



®

***AXIOMTEK***

## **ICO120-83D**

**Robust Din-rail Fanless Embedded  
System**

**User's Manual**



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## Safety Precautions

Before getting started, please read the following important safety precautions.

1. The ICO120 does not come equipped with an operating system. An operating system must be loaded first before installing any software into the computer.
2. Be sure to ground yourself to prevent static charge when installing the internal components. Use a grounding wrist strap and place all electronic components in any static-shielded devices. Most electronic components are sensitive to static electrical charge.
3. Disconnect the power cord from the ICO120 before making any installation. Be sure both the system and the external devices are turned off. Sudden surge of power could ruin sensitive components. Make sure the ICO120 is properly grounded.
4. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
5. Turn OFF the system power before cleaning. Clean the system using a cloth only. Do not spray any liquid cleaner directly onto the screen.
6. Do not leave this equipment in an uncontrolled environment where the storage temperature is below  $-45^{\circ}\text{C}$  or above  $85^{\circ}\text{C}$ . It may damage the equipment.
7. Do not open the system's back cover. If opening the cover for maintenance is a must, only a trained technician is allowed to do so. Integrated circuits on computer boards are sensitive to static electricity. To avoid damaging chips from electrostatic discharge, observe the following precautions:
  - Before handling a board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. This will help to discharge any static electricity on your body.
  - When handling boards and components, wear a wrist-grounding strap, available from most electronic component stores.
8. Caution  
Risk of explosion if battery is replaced by an incorrect type dispose of used batteries according to the instructions.
9. Warning  
Hot Surface Do Not Touch.  
Restricted access area: The equipment should only be installed in a Restricted Access Area.
10. This product is intended to be supplied by a Listed Power Adapter or DC power source, output meets SELV, rated 12-24Vdc, minimum 0.85-0.45A, Tma = 70 degree C, and the altitude of operation = 5000m.  
If need further assistance with purchasing the power source, please contact to manufacturer for further information.

## **Classification**

1. Degree of protection against electric shock: not classified
2. Degree of protection against the ingress of water: IP40
3. Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.
4. Mode of operation: Continuous
5. Type of protection against electric shock: Class I equipment

## **General Cleaning Tips**

You may need the following precautions before you begin to clean the computer. When you clean any single part or component for the computer, please read and understand the details below fully.

When you need to clean the device, please rub it with a piece of dry cloth.

1. Be cautious of the tiny removable components when you use a vacuum cleaner to absorb the dirt on the floor.
2. Turn the system off before you start to clean up the component or computer.
3. Never drop the components inside the computer or get circuit board damp or wet.
4. Be cautious of all kinds of cleaning solvents or chemicals when you use it for the sake of cleaning. Some individuals may be allergic to the ingredients.
5. Try not to put any food, drink or cigarette around the computer.

## Cleaning Tools

Although many companies have created products to help improve the process of cleaning your computer and peripherals users can also use household items to clean their computers and peripherals. Below is a listing of items you may need or want to use while cleaning your computer or computer peripherals.

Keep in mind that some components in your computer may only be able to be cleaned using a product designed for cleaning that component, if this is the case it will be mentioned in the cleaning.

**Cloth:** A piece of cloth is the best tool to use when rubbing up a component. Although paper towels or tissues can be used on most hardware as well, we still recommend you to rub it with a piece of cloth.

**Water or rubbing alcohol:** You may moisten a piece of cloth a bit with some water or rubbing alcohol and rub it on the computer. Unknown solvents may be harmful to the plastics parts.

**Vacuum cleaner:** Absorb the dust, dirt, hair, cigarette particles, and other particles out of a computer can be one of the best methods of cleaning a computer. Over time these items can restrict the airflow in a computer and cause circuitry to corrode.

**Cotton swabs:** Cotton swabs moistened with rubbing alcohol or water are excellent tools for wiping hard to reach areas in your keyboard, mouse, and other locations.

**Foam swabs:** Whenever possible it is better to use lint free swabs such as foam swabs.



**Note:** *We strongly recommended that you should shut down the system before you start to clean any single components.*

### **Please follow the steps below:**

1. Close all application programs
2. Close operating software
3. Turn off power
4. Remove all device
5. Pull out power cable

## **Scrap Computer Recycling**

If the computer equipments need the maintenance or are beyond repair, we strongly recommended that you should inform your Axiomtek distributor as soon as possible for the suitable solution. For the computers that are no longer useful or no longer working well, please contact your Axiomtek distributor for recycling and we will make the proper arrangement.

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# CHAPTER 1

## INTRODUCTION

This chapter contains general information and detailed specifications of the ICO120. The Chapter 1 includes the following sections:

- General Description
- System Specification
- Dimensions
- I/O Outlets

### 1.1 General Description

ICO120 Din-rail fanless embedded system is suitable for communications control and for protocol converter applications in critical environments. Built for rugged work environments, ICO120 features an extra low power consumption Intel® ATOM™ N3350 (1.1GHz/2-cores) processor supporting industrial temperature range of -20°C to +70°C. Its front accessible I/O cabling is very convenient for wiring and maintenance. ICO120 offers a VGA output, making it particularly well-suited for communication control, SCADA and industrial automation. Its compact size with Din-rail mounting allows for easy installation into control cabinet. Pre -installed with Linux and Windows® 10, ICO120 provides programmers with a friendly environment for developing application software at a lower cost.

ICO120 is robust industrial-grade hardware design and adopts the advanced cooling system, besides, supporting the mSATA, which makes it especially suitable for field control & monitoring system solution for following markets:

Utility Industries (Water; Energy; Chemical Plant; Mining...)

Public Transportation Industries (Traffic/ Highway Control; Train/Bus Control...)

Homeland Security (Weather Monitoring/Alarm System...)

#### Features

- Fanless design
- No Wide temperature operation of -20°C – +70°C
- Wide temperature operation of -40°C – +70°C (Optional)
- Supports 2 10/100/1000 Base-T Ethernets with Magnetic Isolated Protection
- 1 COM Ports support RS-232/422/485
- 2 USB 2.0 Ports
- 1 Wireless (USB and PCIe Interface)
- Support one mSATA
- Wide range 12–24V DC-in with terminal block
- 8 bits programmable TTL level digital input/output ports.
- Din-rail mounting
- Wall mounting (optional)
- Passed CE with FCC testing

- **O.S. Supported**

ICO120 supports Windows<sup>®</sup> 10 and Linux package. For storage device, ICO120 supports one mSATA.

## **1.2 System Specifications**

### **1.2.1 CPU**

- Onboard Intel<sup>®</sup> ATOM<sup>™</sup> N3350(1.1 GHz/2-core) processor.

### **1.2.2 BIOS**

- AMI(American Megatrends Inc.) UEFI(Unified Extensible Firmware Interface) BIOS.

### **1.2.3 System Memory**

- One DDR3L 204-pin SO-DIMM(1.35V) slot.
- Supports 1600MHz max. up to 8GB.

### **1.2.4 Display**

- A slim type 15-pin D-Sub connector as VGA connector
- Support VGA standards up to 1920x1200@60Hz

### **1.2.5 Ethernet Ports**

- LAN Chip: Intel Ethernet Controller  
Intel I210 ( wide temperature )  
Intel I211 ( no wide temperature )
- One RJ-45 connector, support 10/100/1000 Base-T Ethernet with 1.5KV magnetic isolated protection

### **1.2.6 Storages**

- 1 x mSATA.

### **1.2.7 Wireless**

- 1 x Full size Mini Card slot supports Module with USB and PCIe Interface.
- 1 x SIM Card Socket.
- 2 x Antenna holes.

**1.2.8 USB**

- 2 USB 2.0 Ports
- USB Pin Define :

USB 2.0

Pin	Signal USB2.0 Port 1	Pin	Signal USB2.0 Port 2
1	VCC	1	VCC
2	D0-	2	D1-
3	D0+	3	D1+
4	GND	4	GND

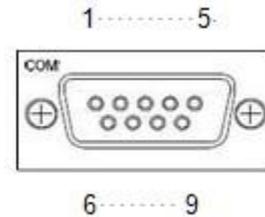


**1.2.9 COM**

- 1 ports DB9 support RS-232/422/485 which can be selected by BIOS.
- Supports Auto Flow Control in RS485 mode.
- Serial Port Pin Define: (DB9 Male) as below
- Supports High Speed Mode 115.2 Kbps, Up to 1.5 Mbps

COM1

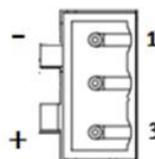
Pin	RS-232	RS-422	RS-485
1	DCD	TX-	Data-
2	RXD	TX+	Data+
3	TXD	RX+	--
4	DTR	RX-	--
5	GND	GND	GND
6	DSR	--	--
7	RTS	--	--
8	CTS	--	--
9	RI	--	--



**1.2.10 Power**

- Power Input
- DC Terminal block : Wide-range 12 - 24V. OVP and Reverse protection.

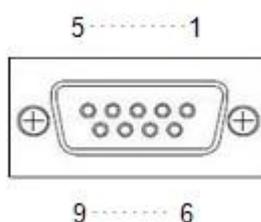
Pin	Signal
1	-
2	NC
3	+



### 1.2.11 DIO

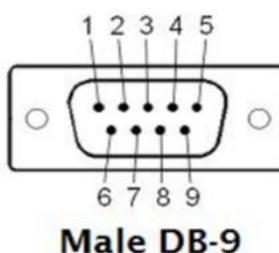
- One DB9 female connector supports 8 bits TTL level programmable digital input/output
- The voltage of TTL is 5V
- The programming is as follow:
  - I/O sink current is 8~10mA
  - Input/Output can be programmed

Pin	Signal
1	DIO0
2	DIO1
3	DIO2
4	DIO3
5	DIO4
6	DIO5
7	DIO6
8	DIO7
9	GND



### 1.2.12 CANbus

CAN DB9 Connector Pin Define	
1	NC
2	CAN-L
3	NC
4	NC
5	GND
6	NC
7	CAN-H
8	NC
9	NC

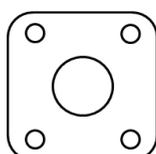


### 1.2.13 WatchDog Timer (WDT)

- 1~255 seconds or minutes; up to 255 levels.

### 1.2.14 Restore BIOS Optimal Defaults (SW1)

- Press the tact switch (SW 1) can restore BIOS optimal defaults.



