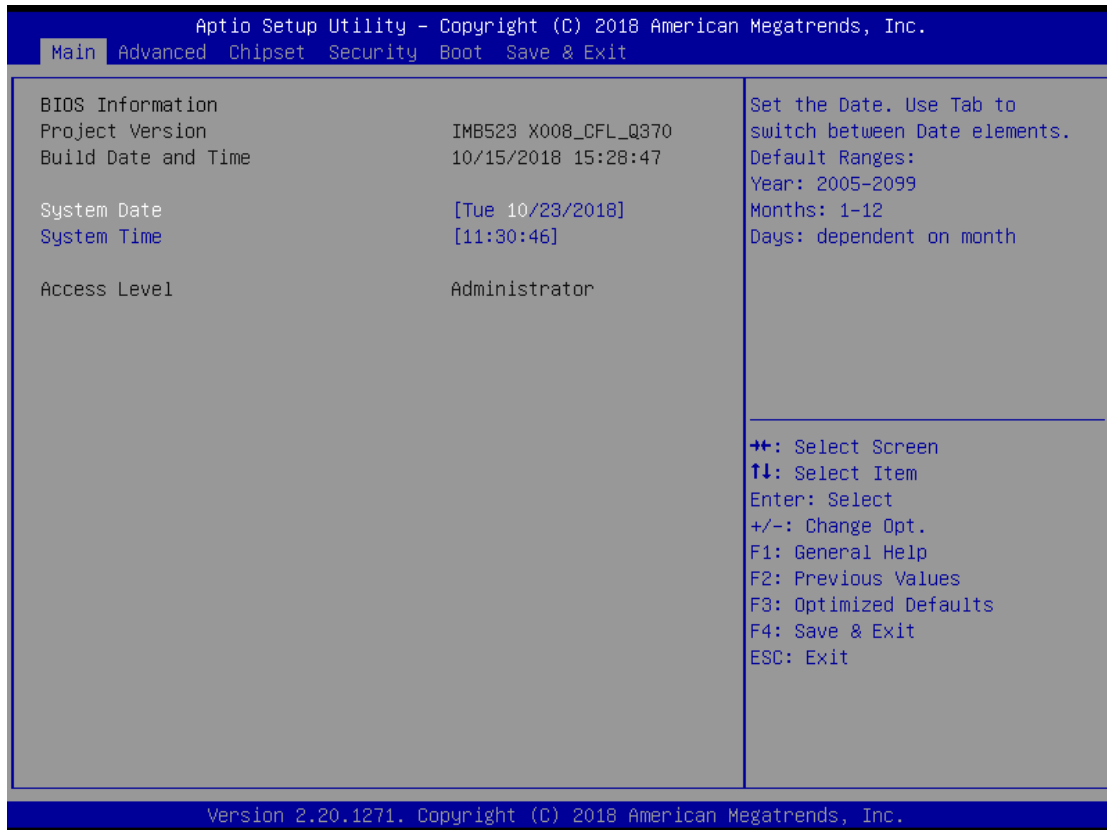
Note

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. |

4.3 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

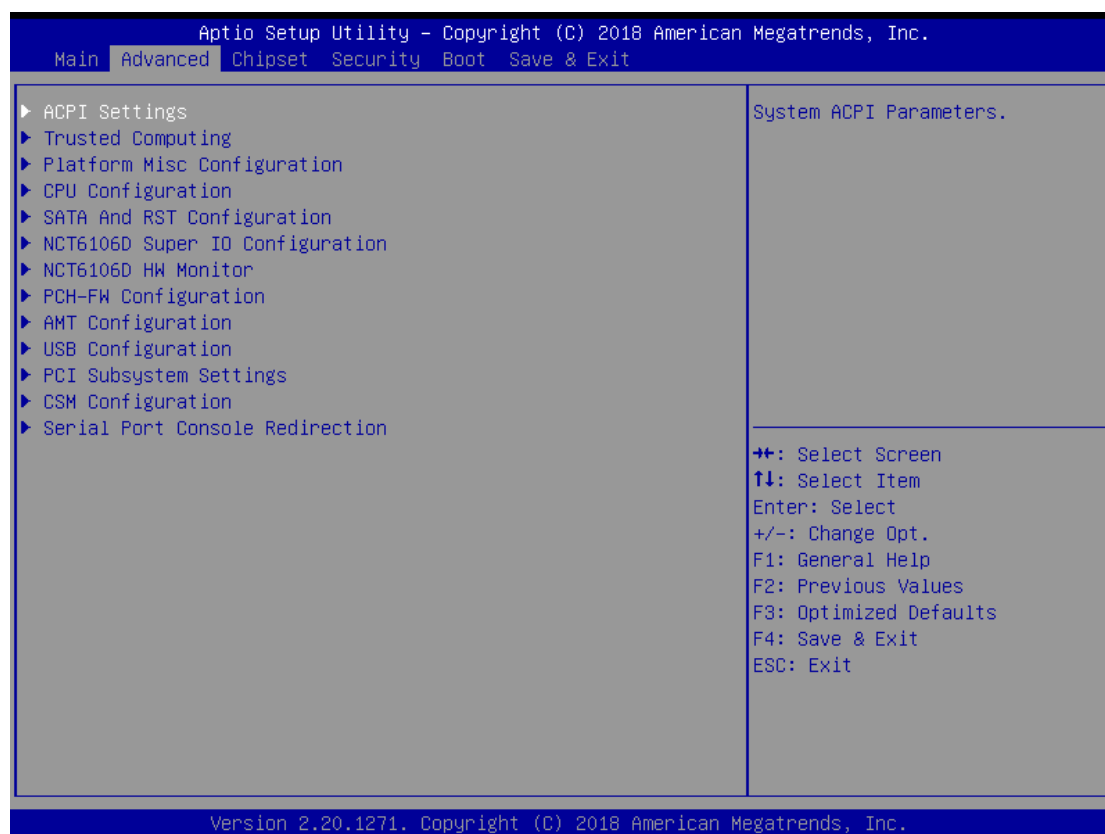
Display the access level of current user.

4.4 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:

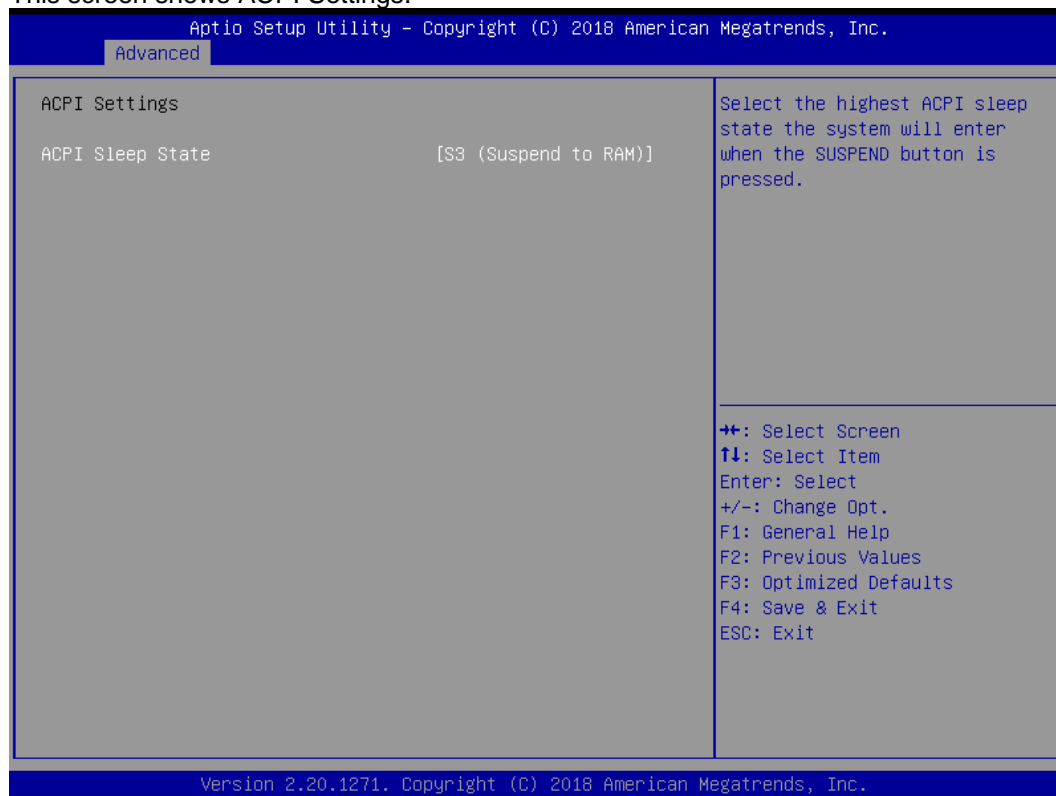
- ▶ ACPI Settings
- ▶ Trusted Computing
- ▶ Platform Misc Configuration
- ▶ CPU Configuration
- ▶ SATA and RST Configuration
- ▶ NCT6106D Super IO Configuration
- ▶ NCT6106D Hardware Monitor
- ▶ PCH-FW configuration
- ▶ AMT configuration
- ▶ USB Configuration
- ▶ PCI Subsystem Settings
- ▶ CSM Configuration
- ▶ Serial Port Console Redirection

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



- **ACPI Settings**

This screen shows ACPI Settings.

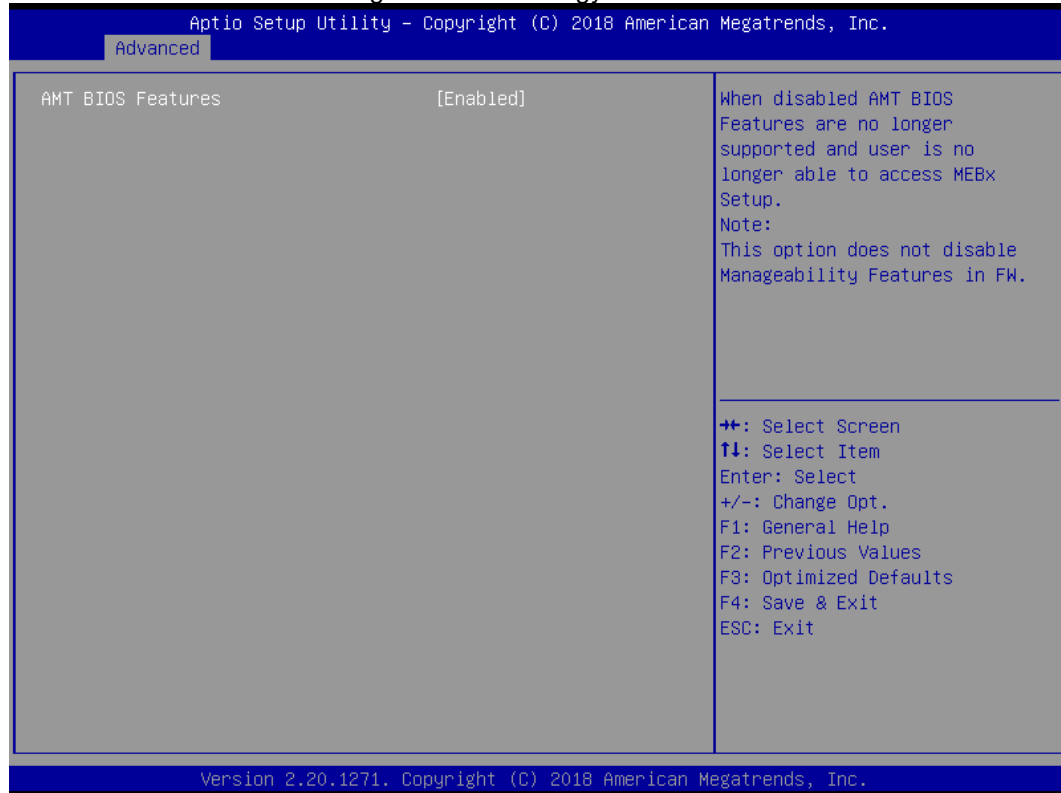


ACPI Sleep State

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 the ACPI sleep state the system will enter when the suspend button is pressed.

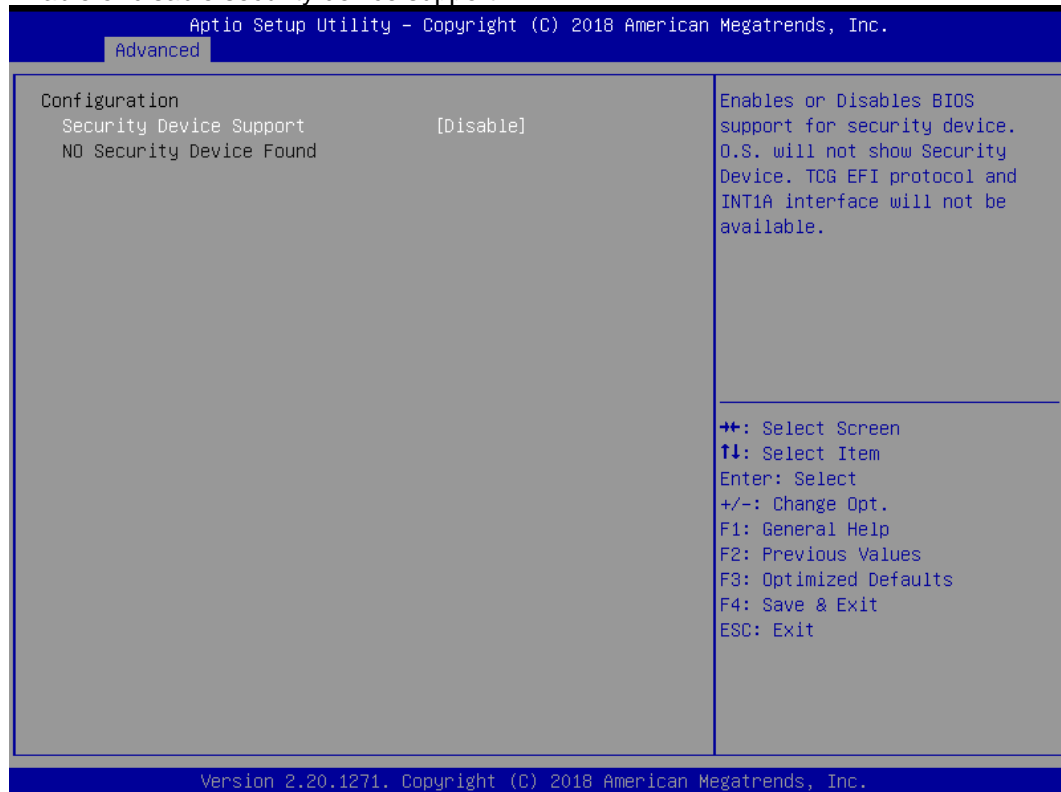
AMT BIOS Features

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



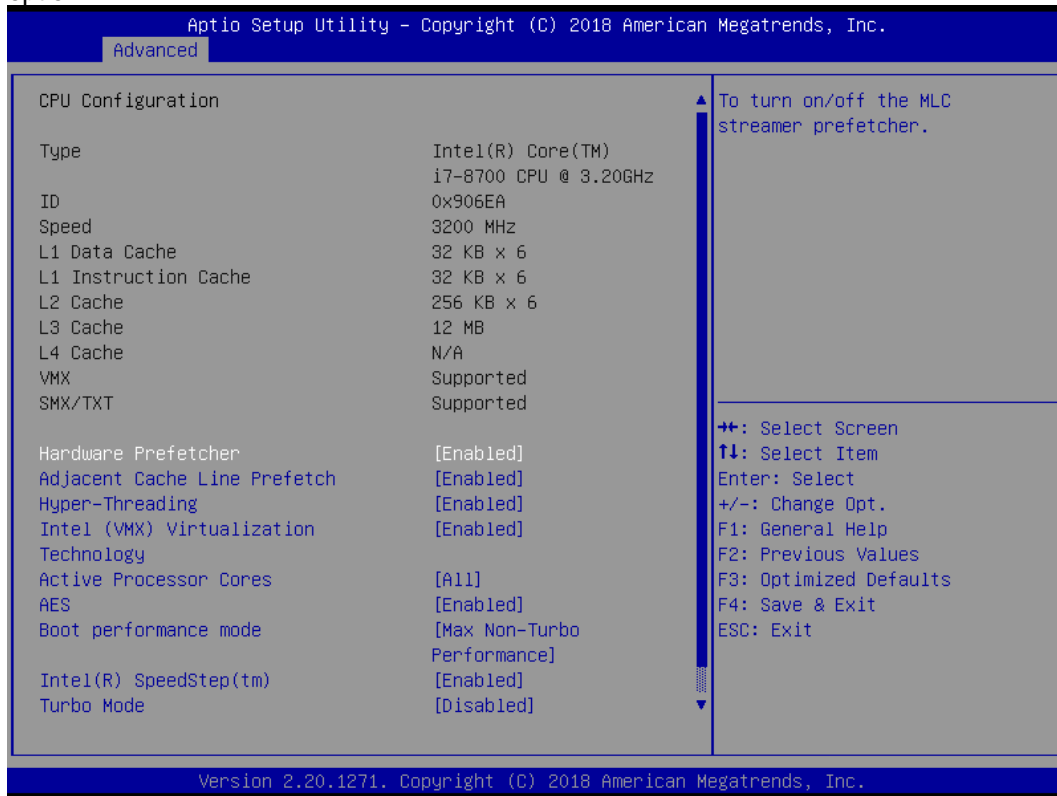
- **Trusted Computing**

Enable or disable security device support.



