AXIOMTEK

CEM501/511

6th/7th Generation Intel® Core™ i7/ i5/ i3 Processors COM Express™ Type 6 Module

User's Manual

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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.

Trademarks Acknowledgments

Table of Contents

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Chapter 1
Introduction

The CEM501 is a new COM Express™ Type 6 Compact Module powering by BGA type dual core 6th generation Intel® Core™ i7/ i5/ i3 processors. Meanwhile, the CEM511 is a new COM Express™ Type 6 Compact Module powering by BGA type dual core 7th generation Intel® Core™ i7/ i5/ i3 and Celeron® processors. Both of them support the most updated high speed I/Os like PCI-Express Gen 3 at 8GT/s, SuperSpeed USB 3.0 at 5Gb/s and SATA-600 at 6Gb/s. The CEM501/511 fully comply with PICMG COM.0 Rev 2.1 COM Express™ Type 6 specification. In additional, they also provide 6 Lanes of PCI-Express, Gigabit Ethernet, HD audio interface, LVDS LCD and 2 configurable DDI for more flexible digital display options.

1.1 Features

- CEM501: 6th generation Intel® Core™ i7/ i5/ i3 BGA processors
- CEM511: 7th generation Intel® Core™ i7/ i5/ i3 and Celeron® BGA processors
- 2 DDR4-2133 SO-DIMMs support up to 32GB memory capacity
- Support 6 lanes of PCI-Express
- 3 SATA-600
- 4 USB 3.0 ports
- 8 USB 2.0 ports
- TPM v1.2

1.2 Specifications

- **CPU**
  - CEM501
    - Intel® 6th generation Core™ i7/ i5/ i3 BGA processors.
  - CEM511
    - Intel® 7th generation Core™ i7/ i5/ i3 and Celeron® BGA processors.

- **Chipset**
  - Integrated in CPU.

- **BIOS**
  - American Megatrends Inc. BIOS.
  - 128Mbit SPI Flash, DMI, Plug and Play.
  - PXE Ethernet Boot ROM, customized default saving features, LPC-free supported.

- **System Memory**
  - Two 260-pin DDR4 2133MHz SO-DIMM sockets for maximum memory capacity up to 32GB.

- **TPM**
  - Trusted Platform Module compatible with TPM1.2 Main and PC Client specification based on Intel LPC Bus Interface.

- **Expansion Interface**
  - Six lanes of PCI-Express (can be configured as one PCIe x4 and two PCIe x1, three PCIe x2, six PCIe x1).

- **USB Interface**
  - Four USB ports comply with USB Spec. Rev. 3.0.
  - Eight USB ports comply with USB Spec. Rev. 2.0.

- **SATA Interface**
  - Three SATA 6Gb/s ports supported through COM Express™ connector.

- **Graphics**
  - Integrated in processor HD graphics Gen 9.
  - 18/24-bit single/dual channel LVDS interface (eDP optional).
  - Two DDI ports support HDMI/DVI/DisplayPort. The second DDI port can be configured as VGA port (optional).

- **Ethernet**
  - One 1000/100/10 Base-T provided by Intel® I219LM with integrated boot ROM.

- **Audio**
  - HD link interface to carrier board for codec.

- **General Purpose Serial Interface**
  - Support two UART interfaces.

- **Watchdog Timer**
  - Timeout value range is 1~65535 seconds.

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

- **Form Factor**
  - Basic module 95mm x 95mm.

1.3 Utilities Supported

- Chipset driver
- Graphics driver
- Ethernet utility and driver
- ME driver

Note

All specifications and images are subject to change without notice.

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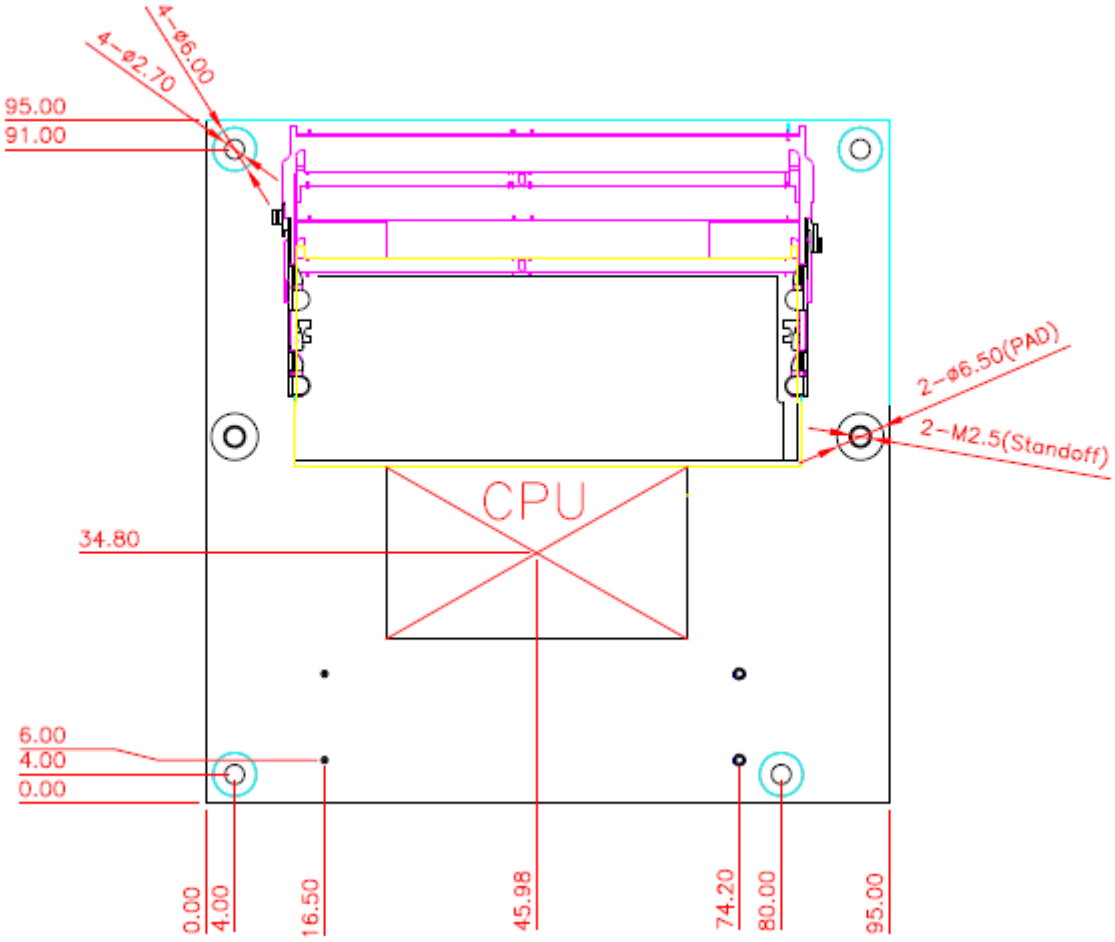
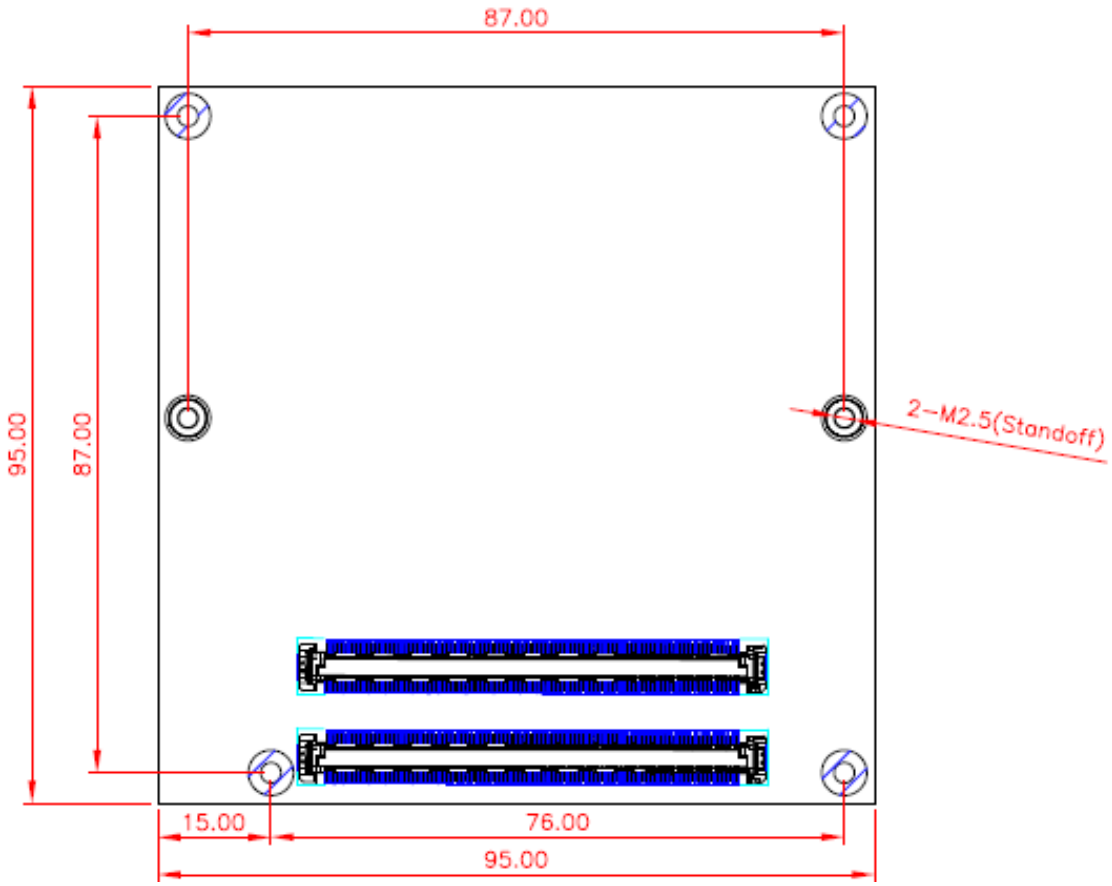
Chapter 2
Module and Pin Assignments

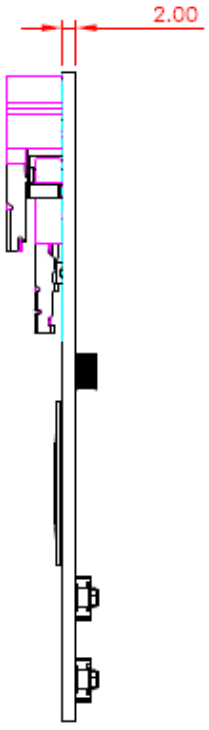
2.1 Module Dimensions and Fixing Holes



Top View

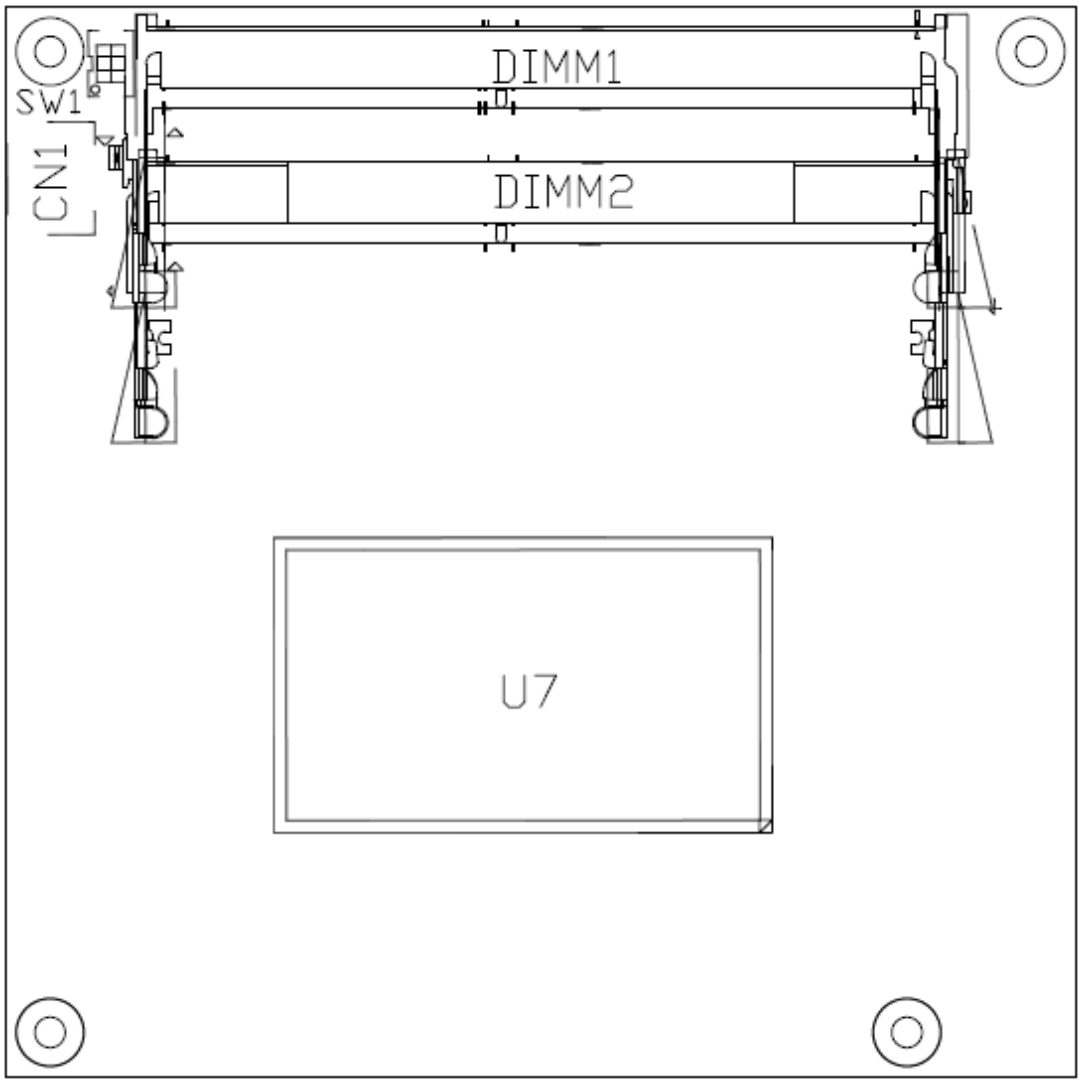


Bottom View

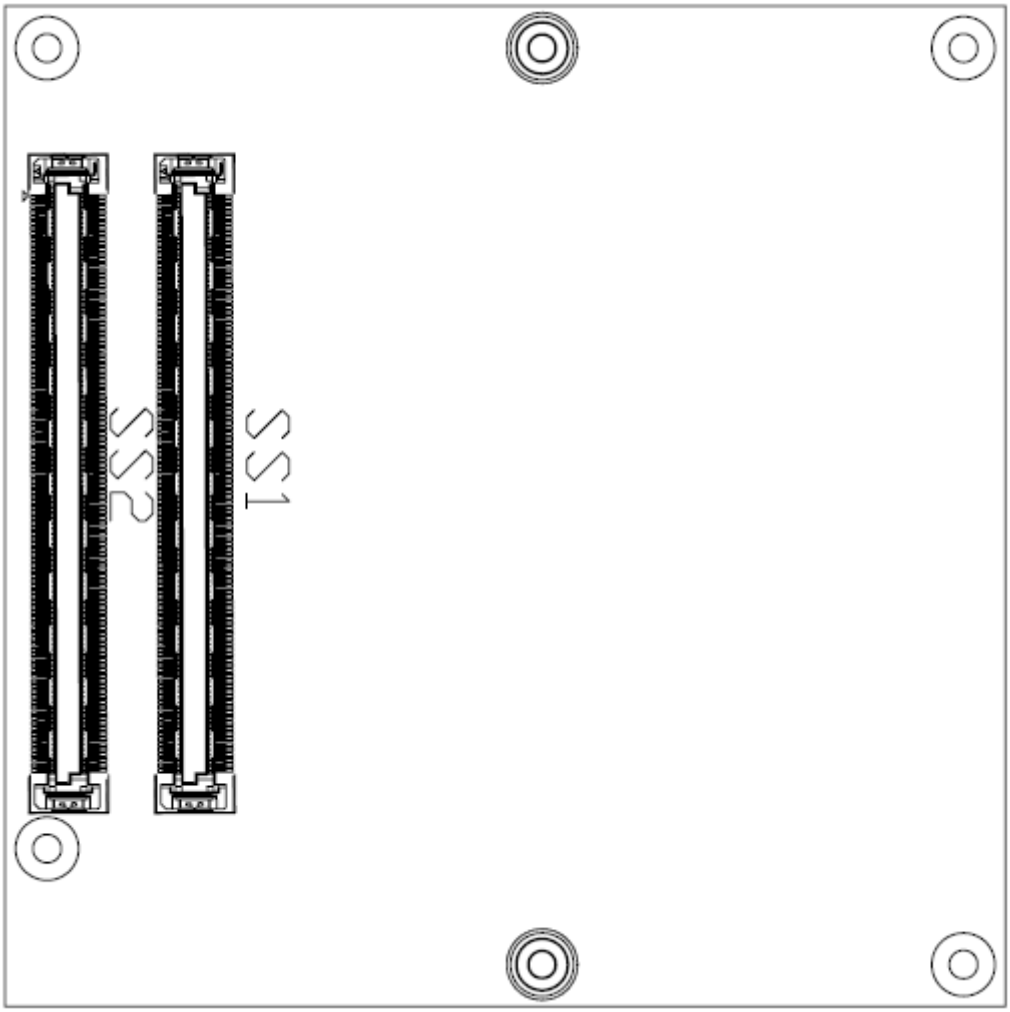


Side View

2.2 Module Layout



Top View



Bottom View

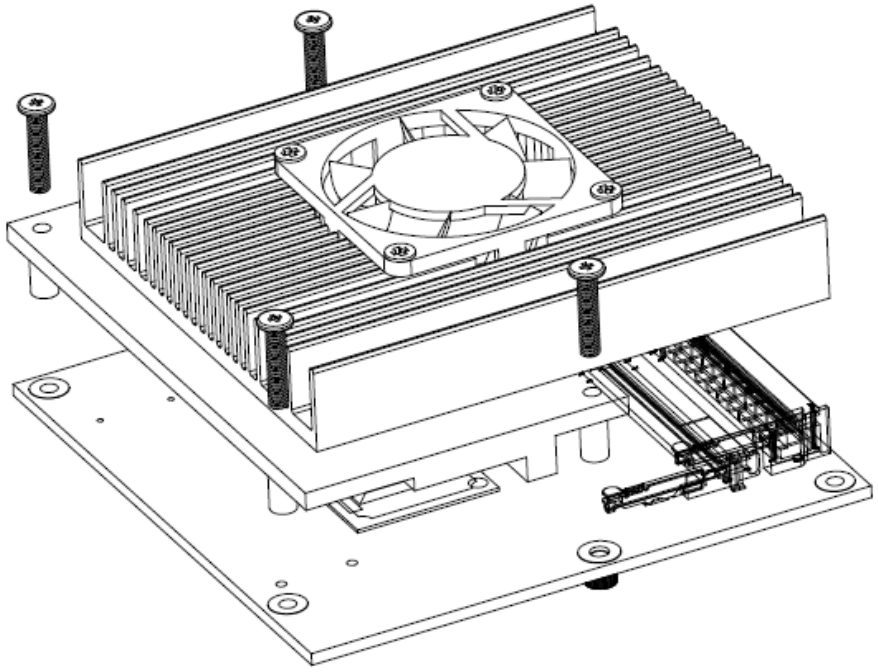
2.3 Installing Thermal Solution

For thermal dissipation, a thermal solution enables the CEM501/511's components to dissipate heat efficiently. All heat generating components are thermally conducted to the heatsink in order to avoid hot spots. Below images illustrate how to install the thermal solution on CEM501/511.

1. There is a protective plastic covering on the thermal pads. This must be removed before the heatspreader can be mounted.

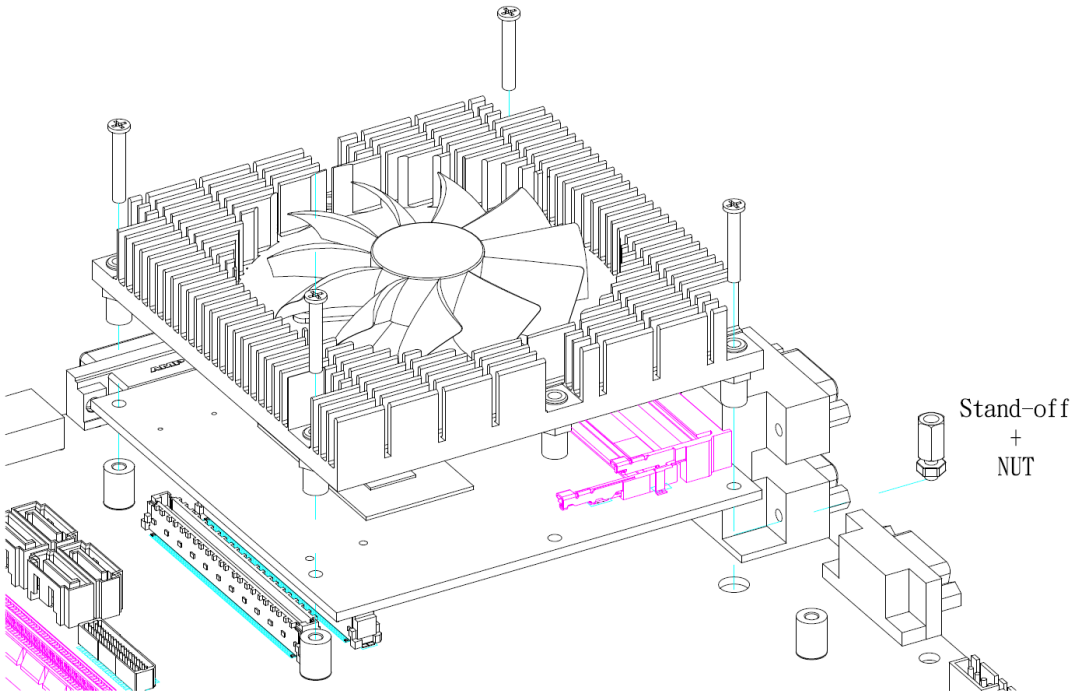
2. Each thermal solution is designed for a specific CEM module. The thermal pads on the heatspreader are designed to make contact with the necessary components on the CEM module. When mounting the heatspreader you must make sure that the thermal pads on the heatspreader make complete contact (no space between thermal pad and component) with the corresponding components on the CEM module. This is especially critical for CEM modules that have higher CPU speeds (for example 1.0GHz or more) to ensure that the heatspreader acts as a proper thermal interface for cooling solutions.

3. Before installing the heatspreader to the CPU module, please apply thermal grease on the CPU die. This CPU module has four assembly holes for installing heatspreader plate. Use the four screws to secure the heatspreader plate to the CEM501/511. Be careful not to over-tighten the screws. Then, apply thermal grease at the bottom of heatsink and secure the heatsink on the heatspreader by another four screws.



Note

When installing CEM501/511 on CEB94011, please add stand-off and secure with nut. Then, use the screws to secure the heatsink plate to the CEM501/511.



2.4 Switch Settings

Properly configure switch settings on the CEM501/511 to meet your application purpose. Below you can find a summary table of switch and onboard default setting.

Note

Once the default switch setting needs to be changed, please do it under power-off condition.

Switch	Description	Setting
SW1	Auto Power On Default: Disable	SW1-1 OFF
	Restore BIOS Optimal Defaults Default: Normal Operation	SW1-2 OFF

2.4.1 Auto Power On and Restore BIOS Optimal Defaults (SW1)

If dip1 of SW1 (SW1-1) is set to ON position, the system will be automatically power on without pressing soft power button. If this switch is set to OFF position, it is necessary to manually press soft power button to power on the system.

The dip2 of SW1 (SW1-2) is for restoring BIOS default status. Flip SW1-2 to ON position for a few seconds then flip it back to OFF position. Doing this procedure can restore BIOS optimal defaults.