### 1.2.15 System LED

- There are showed the LED's indicators and functional descriptions.

LED Name	Description	Color
ACT	Indicate the storage status and it's flashing when storage access.	Orange
PWR	Indicate the Power status. When the DC input is acceptable, the LED will ON.	Green

### 1.2.16 Operation Temperature

- No wide temperature -20°C ~ +70°C  
Wide temperature -40°C ~ +70°C (Optional)

### 1.2.17 Storage Temperature

- -40°C ~ +85°C

### 1.2.18 Humidity

- 10% ~ 95% (non-condensation)

### 1.2.19 Weight

- 0.3 kg

### 1.2.20 Dimensions

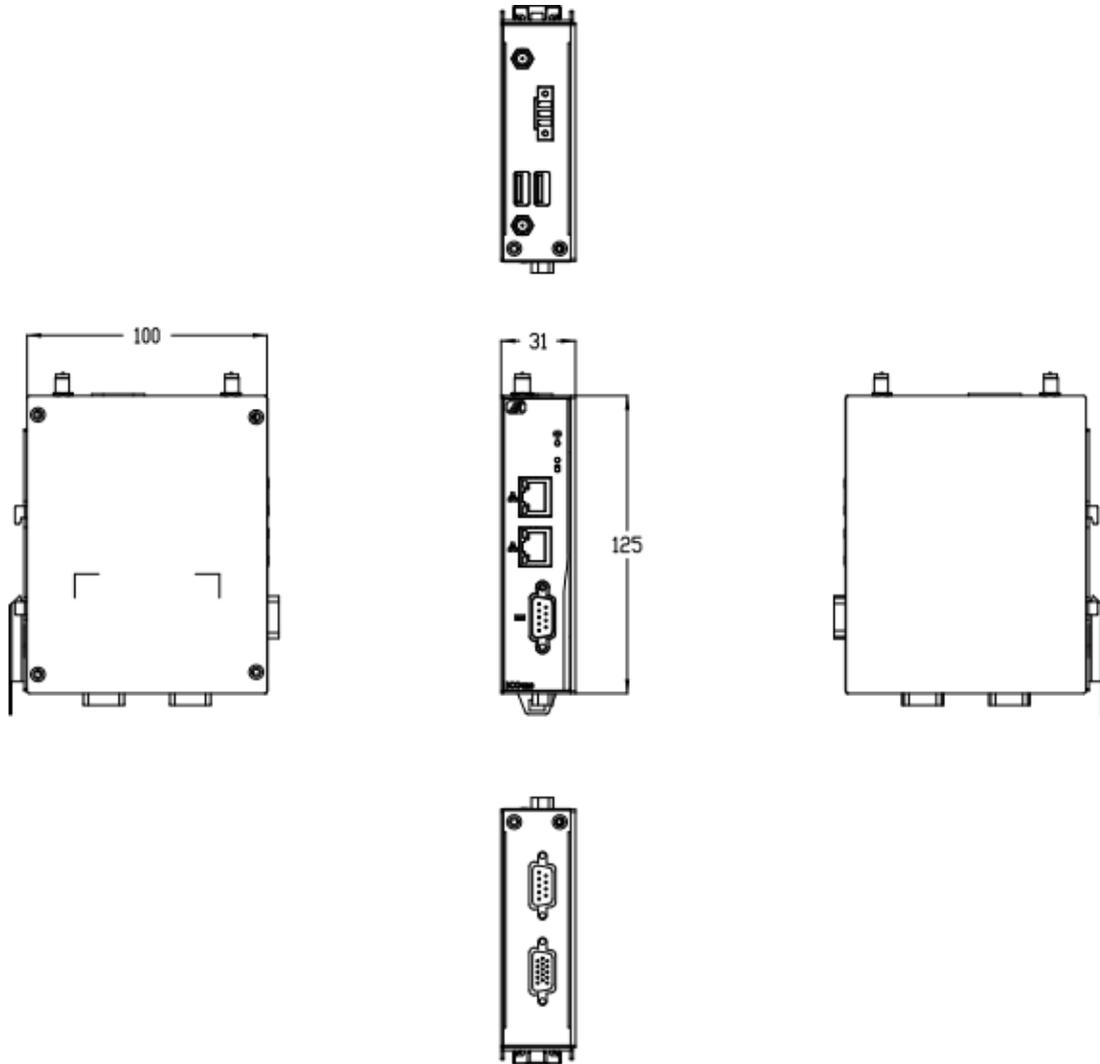
- 31mm (1.22") (W) x100mm (3.93") (D) x125mm (4.92") (H)

### 1.2.21 System I/O Outlets

- One 9-pin D-Sub male connectors, COM1.
- One 15-pin D-Sub female connector for VGA.
- Two 10/100/1000 Base-T RJ-45 with 1.5KV magnetic isolated protection.
- Two USB 2.0 Ports
- One DC Power Input with terminal block.
- One 9-pin D-Sub Female connectors for DIO.
- Two Antenna holes.

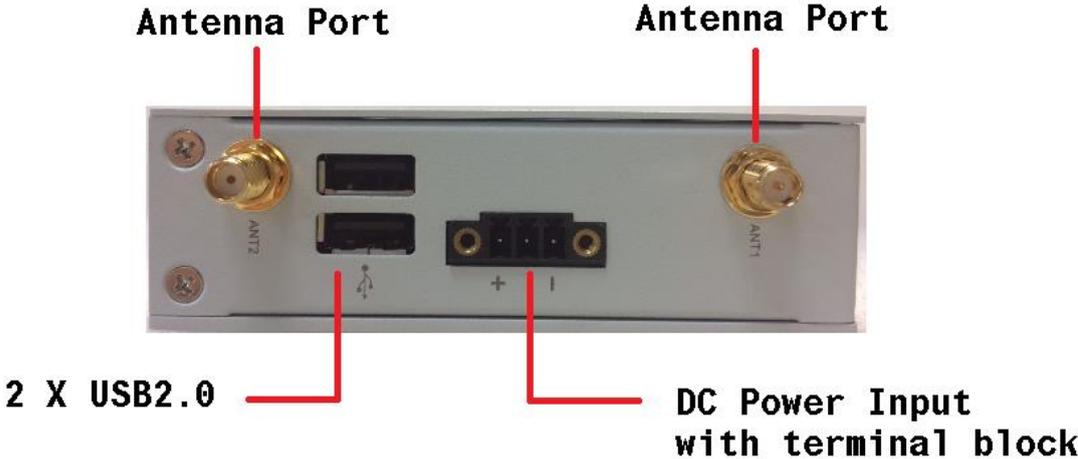
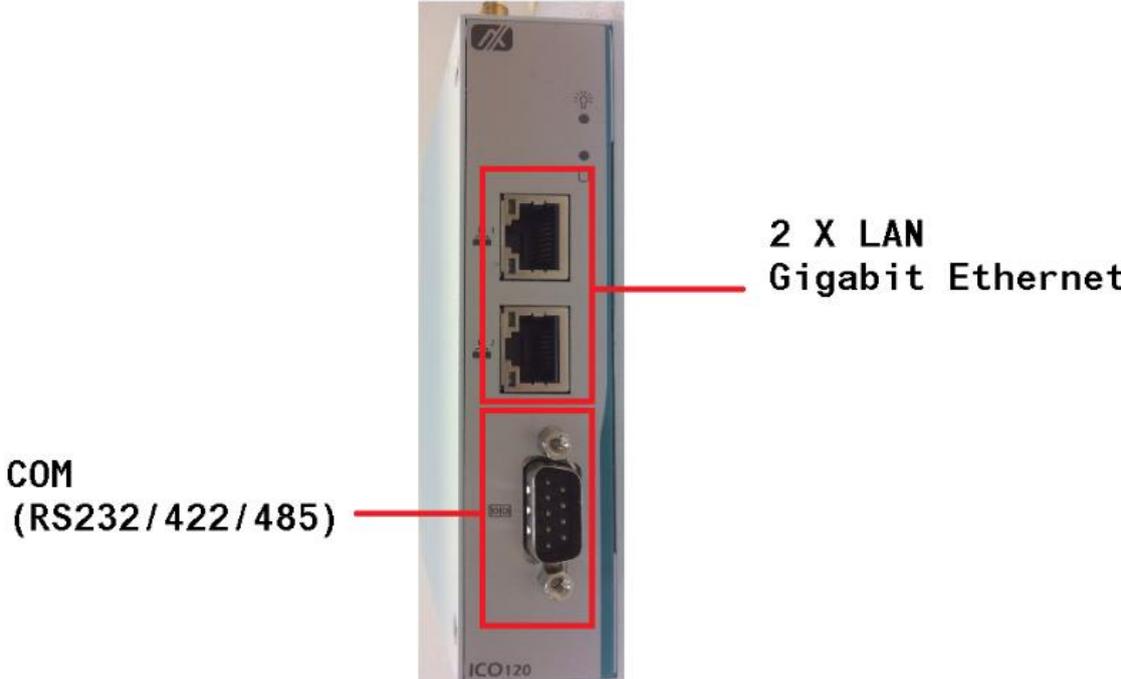
### 1.3 Dimensions

The following diagrams show you dimensions and outlines of the ICO120.

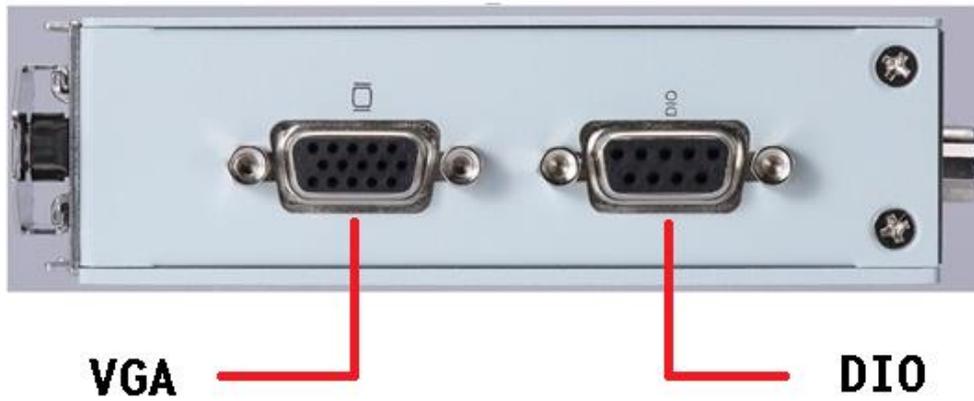


### 1.4 I/O Outlets

The following figures show you I/O outlets on front view and top view of the ICO120.