CPU Configuration

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



Hardware Prefetcher

Turn on/off the MLC streamer prefetcher.

Adjacent Cache Line Prefetch

Turn on/off prefetching of adjacent cache lines.

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.

Active Processor Cores

Number of cores to enable in each processor package.

AES

Enable / 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

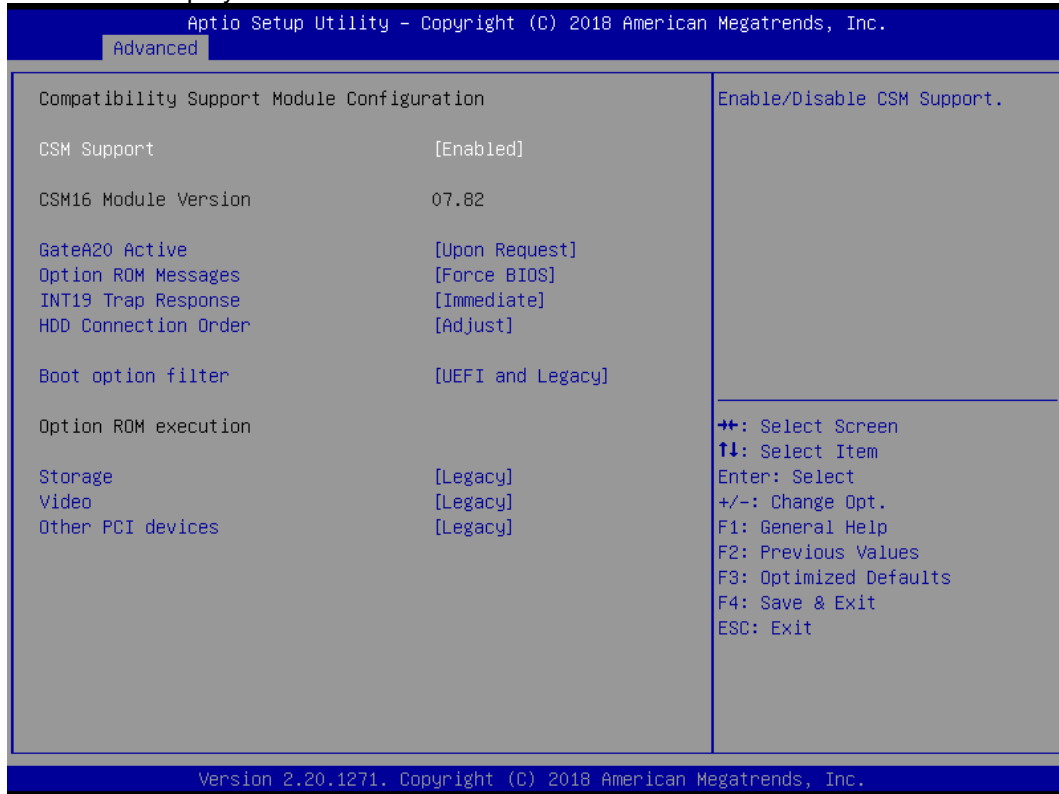
Enable/Disable processor Turbo Mode (requires EMTTM enabled too). AUTO means enabled, unless max turbo ratio is bigger than 16 - SKL A0 W/A.

C states

Enable/Disable CPU Power Management, which allows CPU to go to power saving C-states when it's not 100% utilized.

- **Compatibility Support Module (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

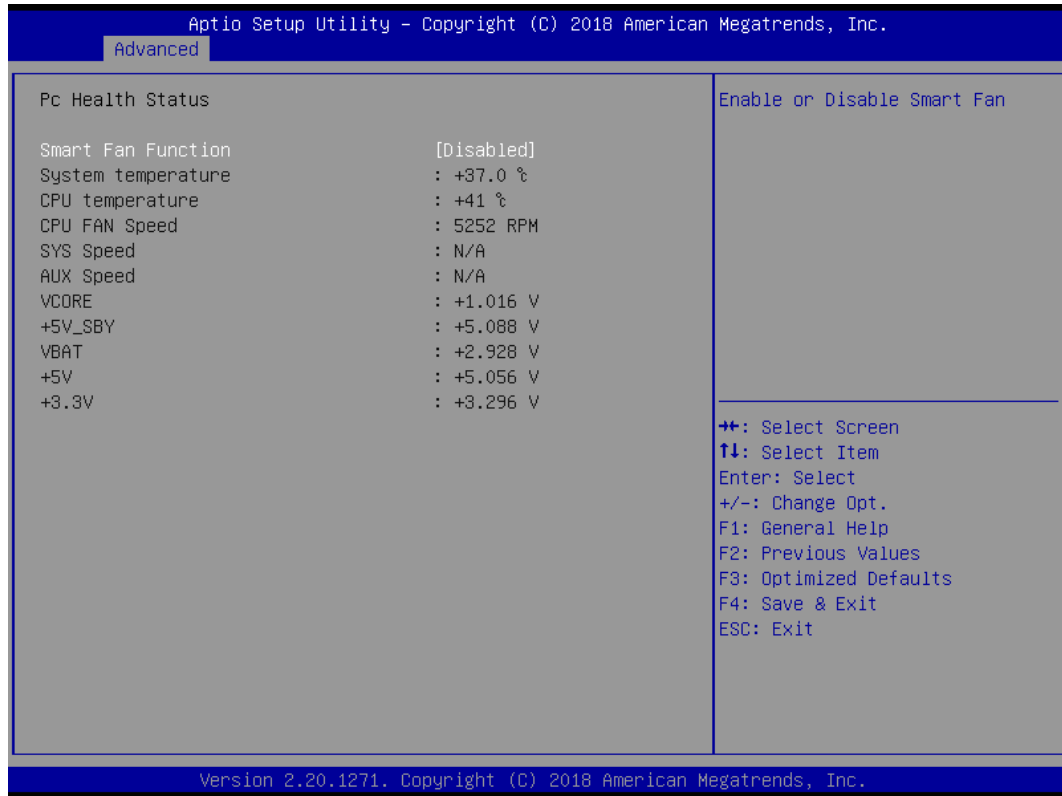
Controls the execution of UEFI and Legacy Video OpROM.

Other PCI devices

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

- **NCT6106D 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).



Note

CPU FAN = FAN1; SYS FA = FAN2; AUX FAN = FAN3.

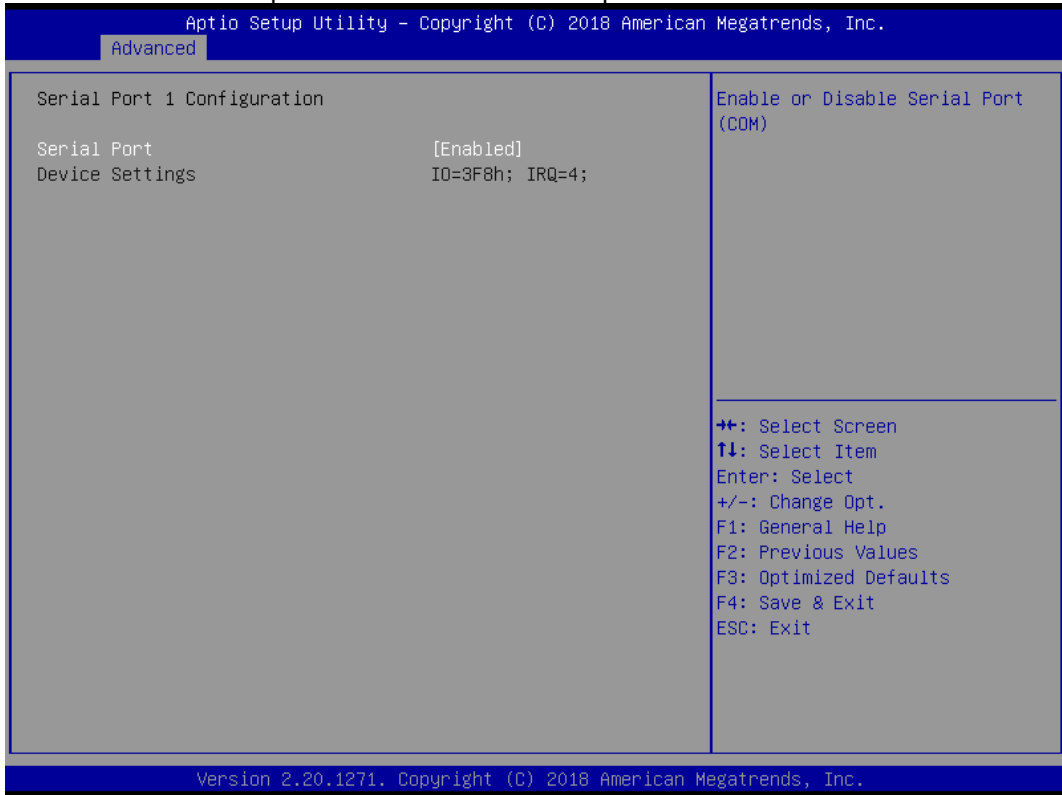
NCT6106D Super IO Configuration

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.



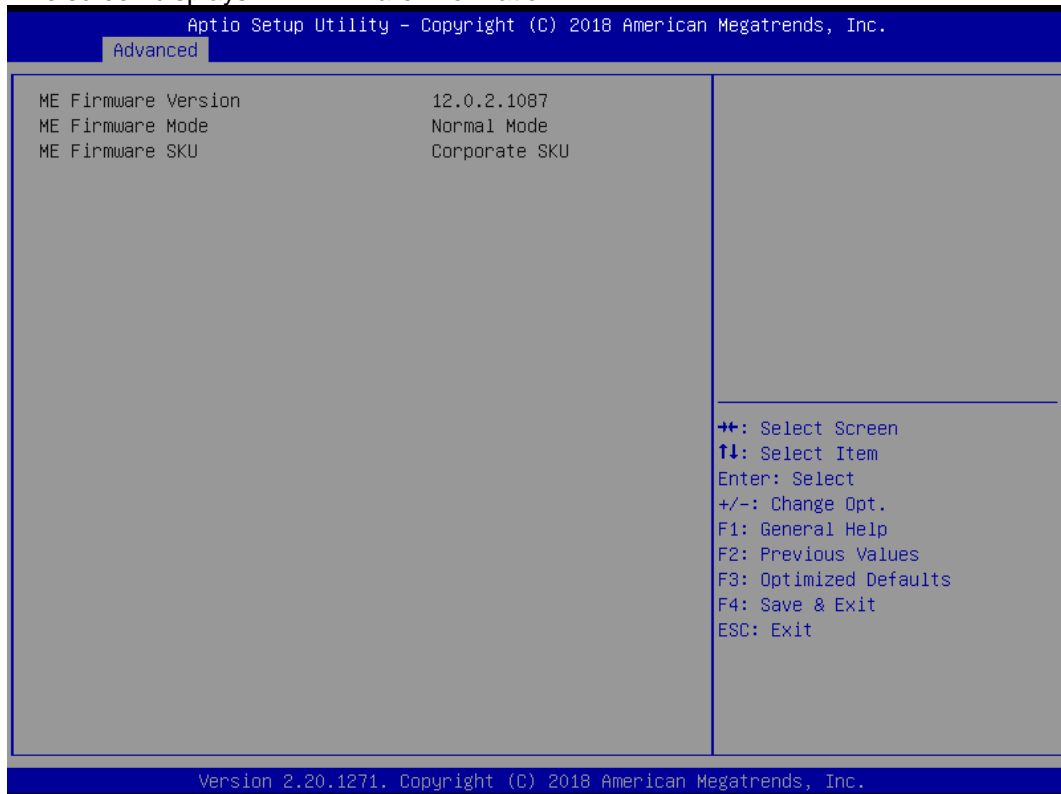
Serial Port 1~6 Configuration

Use these items to set parameters related to serial port 1~6.



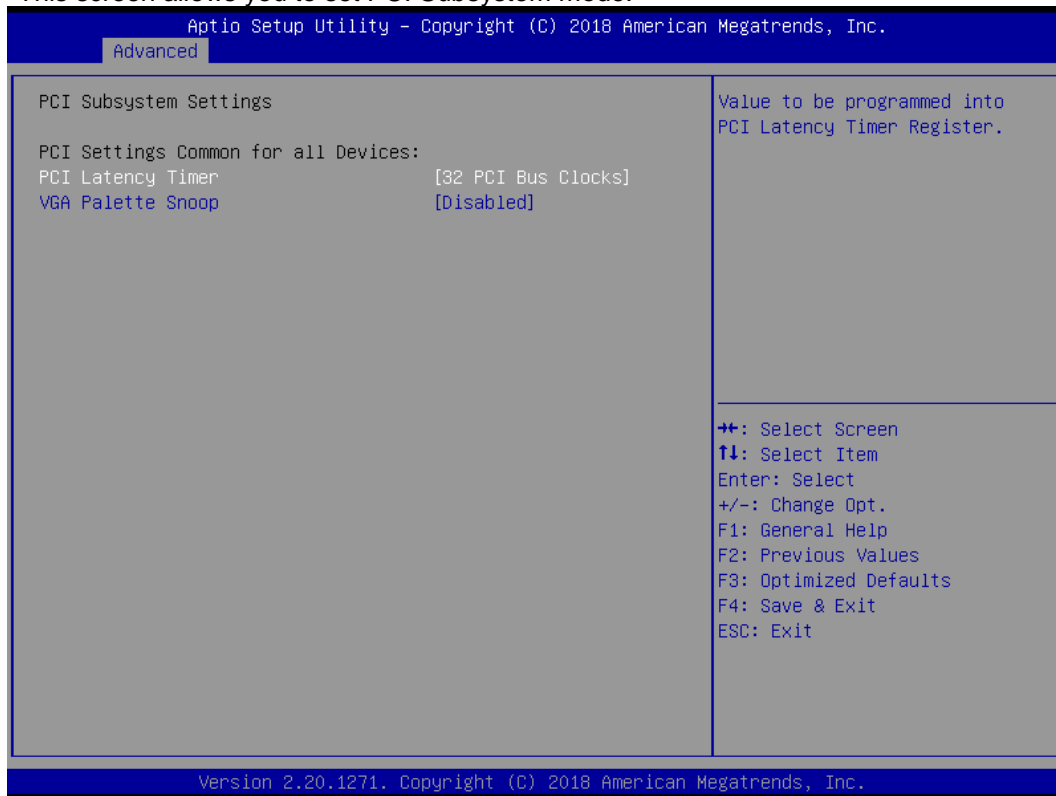
- **PCH-FW Configuration**

This screen displays ME Firmware information.



- **PCI Subsystem Settings**

This screen allows you to set PCI Subsystem mode.