Function	Setting
Disable auto power on (Default)	SW1-1 OFF
Enable auto power on	SW1-1 ON
Normal operation (Default)	SW1-2 OFF
Restore BIOS optimal defaults	SW1-2 ON

2.5 Connector

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

Connector	Description
CN1	Fan Connector
SS1	COM Express™ Connector
SS2	COM Express™ Connector
DIMM1	Channel 1 DDR4 SO-DIMM Socket
DIMM2	Channel 0 DDR4 SO-DIMM Socket

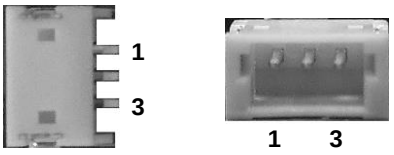
Note

- ***For single memory channel configuration, install memory module in channel 0 (DIMM2) DDR4 SO-DIMM socket.***
- ***For dual memory channel configuration, install memory modules of the same size, chip width, density and rank in both channel 0 (DIMM2) and channel 1 (DIMM1) DDR4 SO-DIMM sockets.***

2.5.1 Fan Connector (CN1)

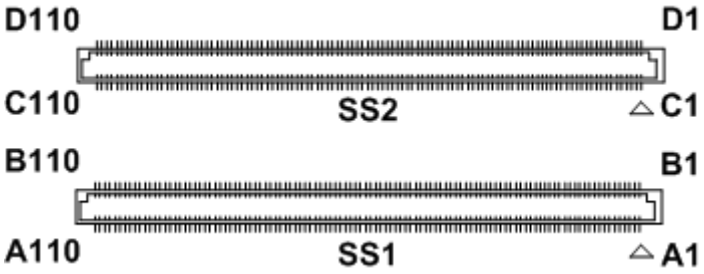
The CN1 is a 3-pin connector for fan interface.

Pin	Signal
1	GND
2	Sensor
3	+12V level



2.5.2 COM Express™ Connector (SS1 and SS2)

The following table shows pin assignments of the 220-pin COM Express™ connectors.



Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A1	GND (FIXED)	B1	GND (FIXED)	C1	GND (FIXED)	D1	GND (FIXED)
A2	GBE0_MDI3-	B2	GBE0_ACT#	C2	GND	D2	GND
A3	GBE0_MDI3+	B3	LPC_FRAME#	C3	USB_SSRX0-	D3	USB_SSTX0-
A4	GBE0_LINK100#	B4	LPC_AD0	C4	USB_SSRX0+	D4	USB_SSTX0+
A5	GBE0_LINK1000#	B5	LPC_AD1	C5	GND	D5	GND
A6	GBE0_MDI2-	B6	LPC_AD2	C6	USB_SSRX1-	D6	USB_SSTX1-
A7	GBE0_MDI2+	B7	LPC_AD3	C7	USB_SSRX1+	D7	USB_SSTX1+
A8	GBE0_LINK#	B8	N.C.	C8	GND	D8	GND
A9	GBE0_MDI1-	B9	N.C.	C9	USB_SSRX2-	D9	USB_SSTX2-
A10	GBE0_MDI1+	B10	LPC_CLK	C10	USB_SSRX2+	D10	USB_SSTX2+
A11	GND (FIXED)	B11	GND (FIXED)	C11	GND (FIXED)	D11	GND (FIXED)
A12	GBE0_MDI0-	B12	PWRBTN#	C12	USB_SSRX3-	D12	USB_SSTX3-
A13	GBE0_MDI0+	B13	SMB_CK	C13	USB_SSRX3+	D13	USB_SSTX3+
A14	GBE0_CTREF	B14	SMB_DAT	C14	GND	D14	GND
A15	SUS_S3#	B15	SMB_ALERT#	C15	N.C.	D15	DDI1_CTRLCLK_AUX+
A16	SATA0_TX+	B16	SATA1_TX+	C16	N.C.	D16	DDI1_CTRLDATA_AUX-
A17	SATA0_TX-	B17	SATA1_TX-	C17	N.C.	D17	N.C.
A18	SUS_S4#	B18	SUS_STAT#	C18	N.C.	D18	N.C.
A19	SATA0_RX+	B19	SATA1_RX+	C19	N.C.	D19	N.C.
A20	SATA0_RX-	B20	SATA1_RX-	C20	N.C.	D20	N.C.
A21	GND (FIXED)	B21	GND (FIXED)	C21	GND (FIXED)	D21	GND (FIXED)
A22	SATA2_TX+	B22	N.C.	C22	N.C.	D22	N.C.
A23	SATA2_TX-	B23	N.C.	C23	N.C.	D23	N.C.
A24	SUS_S5#	B24	PWR_OK	C24	DDI1_HPD	D24	N.C.
A25	SATA2_RX+	B25	N.C.	C25	N.C.	D25	N.C.
A26	SATA2_RX-	B26	N.C.	C26	N.C.	D26	DDI1_PAIR0+
A27	BATLOW#	B27	WDT	C27	N.C.	D27	DDI1_PAIR0-
A28	(S)ATA_ACT#	B28	N.C.	C28	N.C.	D28	N.C.
A29	AC/HDA_SYNC	B29	AC/HDA_SDIN1	C29	N.C.	D29	DDI1_PAIR1+
A30	AC/HDA_RST#	B30	AC/HDA_SDIN0	C30	N.C.	D30	DDI1_PAIR1-
A31	GND (FIXED)	B31	GND (FIXED)	C31	GND (FIXED)	D31	GND (FIXED)
A32	AC/HDA_BITCLK	B32	SPKR	C32	DDI2_CTRLCLK_AUX+	D32	DDI1_PAIR2+
A33	AC/HDA_SDOUT	B33	I2C_CK	C33	DDI2_CTRLCLK_AUX+-	D33	DDI1_PAIR2-
A34	BIOS_DISABLE#	B34	I2C_DAT	C34	DDI2_DDC_AUX_SEL	D34	DDI1_DDC_AUX_SEL
A35	THRMTRIP#	B35	THRM#	C35	N.C.	D35	N.C.
A36	USB6-	B36	USB7-	C36	N.C.	D36	DDI1_PAIR3+
A37	USB6+	B37	USB7+	C37	N.C.	D37	DDI1_PAIR3-
A38	USB_6_7_OC#	B38	USB_4_5_OC#	C38	N.C	D38	N.C.
A39	USB4-	B39	USB5-	C39	N.C	D39	DDI2_PAIR0+
A40	USB4+	B40	USB5+	C40	N.C	D40	DDI2_PAIR0-
A41	GND (FIXED)	B41	GND (FIXED)	C41	GND (FIXED)	D41	GND (FIXED)
A42	USB2-	B42	USB3-	C42	N.C	D42	DDI2_PAIR1+
A43	USB2+	B43	USB3+	C43	N.C	D43	DDI2_PAIR1-
A44	USB_2_3_OC#	B44	USB_0_1_OC#	C44	N.C	D44	DDI2_HPD
A45	USB0-	B45	USB1-	C45	N.C.	D45	N.C.
A46	USB0+	B46	USB1+	C46	N.C	D46	DDI2_PAIR2+
A47	VCC_RTC	B47	EXCD1_PERST#	C47	N.C	D47	DDI2_PAIR2-
A48	EXCD0_PERST#	B48	EXCD1_CPPE#	C48	N.C.	D48	N.C.
A49	EXCD0_CPPE#	B49	SYS_RESET#	C49	N.C.	D49	DDI2_PAIR3+
A50	LPC_SERIRQ	B50	CB_RESET#	C50	N.C.	D50	DDI2_PAIR3-
A51	GND (FIXED)	B51	GND (FIXED)	C51	GND (FIXED)	D51	GND (FIXED)
A52	PCIE_TX5+	B52	PCIE_RX5+	C52	N.C.	D52	N.C.
A53	PCIE_TX5-	B53	PCIE_RX5-	C53	N.C.	D53	N.C.
A54	GPI0	B54	GPO1	C54	N.C.	D54	N.C.
A55	PCIE_TX4+	B55	PCIE_RX4+	C55	N.C.	D55	N.C.

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A56	PCIE_TX4-	B56	PCIE_RX4-	C56	N.C.	D56	N.C.
A57	GND	B57	GPO2	C57	N.C.	D57	TYPE2#
A58	PCIE_TX3+	B58	PCIE_RX3+	C58	N.C.	D58	N.C.
A59	PCIE_TX3-	B59	PCIE_RX3-	C59	N.C.	D59	N.C.
A60	GND (FIXED)	B60	GND (FIXED)	C60	GND (FIXED)	D60	GND (FIXED)
A61	PCIE_TX2+	B61	PCIE_RX2+	C61	N.C.	D61	N.C.
A62	PCIE_TX2-	B62	PCIE_RX2-	C62	N.C.	D62	N.C.
A63	GPI1	B63	GPO3	C63	N.C.	D63	N.C.
A64	PCIE_TX1+	B64	PCIE_RX1+	C64	N.C.	D64	N.C.
A65	PCIE_TX1-	B65	PCIE_RX1-	C65	N.C.	D65	N.C.
A66	GND	B66	WAKE0#	C66	N.C.	D66	N.C.
A67	GPI2	B67	WAKE1#	C67	N.C.	D67	GND
A68	PCIE_TX0+	B68	PCIE_RX0+	C68	N.C.	D68	N.C.
A69	PCIE_TX0-	B69	PCIE_RX0-	C69	N.C.	D69	N.C.
A70	GND(FIXED)	B70	GND(FIXED)	C70	GND(FIXED)	D70	GND(FIXED)
A71	LVDS_A0+	B71	LVDS_B0+	C71	N.C.	D71	N.C.
A72	LVDS_A0-	B72	LVDS_B0-	C72	N.C.	D72	N.C.
A73	LVDS_A1+	B73	LVDS_B1+	C73	GND	D73	GND
A74	LVDS_A1-	B74	LVDS_B1-	C74	N.C.	D74	N.C.
A75	LVDS_A2+	B75	LVDS_B2+	C75	N.C.	D75	N.C.
A76	LVDS_A2-	B76	LVDS_B2-	C76	GND	D76	GND
A77	LVDS_VDD_EN	B77	LVDS_B3+	C77	N.C.	D77	N.C.
A78	LVDS_A3+	B78	LVDS_B3-	C78	N.C.	D78	N.C.
A79	LVDS_A3-	B79	LVDS_BKLT_EN	C79	N.C.	D79	N.C.
A80	GND(FIXED)	B80	GND(FIXED)	C80	GND(FIXED)	D80	GND(FIXED)
A81	LVDS_A_CK+	B81	LVDS_B_CK+	C81	N.C.	D81	N.C.
A82	LVDS_A_CK-	B82	LVDS_B_CK-	C82	N.C.	D82	N.C.
A83	LVDS_I2C_CK	B83	LVDS_BKLT_CTRL	C83	N.C.	D83	N.C.
A84	LVDS_I2C_DAT	B84	VCC_5V_SBY	C84	GND	D84	GND
A85	GPI3	B85	VCC_5V_SBY	C85	N.C.	D85	N.C.
A86	N.C.	B86	VCC_5V_SBY	C86	N.C.	D86	N.C.
A87	eDP_HPD	B87	VCC_5V_SBY	C87	GND	D87	GND
A88	PCIE0_CK_REF+	B88	BIOS_DIS1	C88	N.C.	D88	N.C.
A89	PCIE0_CK_REF-	B89	VGA_RED	C89	N.C.	D89	N.C.
A90	GND (FIXED)	B90	GND (FIXED)	C90	GND (FIXED)	D90	GND (FIXED)
A91	SPI_POWER	B91	VGA_GRN	C91	N.C.	D91	N.C.
A92	SPI_MISO	B92	VGA_BLU	C92	N.C.	D92	N.C.
A93	GPO0	B93	VGA_HSYNC	C93	GND	D93	GND
A94	SPI_CLK	B94	VGA_VSYNC	C94	N.C.	D94	N.C.
A95	SPI_MOSI	B95	VGA_I2C_CK	C95	N.C.	D95	N.C.
A96	TPM_PP	B96	VGA_I2C_DAT	C96	GND	D96	GND
A97	N.C.	B97	SPI_CS#	C97	N.C.	D97	N.C.
A98	SER0_TX	B98	N.C.	C98	N.C.	D98	N.C.
A99	SER0_RX	B99	N.C.	C99	N.C.	D99	N.C.
A100	GND (FIXED)	B100	GND (FIXED)	C100	GND (FIXED)	D100	GND (FIXED)
A101	SER1_TX	B101	FAN_PWMOUT	C101	N.C.	D101	N.C.
A102	SER1_RX	B102	FAN_TACHIN	C102	N.C.	D102	N.C.
A103	LID#	B103	SLEEP#	C103	GND	D103	GND
A104	VCC_12V	B104	VCC_12V	C104	VCC_12V	D104	VCC_12V
A105	VCC_12V	B105	VCC_12V	C105	VCC_12V	D105	VCC_12V
A106	VCC_12V	B106	VCC_12V	C106	VCC_12V	D106	VCC_12V
A107	VCC_12V	B107	VCC_12V	C107	VCC_12V	D107	VCC_12V
A108	VCC_12V	B108	VCC_12V	C108	VCC_12V	D108	VCC_12V
A109	VCC_12V	B109	VCC_12V	C109	VCC_12V	D109	VCC_12V
A110	GND (FIXED)	B110	GND (FIXED)	C110	GND (FIXED)	D110	GND (FIXED)

Chapter 3
Hardware Description

3.1 Microprocessor

The CEM501 supports 6th generation Intel® Core™ i7/ i5/ i3 processors, which enables your system to operate under Windows® 8.1, Windows® 10 and Linux environments. The CEM511 supports 7th generation Intel® Core™ i7/ i5/ i3 and Celeron® processors, which enables your system to operate under Windows® 10 and Linux environments. The system performance depends on the microprocessor. You must install the heatsink or cooler carefully and properly to prevent damage.

3.2 BIOS

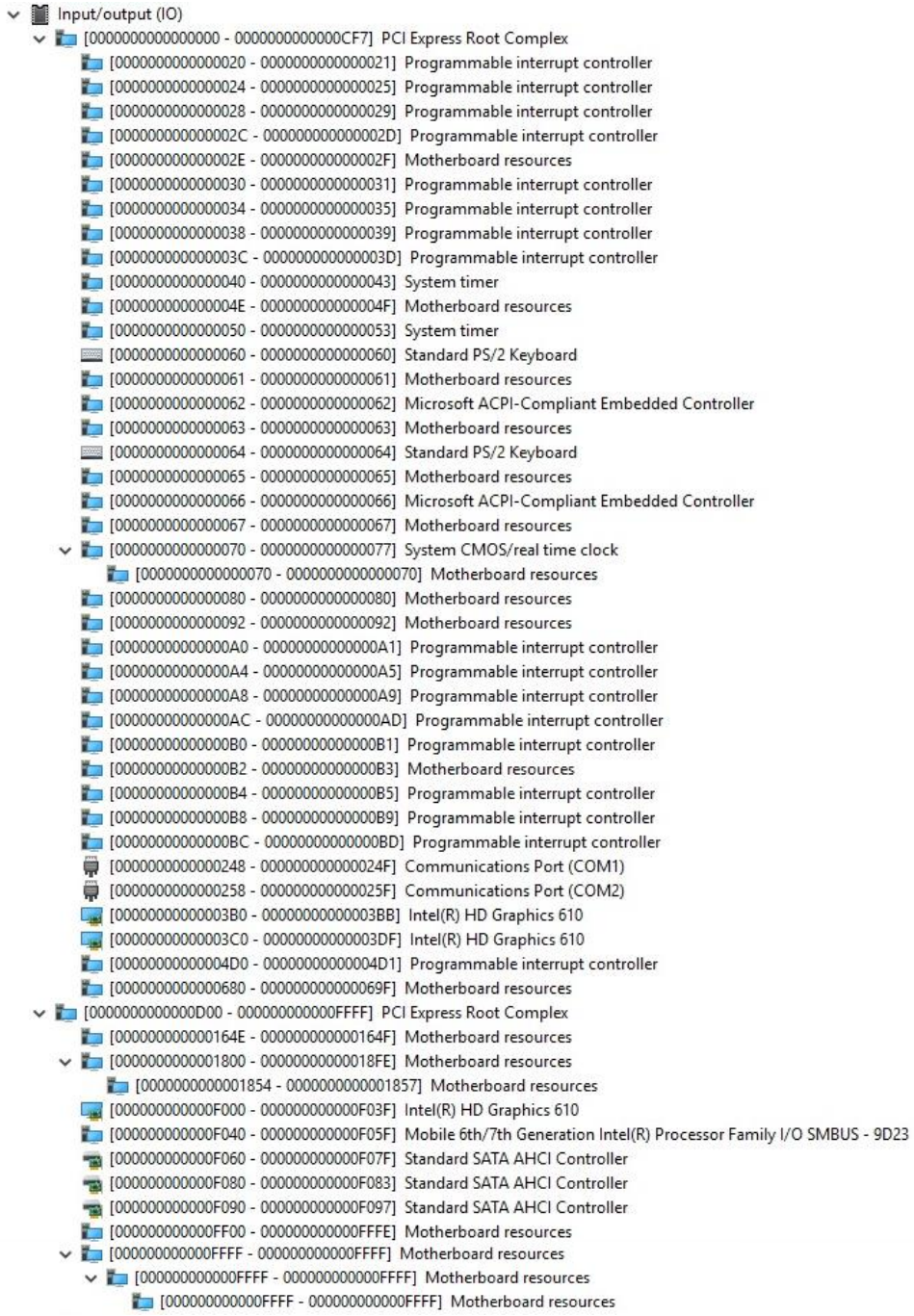
The CEM501/511 uses AMI Plug and Play BIOS with a single 128Mbit SPI Flash.

3.3 System Memory

The CEM501/511 supports two 260-pin DDR4 2133MHz SO-DIMM sockets for maximum memory capacity up to 32GB DDR4 SDRAMs. The memory module can come in sizes of 4GB, 8GB and 16GB.

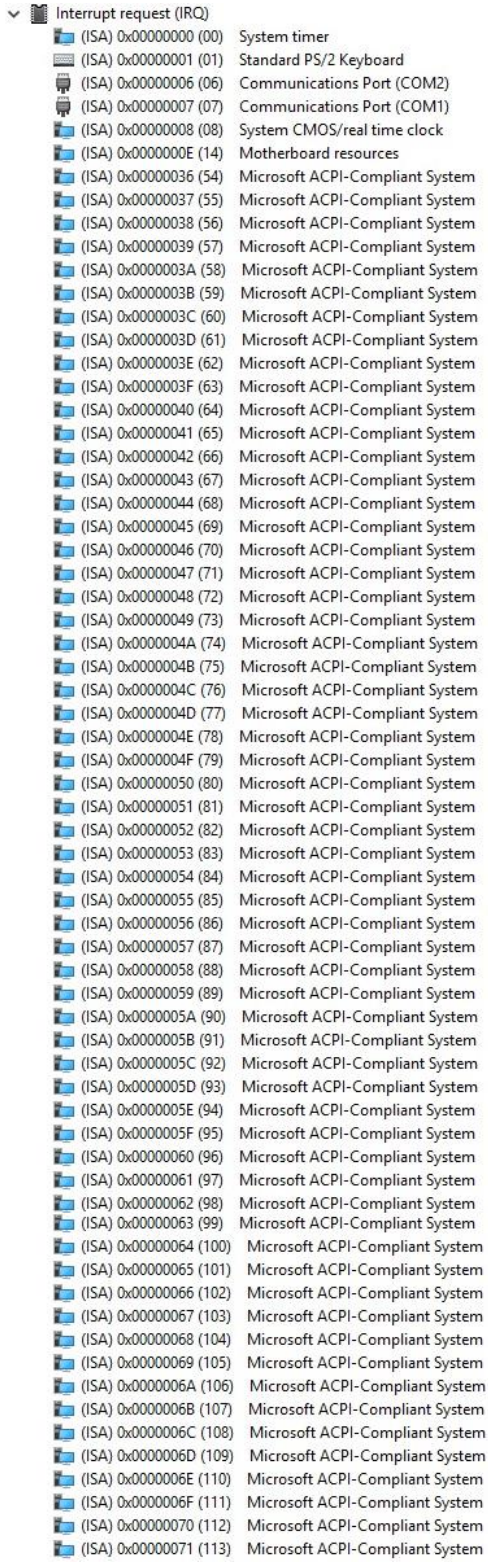
3.4 I/O Port Address Map

The I/O port addresses (with CEB94011 baseboard under Windows® 10) are as follows:



3.5 Interrupt Controller (IRQ) Map

The interrupt controller (IRQ) mapping list (with CEB94011 baseboard under Windows® 10) is shown as follows:



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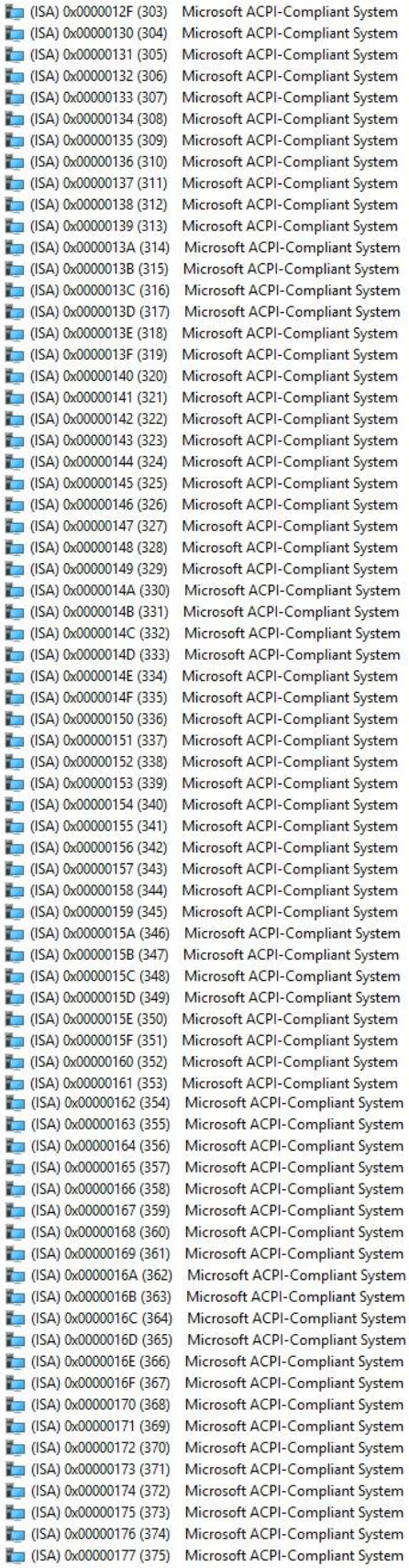
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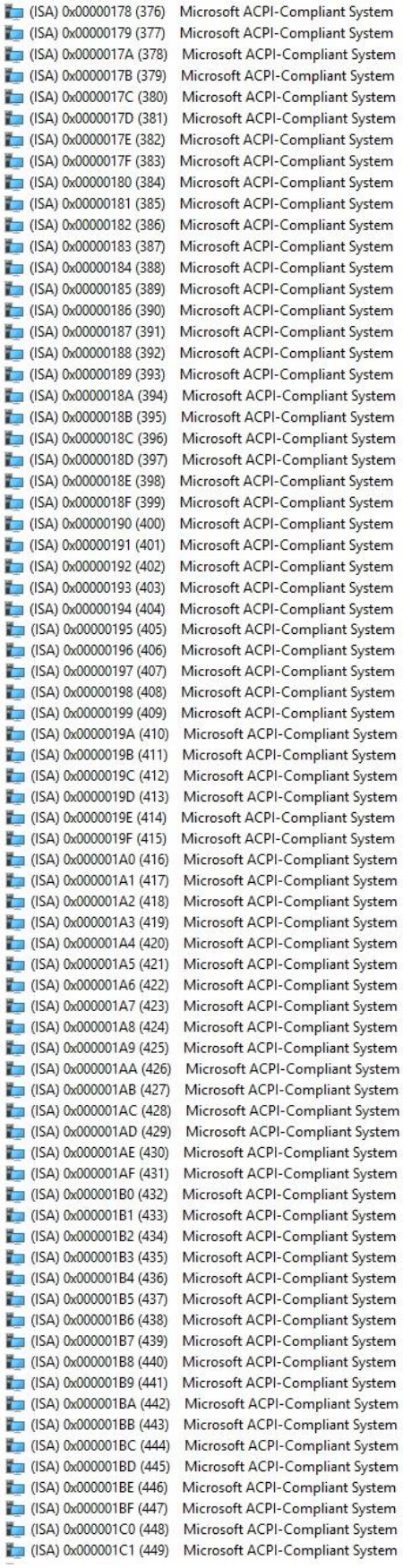
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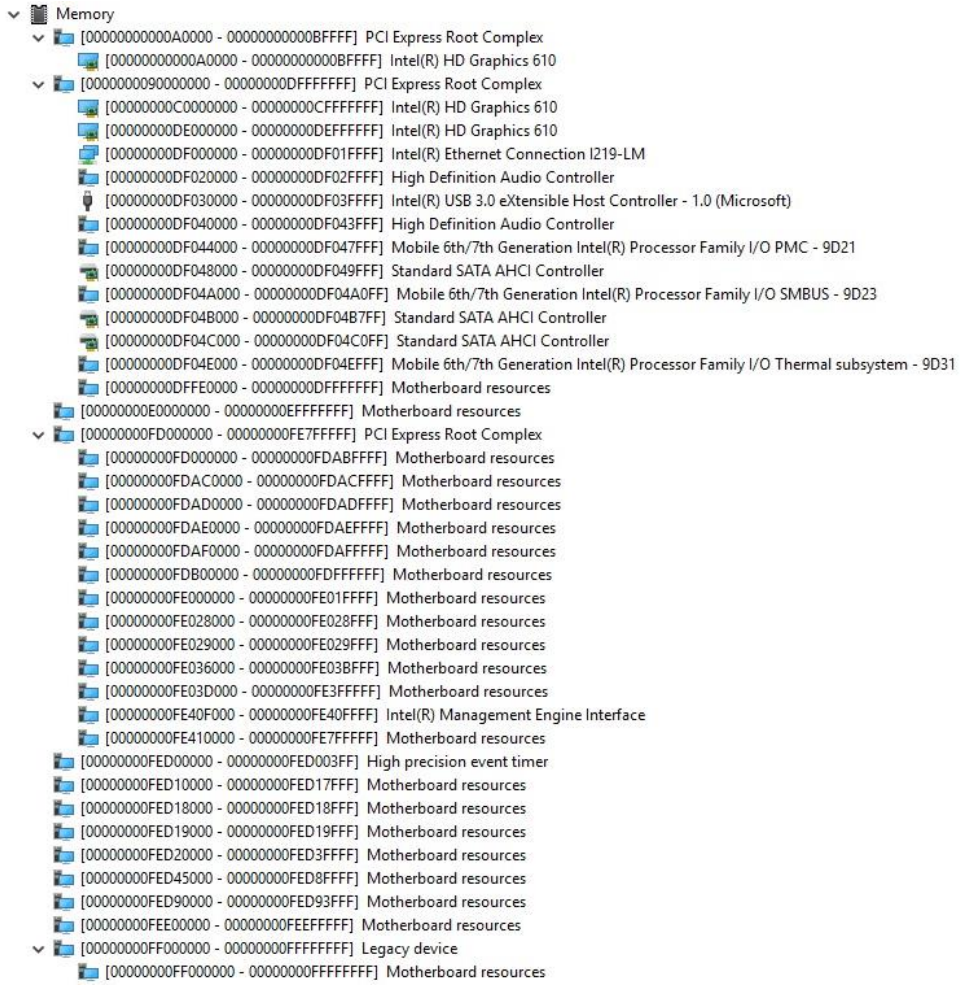
(PCI) 0xFFFFFFFA (-6) Intel(R) Management Engine Interface
(PCI) 0xFFFFFFFB (-5) Intel(R) USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
(PCI) 0xFFFFFFFC (-4) Intel(R) HD Graphics 610
(PCI) 0xFFFFFFFD (-3) Intel(R) Ethernet Connection I219-LM
(PCI) 0xFFFFFFFE (-2) Standard SATA AHCI Controller