The following figures show you I/O outlets on front view and bottom view of the ICO120.



## CHAPTER 2 HARDWARE INSTALLATION

The ICO120 is convenient for your various hardware configurations, such as Memory Module and mSATA. The chapter 2 will show you how to install the hardware. It includes:

### 2.1 Installing the Memory Module

**Step 1** Turn off the system.

**Step 2** Loosen all screws of the cover and remove the cover from the system.



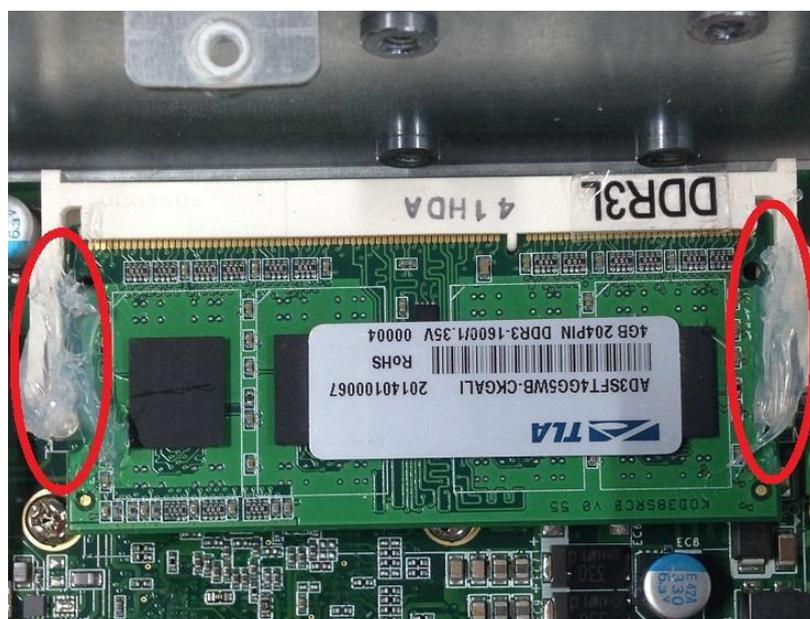
**Step 3** Put the thermal pad on memory module can increase cooling effect.



**Step 4** Use two fingers to hold the memory module, and insert the gold figure into the slot and push the module down.



**Step 5** The memory module is locked by two latches on the sides. We strongly recommend using “LDC737” silicone on the two sides of the memory for good ability of vibration.



**Step 6** Put the cover back to the system, and fasten screws tight close the chassis.

## 2.2 Installing the mSATA

**Step 1** Turn off the system.

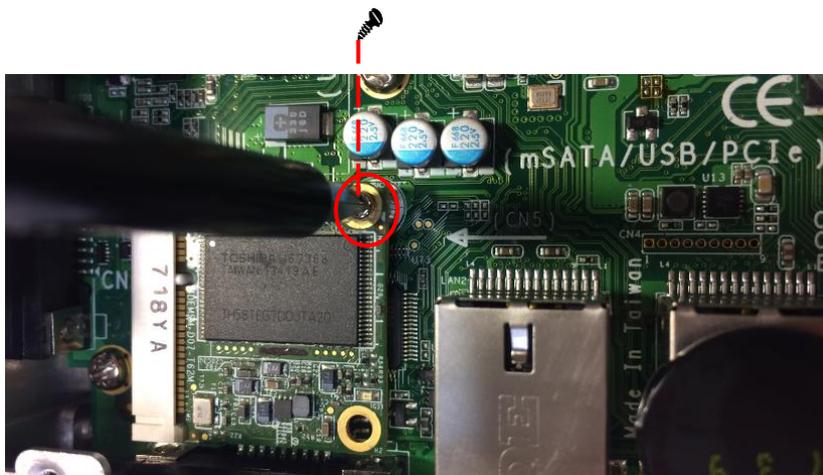
**Step 2** Loosen all screws of the cover and remove the cover from the system.



**Step 3** Insert the mSATA into the slot which marking with “mSATA / USB / PCIe”.



**Step 4** Fasten the screw tightly.



**Step 5** Put the cover back to the system, and fasten screws tight close the chassis.

## 2.3 Installing Wireless Module

**Step 1** Turn off the system.

**Step 2** Loosen all screws of the cover and remove the cover from the system.



**Step 3** Following(Figure 3-1) push the SIM slot back to unlock SIM slot, inserting the SIM card and put it back(Figure 3-2), and lock the SIM slot(Figure 3-3).

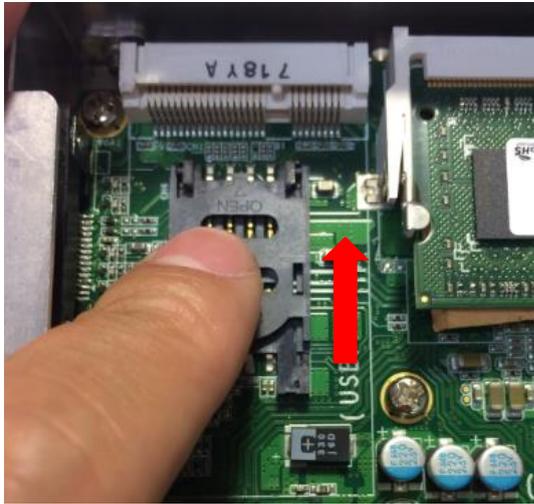


Figure 3-1

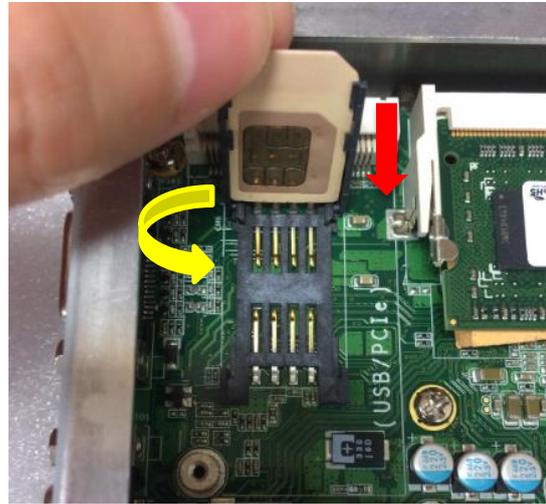


Figure 3-2

Figure 3-3



**Step4.** Insert the wireless module into the slot which marking with “USB/PCIe”.



**Step 5** Insert the 3G module and screws it tight.



**Step 6** Removing the plug cover from the chassis.



**Step 7** Connect the RF cable to the connector of 3G module which "MAIN".



**Step 8** Taking out the parts from the 3G kit package (Figure 8-1) and make the RF cable through the antenna hole (Figure 8-2). Finally, screw it tight(Figure8-3).



Figure 8-1



Figure 8-2



Figure 8-3

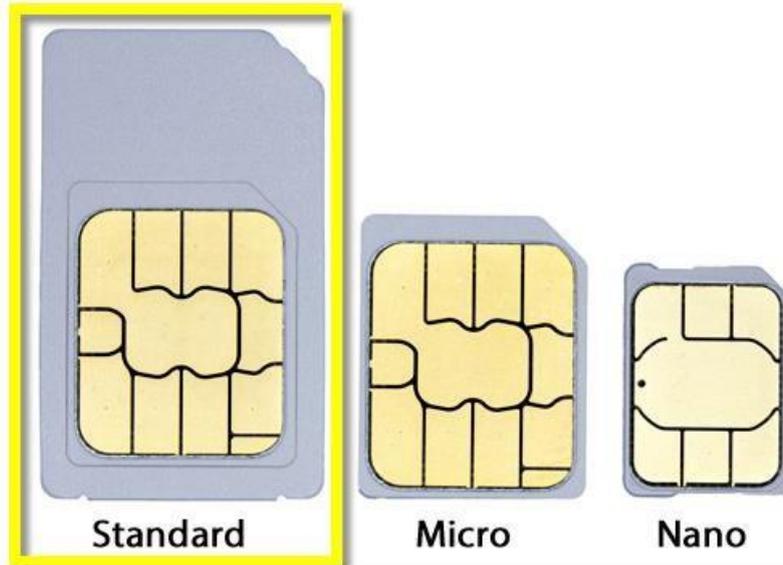
**Step 9** Screwing the RF antenna tight.



**Step 10** Put the cover back to the system, and fasten screws tight close the chassis.



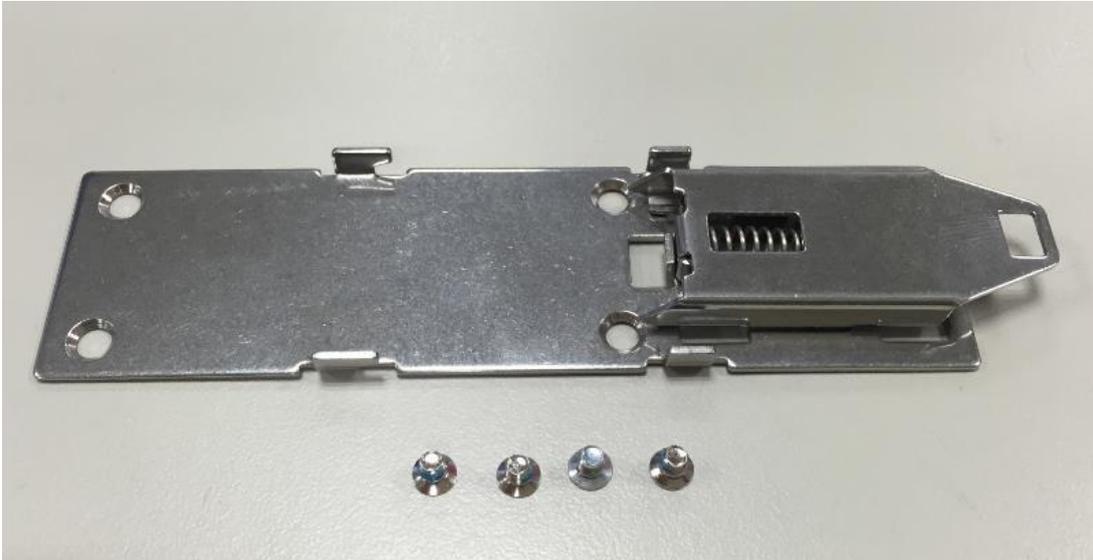
**Note:** SIM Card only can use the standard size as the following pictures.