PCI Latency Timer

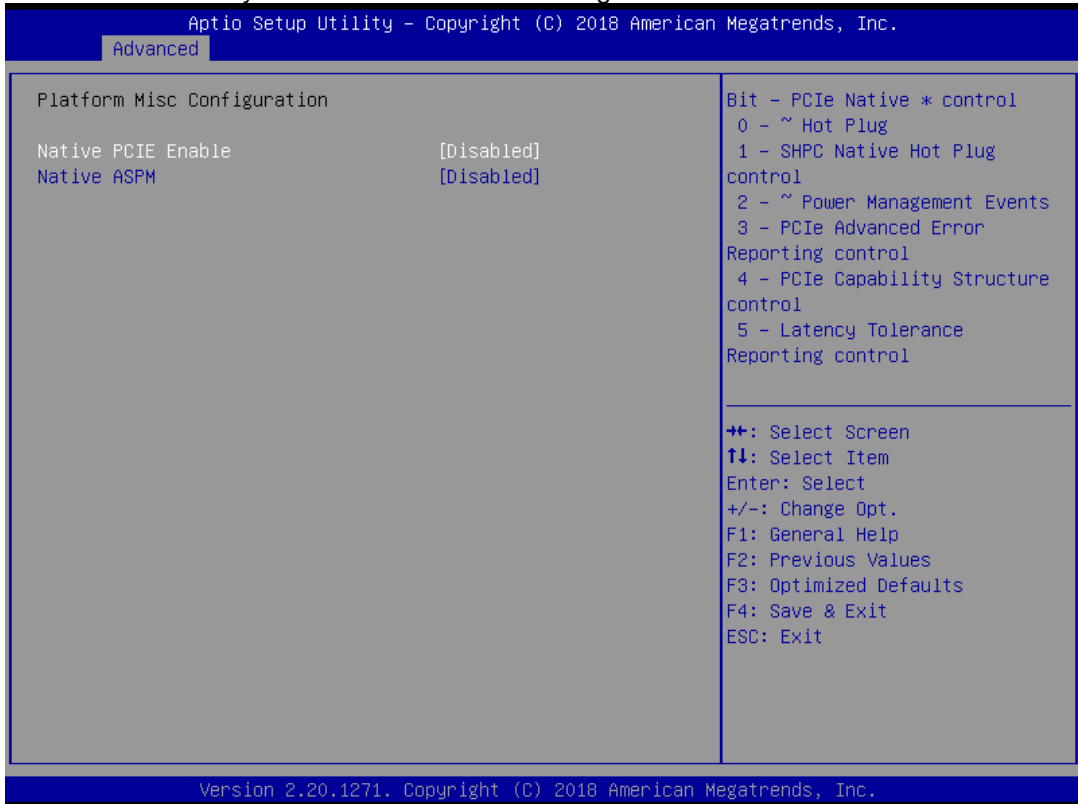
Set the value to be programmed into PCI Latency Timer Register.

VGA Palette Snoop

Enables or Disables VGA Palette Registers Snooping.

- **Platform Misc Configuration**

This screen allows you to set Platform Misc Configuration.



Native PCIE Enable

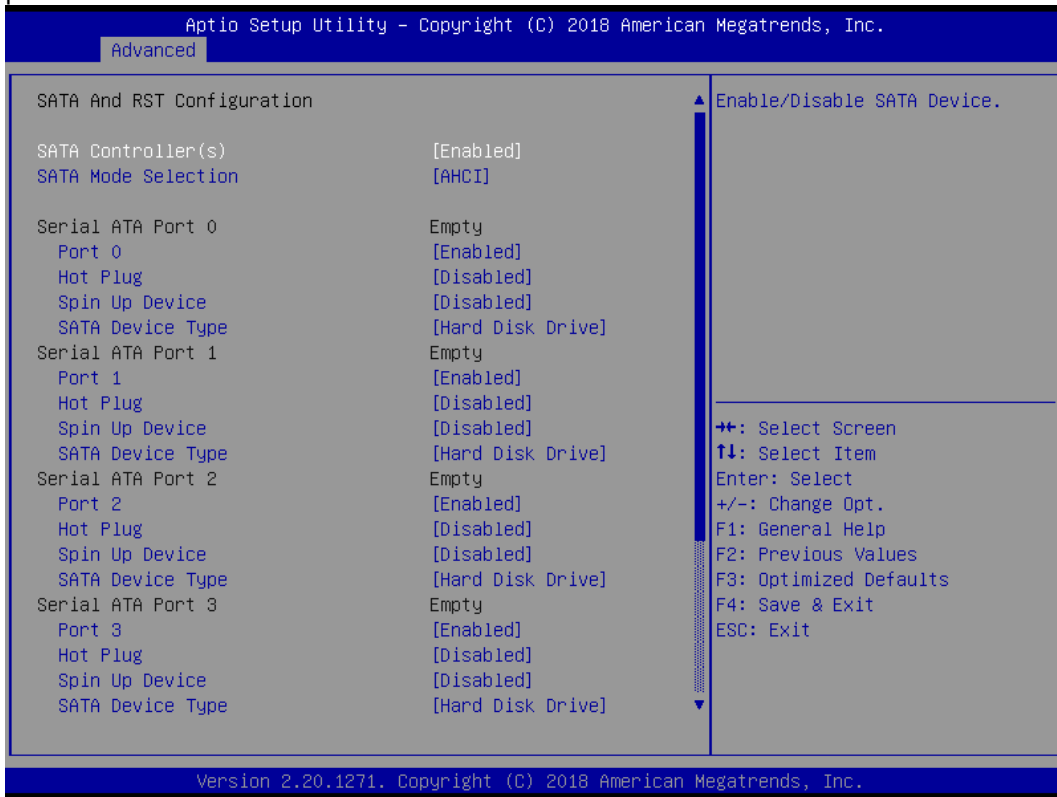
Bit - PCIe Native * control
 0 - ~ Hot Plug
 1 - SHPC Native Hot Plug control
 2 - ~ Power Management Events
 3 - PCIe Advanced Error Reporting control
 4 - PCIe Capability Structure control
 5 - Latency Tolerance Reporting control.

Native ASPM

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

SATA Configuration

During system boot up, the BIOS automatically detects the presence of SATA devices. In the SATA Configuration menu, you can see the hardware currently installed 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). The default is the 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

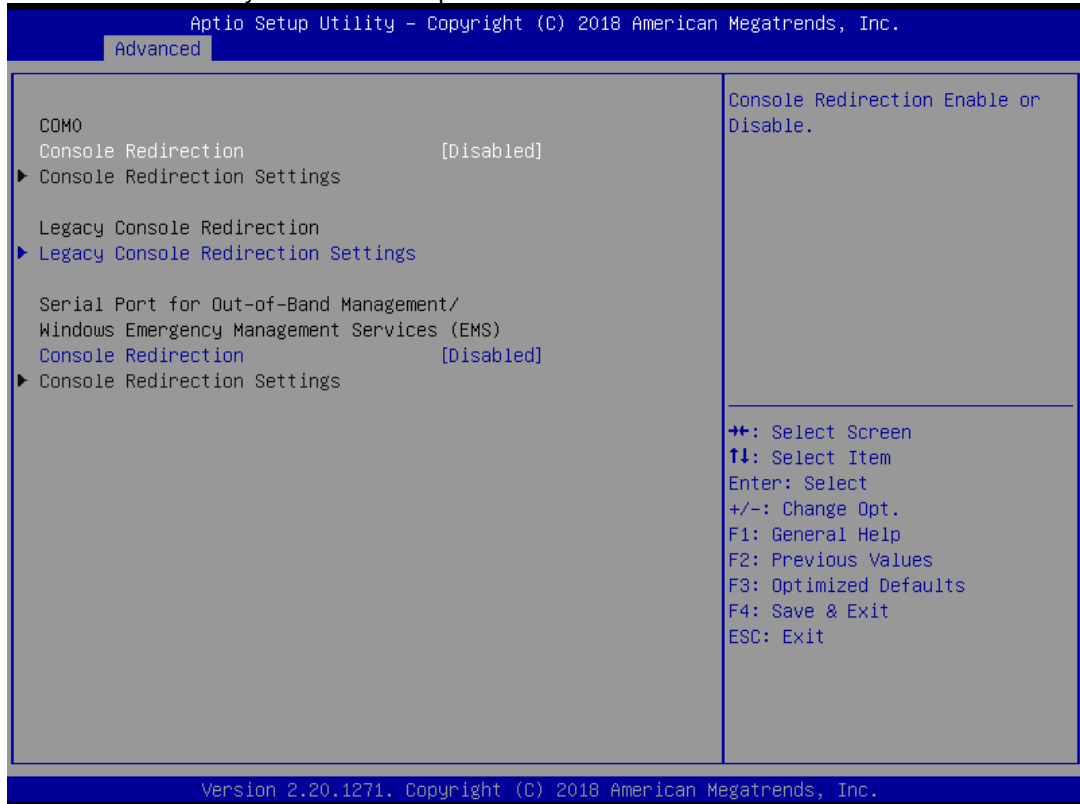
If enabled for any of ports, Staggered Spin Up will be performed and only the drives that have this option enabled will spin up at boot. Otherwise all drives spin up at boot.

SATA Device Type

Identify the SATA port is connected to a solid-state drive (SSD) or hard disk drive (HDD).

- **Serial Port Console Redirection**

This screen allows you to set serial port console redirection.



● **USB Configuration**

This screen shows USB configuration.



USB Devices

Displays 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.

4.5 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:

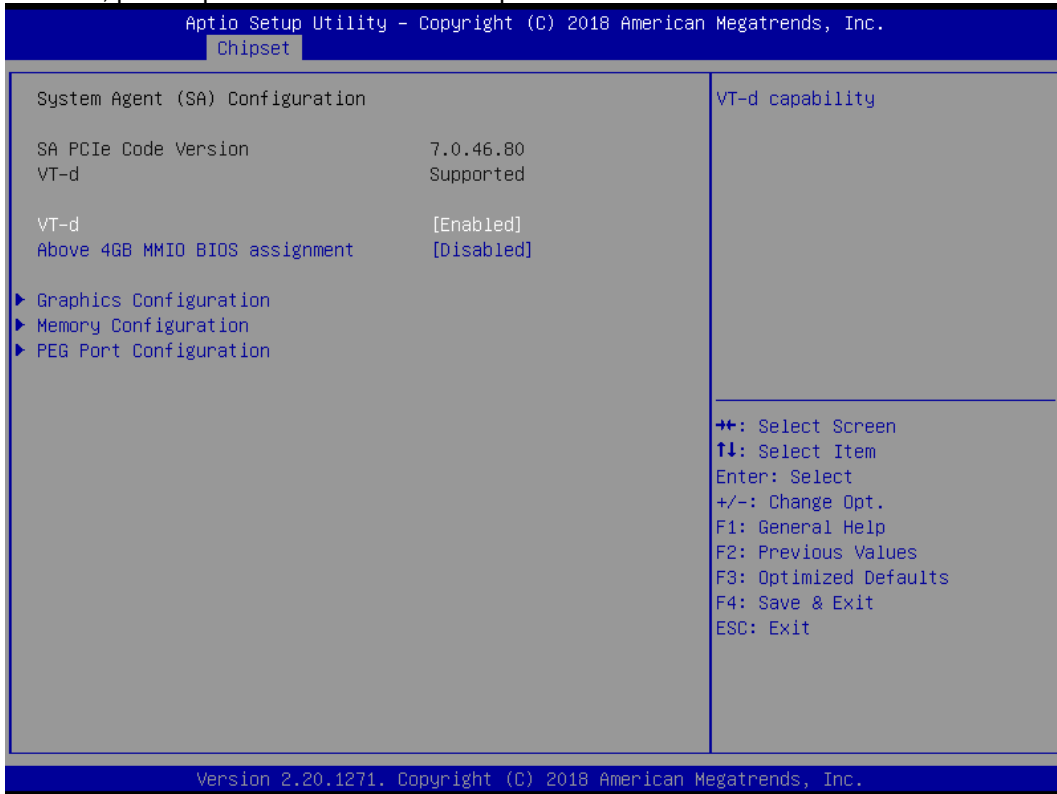
- ▶ System Agent (SA) Configuration
- ▶ PCH-IO Configuration

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 the sub menu for parameters related to graphics configuration.

Memory Configuration

Open the sub menu for information related to system memory.

PEG Port Configuration

Open the sub menu for parameters related to PEG port configuration.

VT-d

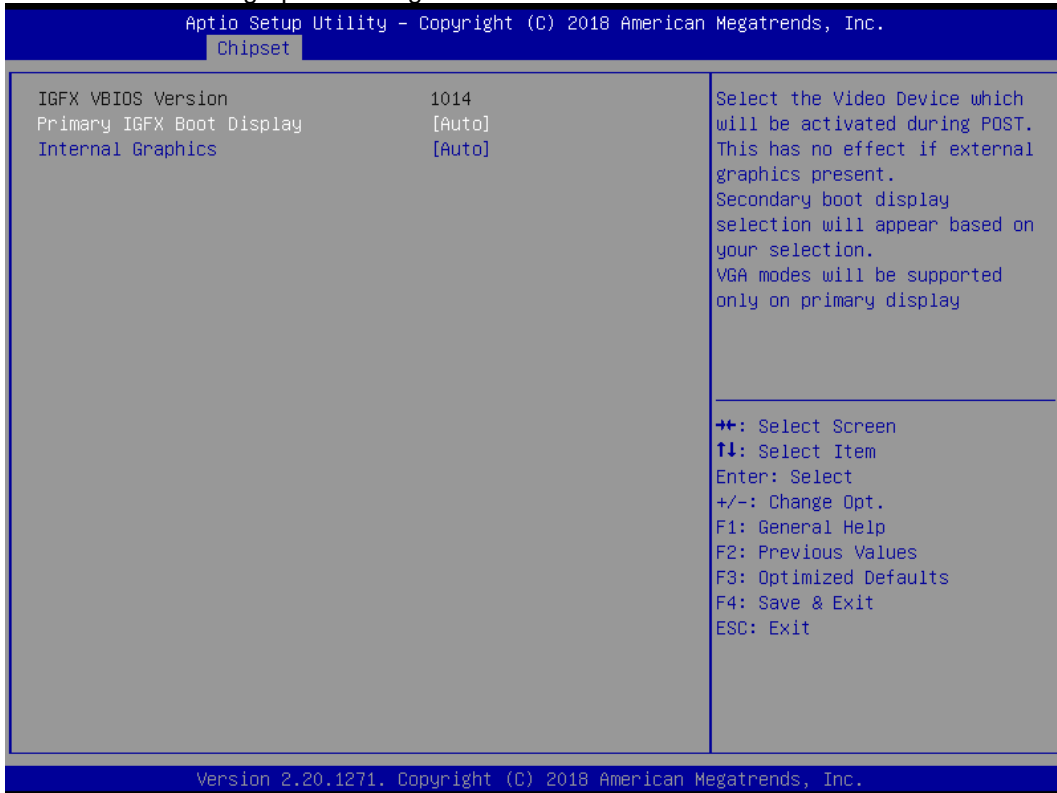
VT-d capability.

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**

This screen shows 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.

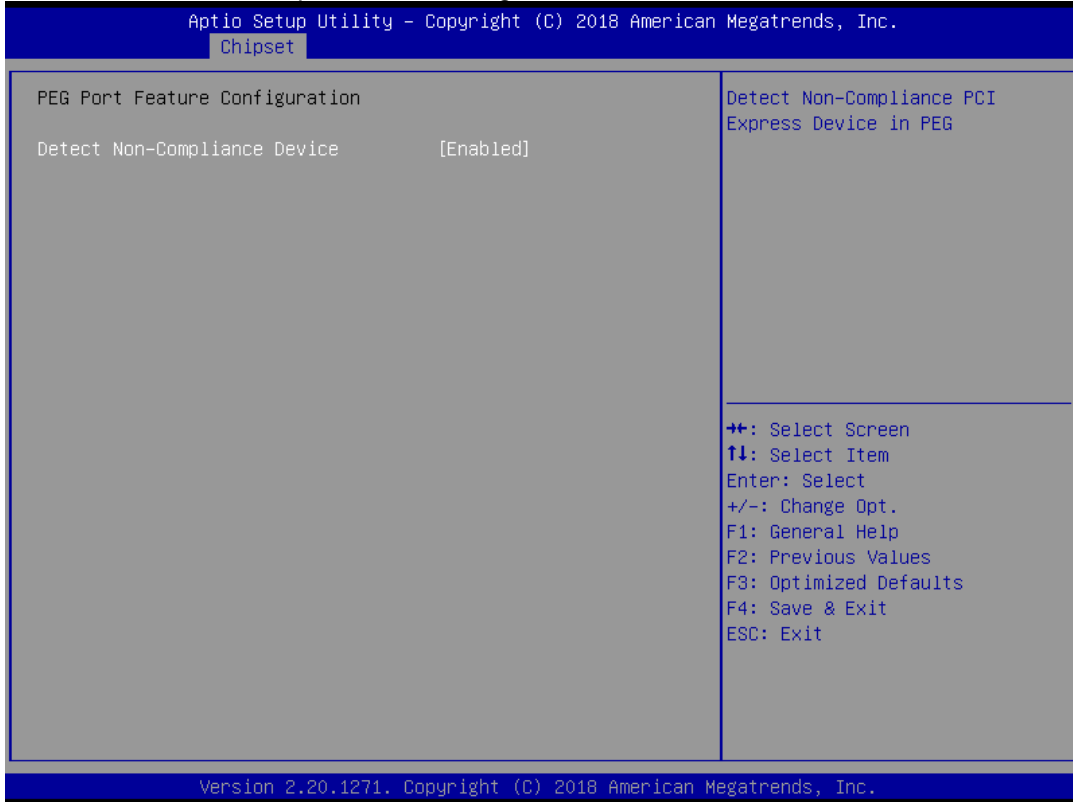


Max Link Speed

Configure PEG 0:1:0 Max Speed.