3.6 Memory Map

The memory (with CEB94011 baseboard under Windows® 10) mapping list is shown as follows:



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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 the <Del> key immediately.
2. After you press the <Del> key, 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 SW1-2 (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.

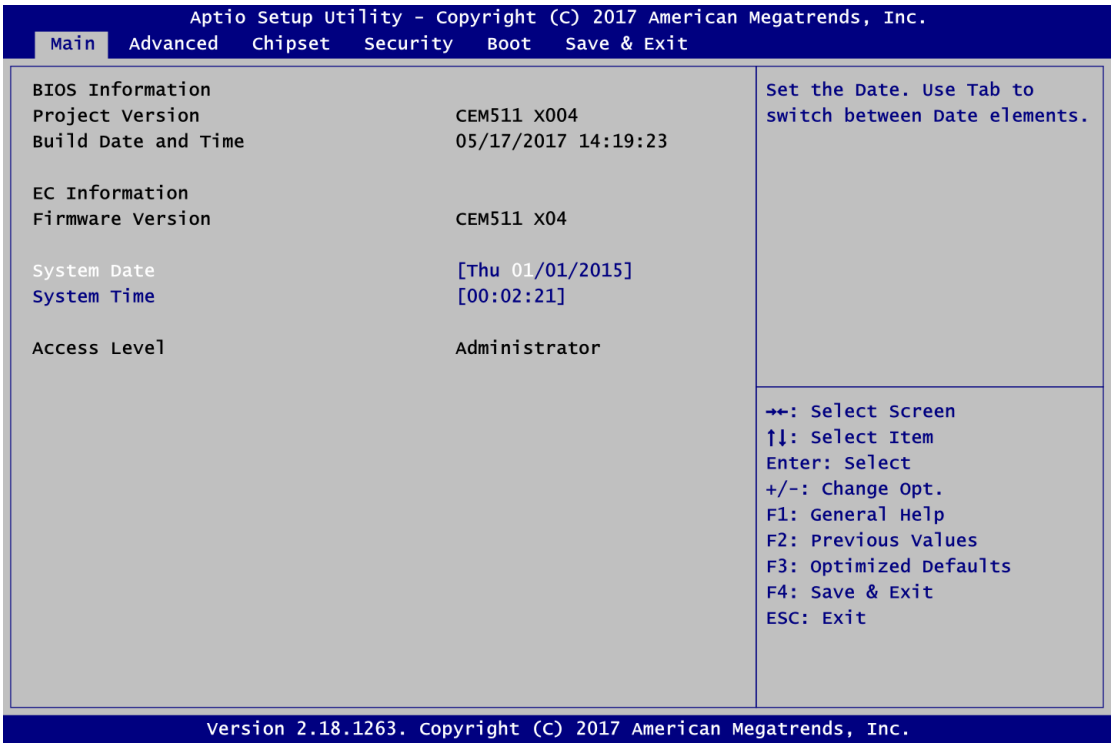
Note

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.
+– Plus/Minus	The Plus and Minus <Arrow> keys allow you to change the field value of a particular setup item.
Tab	The <Tab> key allows you to select setup fields.
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.
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.

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 and EC Information
Display BIOS and EC firmware 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.

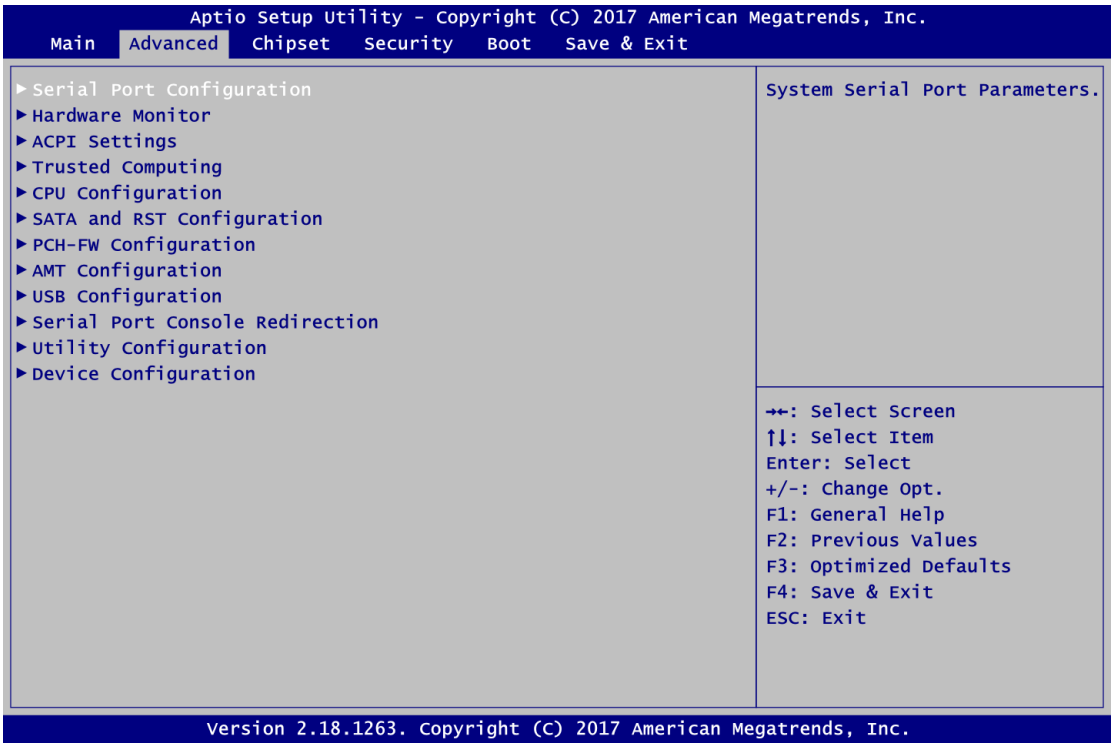
Access Level
Display the access level of current user.

4.4 Advanced Menu

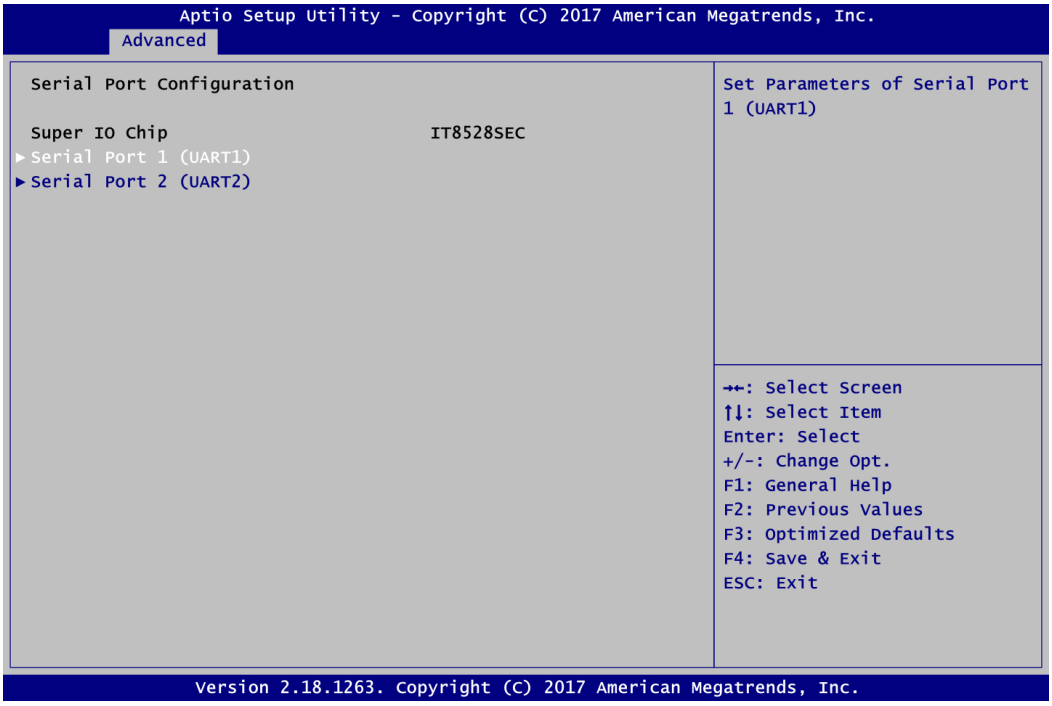
The Advanced menu also allows users to set configuration of the CPU and other system devices. You can select any of the items in the left frame of the screen to go to the sub menus:

- ▶ Serial Port Configuration
- ▶ Hardware Monitor
- ▶ ACPI Settings
- ▶ Trusted Computing
- ▶ CPU Configuration
- ▶ SATA and RST Configuration
- ▶ PCH-FW Configuration
- ▶ AMT Configuration
- ▶ USB Configuration
- ▶ Serial Port Console Redirection
- ▶ Utility Configuration
- ▶ Device Configuration

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

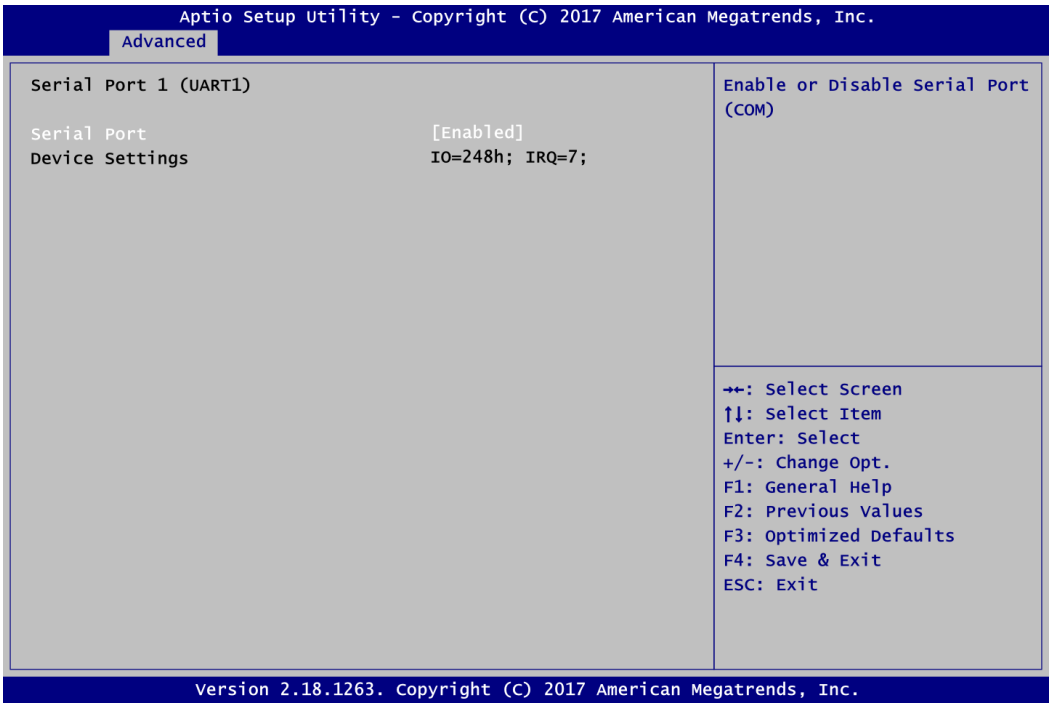


- **Serial Port Configuration**
  You can use this screen to select options for Serial Port Configuration, and change the value of the selected option. A description of the selected item appears on the right side of the screen. For items marked with "►", please press <Enter> for more options.



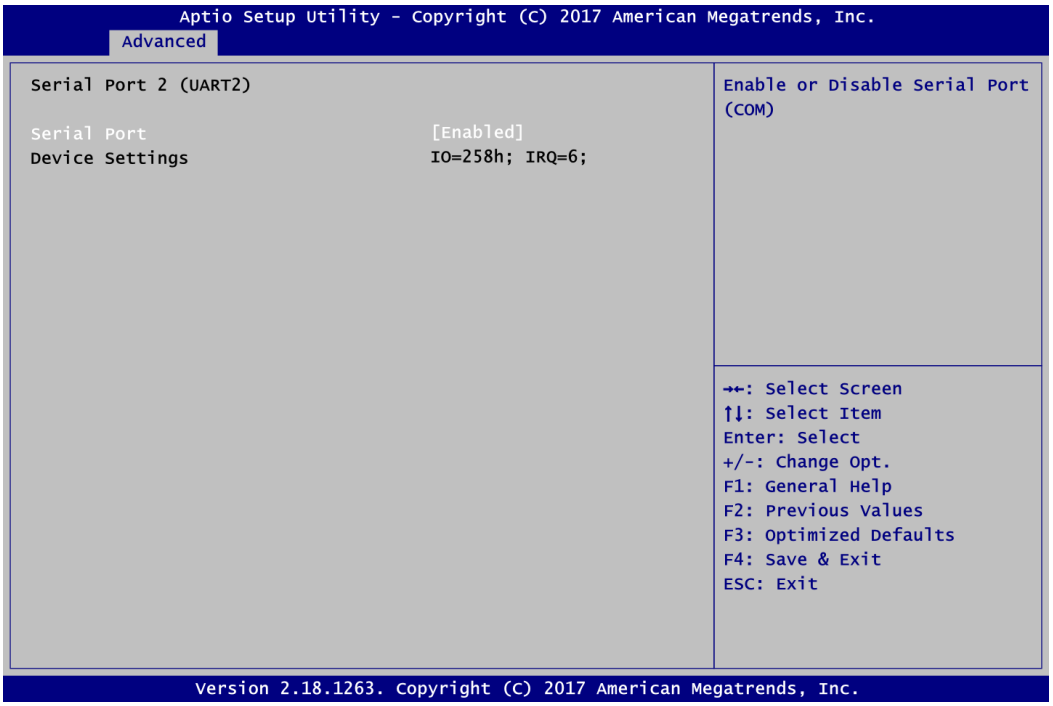
Serial Port Configuration
Set parameters related to serial ports.

- **Serial Port 1 Configuration**



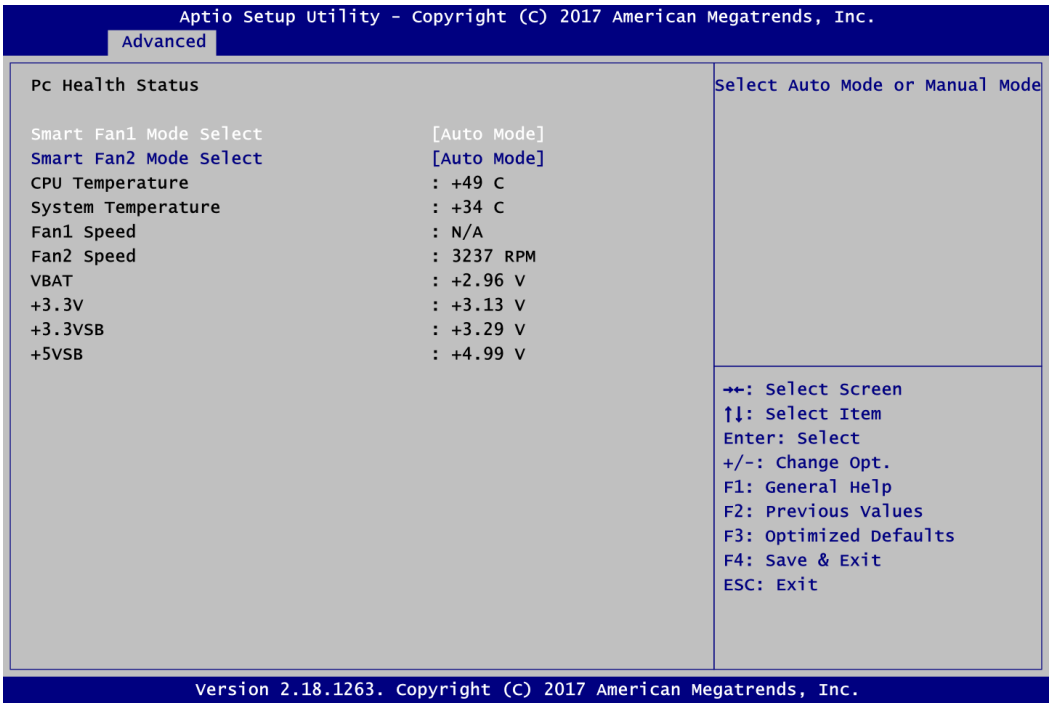
Serial Port 1 (UART1)
Enable or disable serial port 1. The optimal setting for base I/O address is 248h and for interrupt request address is IRQ7.

- **Serial Port 2 Configuration**



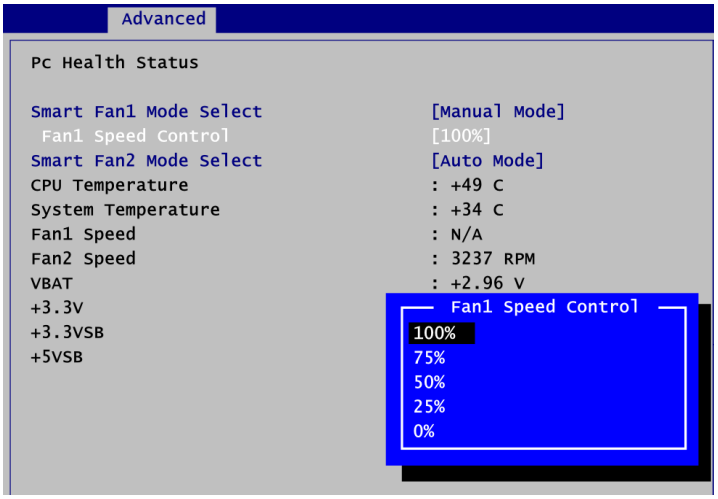
Serial Port 2 (UART2)
Enable or disable serial port 2. The optimal setting for base I/O address is 258h and for interrupt request address is IRQ6.

- **Hardware Monitor**
  This screen is for fan speed control and hardware health status monitoring.

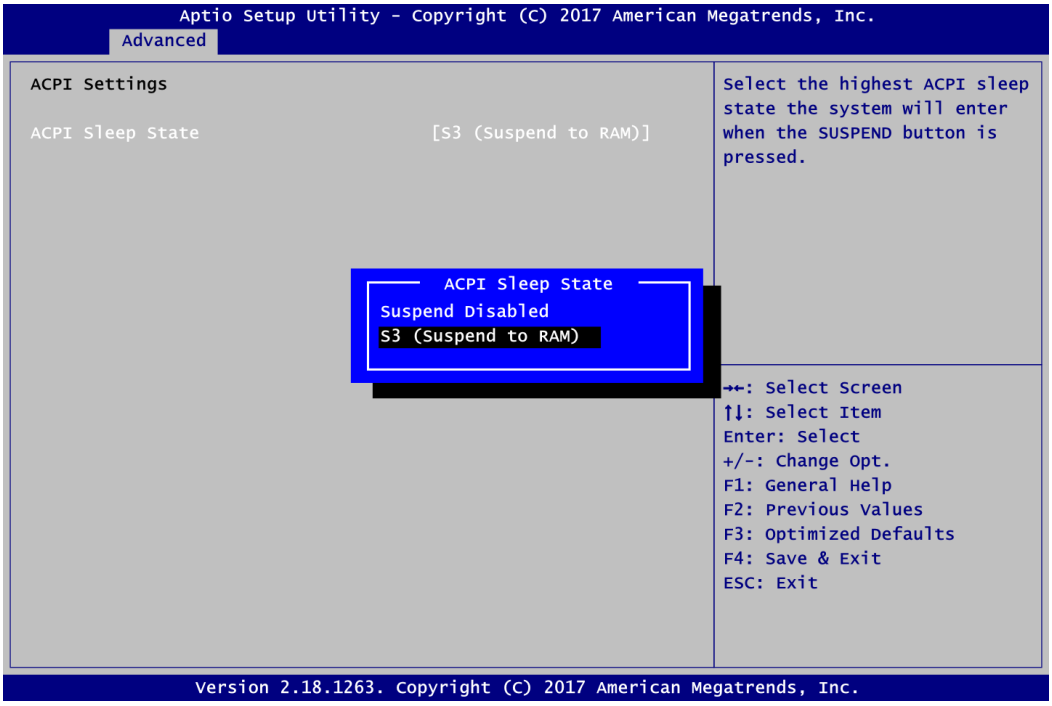


This screen displays the temperature of system and CPU, cooling fans speed in RPM and system voltages (VBAT, +3.3V, +3.3VSB and +5VSB).

Smart Fan1/2 Mode Select
Set Smart Fan 1/2 mode. The default is Auto Mode. If Smart Fan is in Auto Mode, the system fan spins at different speed depending on system temperature; the higher the temperature, the faster the system fan spins. If Smart Fan is in Manual Mode, user can manually change system fan speed to 0%, 25%, 50%, 75% or 100% (see image below).