## 2.4 Installing Din-rail Mounting

The ICO120 provides Din-rail Mount as below:

**Step 1 Prepare Din-rail Mount assembling components (screws and bracket) ready.**



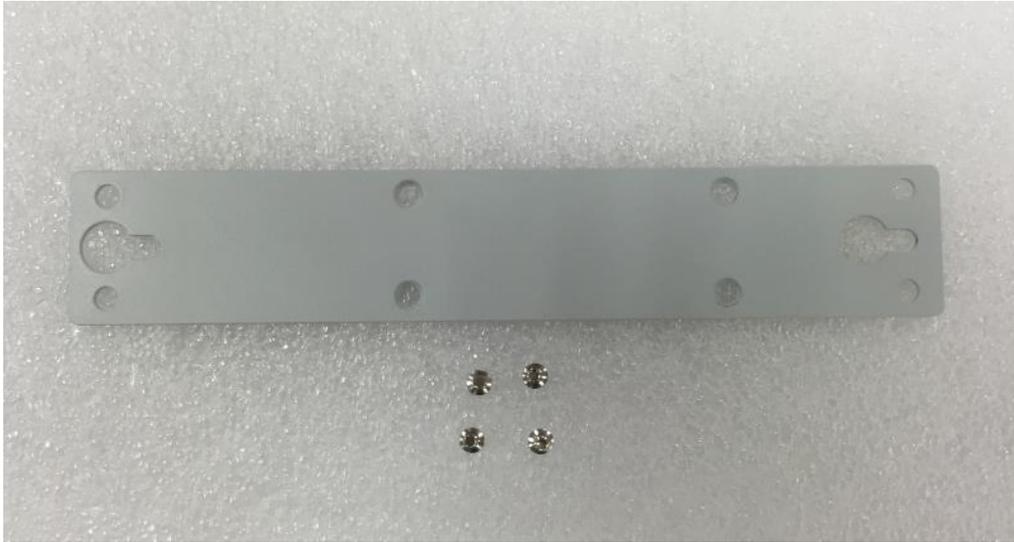
**Step 2 Assembly the bracket to the system and fasten screws tight.**



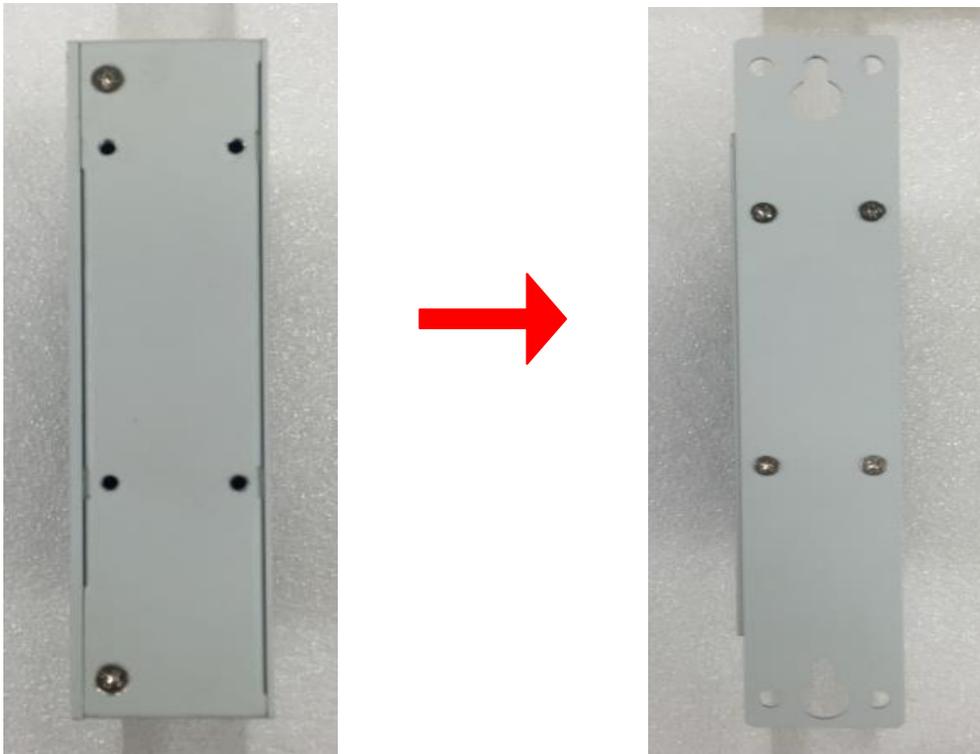
## 2.5 Installing Wall Mounting (optional)

The ICO120 provides Wall Mounting that customers can install as below:

**Step 1 Prepare Wall Mount assembling components (screws and bracket) ready.**



**Step 2 Assembly the bracket to the system, and fasten screws tight.**



## **CHAPTER 3**

# **AMI UEFI BIOS UTILITY**

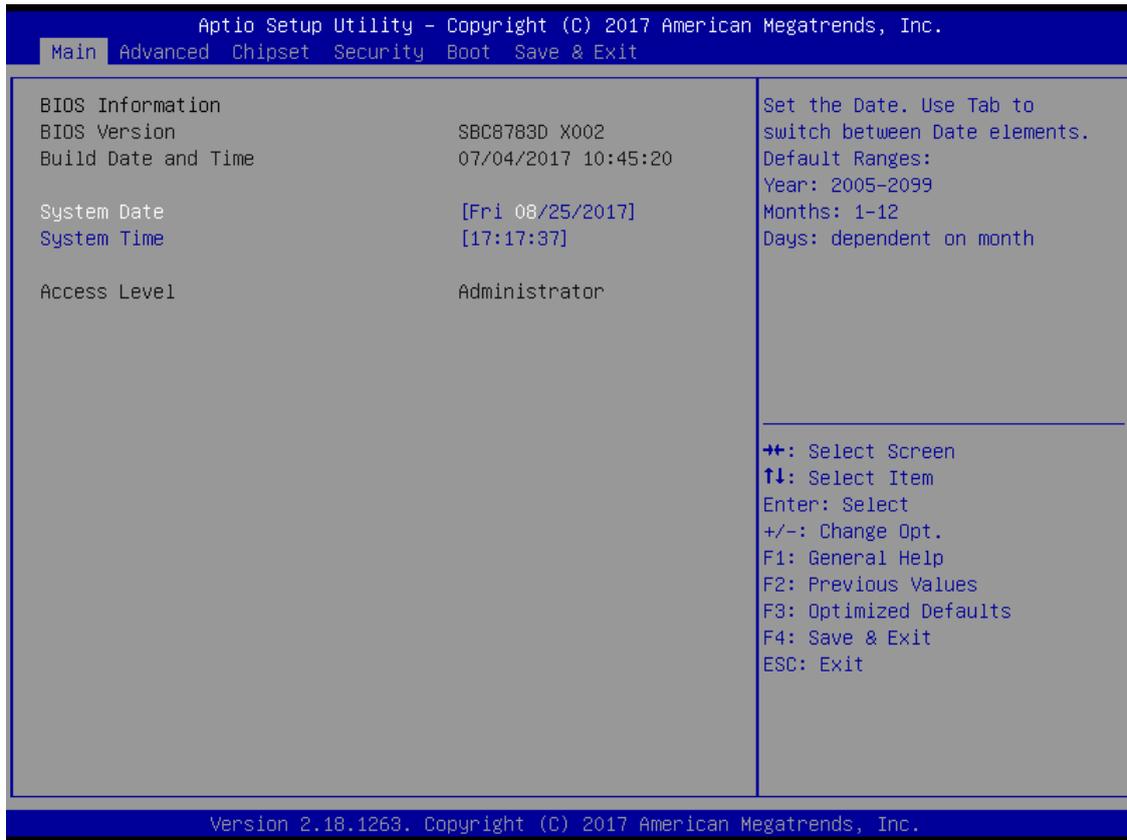
The AMI UEFI BIOS provides users with a built-in Setup program to modify basic system configuration. All configured parameters are stored in a flash-backed-up to save the Setup information whenever the power is turned off.

### **3.1 Entering Setup**

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.

## 3.2 The Main Menu



Once you enter the AMI BIOS Aptio Setup Utility, the Main Menu appears on the screen. In the Main Menu, there are several Setup functions and a couple of Exit options for your selection. Use Select Screen Keys (or Move Keys) to select the Setup Page you intend to configure then press <Enter> to accept or enter its sub-menu.

### System Date

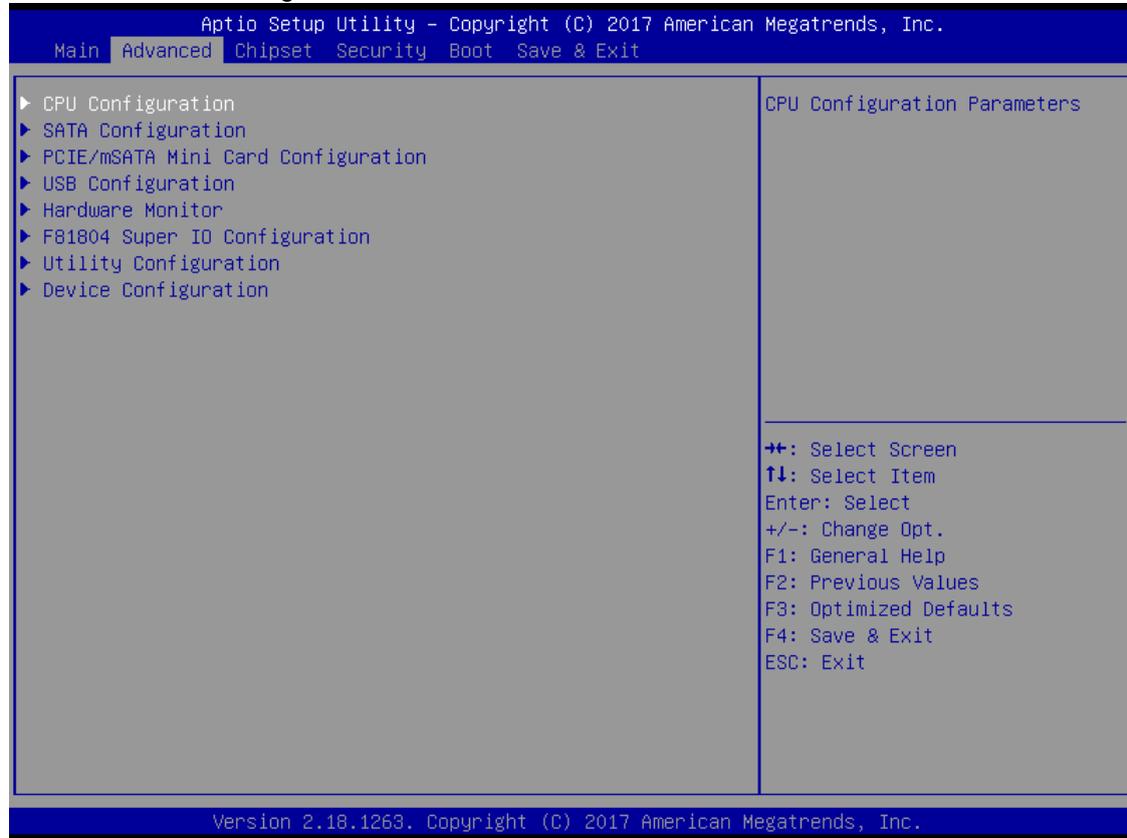
The date format is <day> <month> <date> <year>.