PEG Port Feature Configuration

This screen shows PEG port feature configuration.



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

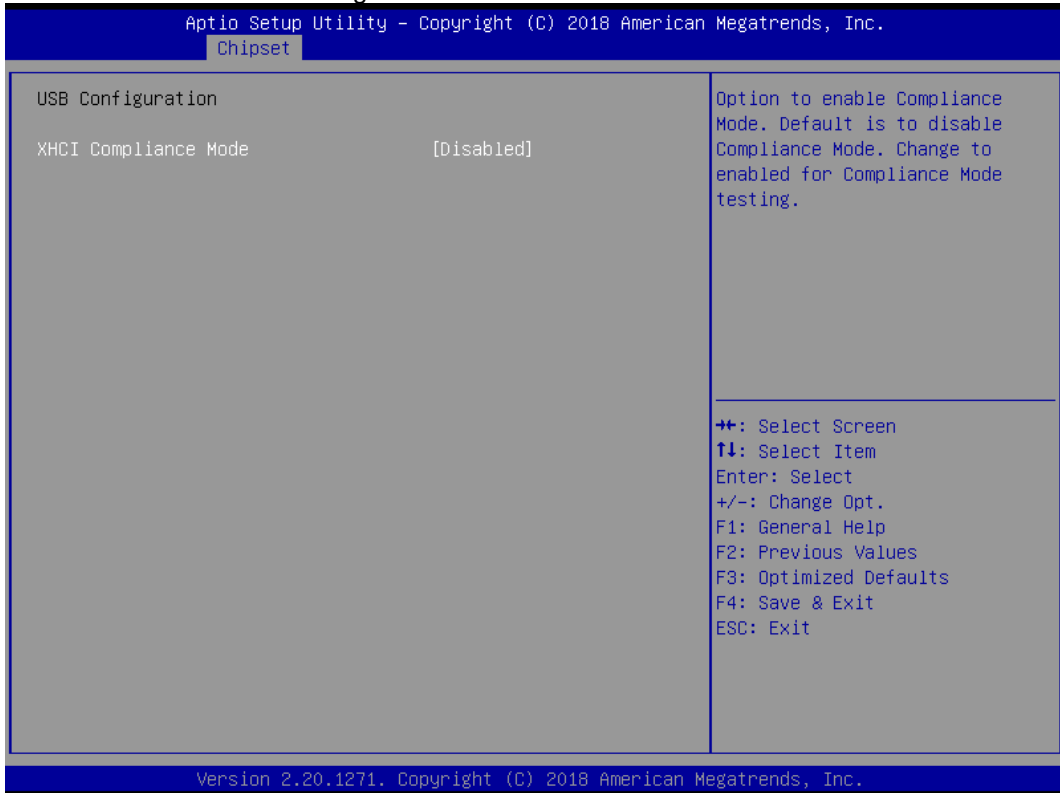
Enable or disable onboard PCH LAN controller.

Wake on LAN Enable

Enable or disable integrated LAN to wake the system.

- **USB Configuration**

This screen shows USB configuration.

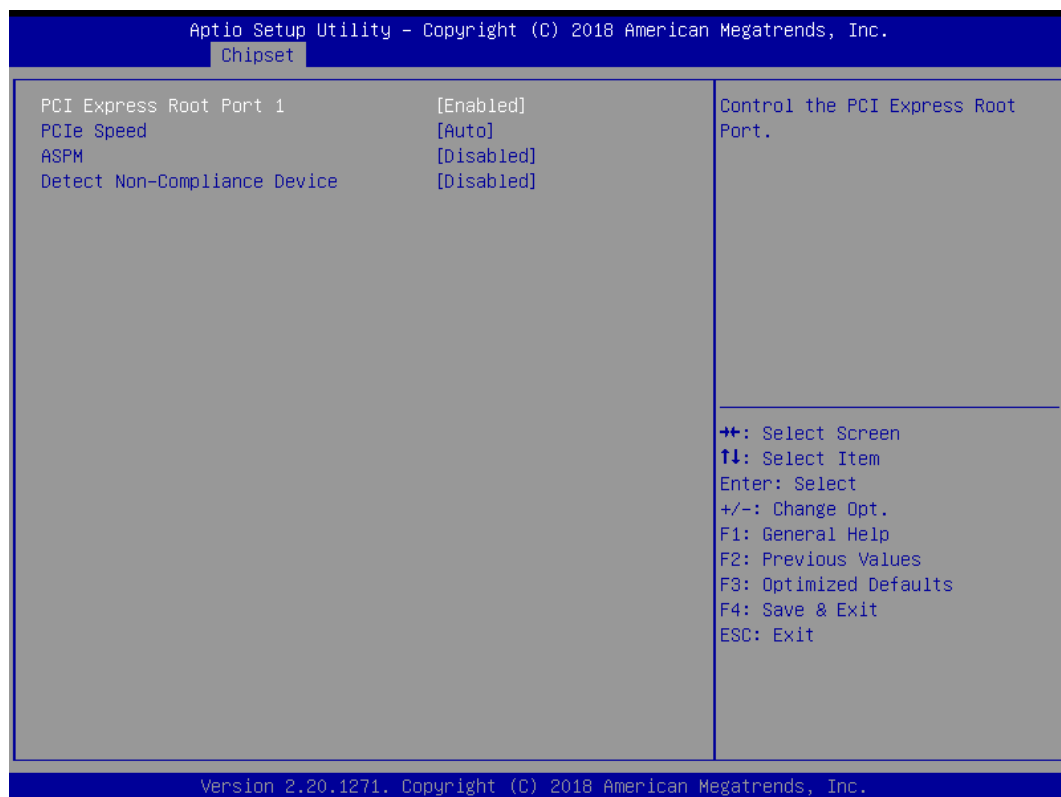
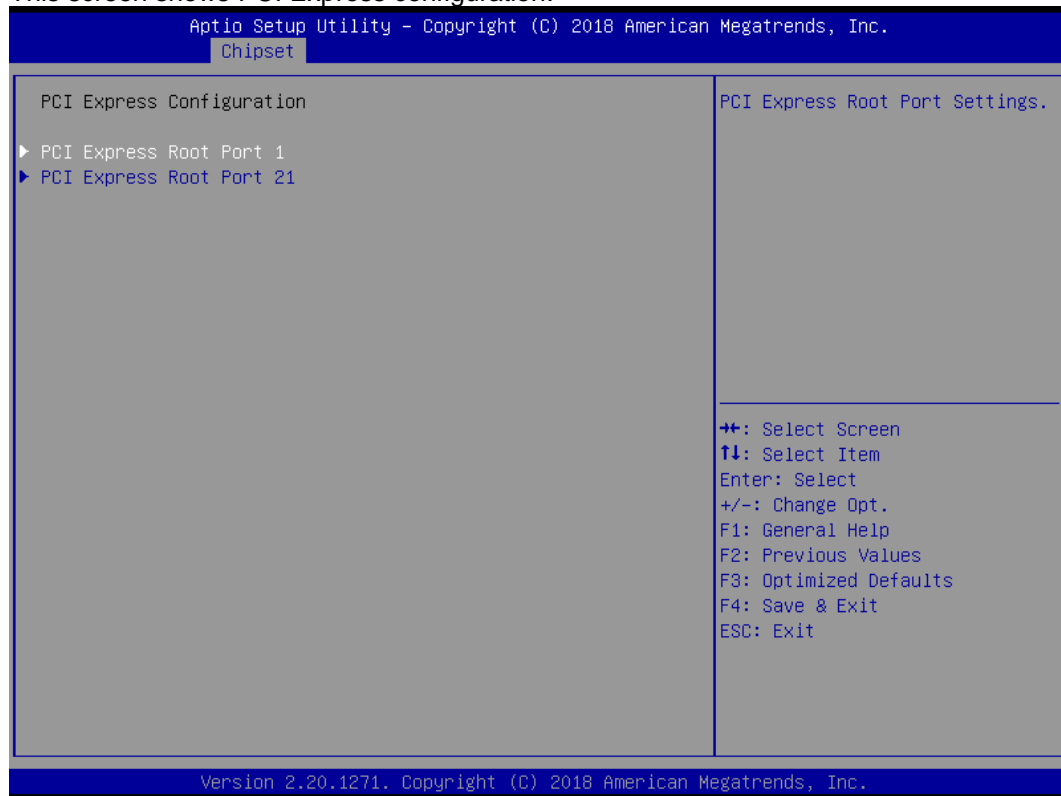


XHCI Disable Compliance Mode

Provides 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

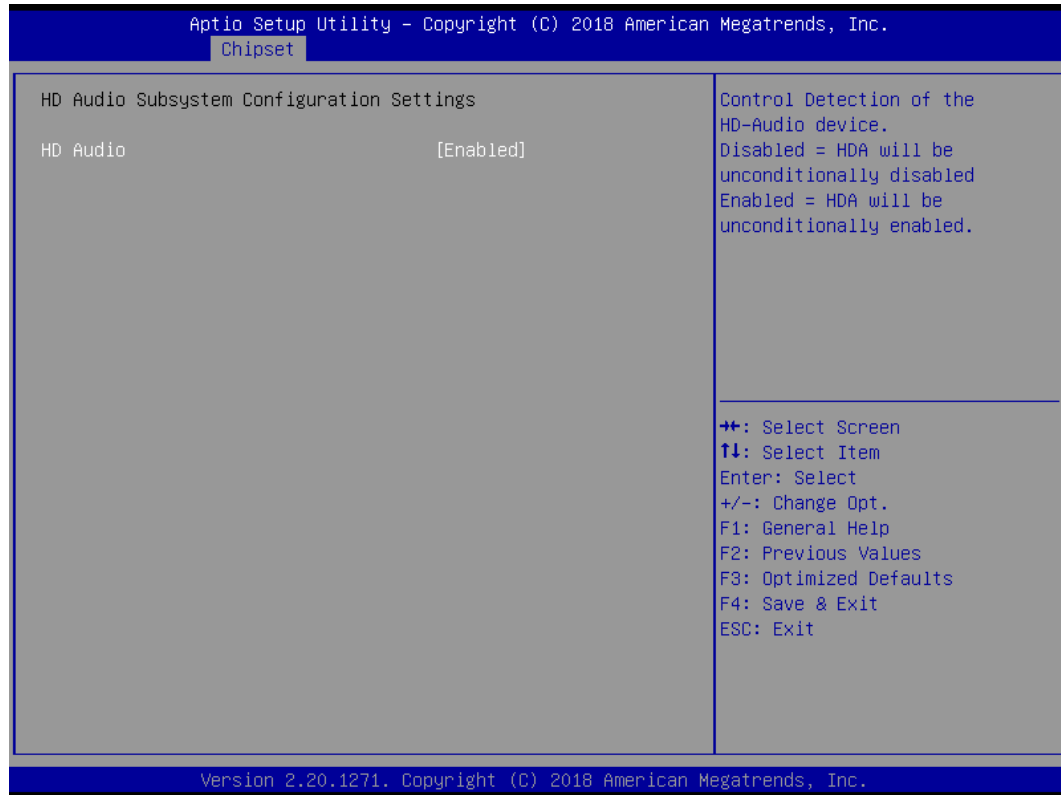
Set the ASPM Level:\nForce L0s - Force all links to L0s State\nAUTO - BIOS auto configure\nDISABLE - Disables ASPM.

Detect Non-Compliance Device

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

- **HD Audio Configuration**

This screen shows HD Audio information



4.6 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).

4.7 Boot Menu

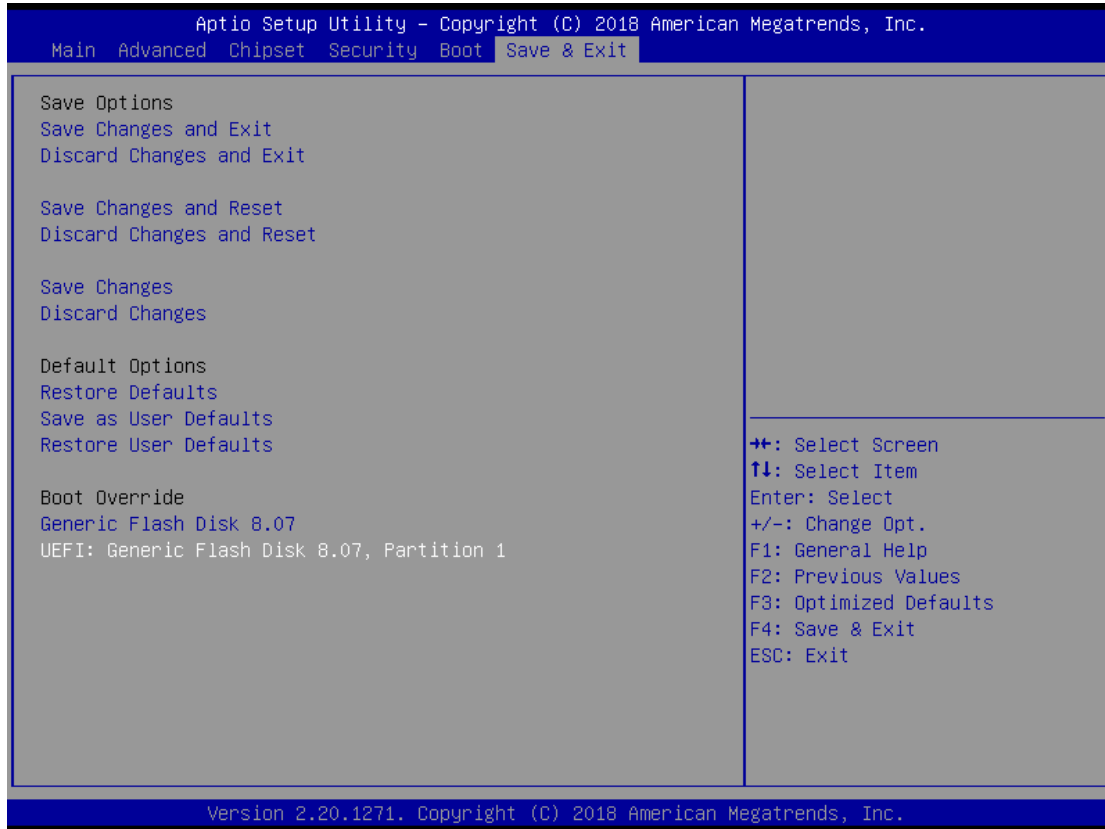
The Boot menu allows users to change boot options of the system.



- 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.

4.8 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.

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Appendix A

Watchdog Timer

About Watchdog Timer

Software stability is a major issue in most applications. Some embedded systems are not watched by humans for 24 hours. It is usually too slow to wait for someone to reboot when computer hangs. The systems need to be able to reset automatically when things go wrong. The watchdog timer gives us that solution.

The watchdog timer is a counter that triggers a system reset when it counts down to zero from a preset value. The software starts the counter with an initial value and must reset it periodically. If the counter ever reaches zero which means the software has crashed, the system will reboot.

How to Use Watchdog Timer

Start

↓

Un-Lock WDT:

O 2E 87 ; Un-lock super I/O
O 2E 87 ; Un-lock super I/O


↓

Select Logic device:

O 2E 07
O 2F 08

↓

Set Second or Minute:

O 2E F0
O 2F N ; N=00 or 08 (See  Note below)

↓

Set base timer:

O 2E F1
O 2F M ; M=00,01,02,...FF(Hex) ,Value=0 to 255

↓

WDT counting re-set timer:

O 2E F1
O 2F M ; M=00,01,02,...FF (See  Note below)

↓


IF No re-set timer:

; WDT time-out, generate RESET

;IF to disable WDT:

O 2E 30
O 2F 00 ; Can be disabled at any time

- Timeout Value Range
 - 1 to 255
 - Minute / Second

 **Note:**

If **N**=00h, the time base is set to second.

M = time value

00h: Time-out Disable

01h: Time-out occurs after 1 second

02h: Time-out occurs after 2 seconds

03h: Time-out occurs after 3 seconds

.

FFh: Time-out occurs after 255 seconds

If **N**=08h, the time base is set to minute.

M = time value

00h: Time-out Disable

01h: Time-out occurs after 1 minute

02h: Time-out occurs after 2 minutes

03h: Time-out occurs after 3 minutes

.