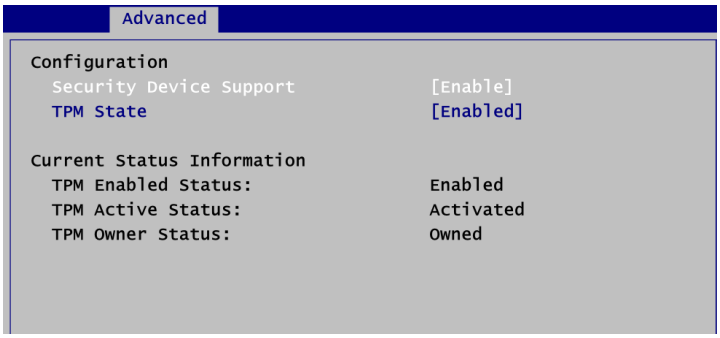
- **ACPI Settings**
  You can use this screen to select options for the ACPI configuration, and change the value of the selected option. A description of the selected item appears on the right side of the screen.



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**
  You can use this screen for TPM (Trusted Platform Module) configuration. It also shows current TPM status information.

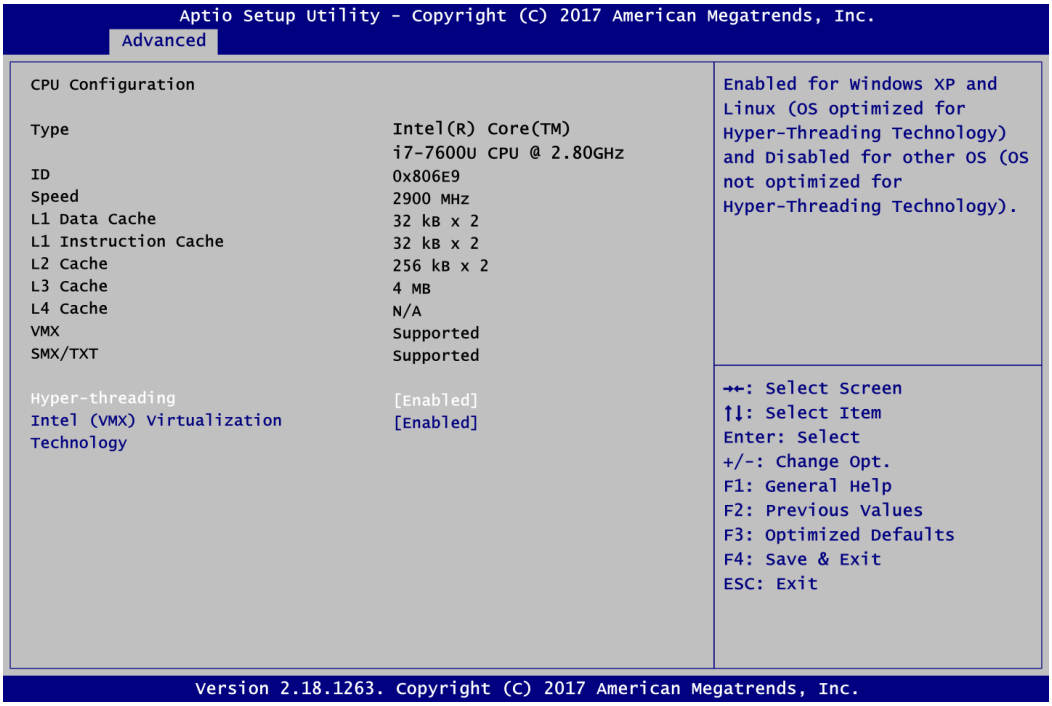
Security Device Support
Enable or disable BIOS support for security device. The default is Disabled. Once the Security Device Support is enabled, you will see the following screen.



TPM State
Specify whether TPM can be used by the operating system.

Current Status Information
Display current TPM status information.

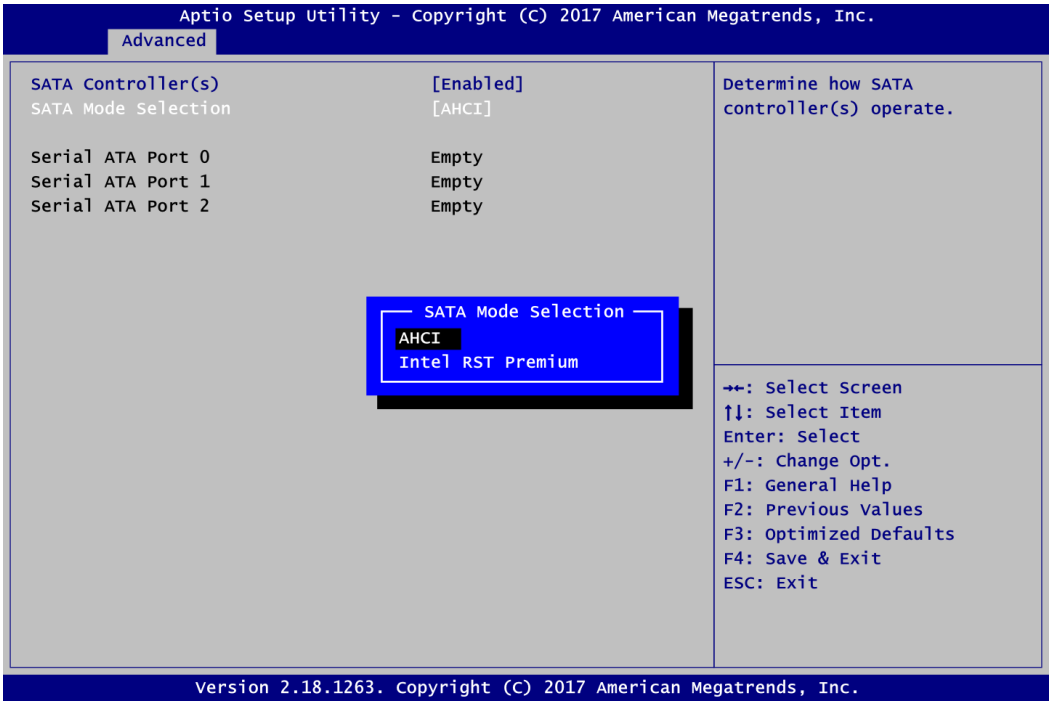
- **CPU Configuration**
  This screen shows the CPU Configuration, and you can change the value of the selected option.



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 computer system to work as several virtual systems.

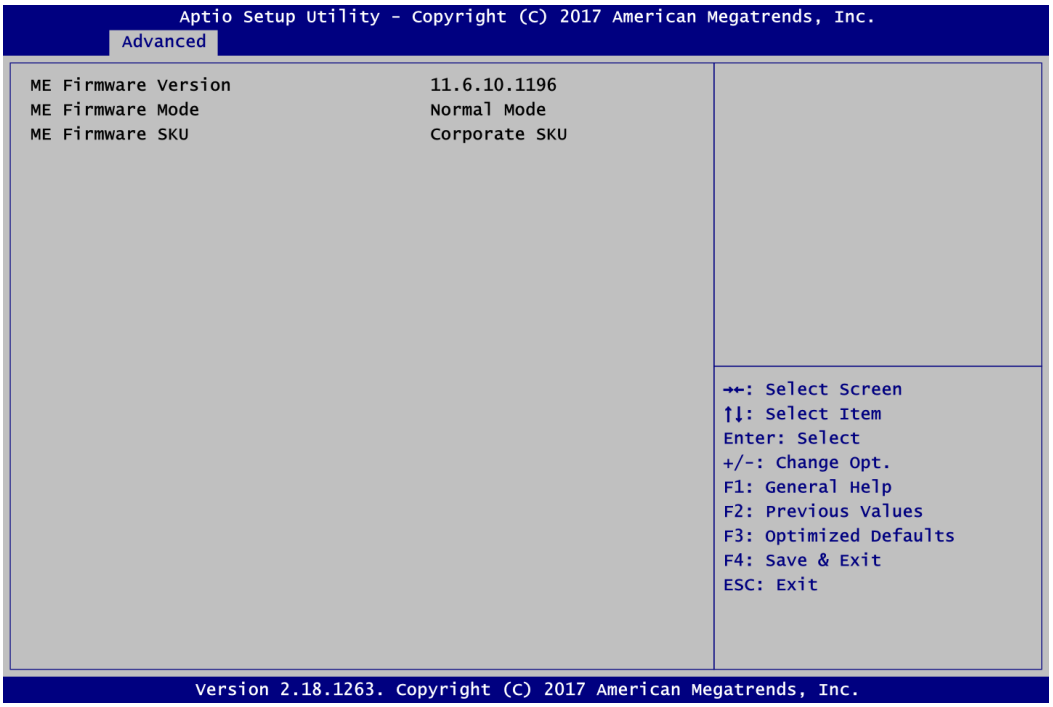
- **SATA and RST Configuration**
  In the SATA Configuration menu, you can see the currently installed hardware in the SATA ports. During system boot up, the BIOS automatically detects the presence of SATA devices.



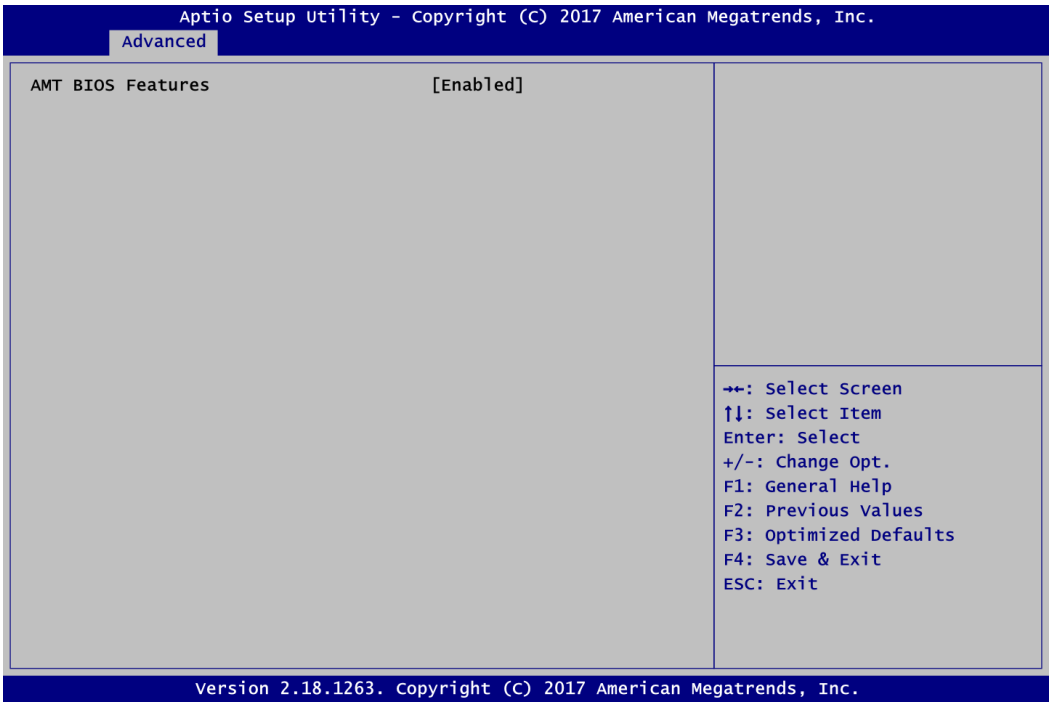
SATA Controller(s)
Enable or disable the SATA Controller feature. The default is Enabled.

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

- **PCH-FW Configuration**
  This screen displays ME Firmware information.

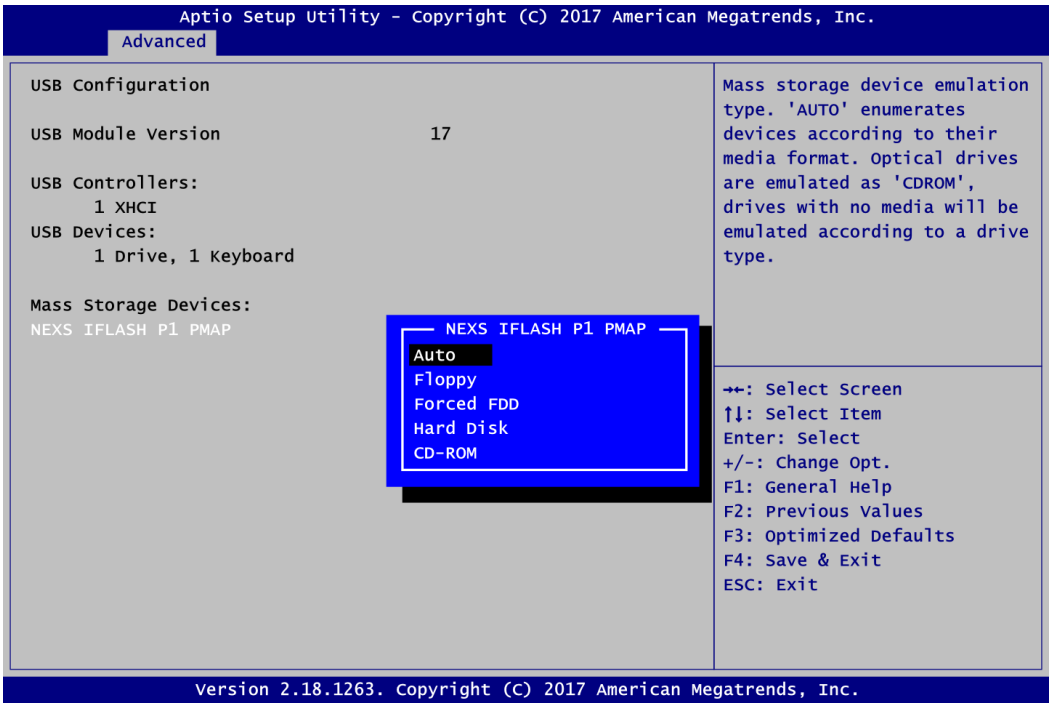


- **AMT Configuration**
  Use this screen to configure AMT parameters.



AMT BIOS Features
Active Management Technology BIOS Extension is enabled. Please refer to Appendix D for iAMT settings.

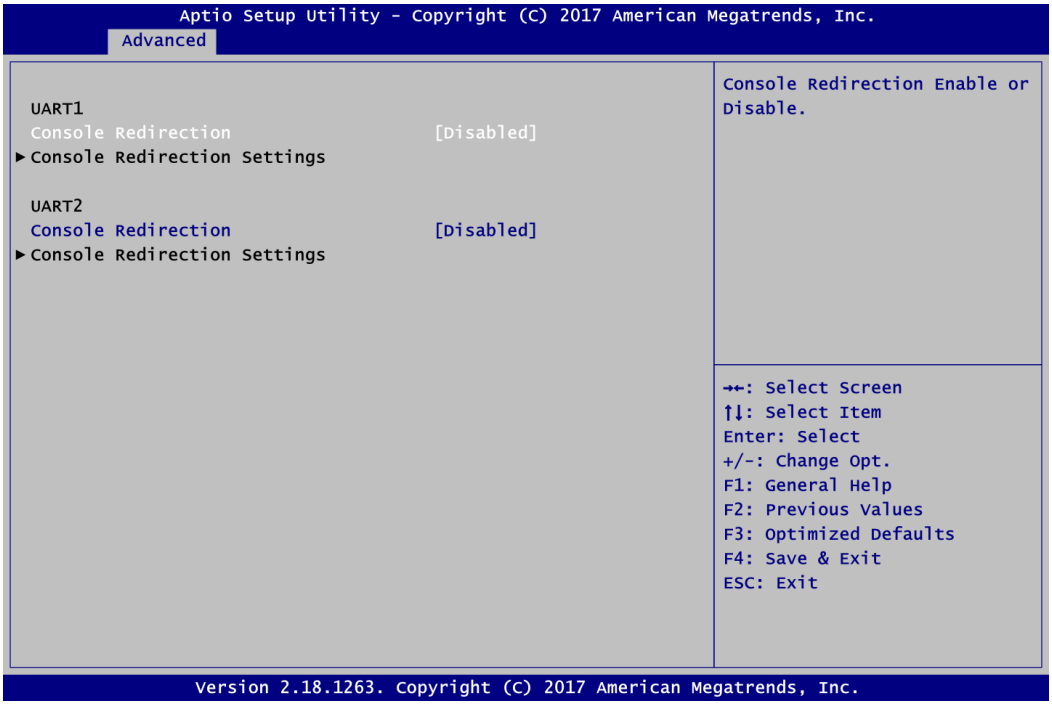
- **USB Configuration**



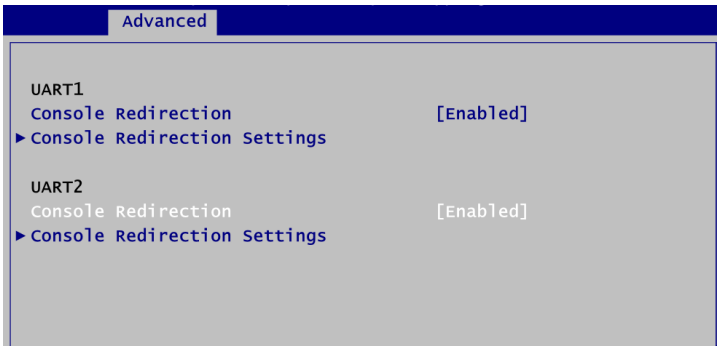
USB Devices
Display all detected USB devices.

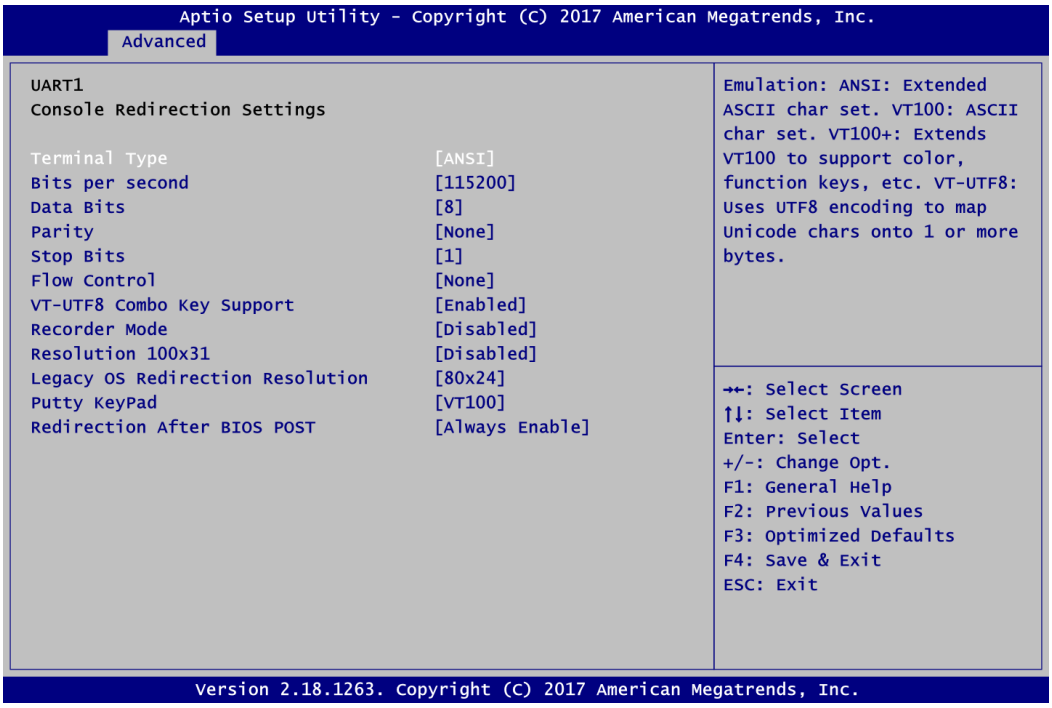
Mass Storage Devices
Mass storage device emulation type. Auto option enumerates devices according to their media format. Optical drives are emulated as CDROM, drives with no media will be emulated according to a drive type.

- **Serial Port Console Redirection**
  You can use this screen to select options for Serial Port Console Redirection, 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.



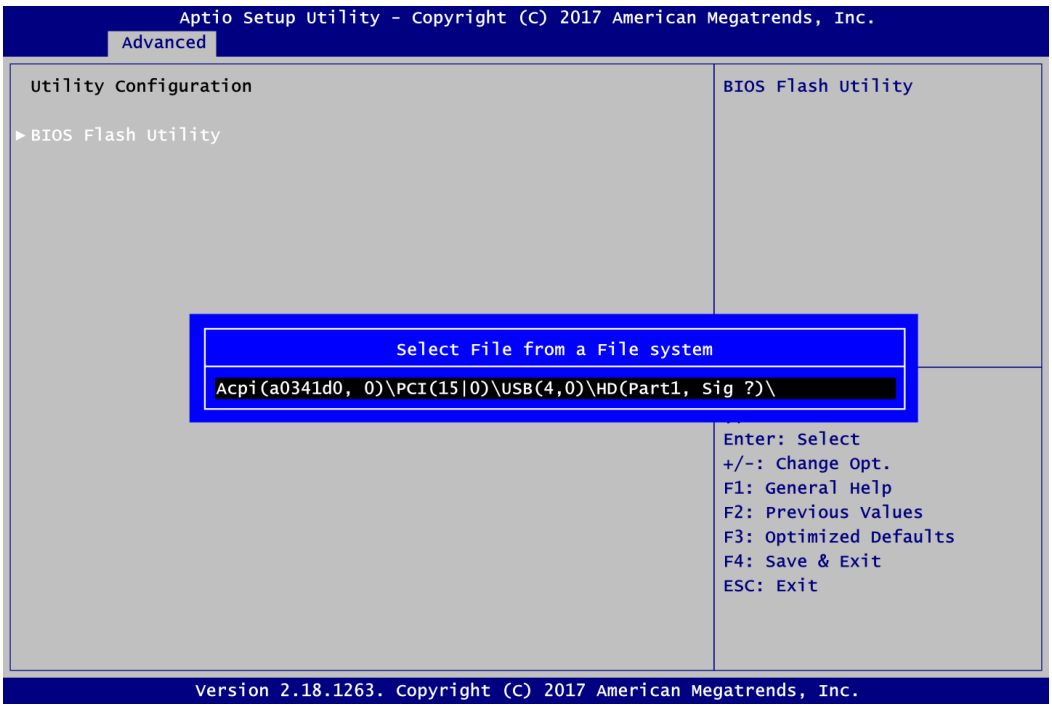
UART1\UART2 Console Redirection
Enable or disable UART1\UART2 console redirection setting. Once it is enabled, you will see the following screen.





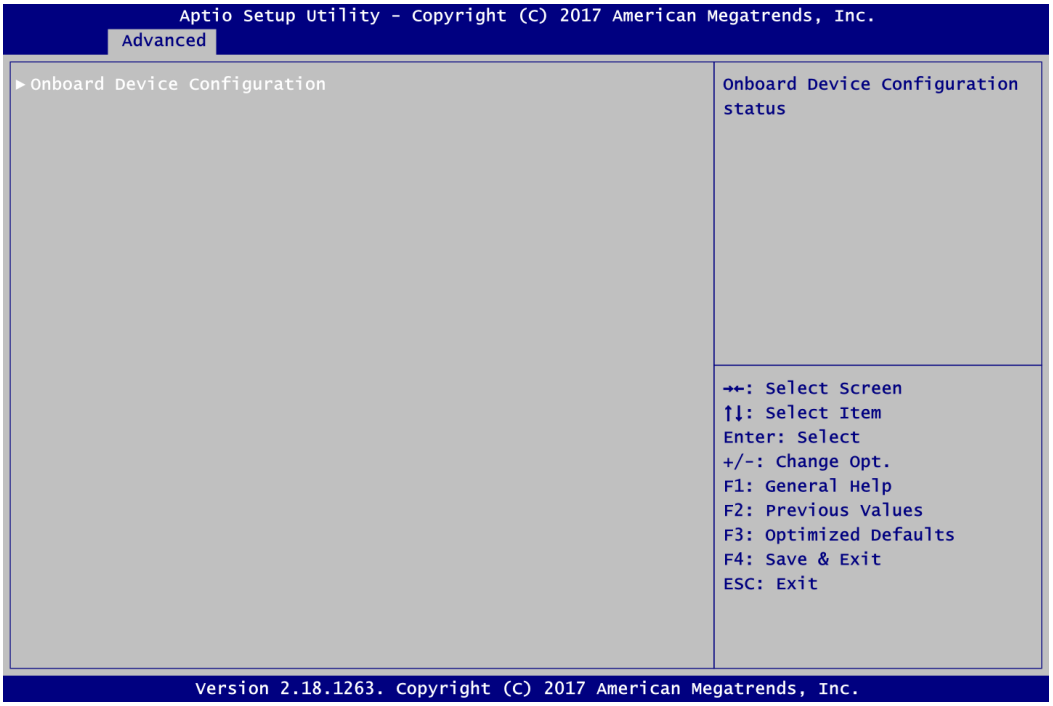
UART1\UART2 Console Redirection Settings
When enabled, the settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.