### System Time

This item shows current time of your system with the format <hour> <minute> <second>. The time is calculated based on the 24-hour military-time clock. For example, 1 p.m. is 13:00:00.

### 3.3 Advanced Features

This Advanced section allows users to configure and improve your system, to set up some system features according to your preference. You can select any of the items in the left frame of the screen to go to the sub menus:



### CPU Configuration

Scroll to this item and press <Enter> to view the CPU Configuration informations.

(Please refer below graphics.)

Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.

Advanced

CPU Configuration		When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology
Intel(R) Celeron(R) CPU N3350 @ 1.10GHz		
CPU Signature	506C9	
Microcode Patch	20	
Max CPU Speed	1100 MHz	
Min CPU Speed	800 MHz	
Processor Cores	2	
Intel HT Technology	Not Supported	
Intel VT-x Technology	Supported	
64-bit	Supported	
L1 Data Cache	24 kB x 2	
L1 Code Cache	32 kB x 2	
L2 Cache	1024 kB x 1	
L3 Cache	Not Present	
Intel Virtualization Technology	[Enabled]	

++: Select Screen  
 ↑↓: Select Item  
 Enter: Select  
 +/-: Change Opt.  
 F1: General Help  
 F2: Previous Values  
 F3: Optimized Defaults  
 F4: Save & Exit  
 ESC: Exit

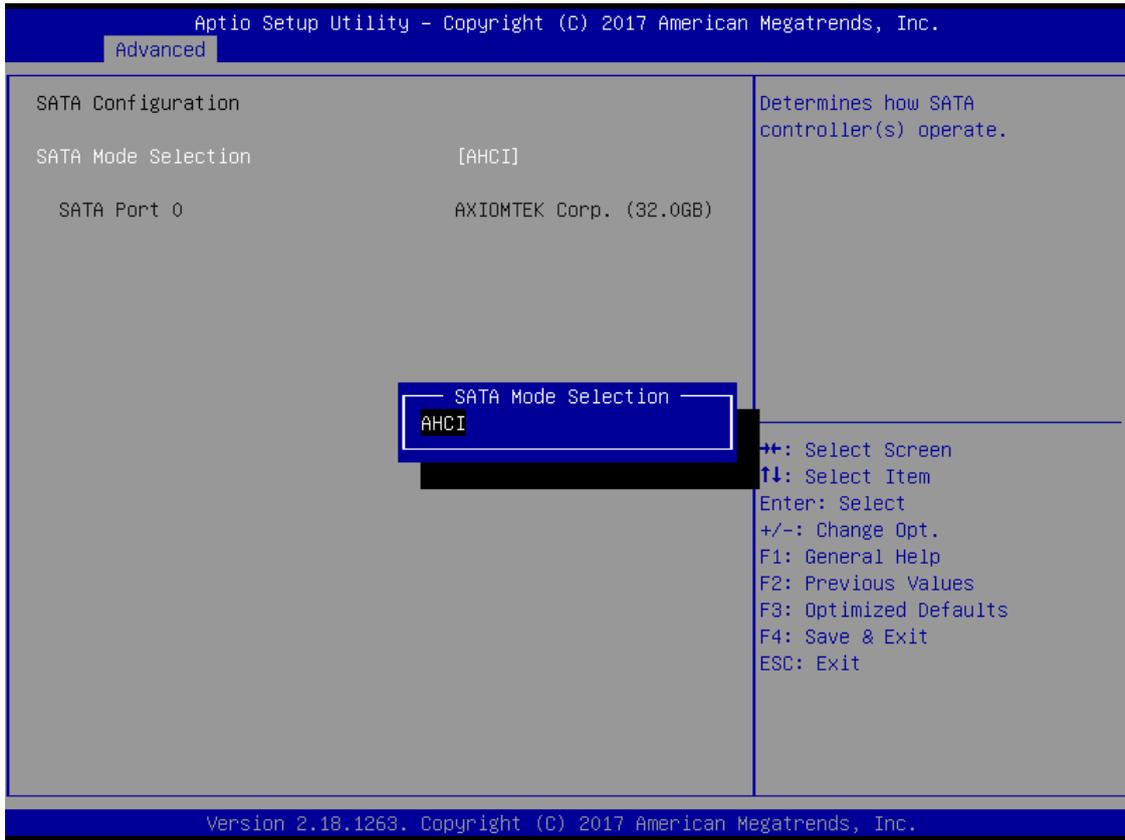
Version 2.18.1263. Copyright (C) 2017 American Megatrends, Inc.

### SATA Configuration

Scroll to this item and press <Enter> to view the SATA Configuration informations.

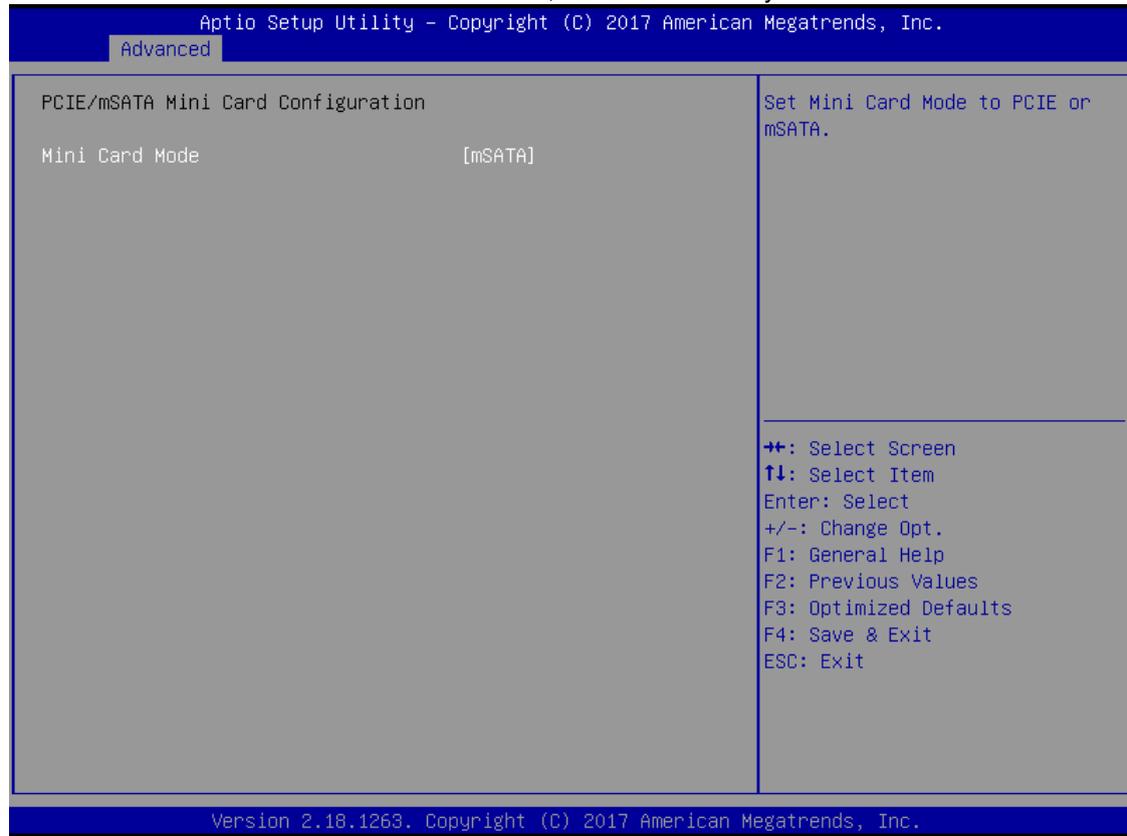
(Please refer below graphics.)





## PCIe/mSATA Mini Card Configuration

You can choose the PCIe or mSATA function, it can be select by BIOS menu.



Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.

Advanced

PCIE/mSATA Mini Card Configuration

Mini Card Mode [mSATA]

Mini Card Mode

PCIE

mSATA

Set Mini Card Mode to PCIE or mSATA.