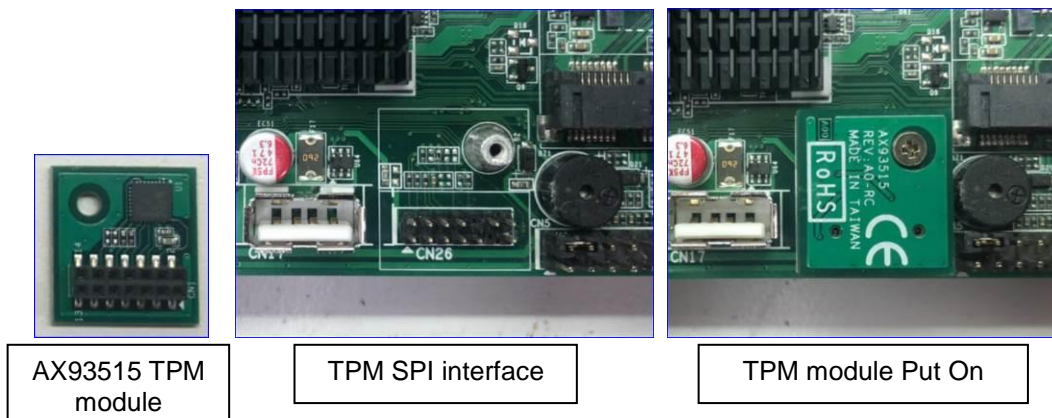
FFh: Time-out occurs after 255 minutes

Appendix B

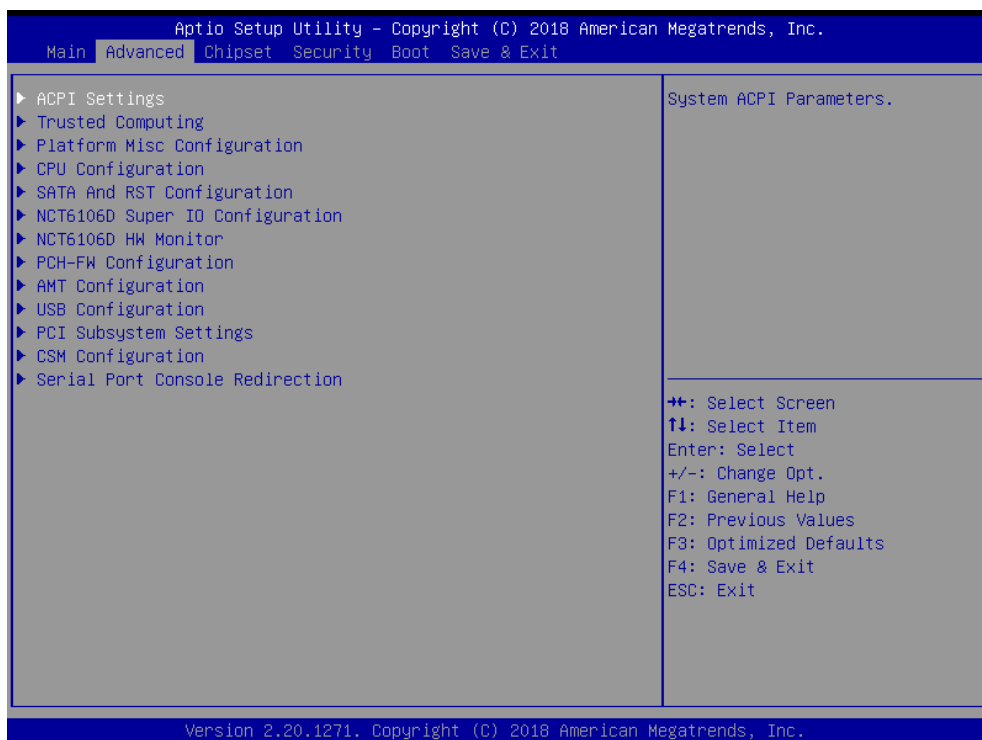
TPM Module Installation

The TPM 2.0 (Trusted Platform Module 2.0) module is a modularized design applying to the IMB523 / 524 / 525 and provides enhanced hardware security for the computer. In this appendix you will learn how to install the TPM 2.0 module into the IMB523 / 524 / 525. Please read and follow the instructions below carefully.

1. Insert TPM module into the SPI interface of motherboard, as illustrated below.



2. There are two ways to confirm whether the TPM Module is installed successfully or not:
 - a. Enter the BIOS setup menu and go to Trusted Computing. On the first line will show "TPM2.0 Device Found".

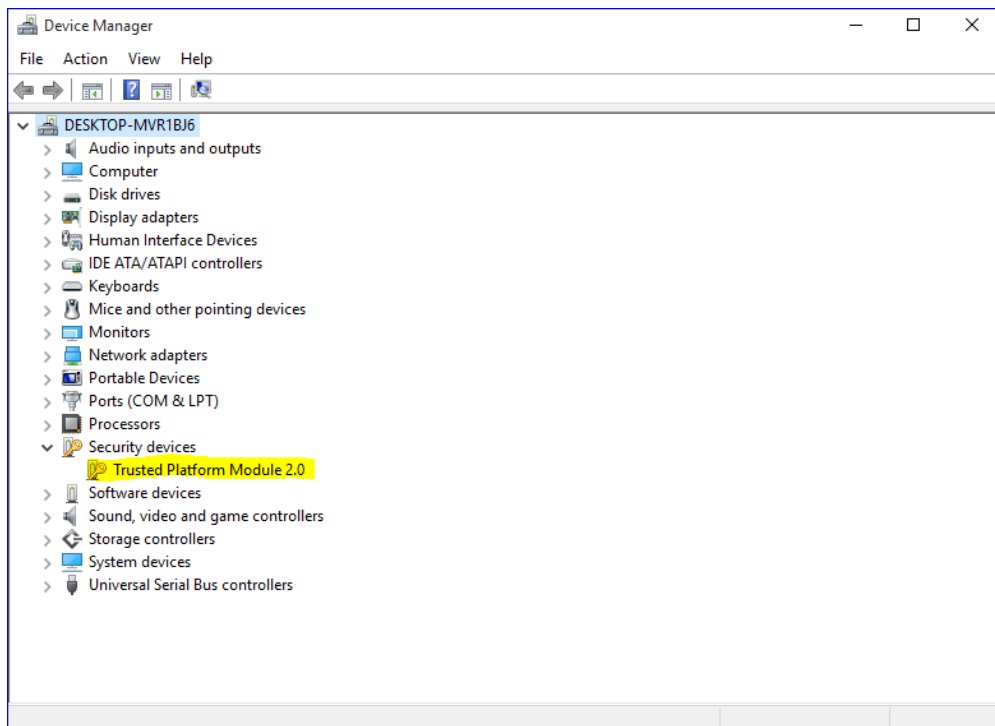


(In the Advance menu, go to Trusted Computing)

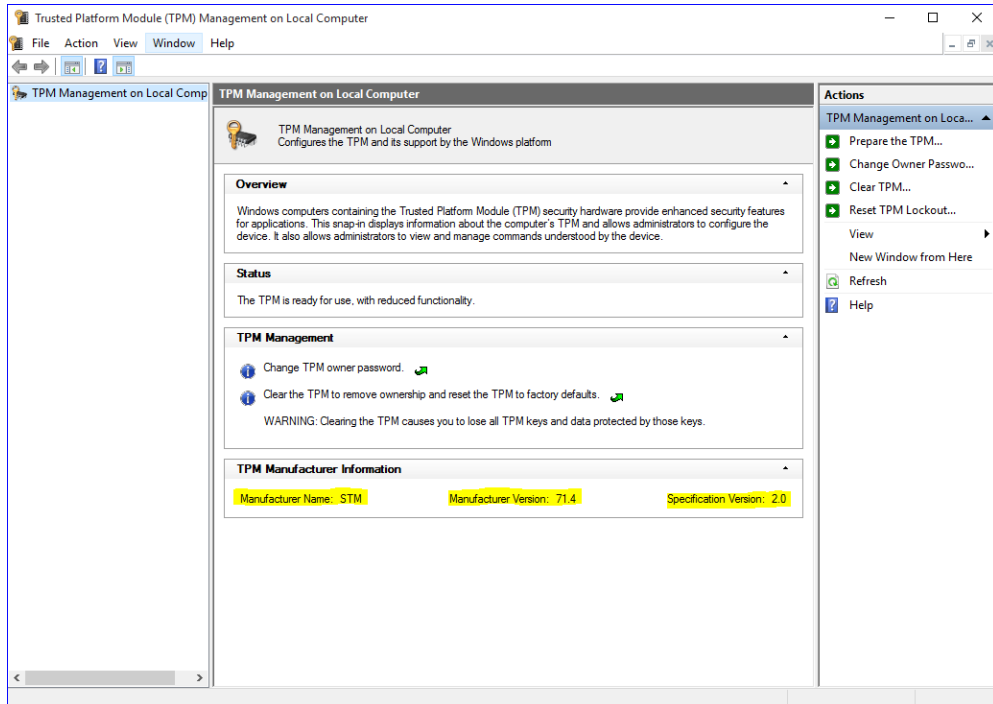


(In the Trusted Computing section, on the first of line will show "TPM2.0 Device Found", if installation is successful.)

- b. In the Windows 10 OS environment, enter Device Manager, and select the item of Security devices. The screen will show "Trusted Platform Module 2.0" if installation is successful.



- c. In the Windows 10 OS environment, enter Control Panel, select the item of BitLocker Drive Encryption, and enter TPM Administration. The screen will show the information below if installation is successful.



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Appendix C

iAMT Settings

The Intel® Active Management Technology (Intel® AMT) utilizes built-in platform capabilities and popular third-party management and security applications to let IT administrators remotely discover, repair and better protect their networked computing assets, thus significantly improving IT management efficiency.

In order to use Intel® AMT 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 Management Engine BIOS Extension (MEBx)

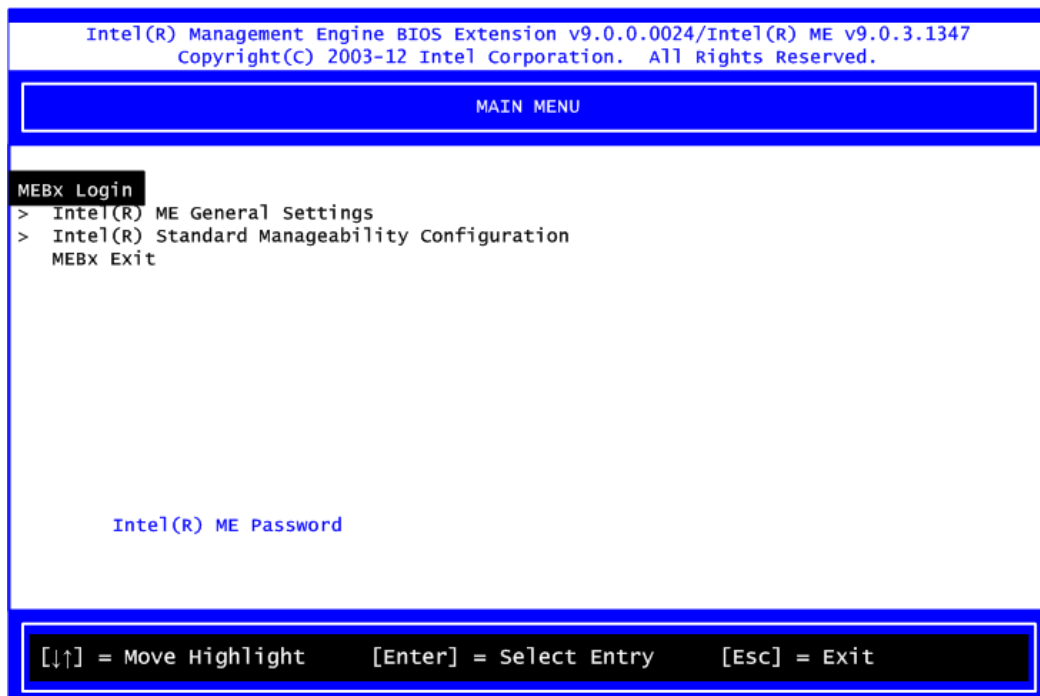
1. Go to BIOS to enable the iAMT function.
2. Exit from BIOS after starting iAMT, and press <Ctrl + P> to enter MEBx Setting.



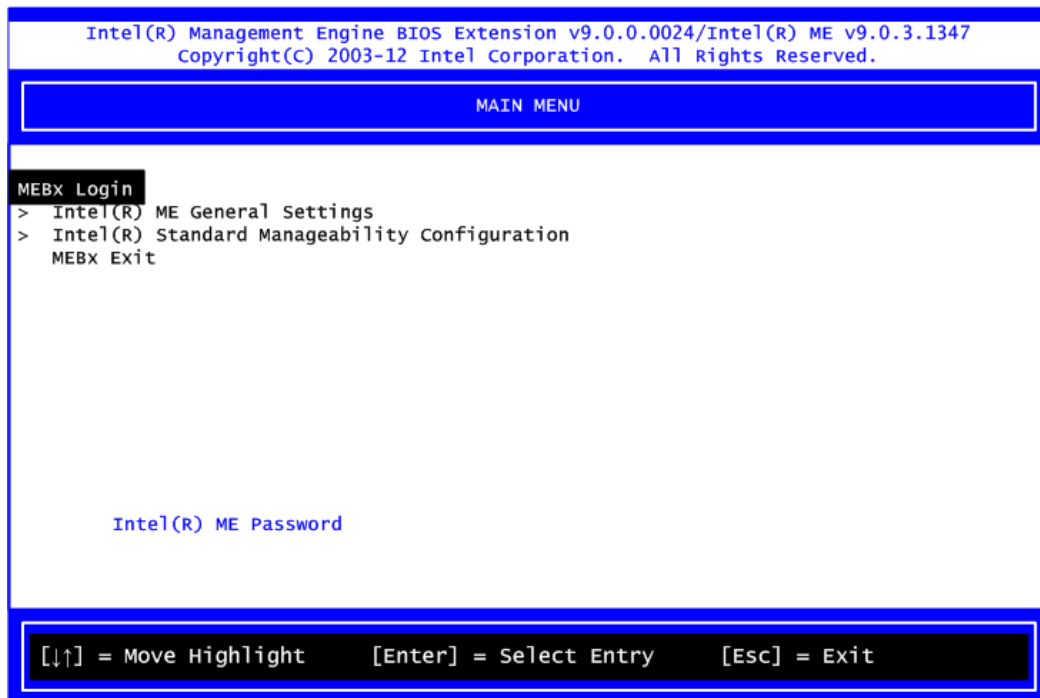
Note: It is advised to press <Ctrl + P> before the screen pops out.