- **Utility Configuration**



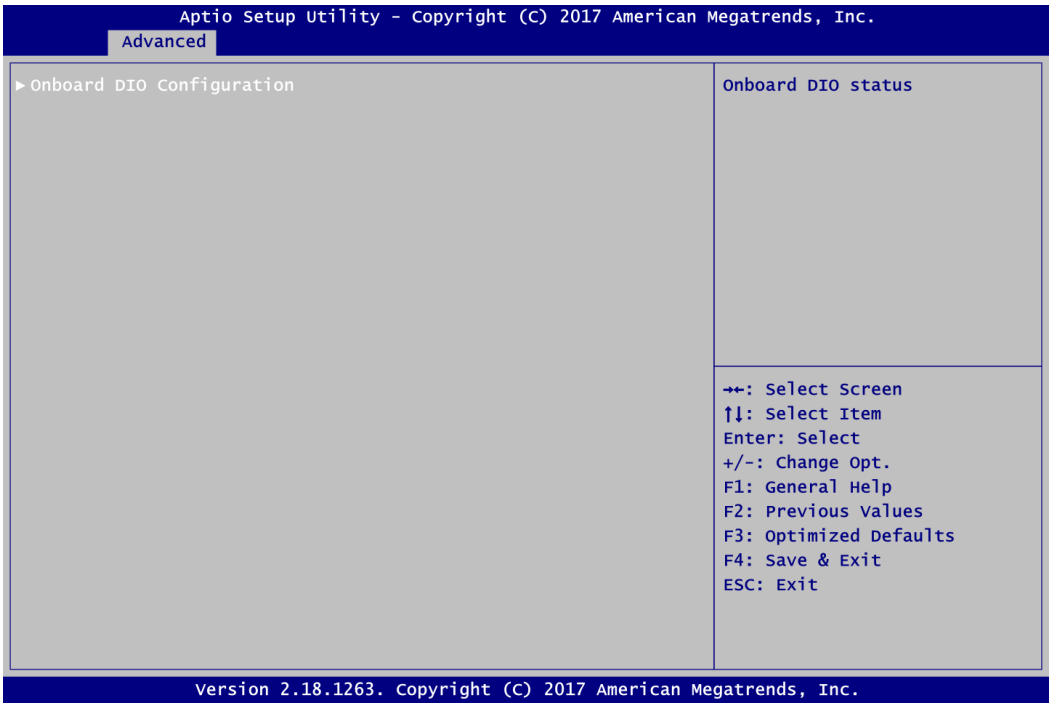
BIOS Flash Utility
BIOS flash utility configuration. For more detailed information, please refer to Appendix C.

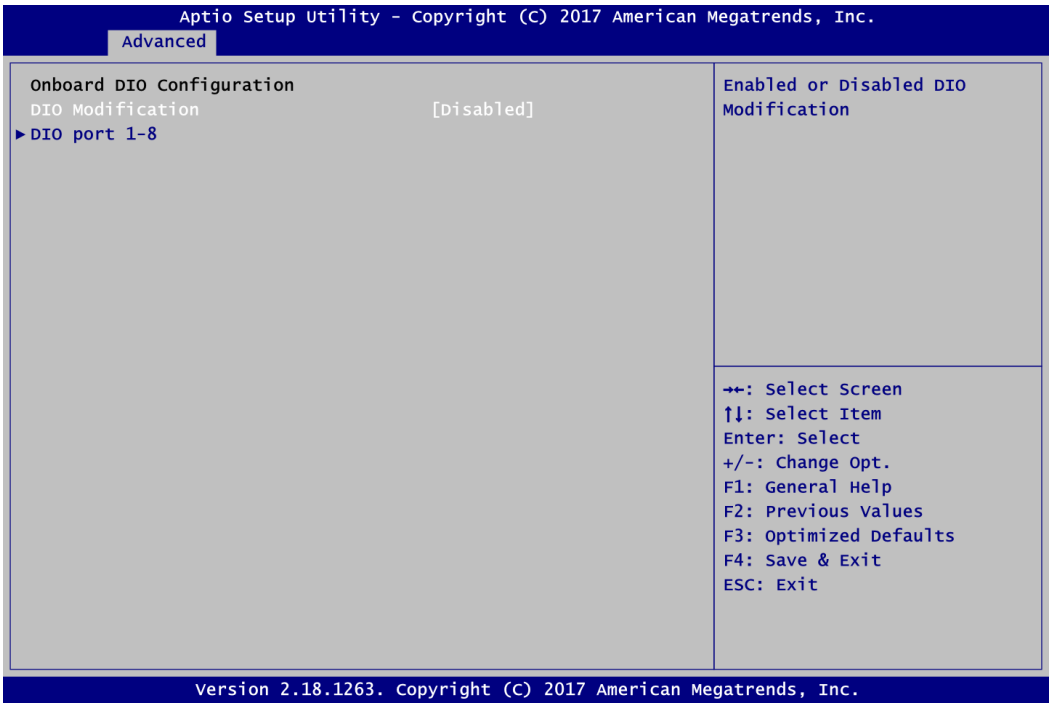
- **Device Configuration**
  A description of selected item appears on the right side of the screen. For items marked with "►", please press <Enter> for more options.



Onboard Device Configuration
Use this option to configure onboard device (e.g., Digital I/O setting).

- **Onboard DIO Configuration**
  You can use this screen to select options for Digital I/O (DIO) Configuration.

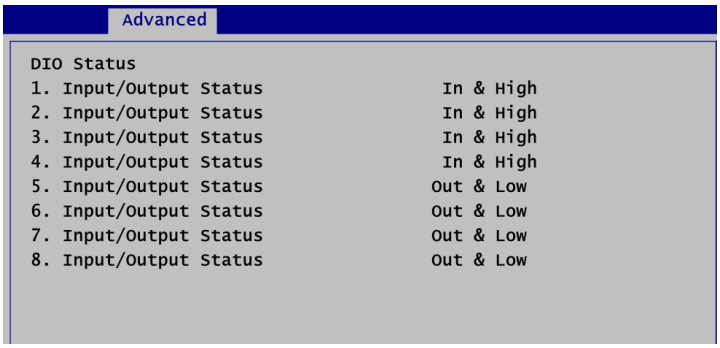




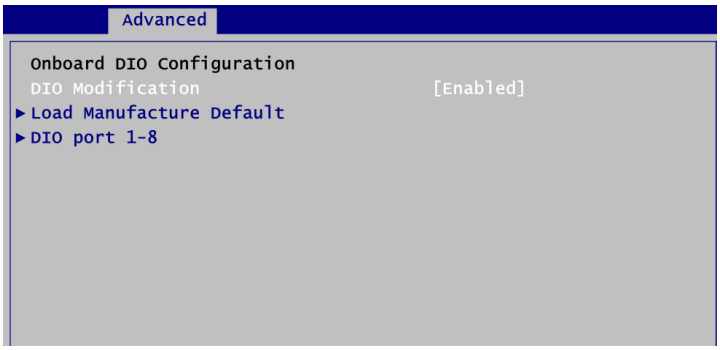
DIO Modification
Enable or disable digital I/O modification. The default is Disabled.

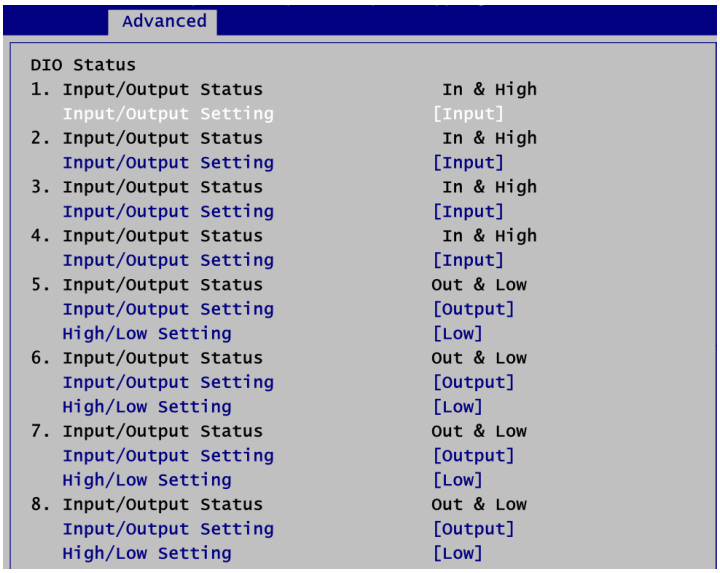
DIO port 1-8
Select this option to open DIO status sub screen.

If DIO Modification is disabled, you are not allowed to change inputs/outputs setting. The DIO status sub screen is as follows:



After enabling, you can load manufacture default and access to the DIO status sub screen to change inputs/outputs setting, see images below.



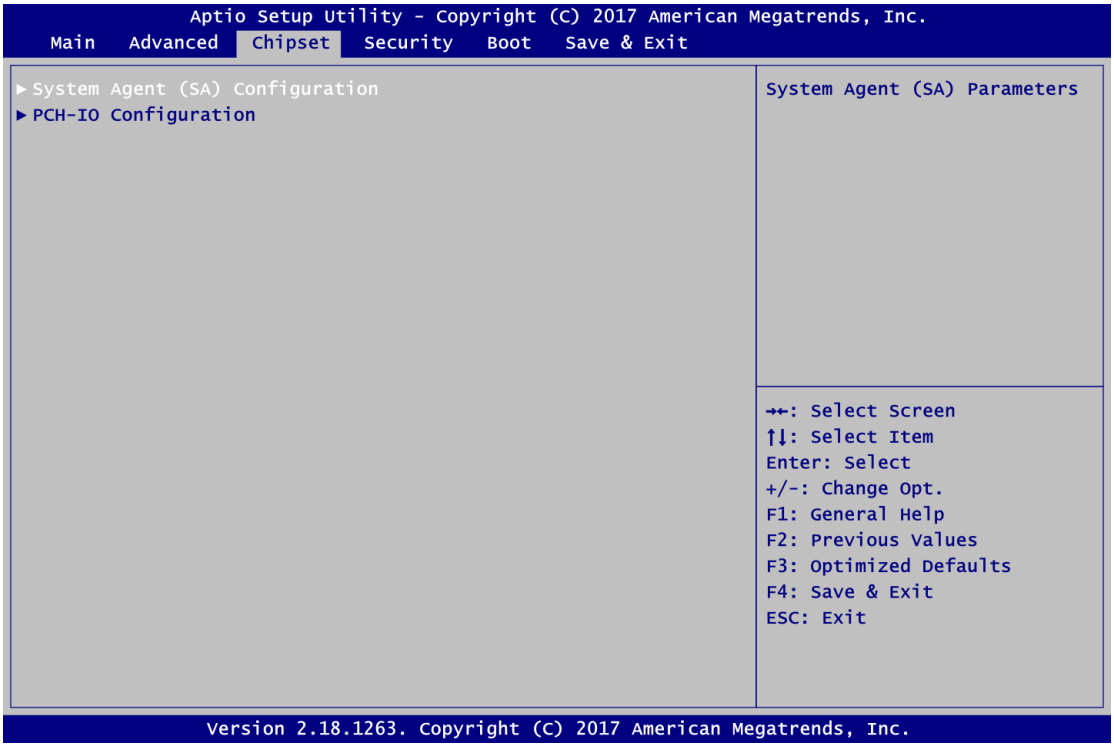


4.5 Chipset Menu

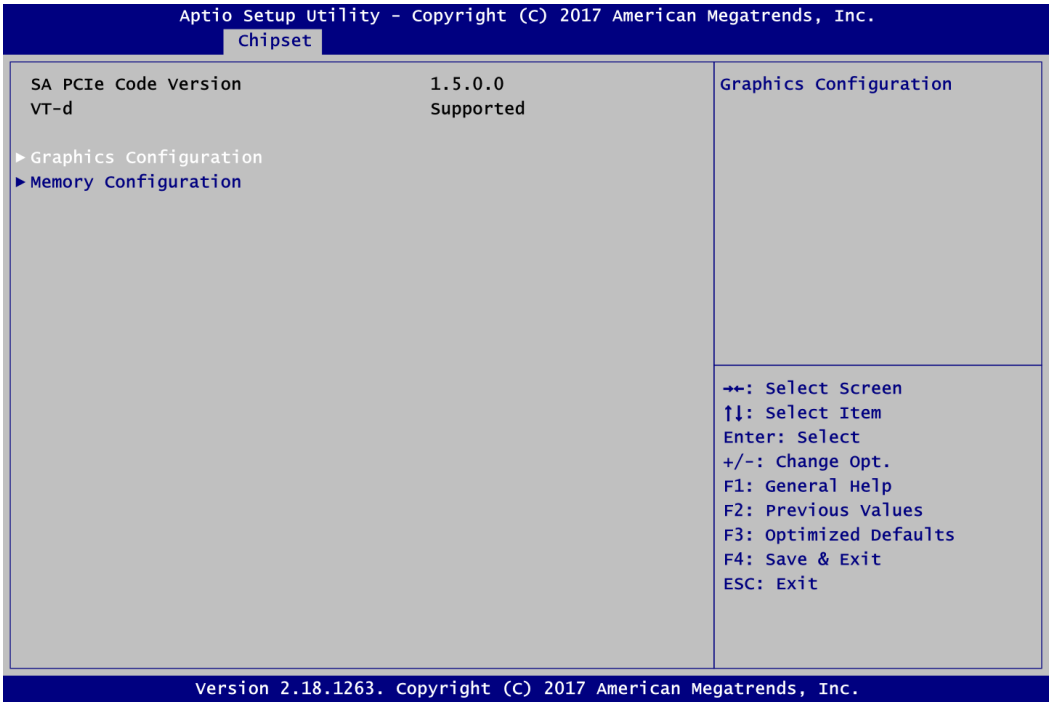
The Chipset menu allows users to change the advanced chipset settings. You can select any of the items in the left frame of the screen to go to the sub menus:

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

For items marked with "►", please press <Enter> for more options.



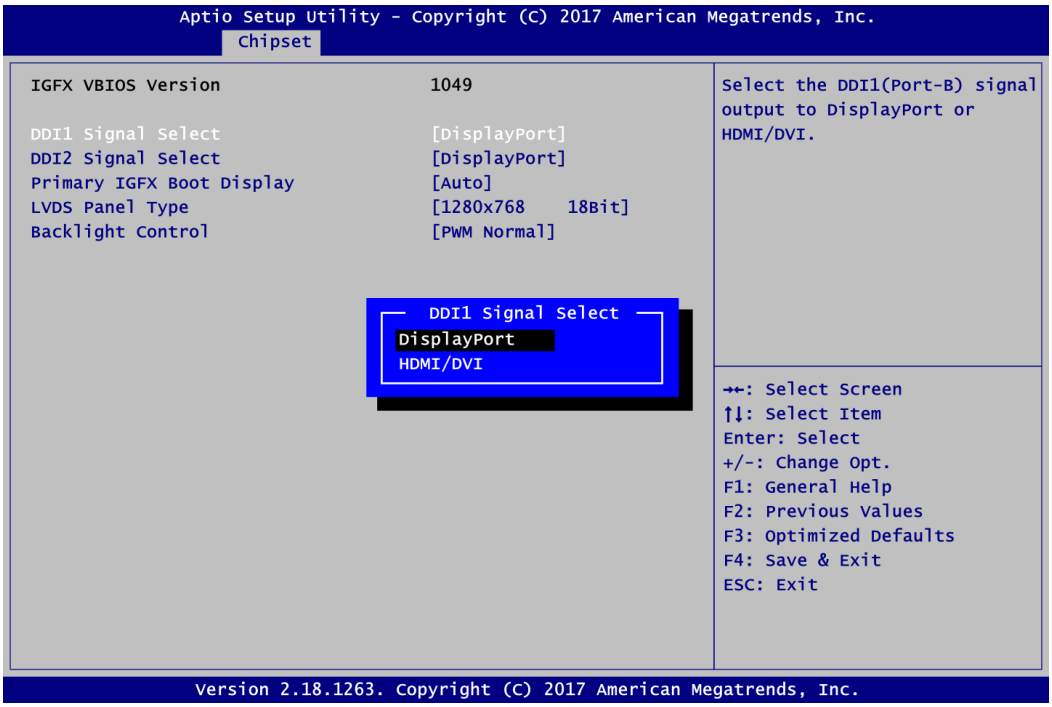
- **System Agent (SA) Configuration**
  This screen allows users to configure System Agent (SA) parameters. For items marked with "►", please press <Enter> for more options.



Graphics Configuration
Open sub menu for parameters related to graphics configuration.

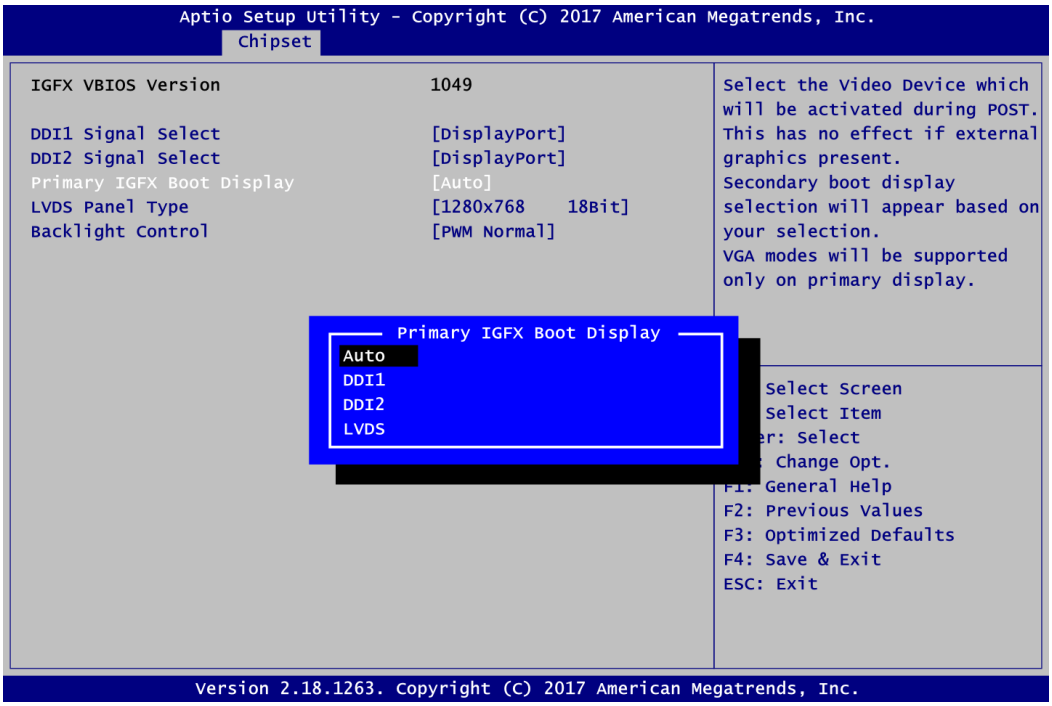
Memory Configuration
Open sub menu for information related to system memory.

- **Graphics Configuration**

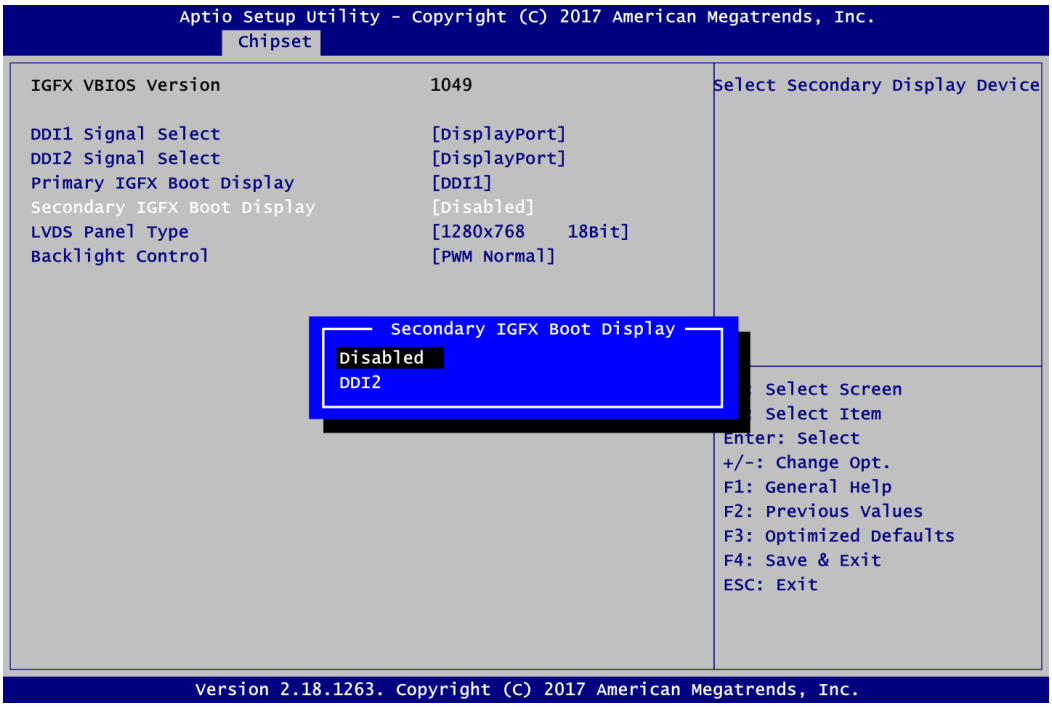


DDI1 Signal Select
Select the DDI1 signal output to DisplayPort or HDMI/DVI.

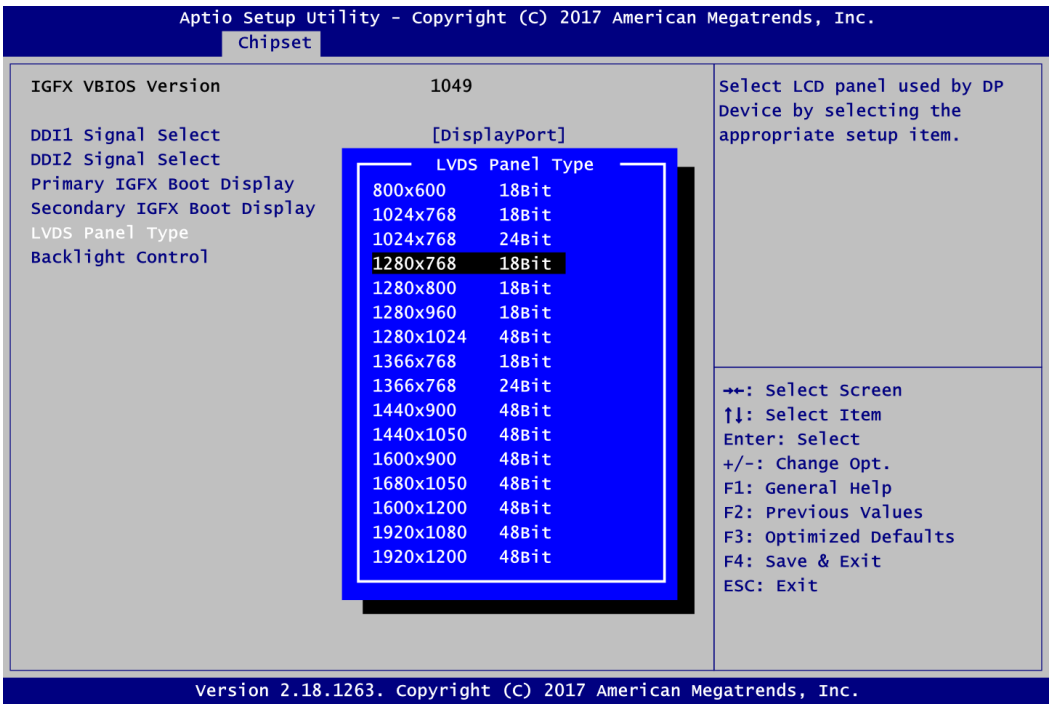
DDI2 Signal Select
Select the DDI2 signal output to DisplayPort or HDMI/DVI.