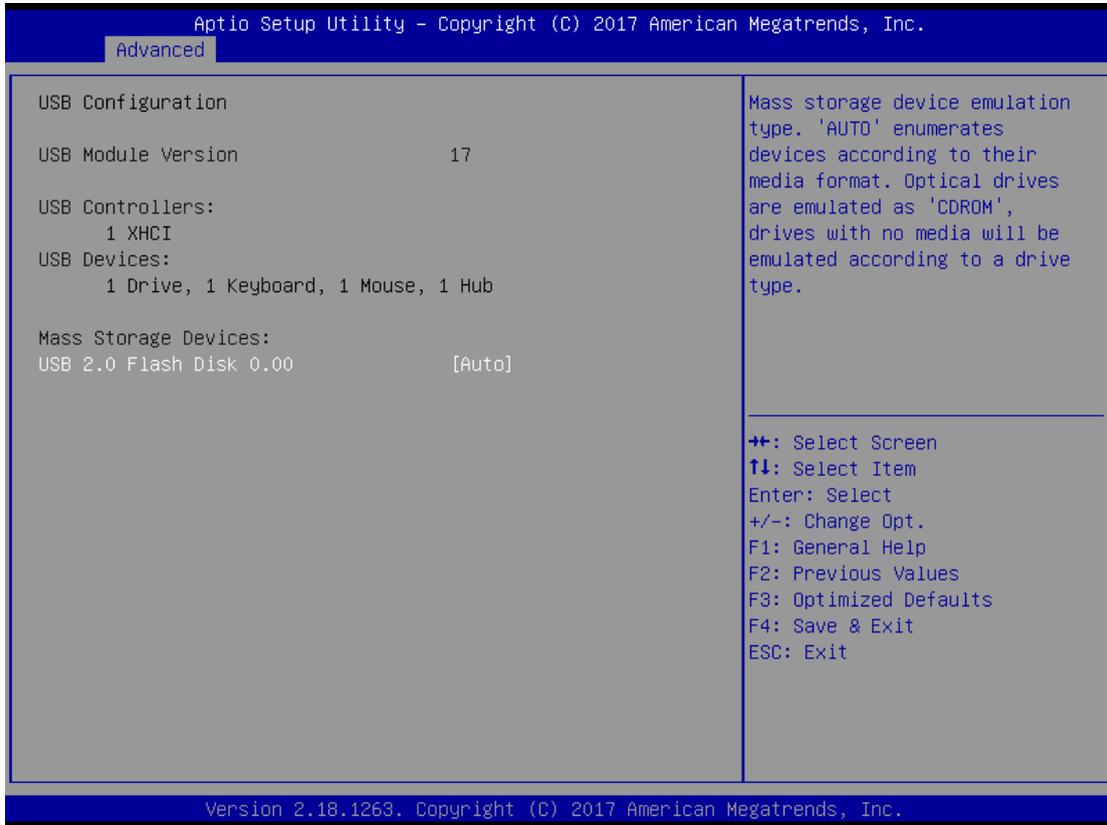
+/: Select Screen  
↑↓: Select Item  
Enter: Select  
+/-: Change Opt.  
F1: General Help  
F2: Previous Values  
F3: Optimized Defaults  
F4: Save & Exit  
ESC: Exit

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### USB Configuration

Scroll to this item and press <Enter> to view the USB Configuration informations.

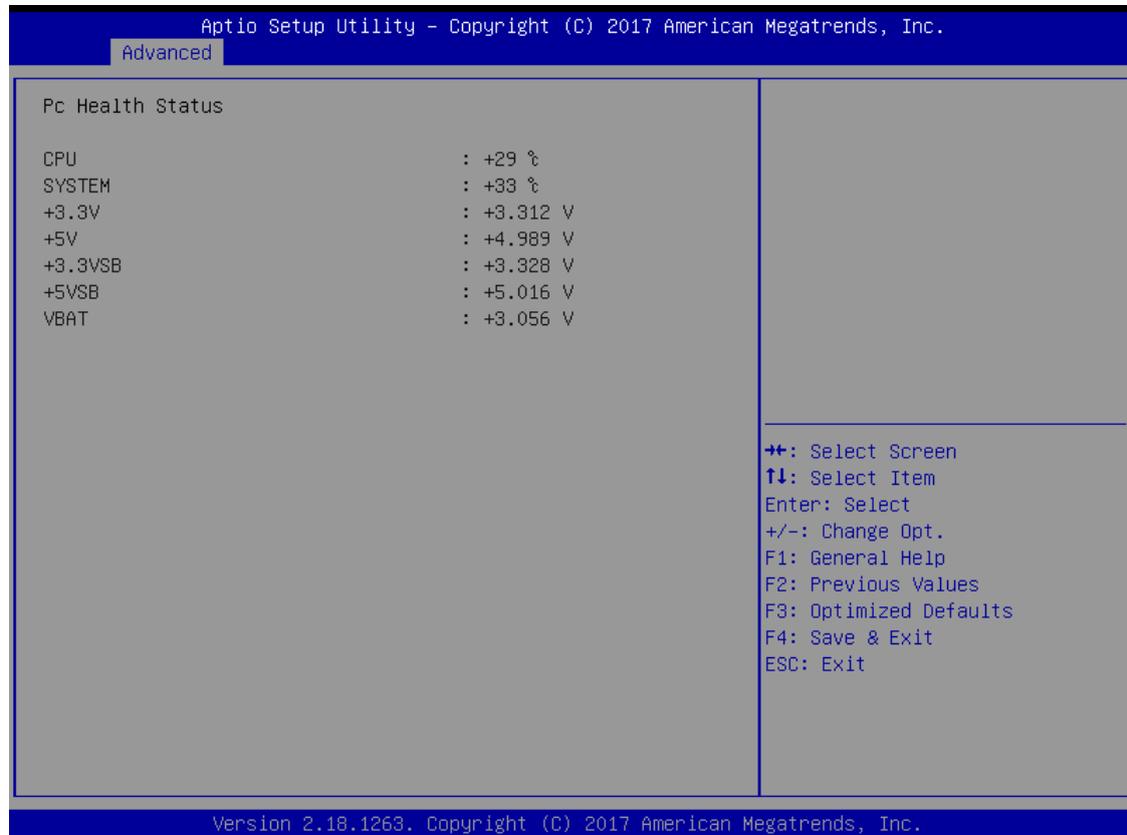
(Please refer below graphics.)



**H/W Monitor**

Scroll to this item and press <Enter> to view the monitor hardware status.

(Please refer below graphics.)



### F81804 Super IO Configuration

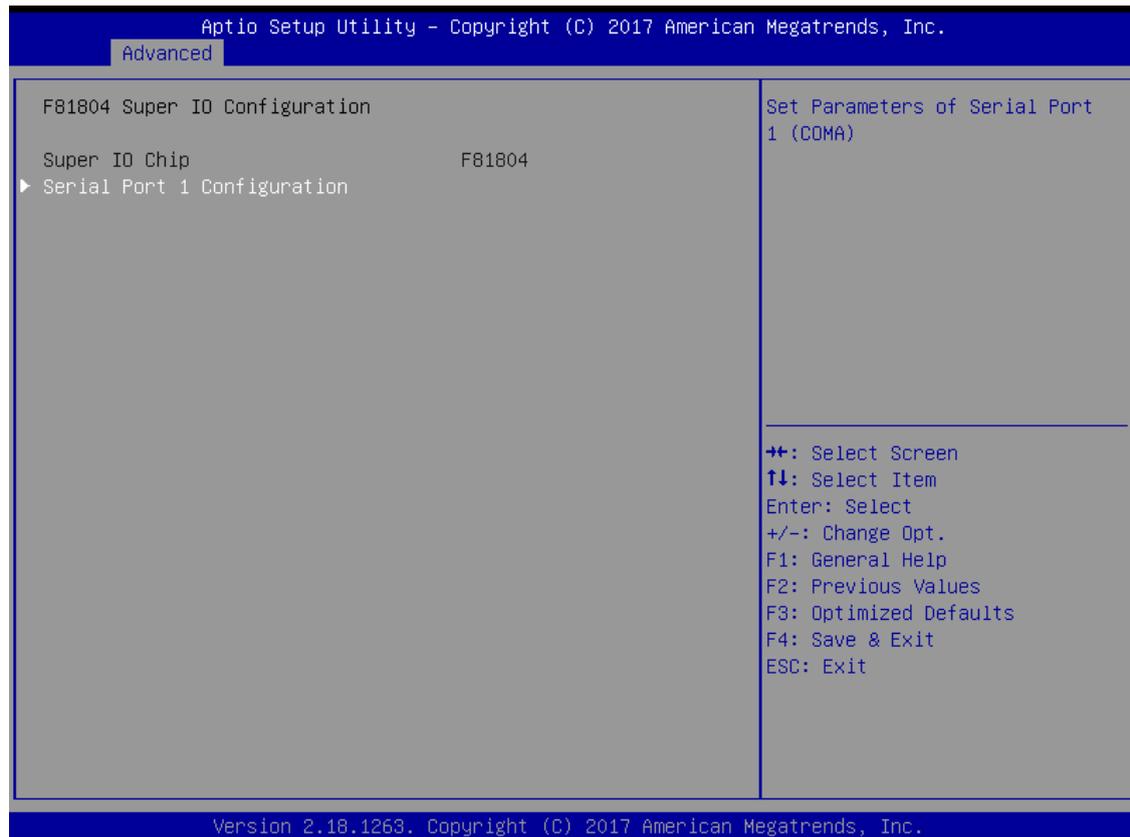
The default setting for all Serial Ports are RS232.

You can change the setting by selecting the value you want in each COM Port Type. Supports RS422 & RS485 mode and high speed mode.

You can enable to High-speed mode, it can be select by BIOS menu.

Com Port speed supports up to 1.5 Mbps.

(Please refer below graphics.)



Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.