Set and Change Password

1. You will be asked to set a password at first login. The default password is “admin”.



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



3. Confirm your new password while revising. The new password must consist of eight characters, including at least:

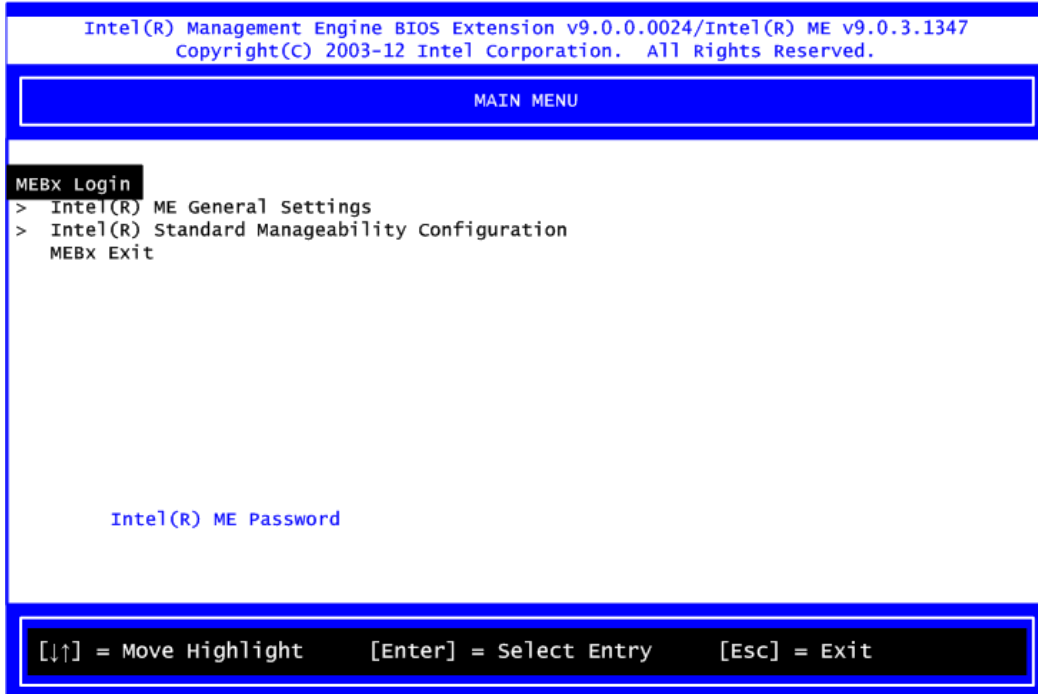
- One upper case letter
- One lower case letter
- One number
- One special symbol, such as '!', '\$', ';' (except: ':', ',', '"'))

The default value demonstrates an example of a valid password: **!!11qqQQ**

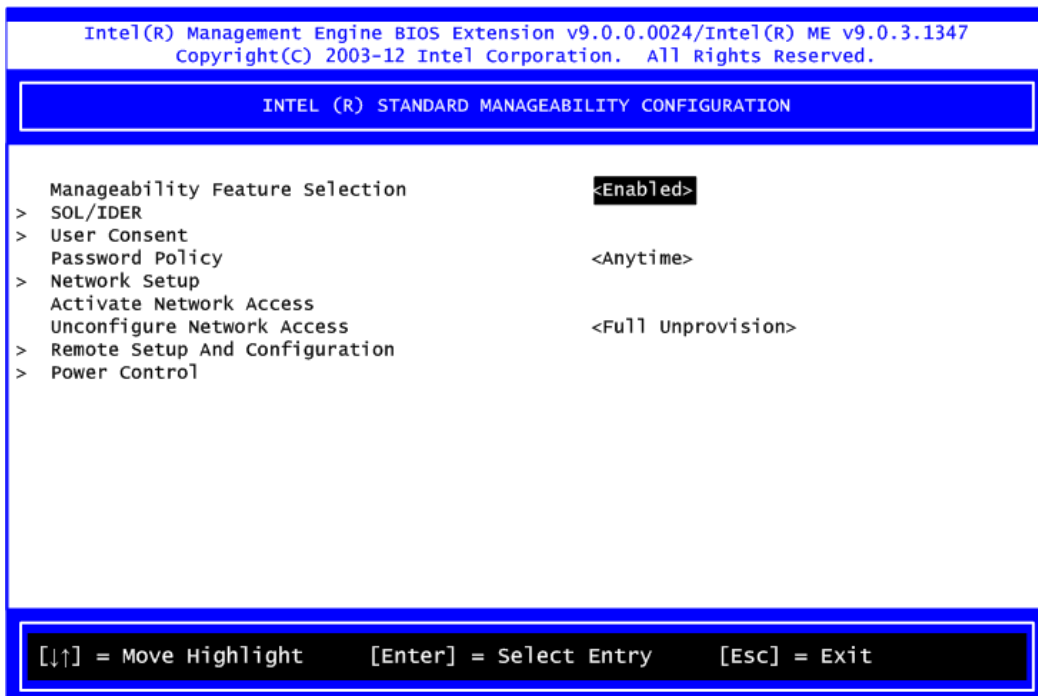
Underline (_) and space are valid characters for the password, but they won't make higher complexity.

iAMT Settings

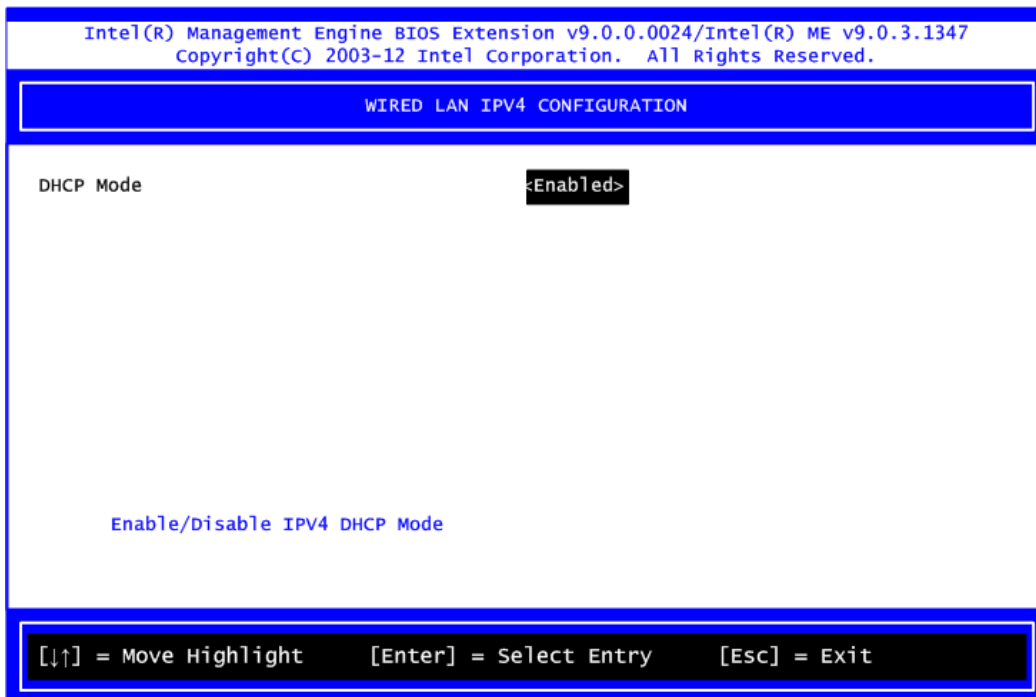
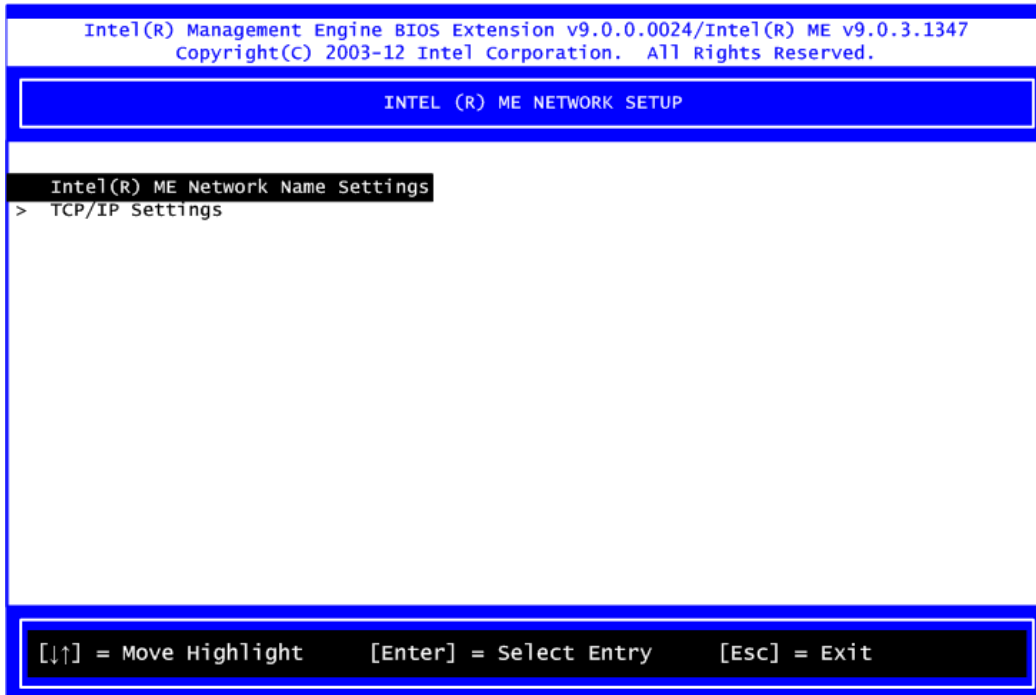
1. Select Intel® AMT configuration and press <Enter>.