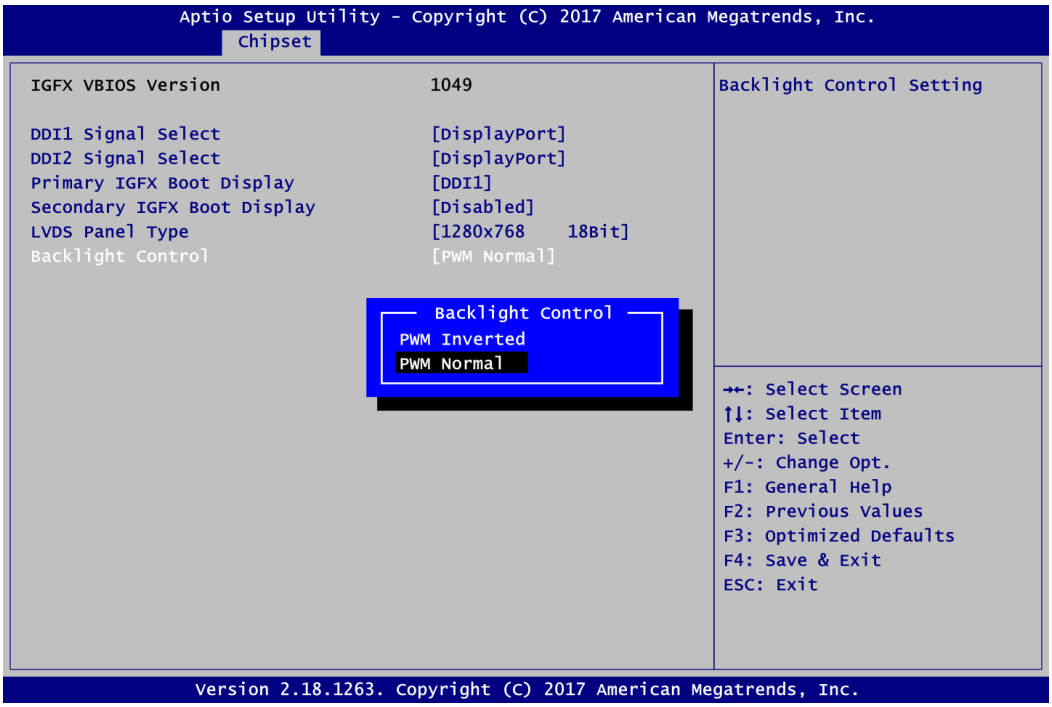
Primary IGFX Boot Display
Select the video device which will be activated during POST (Power-On Self Test). The default is Auto.



Secondary IGFX Boot Display
Select the secondary IGFX boot display. The default is Disabled. This option appears only if you set the Primary IGFX Boot Display to DDI1, DDI2 or LVDS.

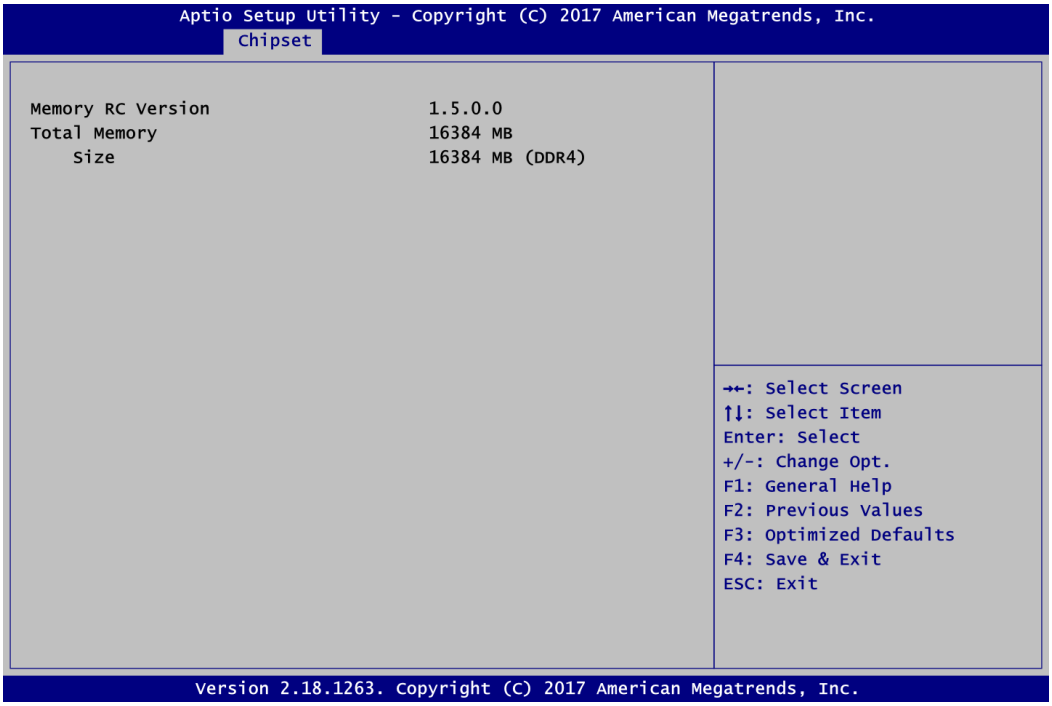


LVDS Panel Type
Select LVDS panel resolution.

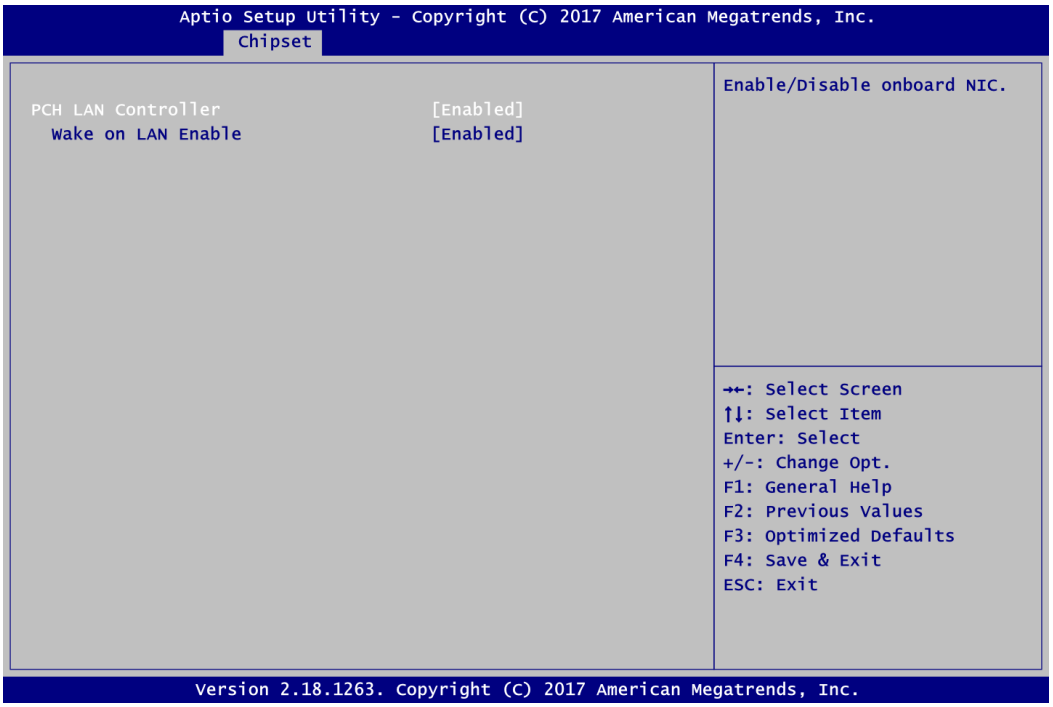


Backlight Control
This item is for backlight control setting. Selection options are PWM Inverted and PWM Normal.

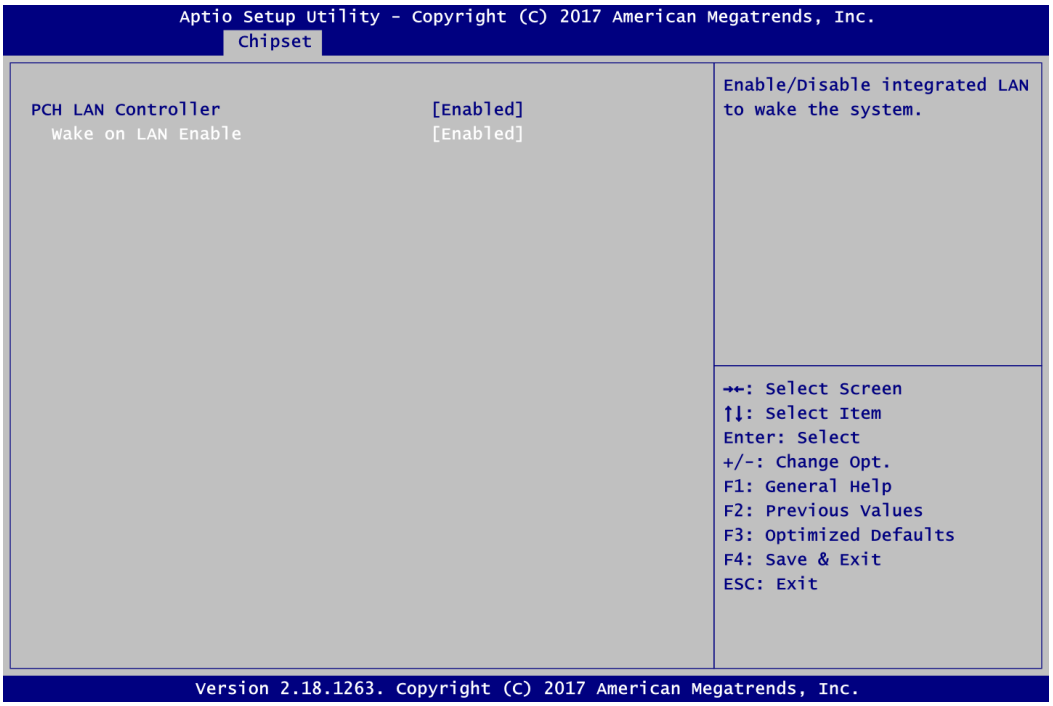
- **Memory Configuration**
  This screen shows the system memory information.



- **PCH-IO Configuration**
  This screen shows PCH-IO information.



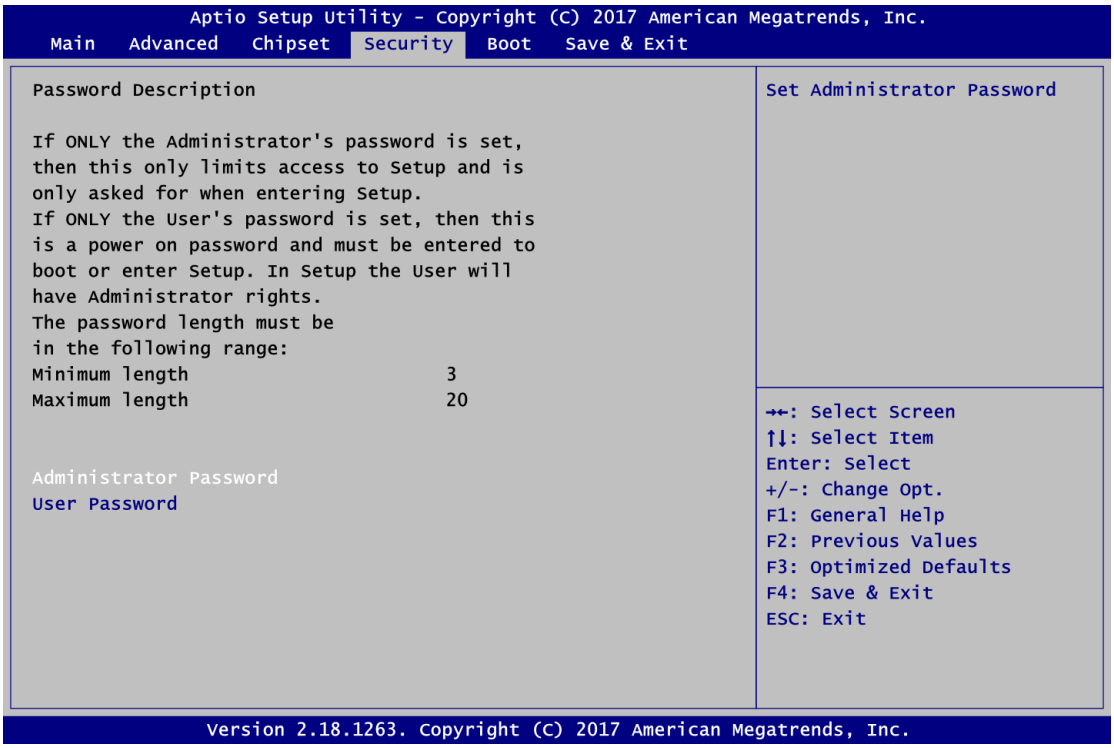
PCH LAN Controller
Enable or disable onboard PCH LAN controller.



Wake on LAN Enable
Enable or disable integrated LAN to wake the system.

4.6 Security Menu

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

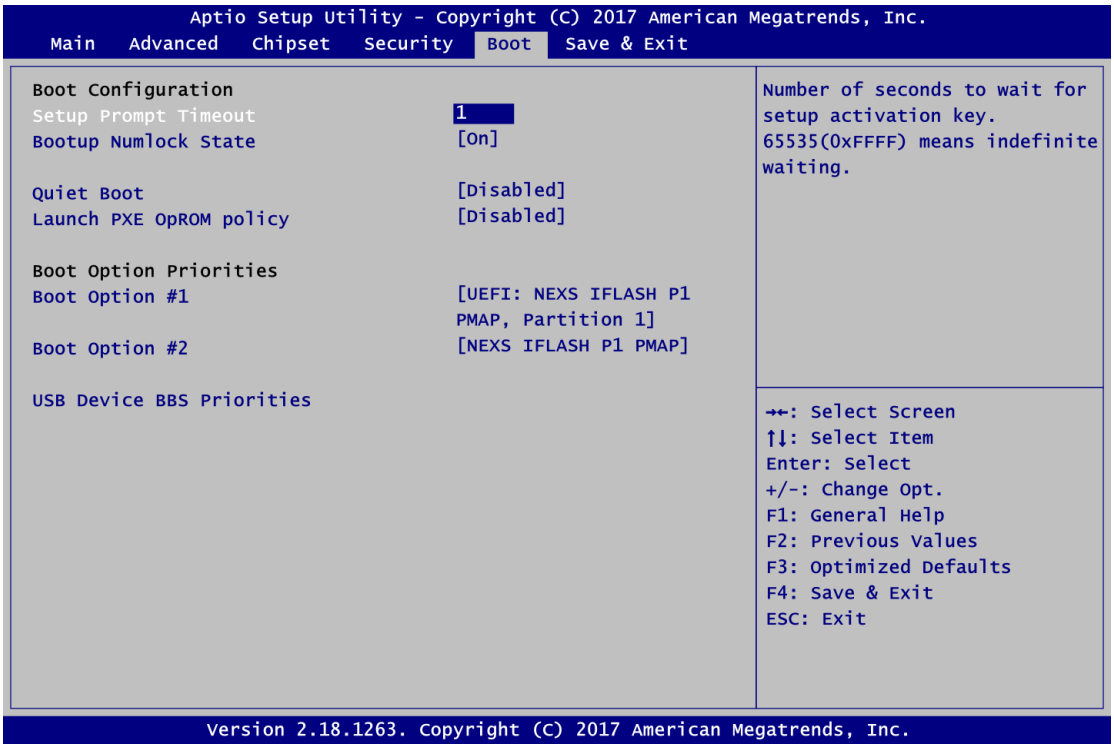


- **Administrator Password**
  This item indicates whether an administrator password has been set (installed or uninstalled).

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

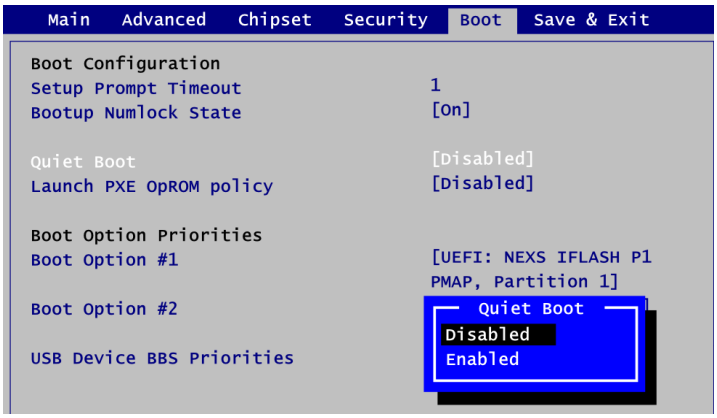
4.7 Boot Menu

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

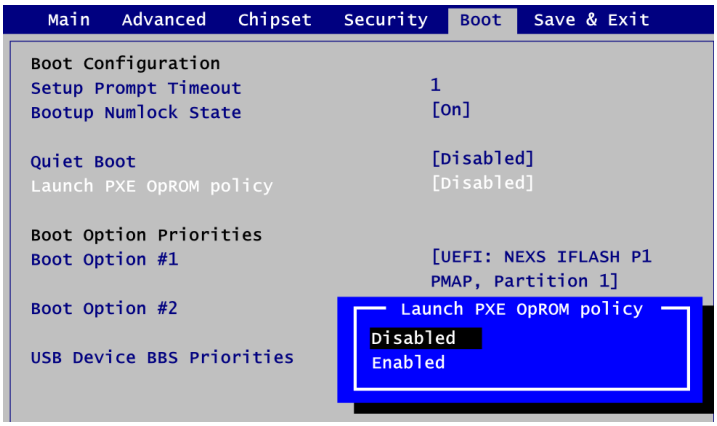


- **Setup Prompt Timeout**
  Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.

- **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.



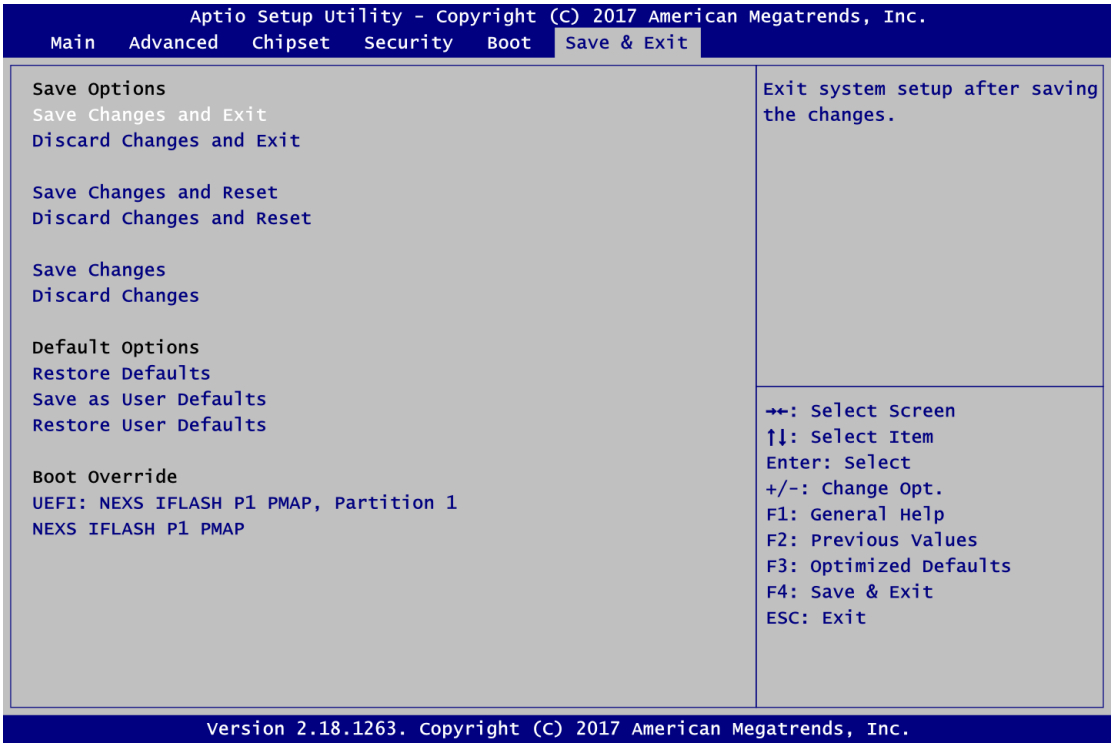
- **Launch PXE OpROM policy**
  Use this item to enable or disable the boot ROM function of the onboard LAN chip when the system boots up.

- **Boot Option Priorities [Boot Option #1, …]**
  These are settings for boot priority. Specify the boot device priority sequence from the available devices.

- **USB Device BBS Priorities**
  These are settings for configuring the order for a specific device group. These options are only visible if at least one device for this group is present.

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 boot device regardless of the current boot priority order.

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Appendix A
Watchdog Timer

A.1 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.

A.2 How to Use Watchdog Timer

Assembly sample code :

```
mov     dx,fa10          ; 5 seconds (Maximum is 65535 seconds; fill in
                         ; 0xFA10 and 0xFA11 register, ex: 0xFA11=0x01,
                         ; 0xFA10=0x68 means 360 seconds)
mov     al,05
out     dx,al

mov     dx,fa12          ; Enable WDT
mov     al,01
out     dx,al
```

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Appendix B
Digital I/O

B.1 About Digital I/O

The onboard GPIO or digital I/O has 8 bits (DIO0~7). Each bit can be set to function as input or output by software programming. In default, all pins are pulled high with +3.3V level (according to main power). The BIOS default settings are 4 inputs and 4 outputs.

B.2 How to Use Digital I/O

Assembly sample code :

```
mov     dx,fa18         ; Set DIO 0-7 to Output
mov     al,00
out     dx,al

mov     dx,fa19         ; Set DIO 4-7 to High
mov     al,f0
out     dx,al

mov     dx,fa18         ; Set DIO 0-7 to Input
mov     al,ff
out     dx,al

mov     dx,fa19         ; Get DIO 0-7 status
in      al,dx

mov     dx,fa18         ; Set DIO 0-4 to Input, 5-7 to Output
mov     al,1f           ; al = 1F => 00011111
out     dx,al

mov     dx,fa19         ; Set DIO 6 to High
mov     al,40           ; al = 40 => 01000000
out     dx,al

in      al,dx           ; Get DIO 0-7 status
```

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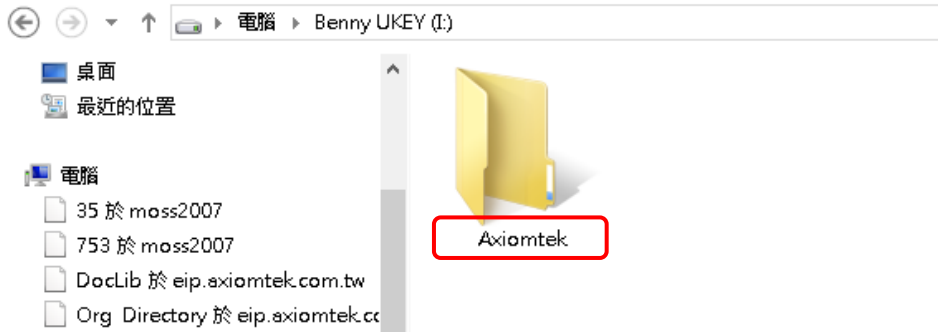
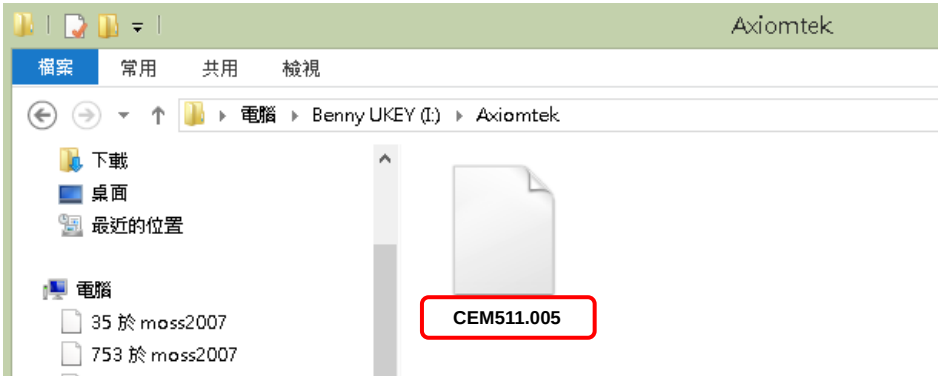
Appendix C
BIOS Flash Utility

The BIOS Flash utility is a new helpful function in BIOS setup program. With this function you can easily update system BIOS without having to enter operating system. In this appendix you may learn how to do it in just a few steps. Please read and follow the instructions below carefully.