Advanced

Serial Port 1 Configuration	RS232/RS422/RS485
Device Settings	ID=3F8h; IRQ=4;
Select Mode	[RS232]
High-speed mode	[Disabled]

Select Mode

- RS232
- RS422
- RS485

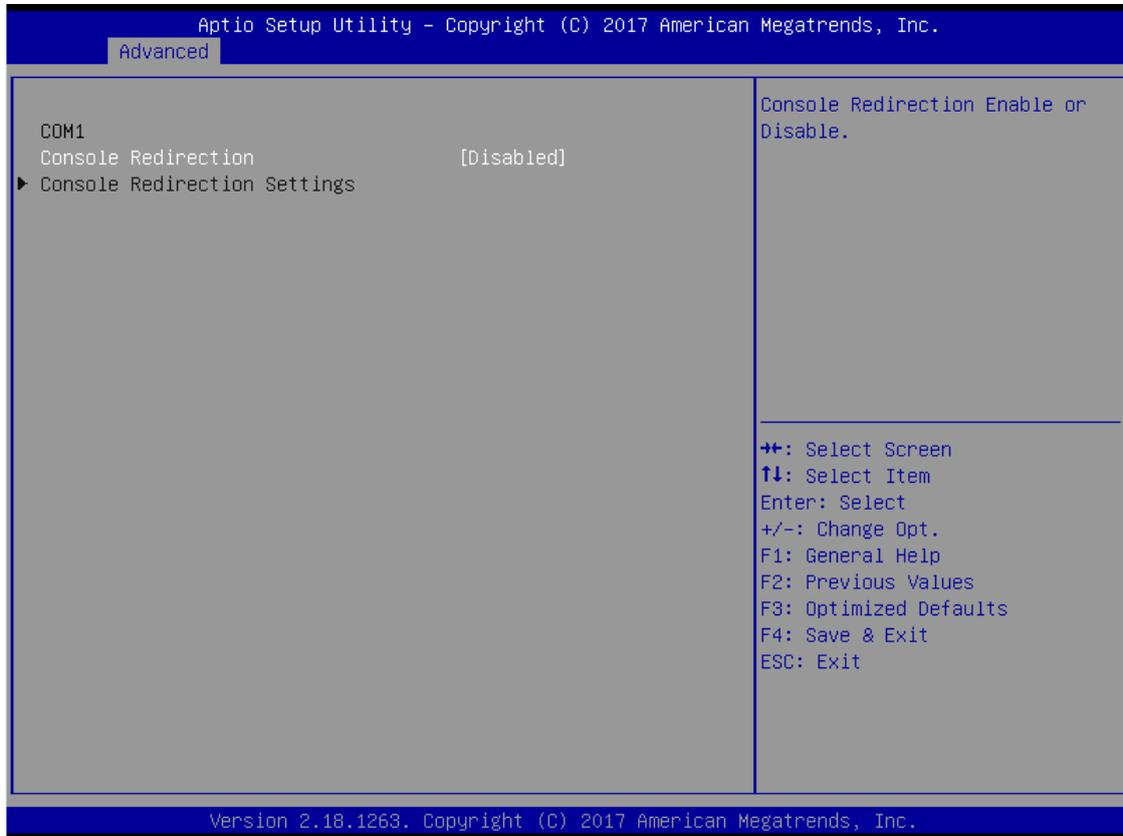
⬆: Select Screen  
⬆⬆: Select Item  
Enter: Select  
+/-: Change Opt.  
F1: General Help  
F2: Previous Values  
F3: Optimized Defaults  
F4: Save & Exit  
ESC: Exit

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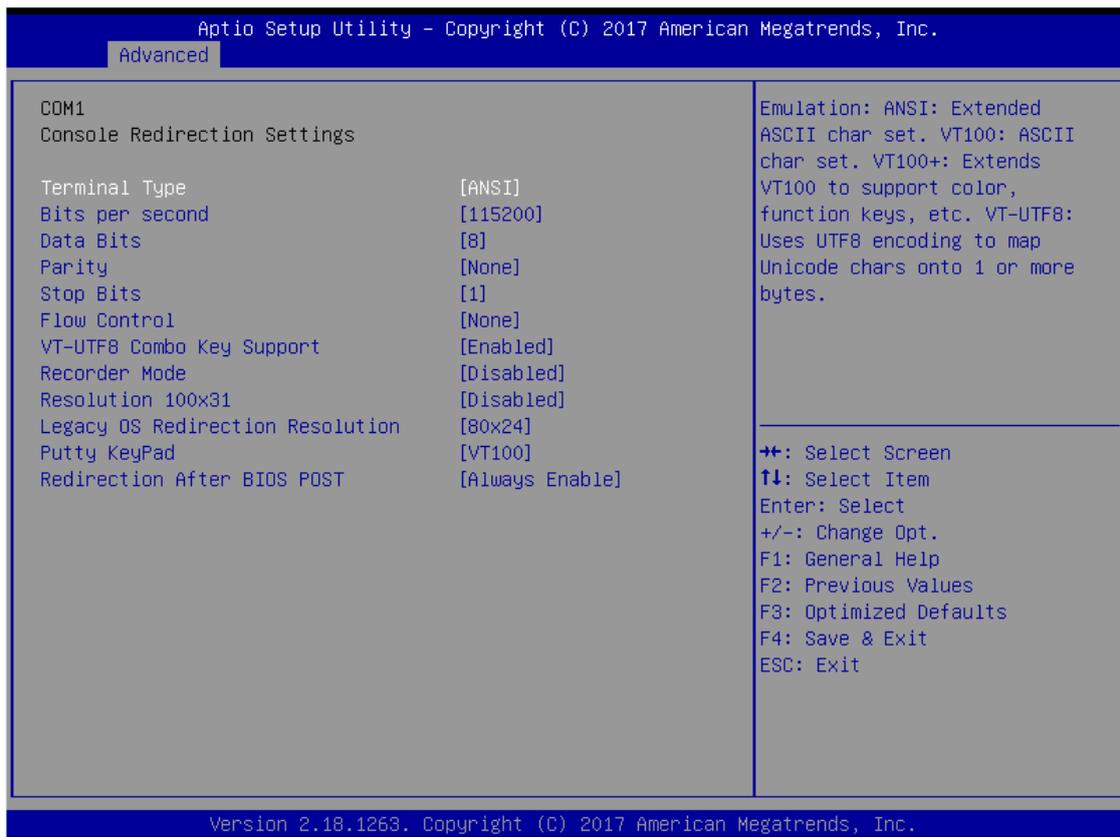
### Serial Port Console Redirection

The default setting for the console redirection function is [Disabled]

(Please refer below graphics.)



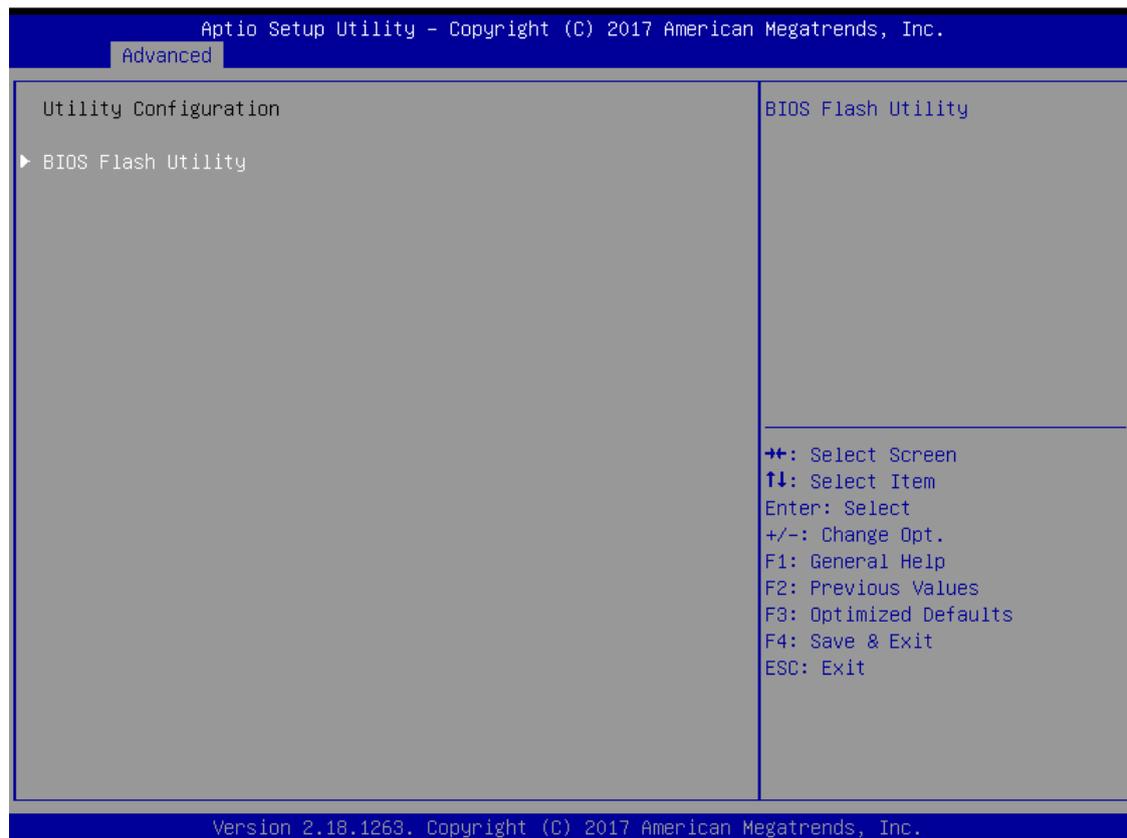
And you can further change the setting by selecting or setting the value you want in each function as the following pictures.