2. Select Network Setup to configure iAMT.

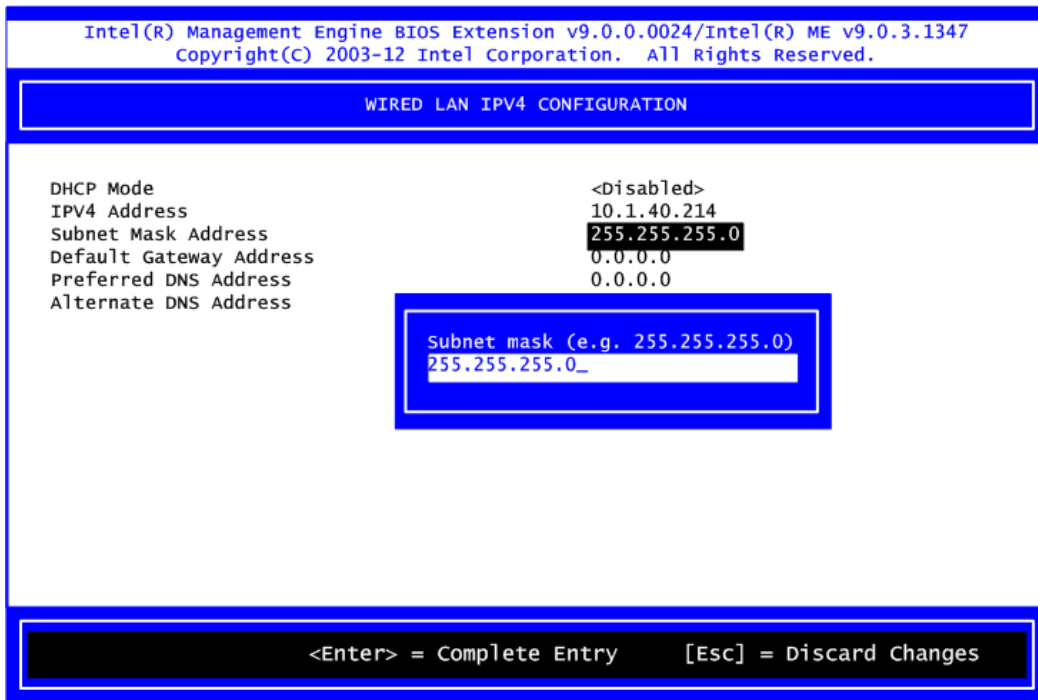


3. Select TCP/IP to go into Network interface and set it to Enabled. Go into DHCP Mode and set it to Disabled.

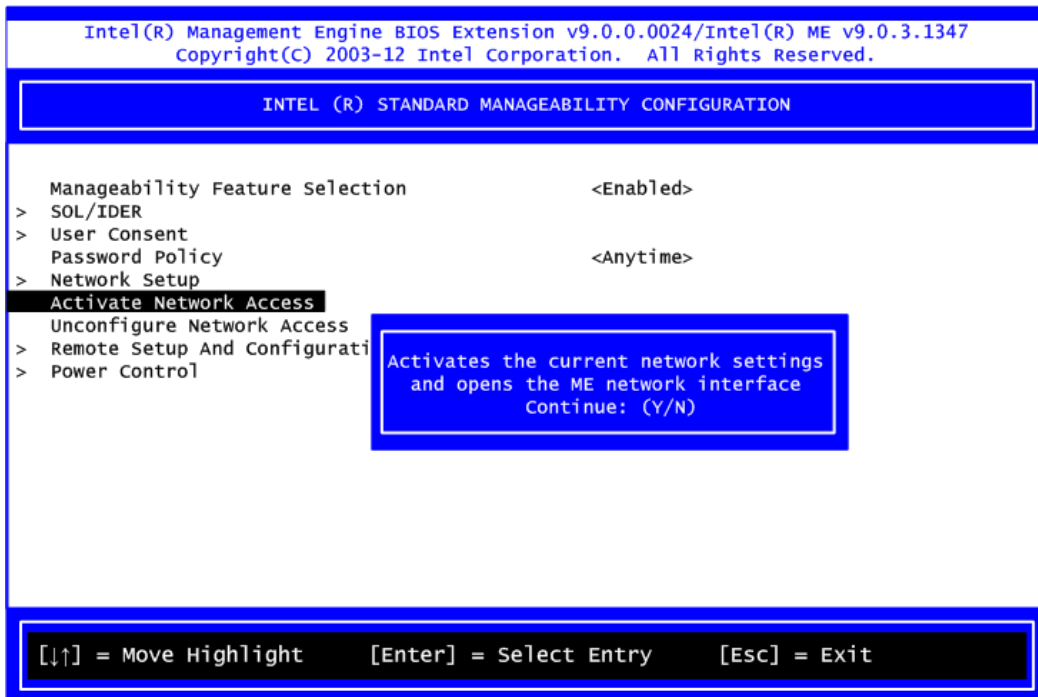


4. If DHCP Mode is disabled, complete the following settings:

- IP address
- Subnet mask



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

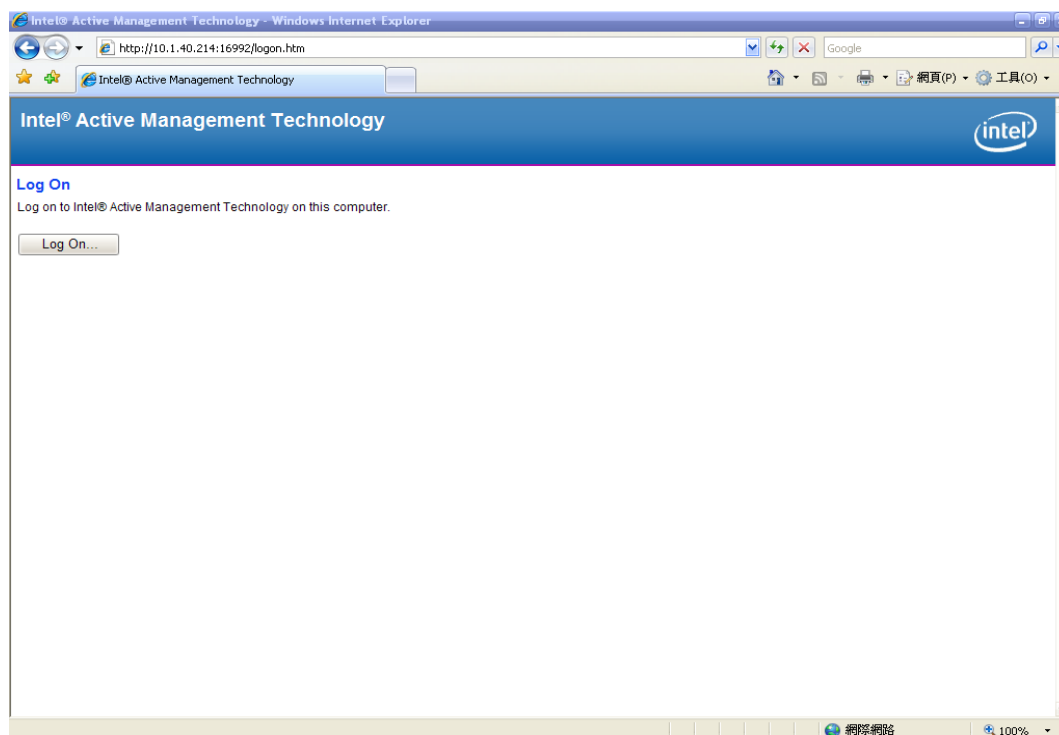


6. Exit from MEBx after completing the iAMT settings.

iAMT Web Console

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

Example: <http://10.1.40.214:16992>

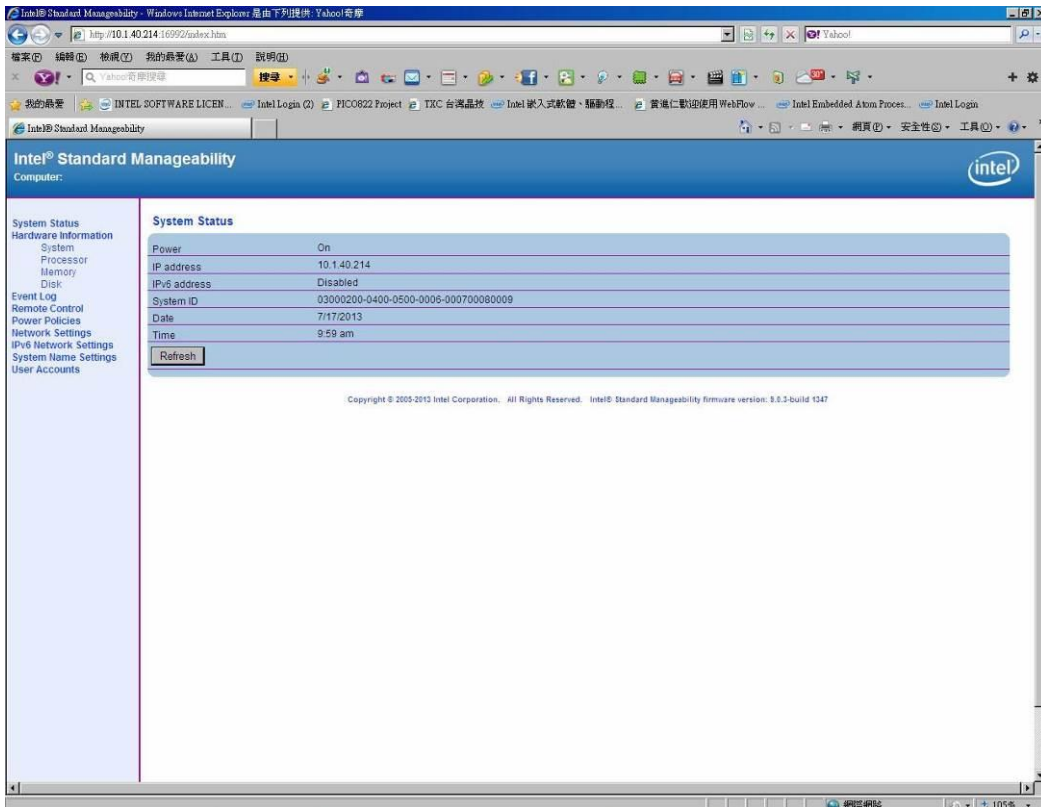


2. To log on, you will be required to type in your username and password for access to the Web.

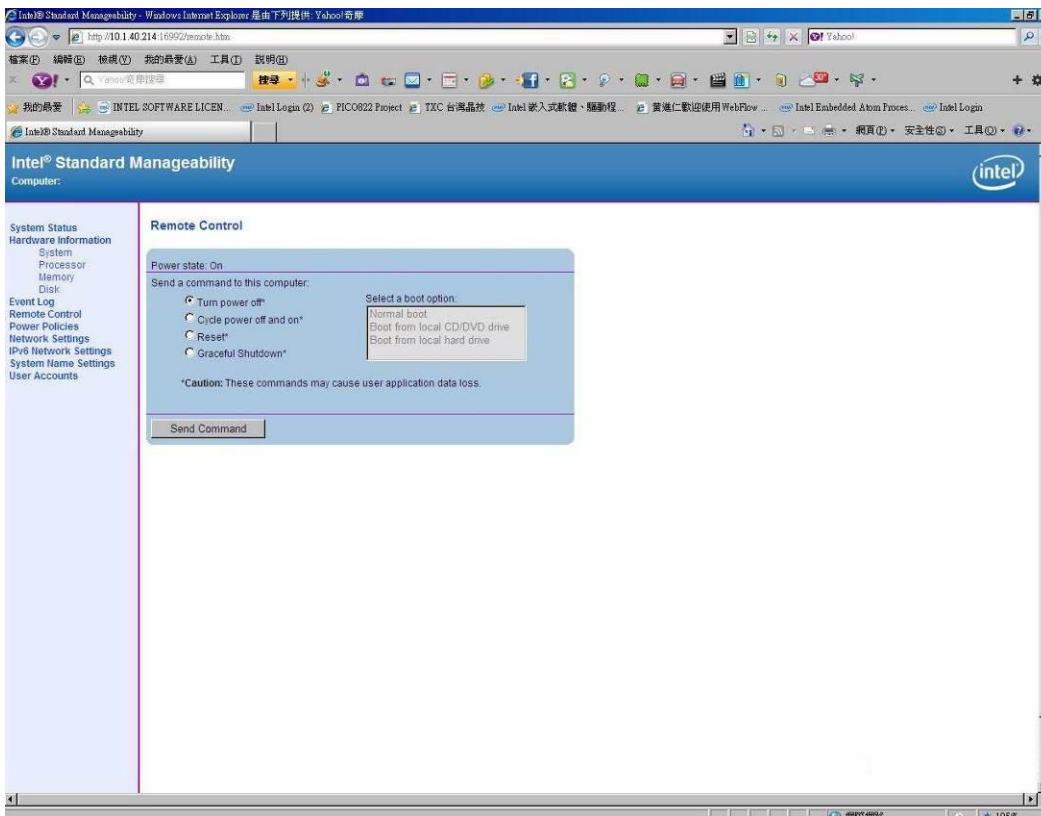
USER: admin (default value)

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 D

Configuring SATA for RAID

Configuring SATA Hard Drive(s) for RAID Function

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.

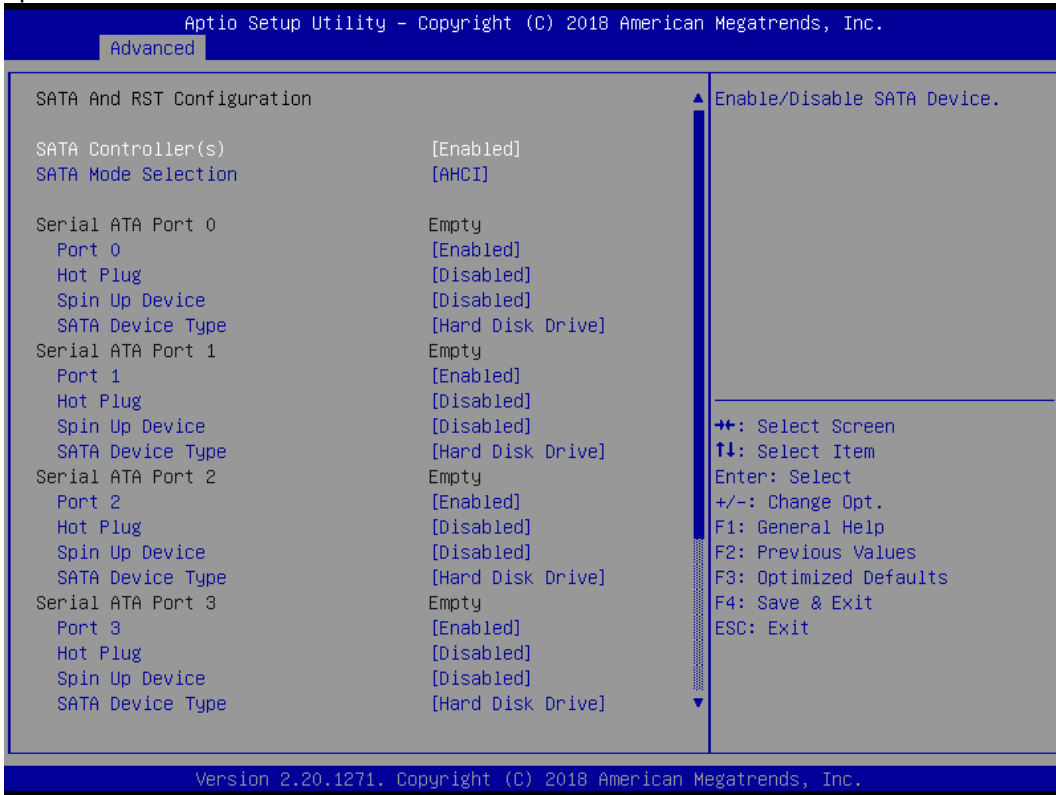
1. Installing SATA hard drive(s) in your system.

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.

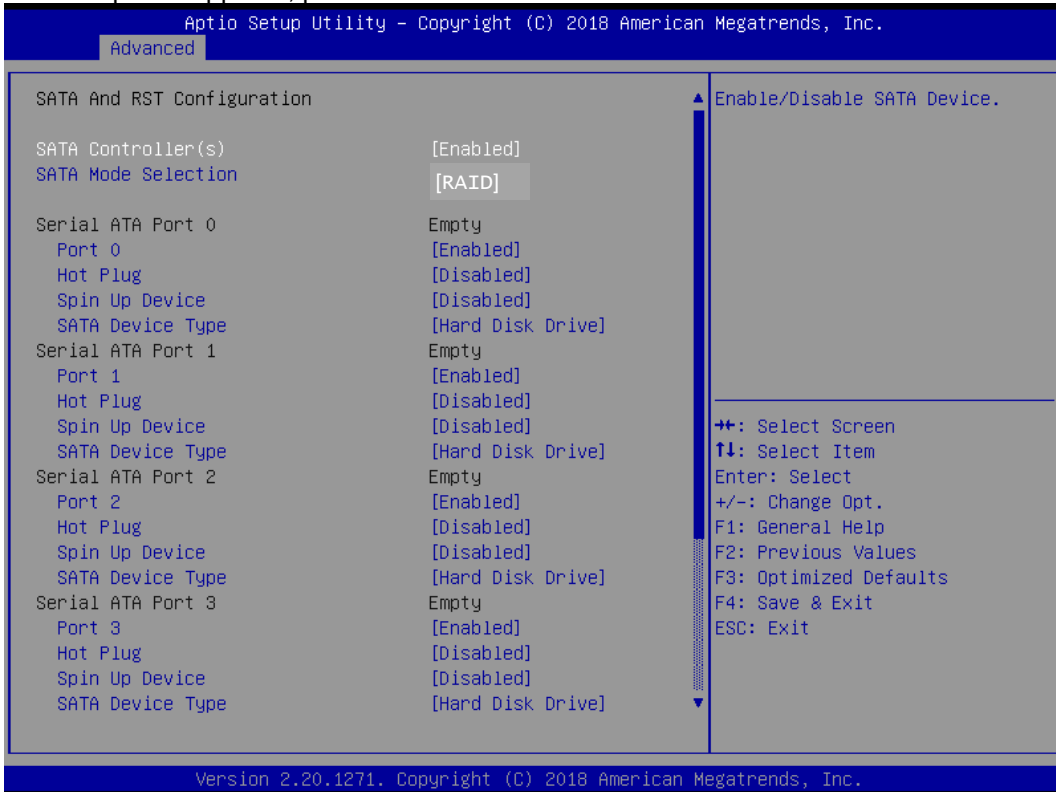
2. Configuring SATA controller mode and boot sequence by the BIOS Setup.

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).

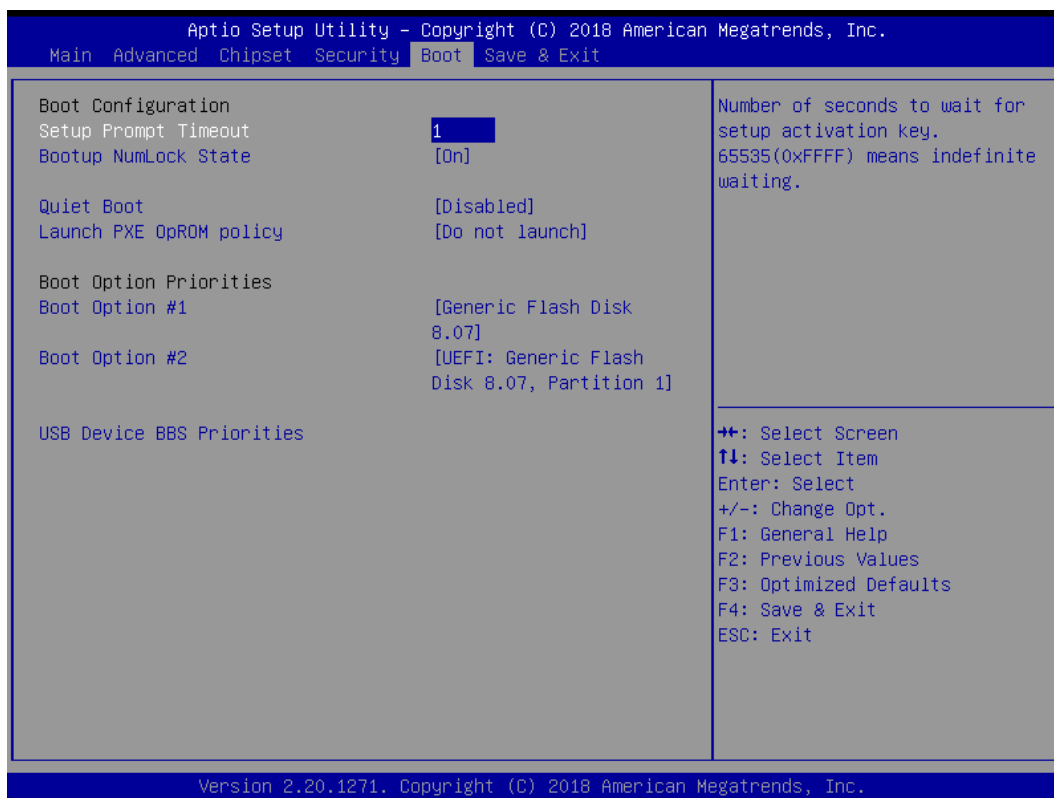
- 2.1. Turn on your system, and then press the button to enter BIOS Setup during running POST (Power-On Self Test). If you want to create RAID, just go to the Advanced Settings menu/SATA Configuration, select the "SATA Mode Selection", and press <Enter> for more options.



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



- 2.2. Under the Boot Settings menu, set DVD-ROM for First Boot Option to boot DVD-ROM after system restarts.

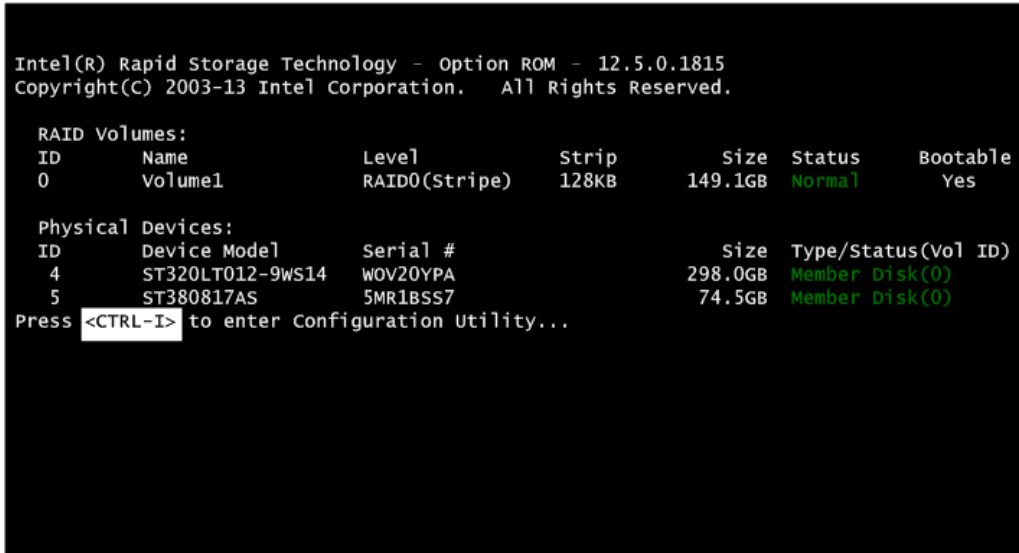


- 2.3. Save and exit the BIOS Setup.

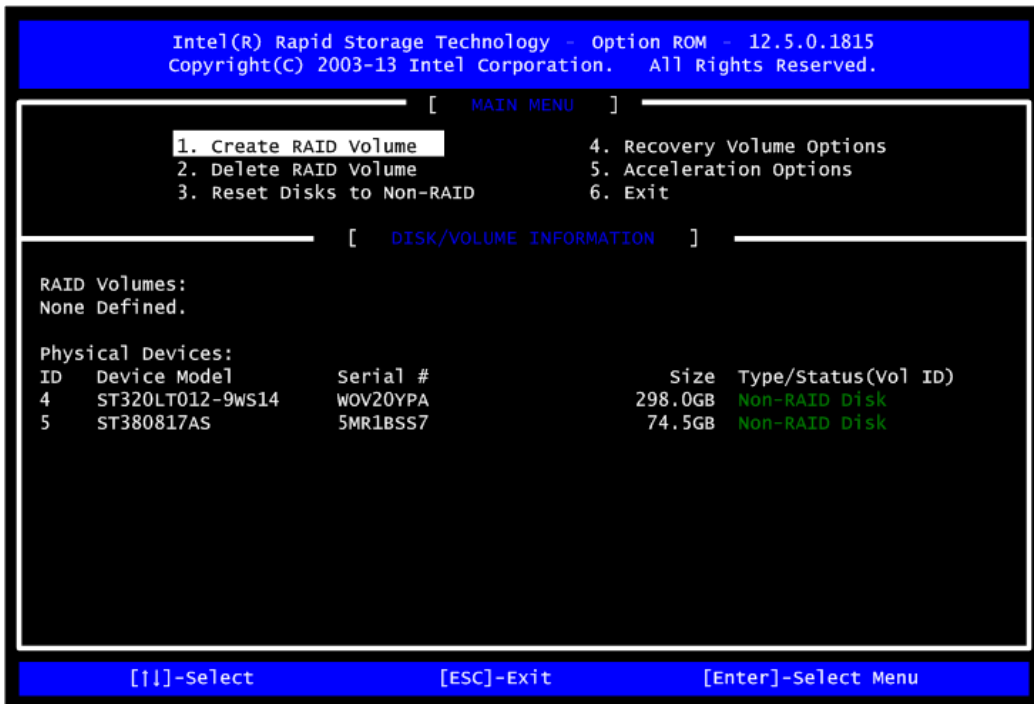
3. Configuring RAID by the RAID BIOS.