1. In your USB flash drive, create a new folder and name it “Axiomtek”, see figure below.



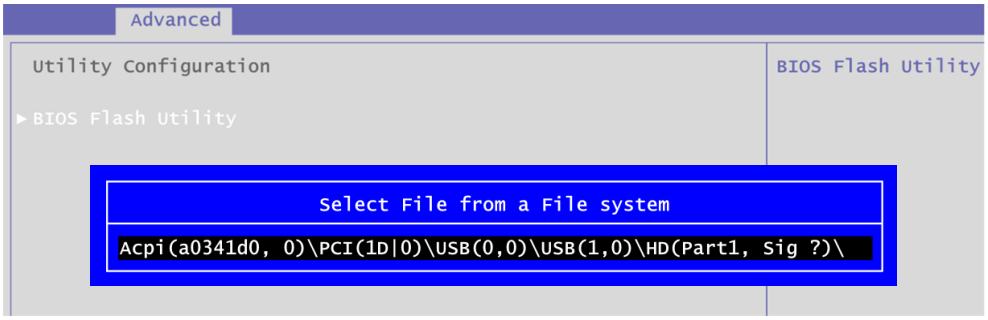
2. Copy BIOS ROM file (e.g. CEM511.005) to “Axiomtek” folder.



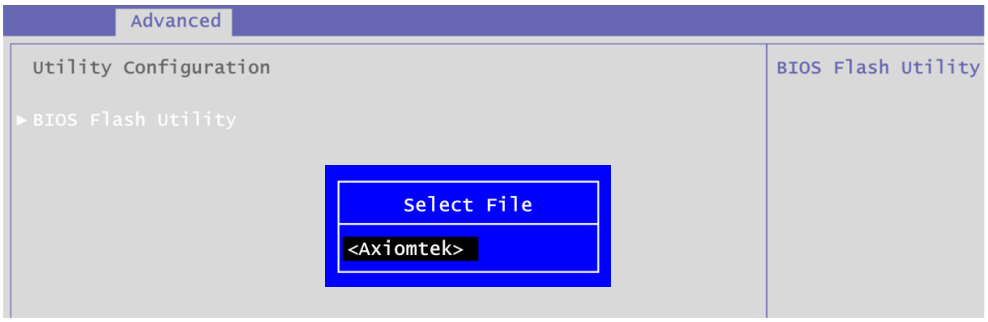
3. Insert the USB flash drive to your system.

4. Enter BIOS setup menu and go to Advanced\Utility Configuration. Select BIOS Flash Utility and press <Enter>.

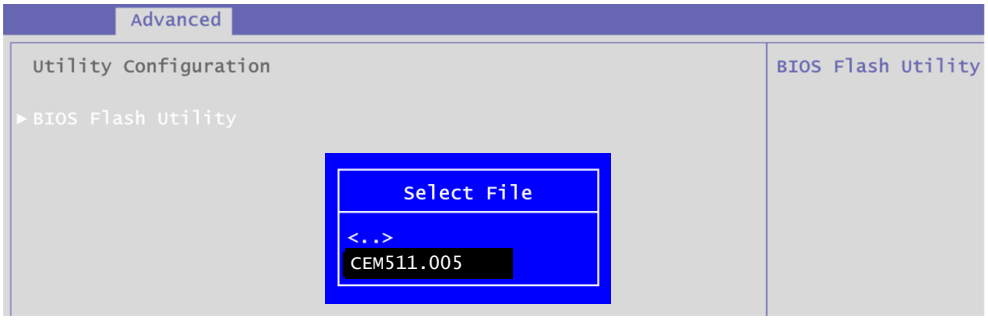
5. BIOS automatically detect all USB drive(s) attached to the system. In this example only one USB drive is attached to the system. That's why, you can see only one device is displayed in figure below.



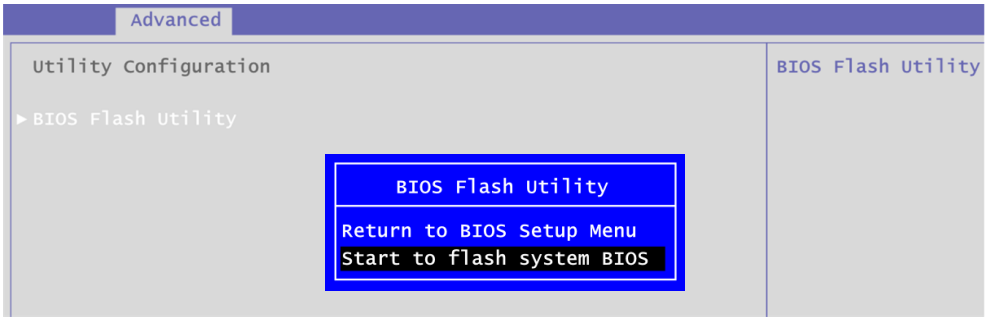
6. Select the USB drive containing BIOS ROM file you want to update using the <↑> or <↓> key. Then press <Enter> to get into "Axiomtek" folder.



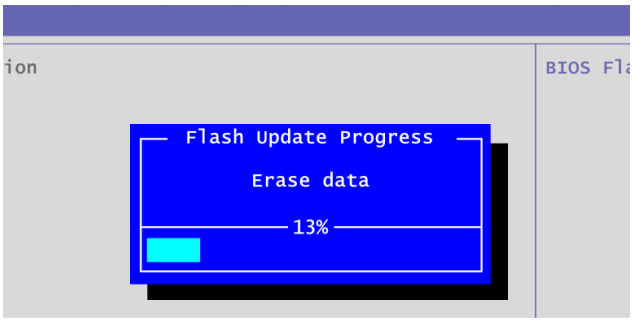
7. Now you can see the BIOS ROM file on the screen, press <Enter> to select.

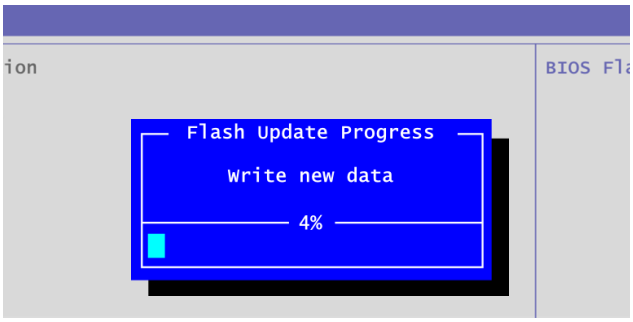


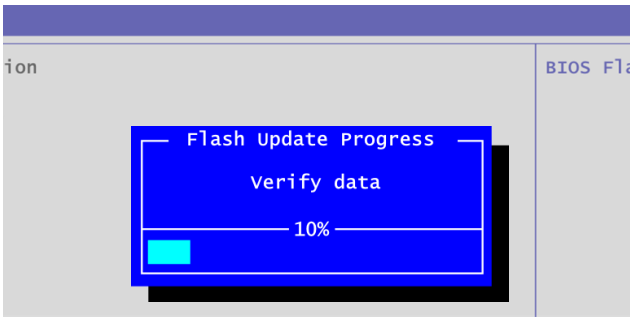
8. Select Start to flash system BIOS option to begin updating procedure.



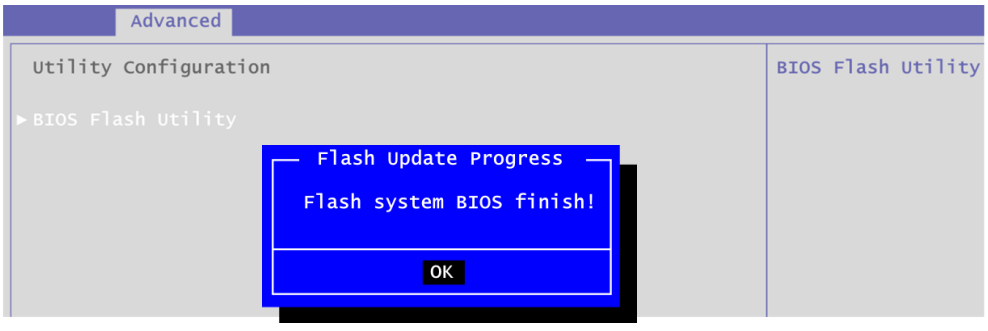
9. Please wait while BIOS completes the entire flash update process: erase data, write new data and verify data.







10. When you see the following figure, press <Enter> to finish the update process. After that the system will shut down and restart immediately.



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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.

D.1 Entering MEBx

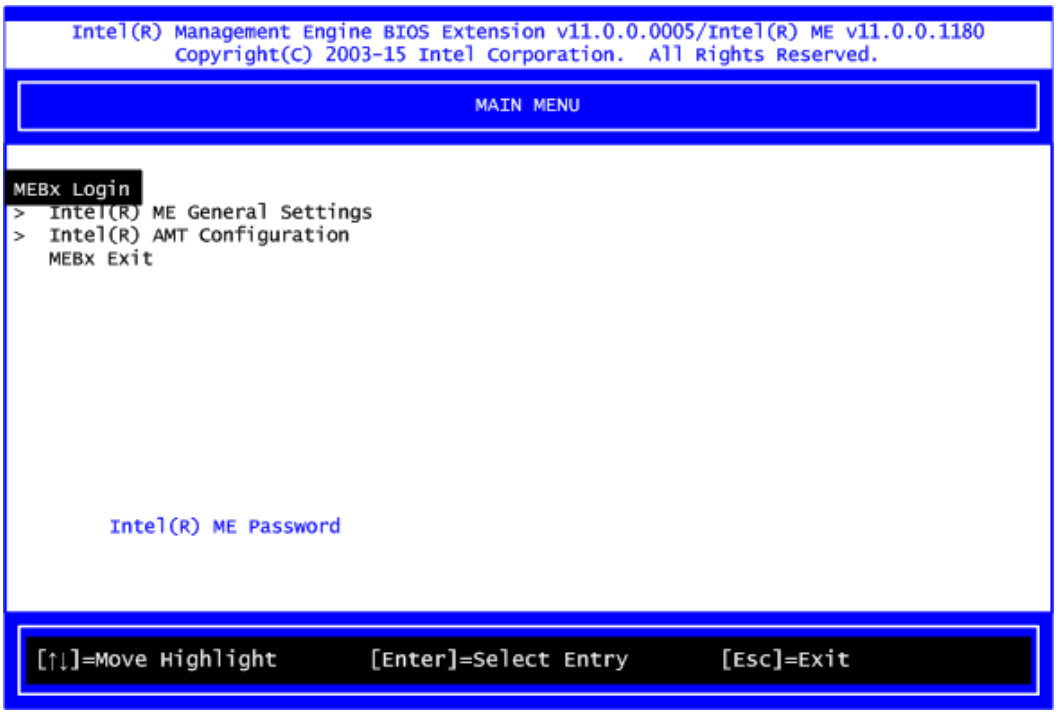
1. Go to BIOS to enable iAMT function (see section 4.4).
2. Exit from BIOS after starting iAMT, and press <Ctrl + P> to enter MEBx Setting.

Note

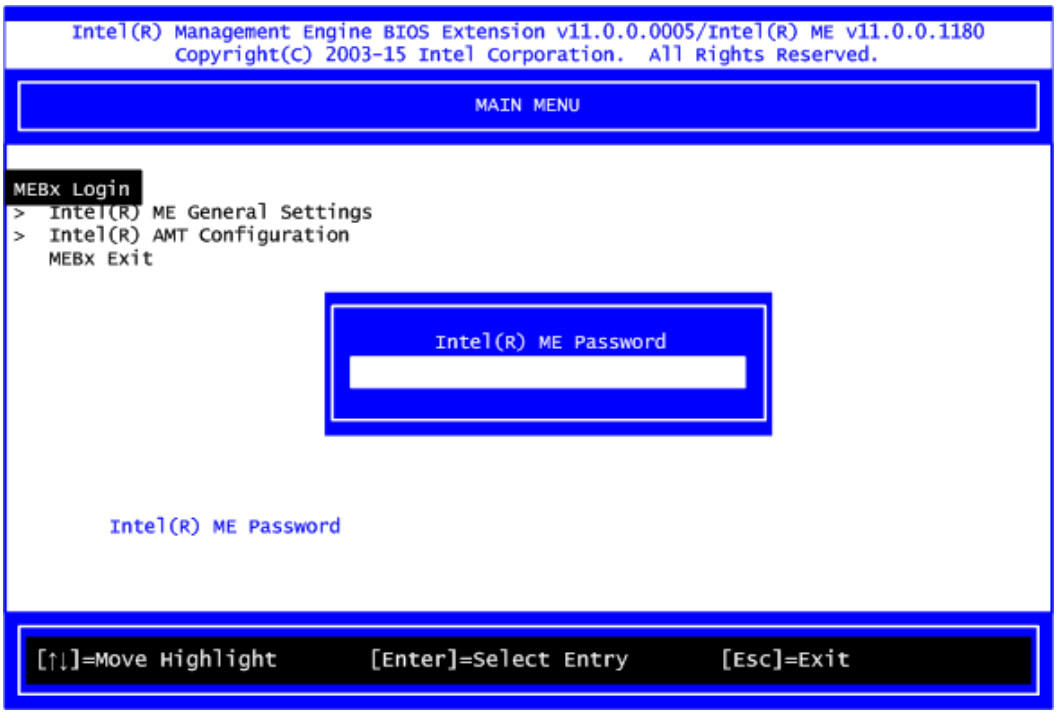
It is better to press <Ctrl + P> before the screen popping out.

D.2 Set and Change Password

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



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

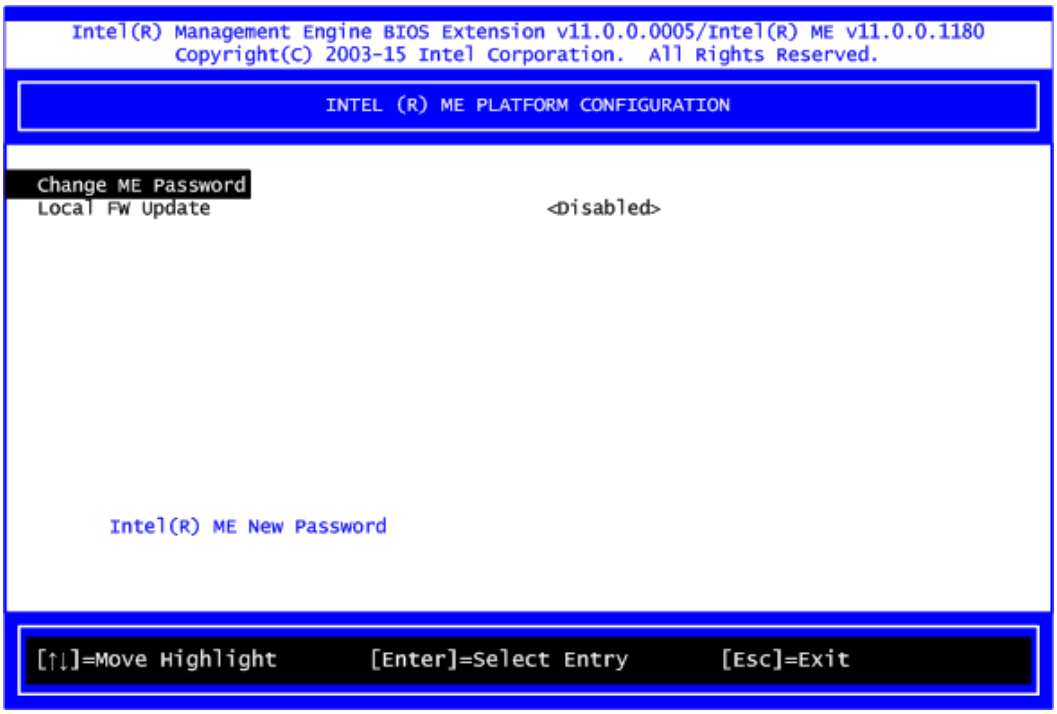


3. You must confirm your new password while revising. The new password must contain: (example: **!!11qqQQ**) (default value).

   - 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.

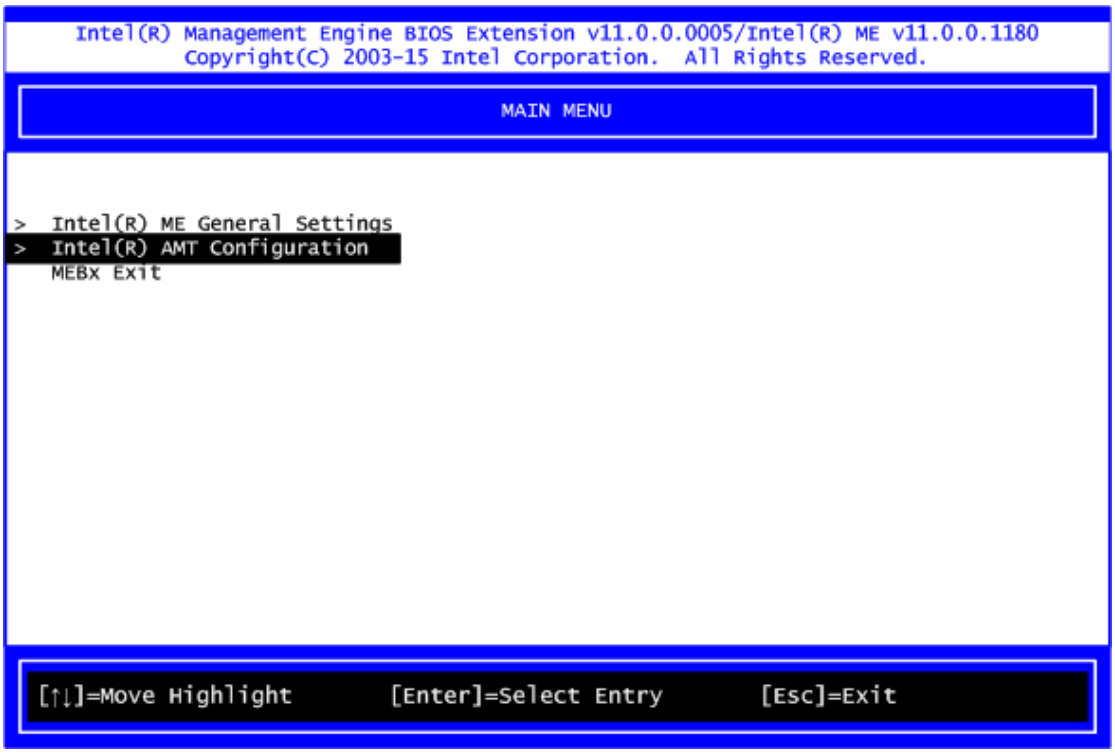
4. From Main Menu, select ME General Settings to get into ME Platform Configuration screen. In this screen you can modify Local FW Update setting.



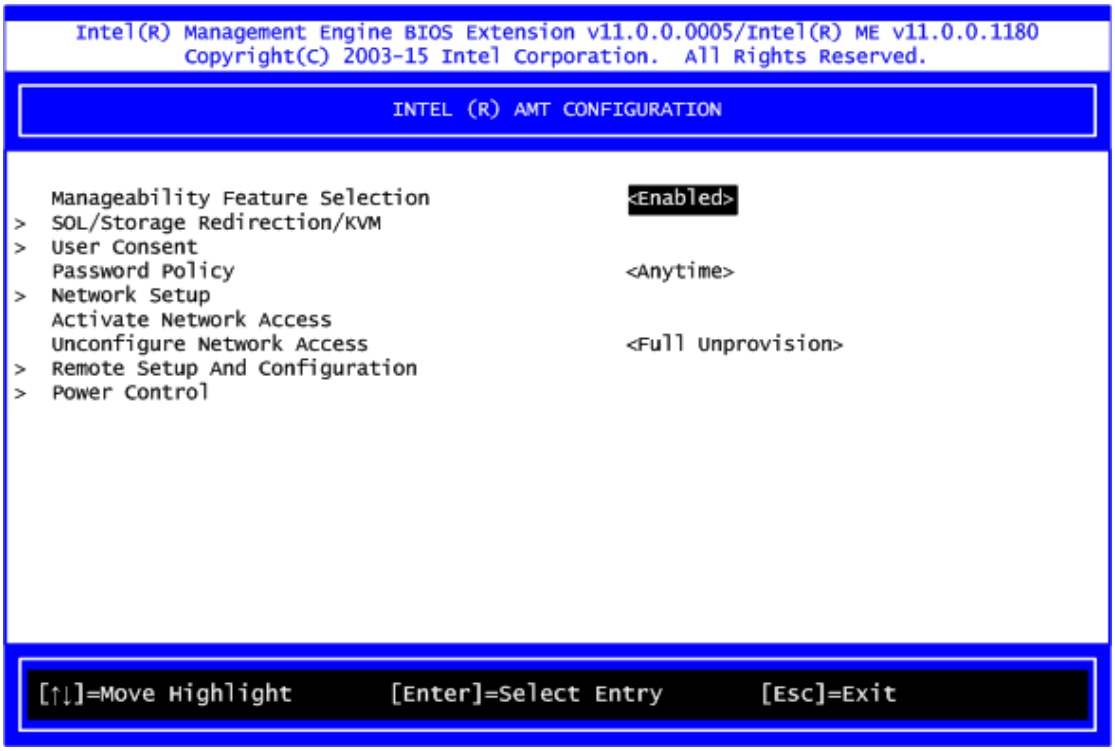
5. Return to Main Menu.

D.3 iAMT Settings

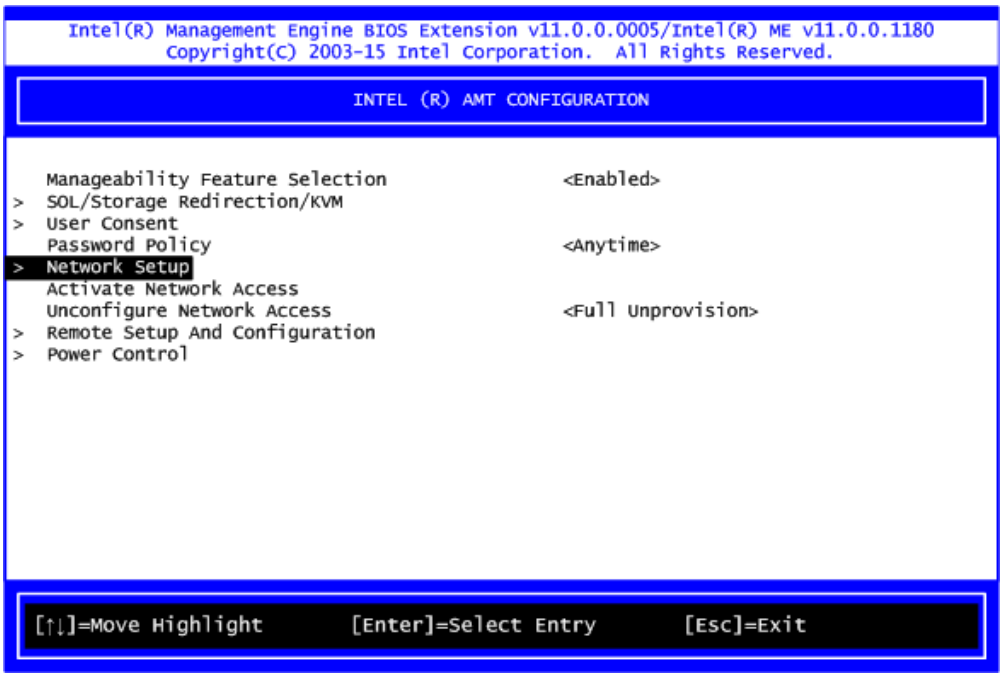
Select Intel® AMT configuration and press <Enter>.