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.



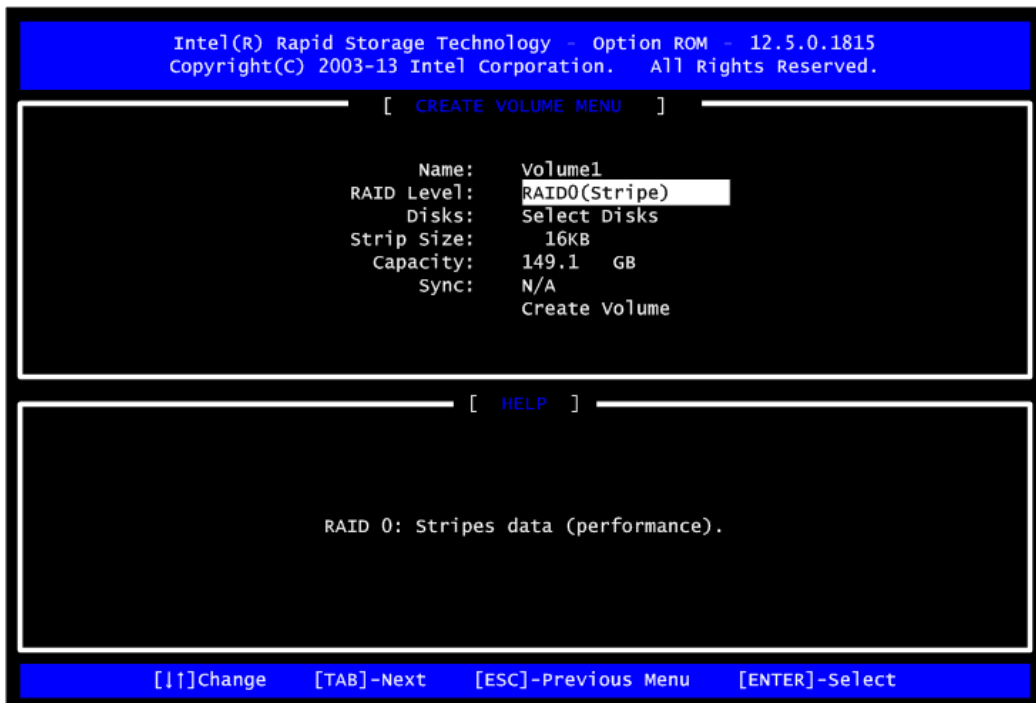
- 3.2. After you press <Ctrl - I>, the “Create RAID Volume” screen will appear. If you want to create a RAID array, select the “Create RAID Volume” option in the Main Menu and press <Enter>.



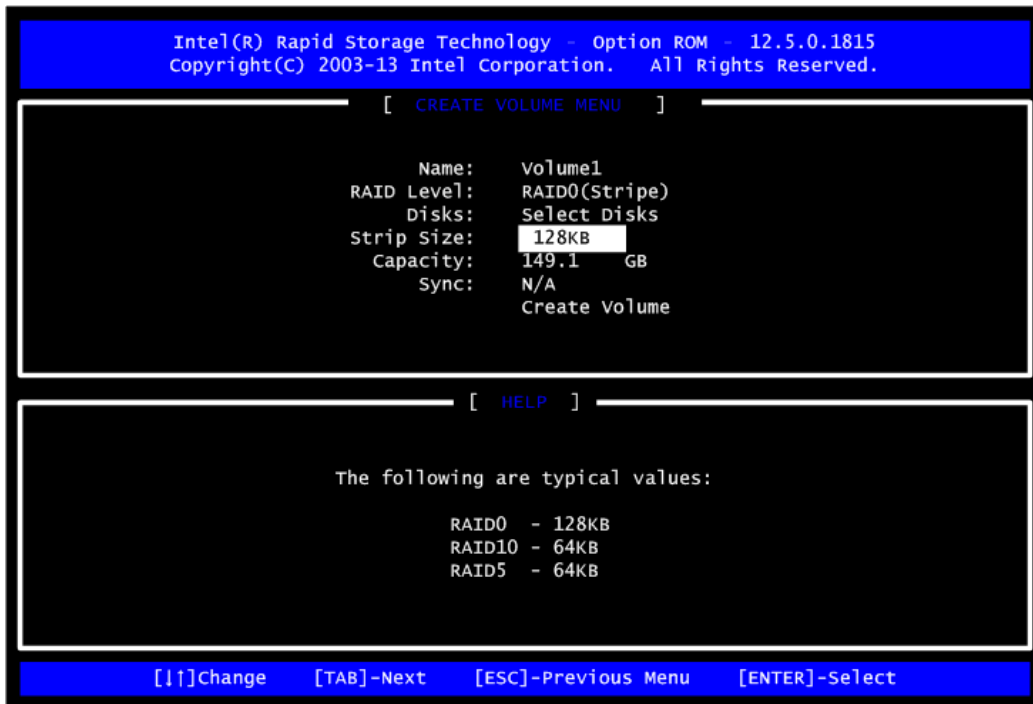
3.3. After entering the “Create Volume Menu” screen, you can type the disk array name with 1~16 letters (letters cannot be special characters) in the item “Name”.



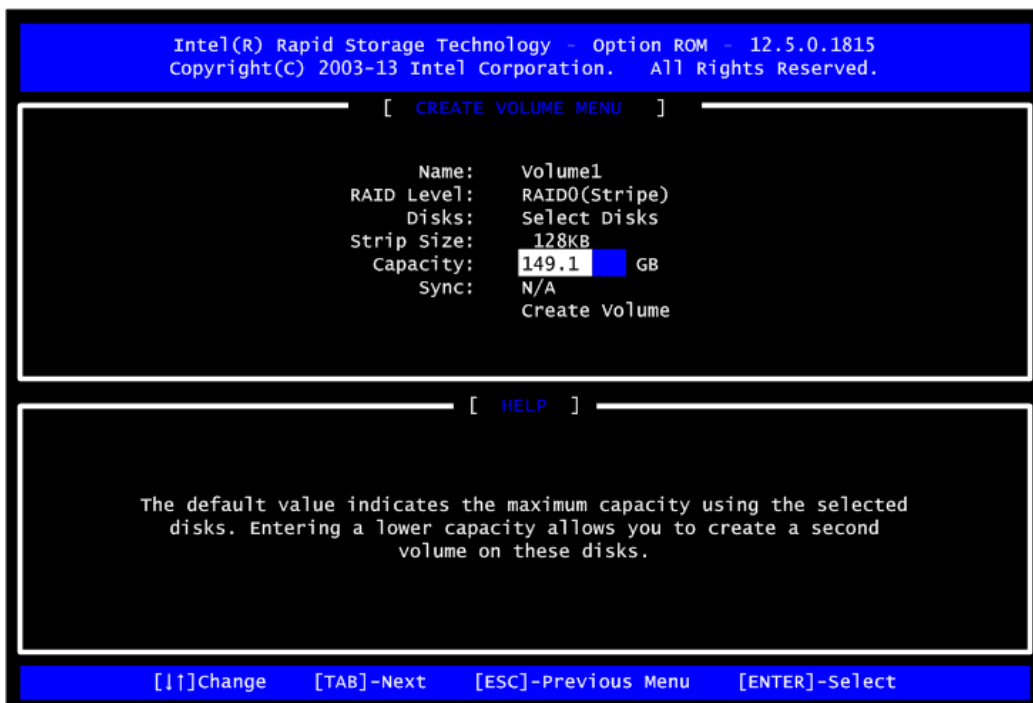
3.4. When finished, press <Enter> to select a RAID level. There are four RAID levels: RAID0, RAID1, RAID5 and RAID10. Select a RAID level and press <Enter>.



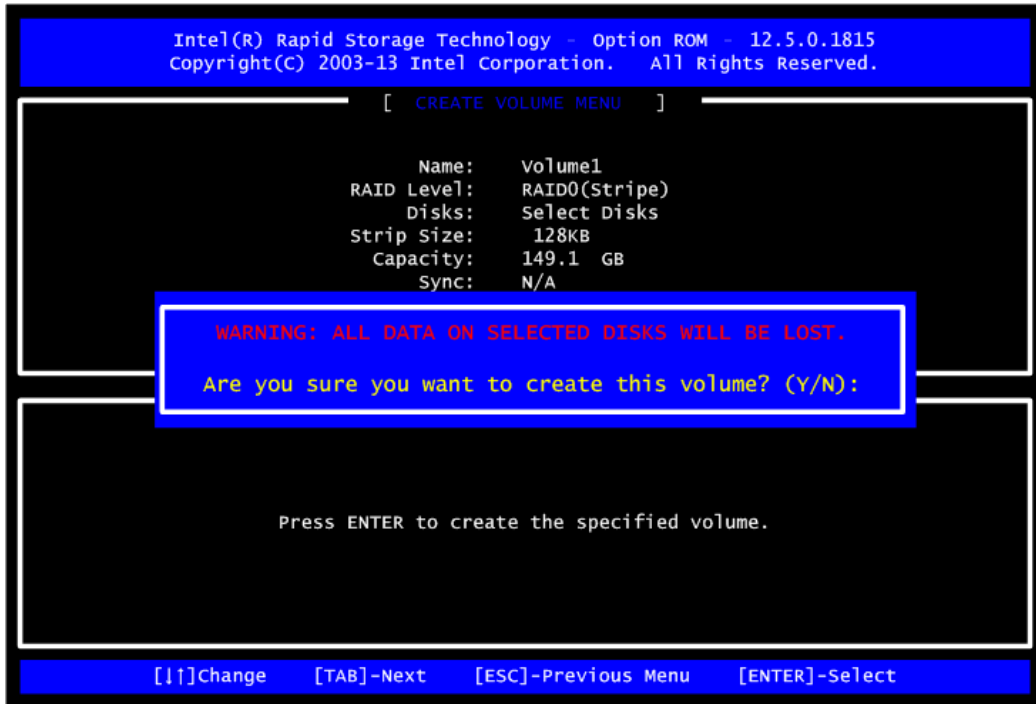
- 3.5. Set the stripe block size. The KB is the standard unit of stripe block size. The stripe block size can be 4KB to 128KB. After the setting, press <Enter> for the array capacity.



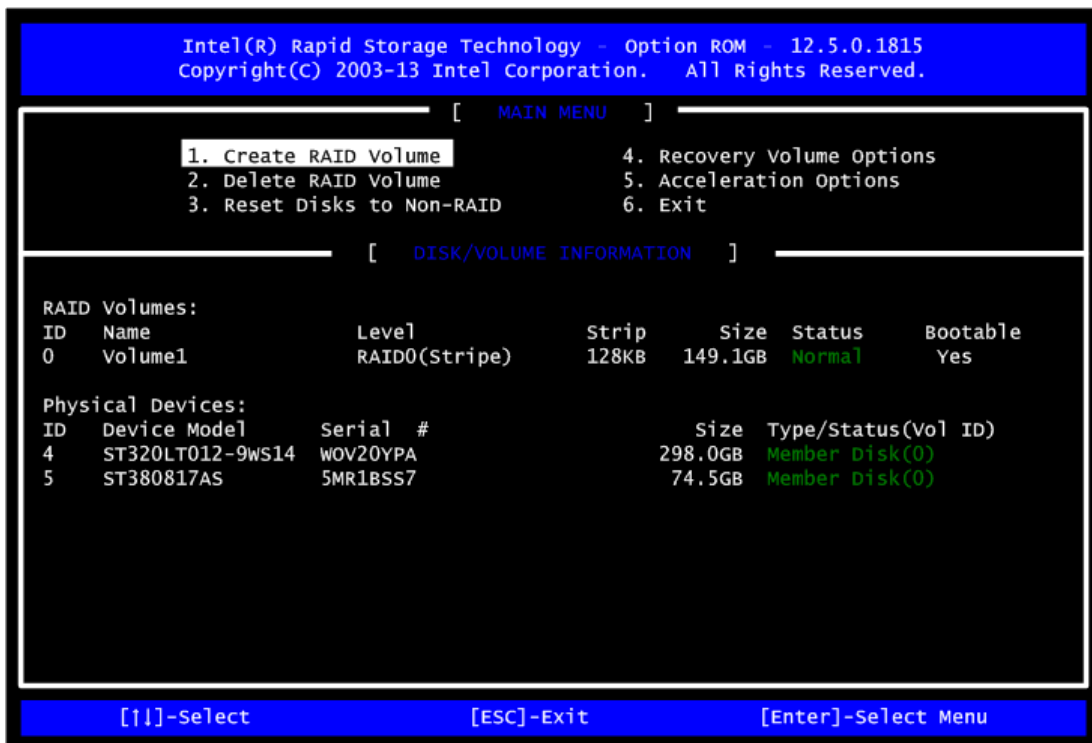
- 3.6. After setting all the items on the menu, select "Create Volume" and press <Enter> to start creating the RAID array.



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

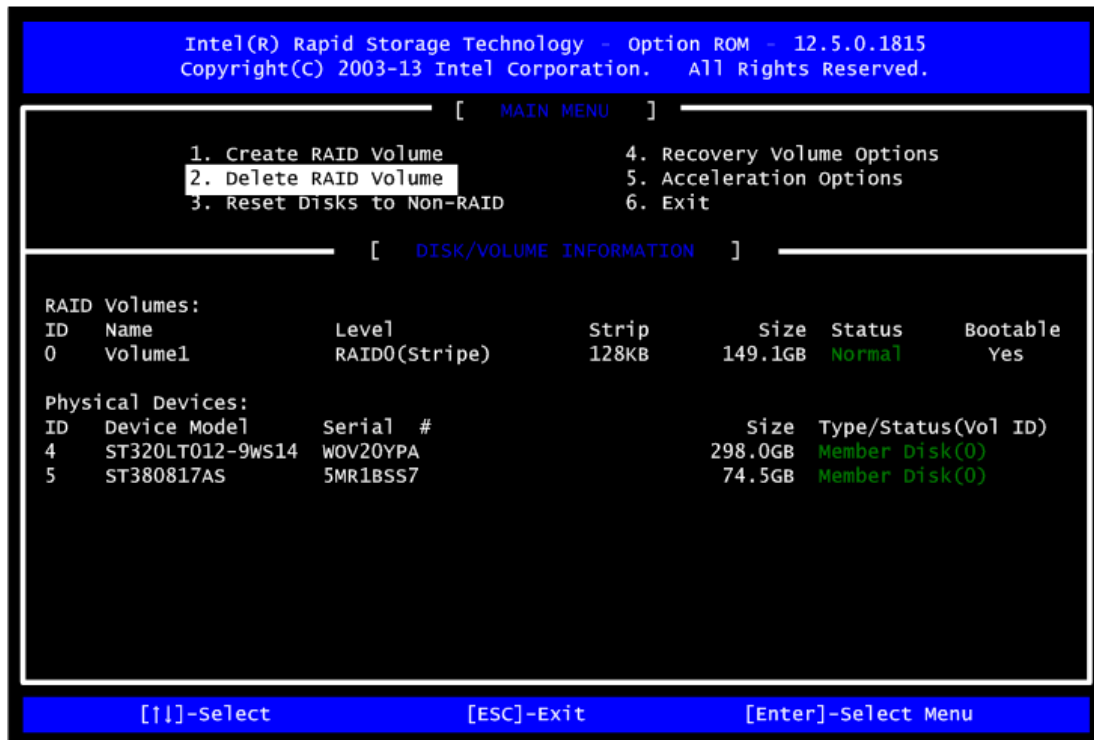


After the creation is completed, you will see detailed information about the RAID Array in the Disk/Volume Information section, including RAID mode, disk block size, disk name, and disk capacity, etc.



Delete RAID volume

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



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

Appendix E

Digital I/O

Digital I/O Software Programming

- I2C to GPIO PCA9554PW GPIO[3:0] is Output, GPIO[7:4] is Input.
- 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 is 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 VDD.

| 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