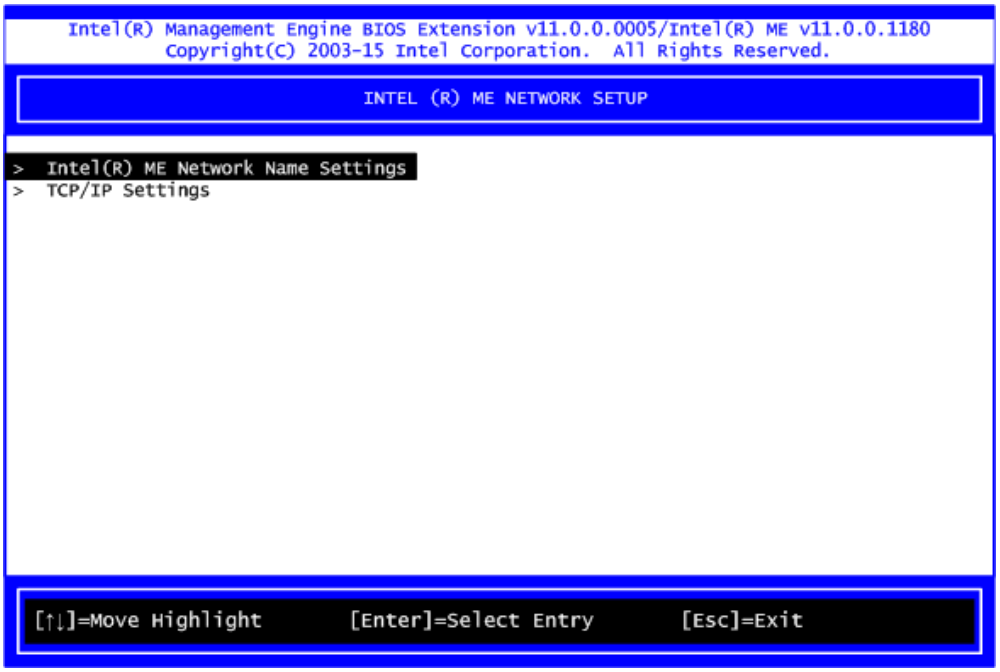
From AMT Configuration menu, select Manageability Feature Selection and set it to Enabled. This item allows you to enable or disable Intel® AMT feature.

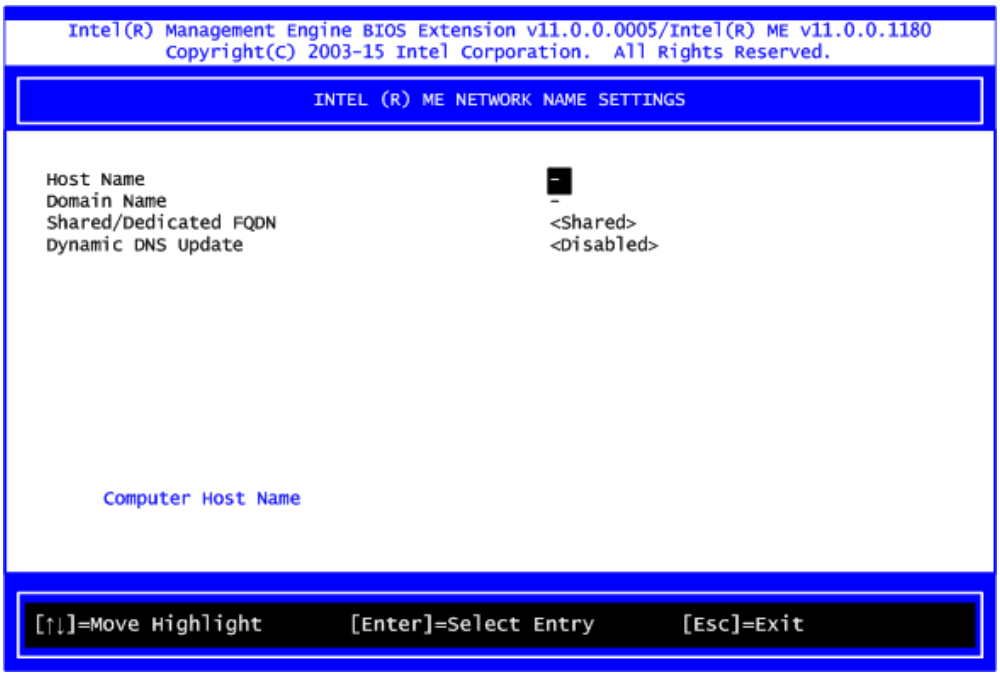


- **Network Setup**
  1. Select Network Setup to configure iAMT.

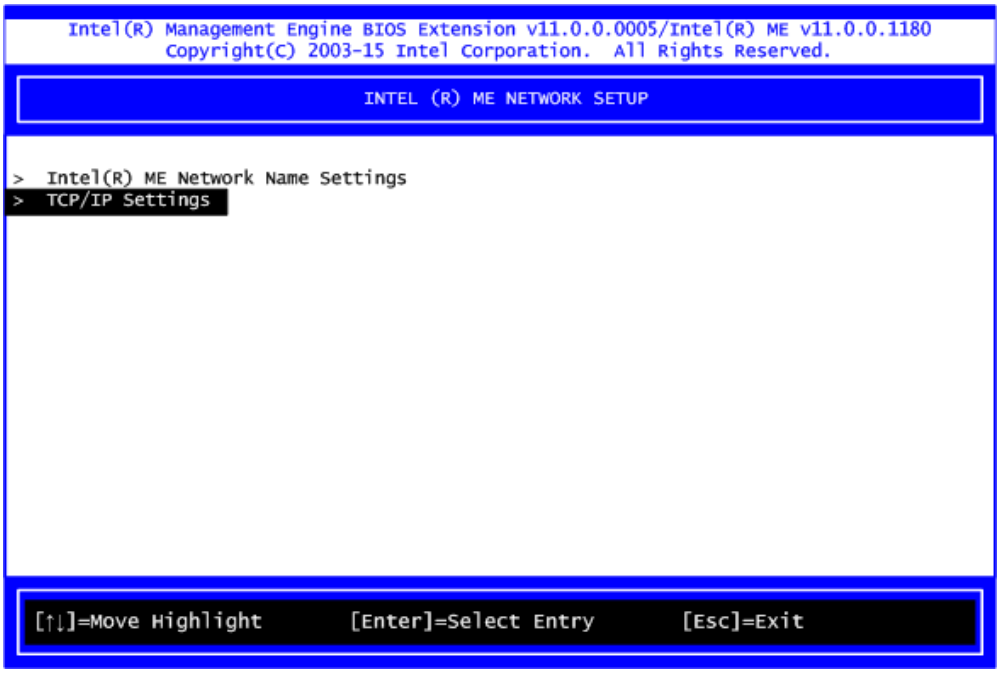


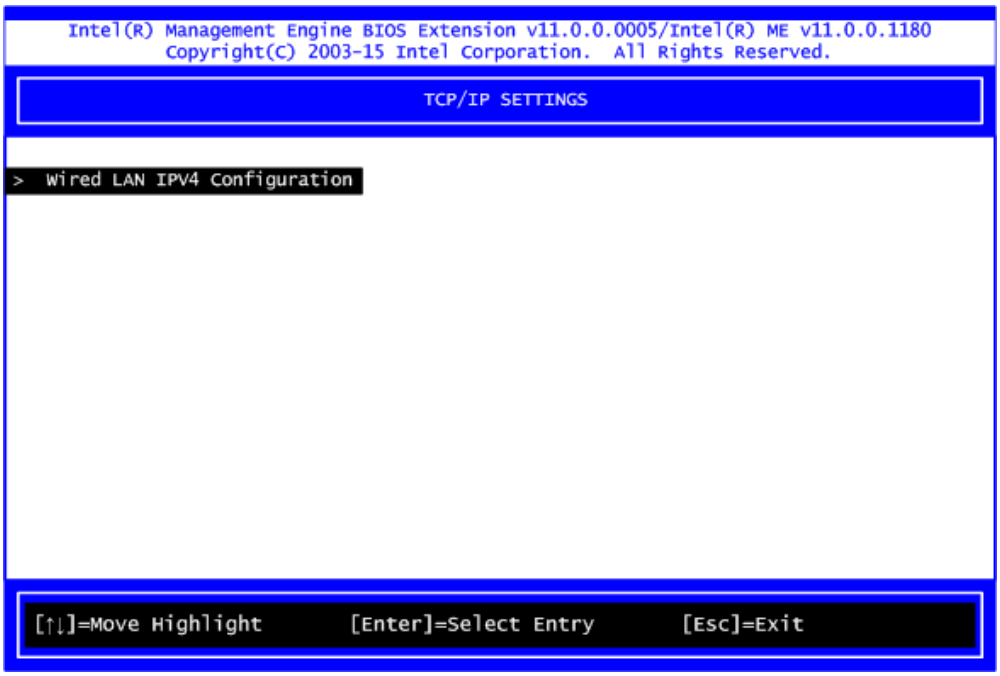
  2. Select ME Network Name Settings to set computer host and domain name.

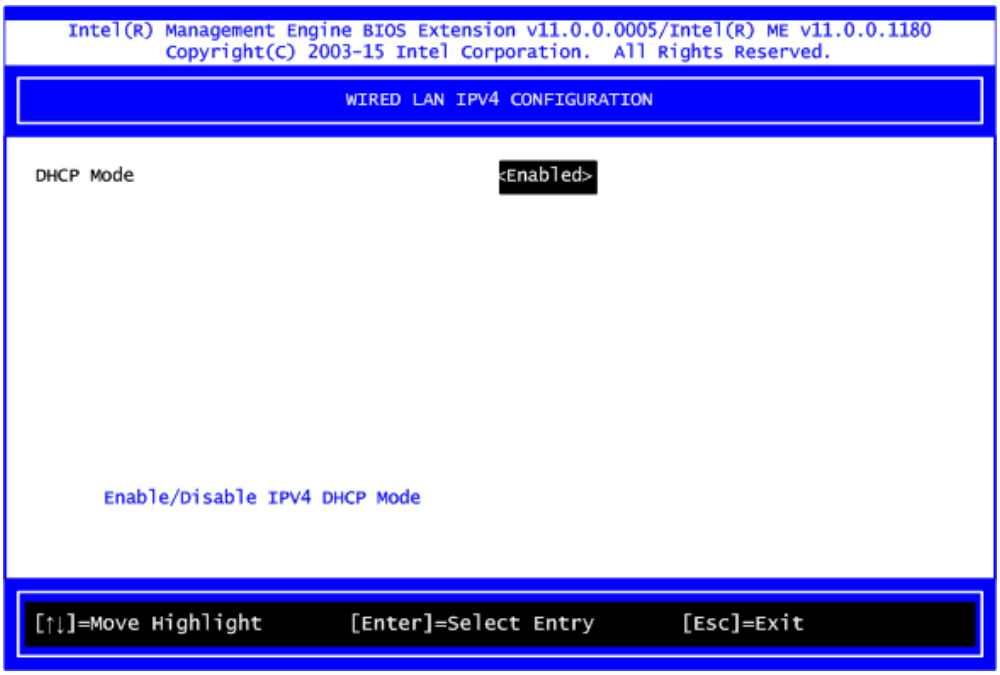




3. Select TCP/IP to get into Network interface and set it to Enabled. Get into DHCP Mode and set it to Disabled.

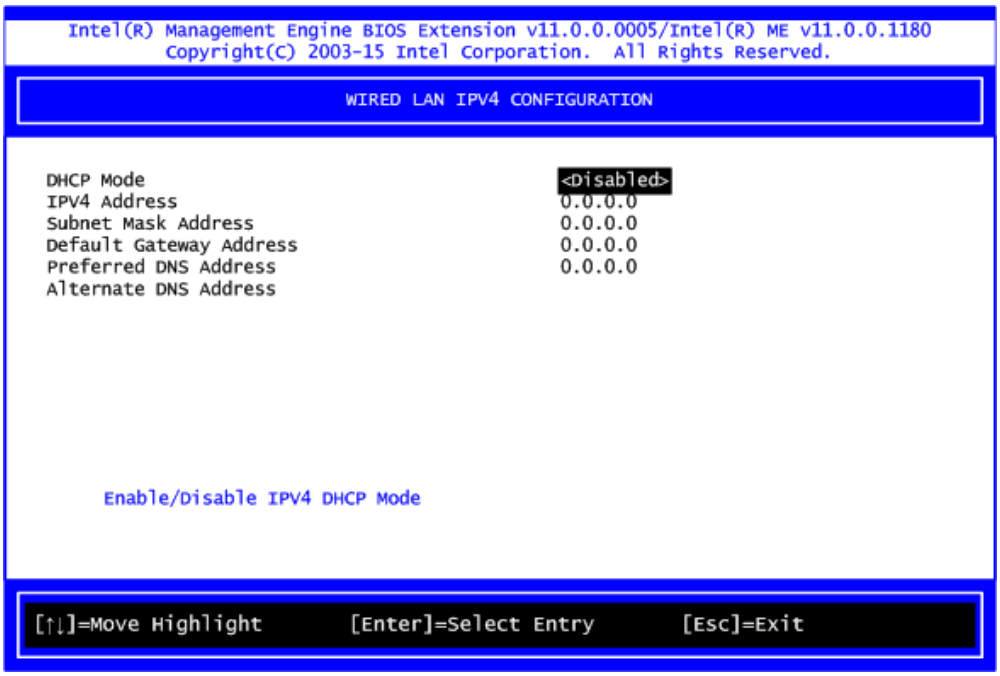




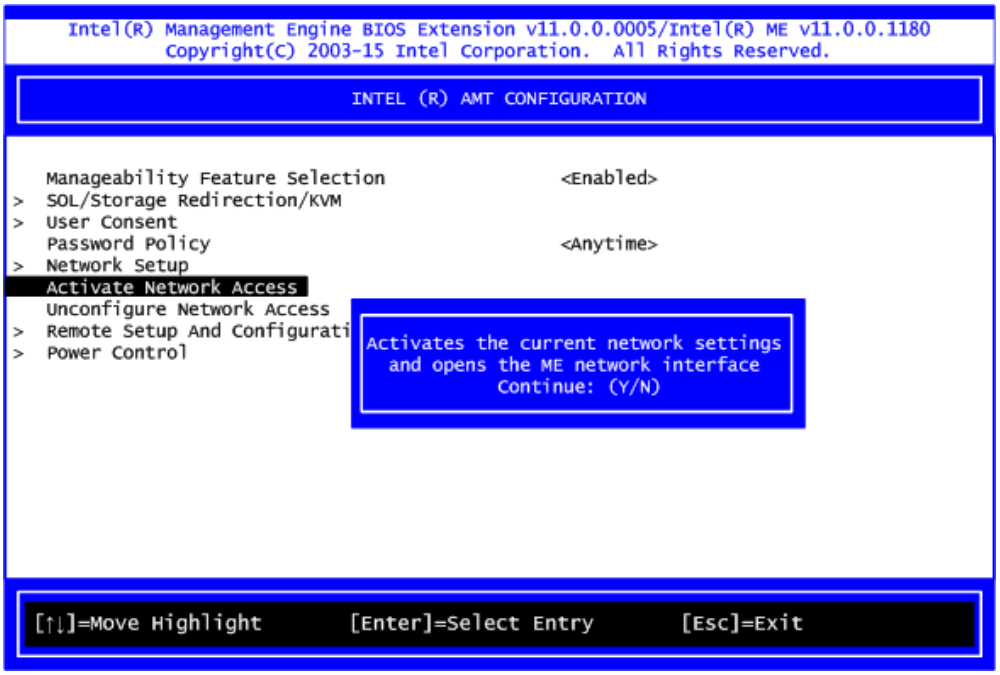


4. If DHCP Mode is disabled, set the following settings:

   - IP address
   - Subnet mask



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

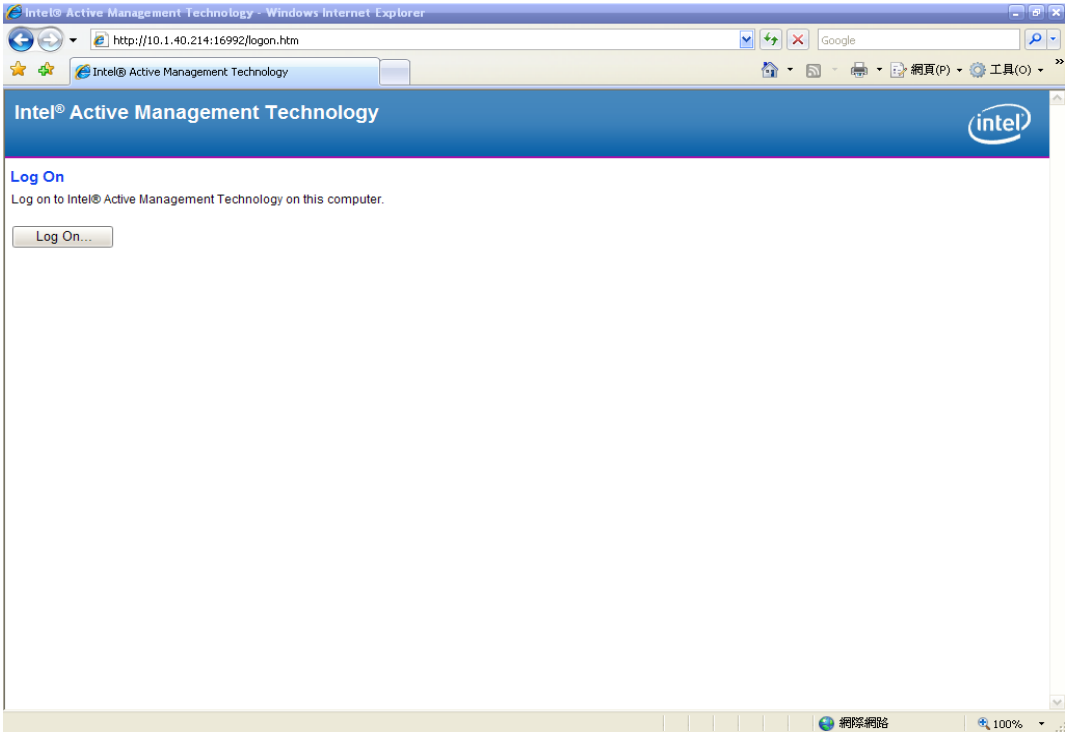


6. Exit from MEBx after completing the iAMT settings.

D.4 iAMT Web Console

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

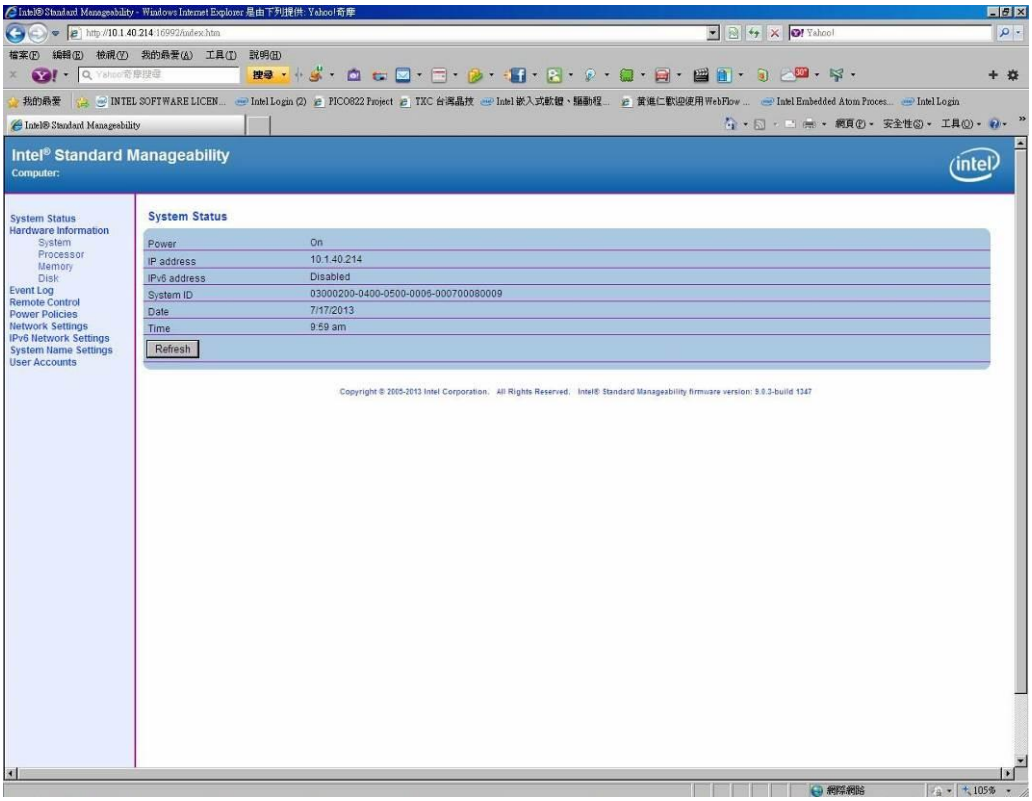
   Example: http://10.1.40.214:16992



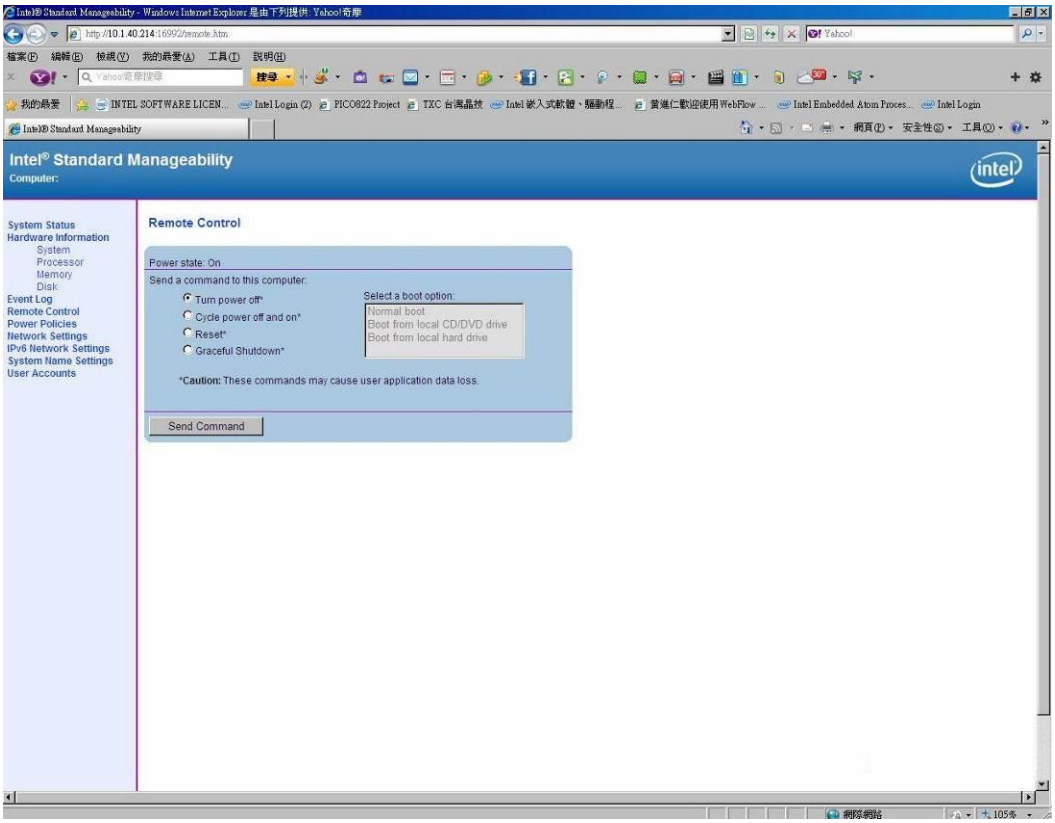
2. To log on, you will be required to type in username and password for access to the Web.

   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.