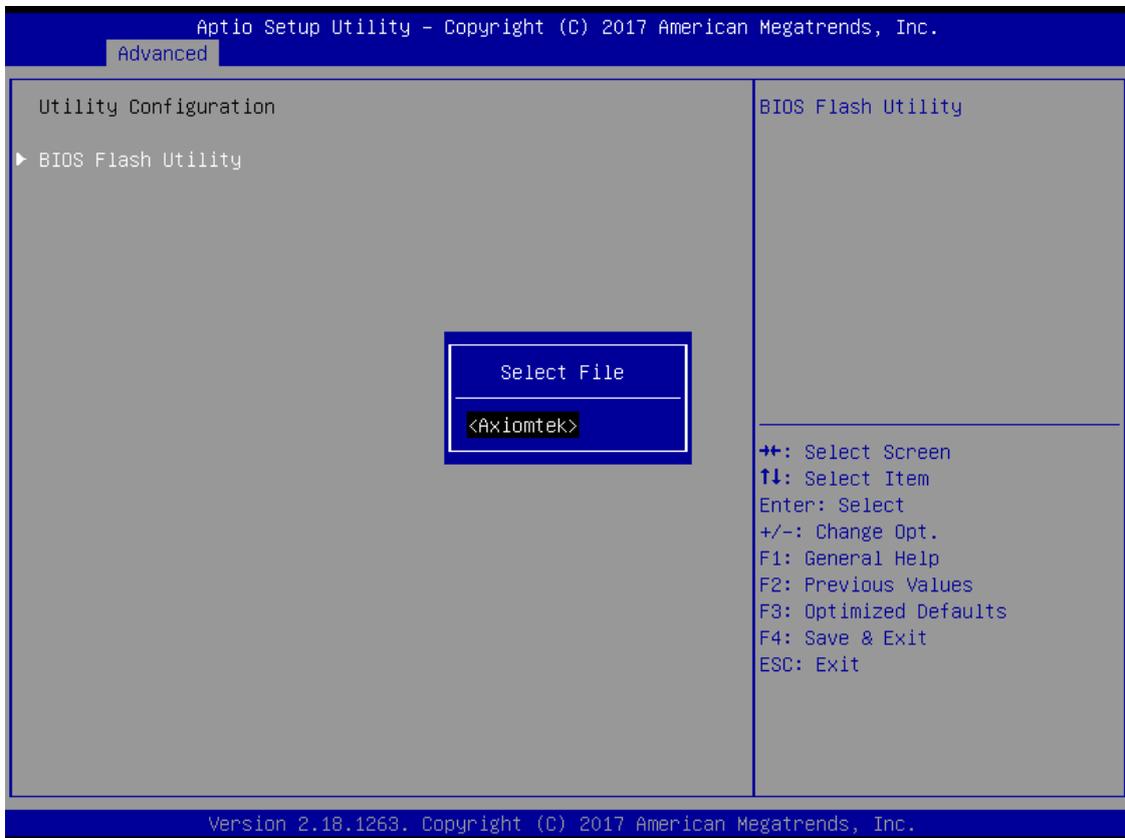
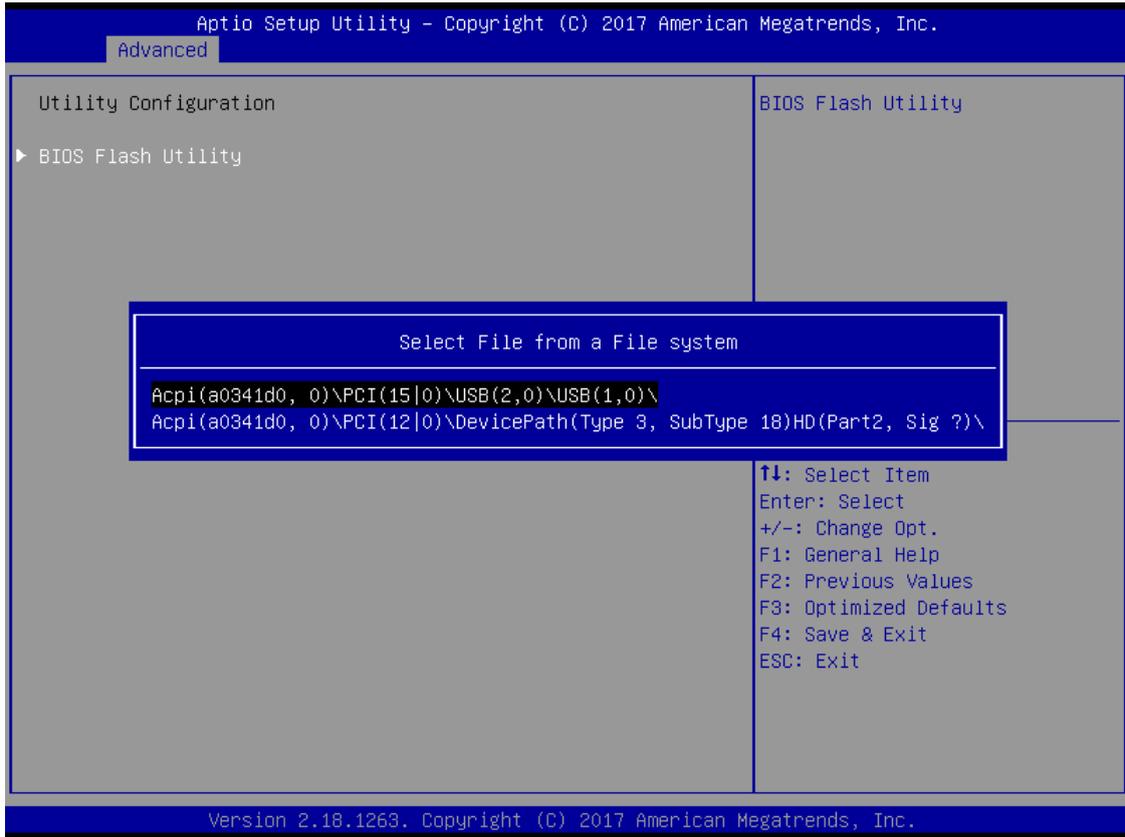


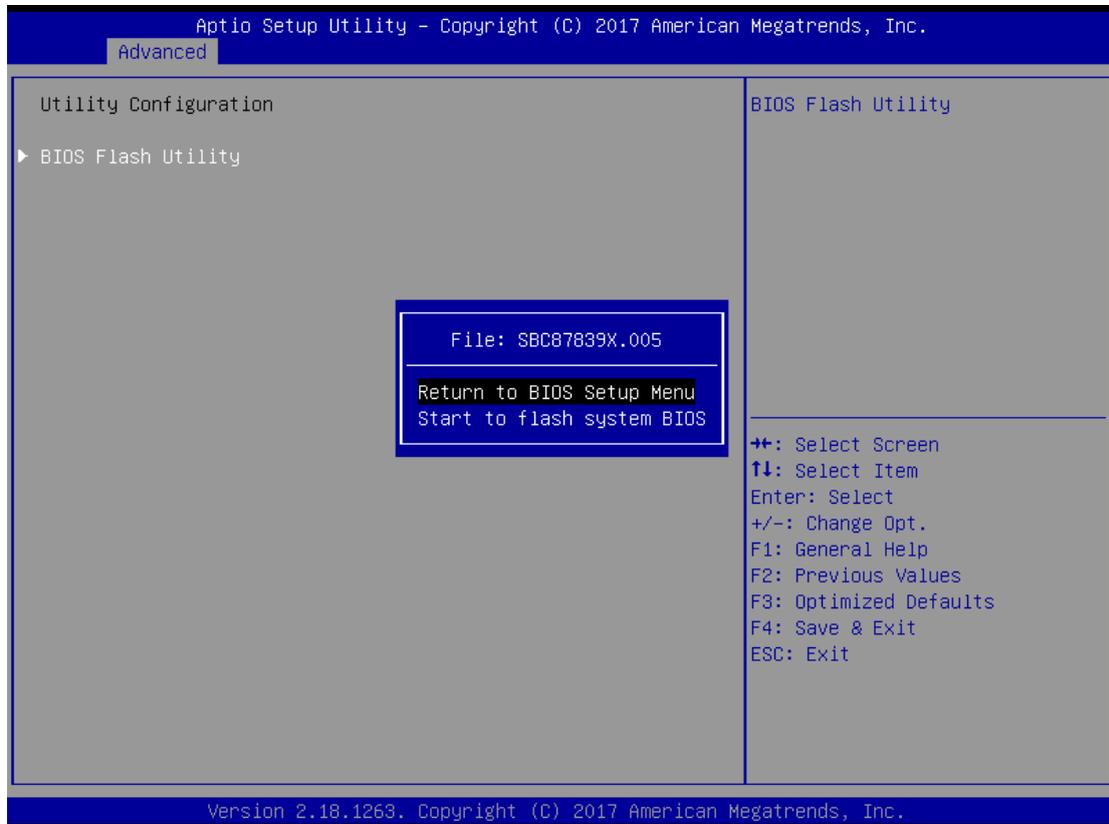
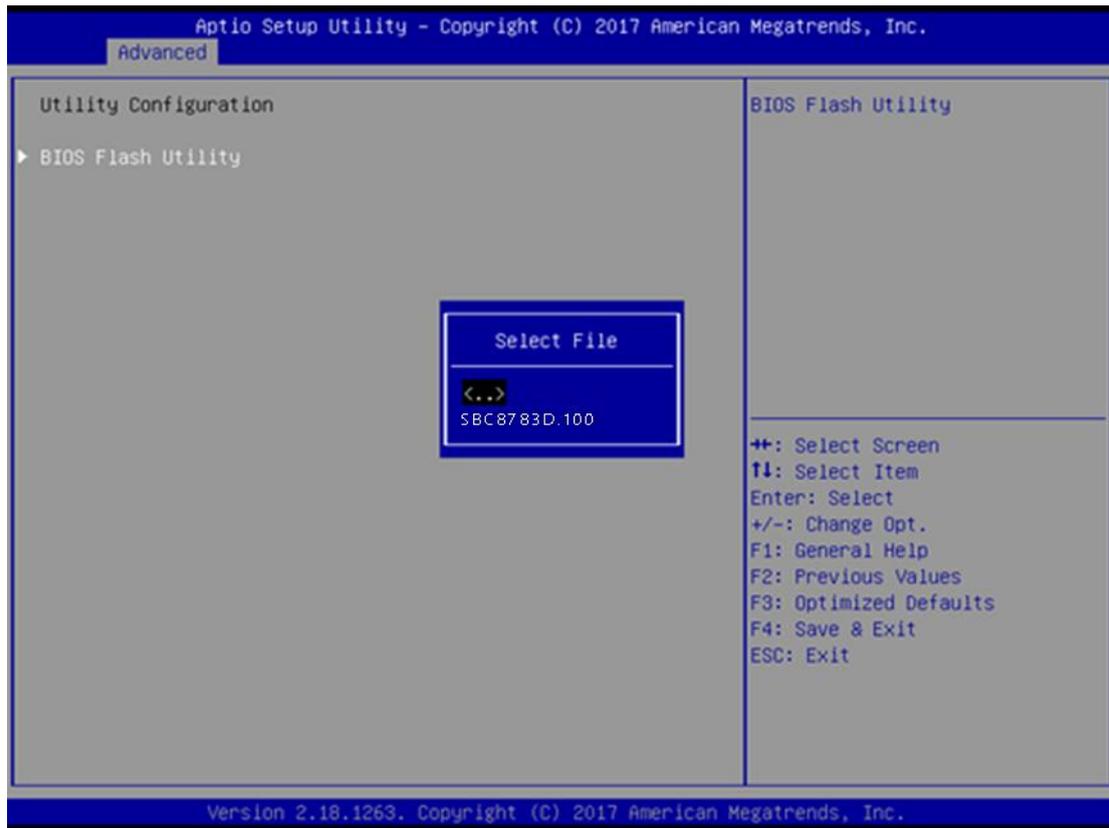
## Utility Configuration

BIOS flash utility is a tool for flash BIOS on setup menu, follow the step to flash BIOS.

1. Create a folder and rename to Axiomtek on the root of USB storage (Ex: X:\Axiomtek)
2. Copy BIOS file to the Axiomtek folder (Ex: X:\Axiomtek\SBC8783D.100)  
(Note : BIOS file name must contain the word SBC8783D)
3. Enter the BIOS flash utility and locate the BIOS file
4. Select "Start flash system BIOS"





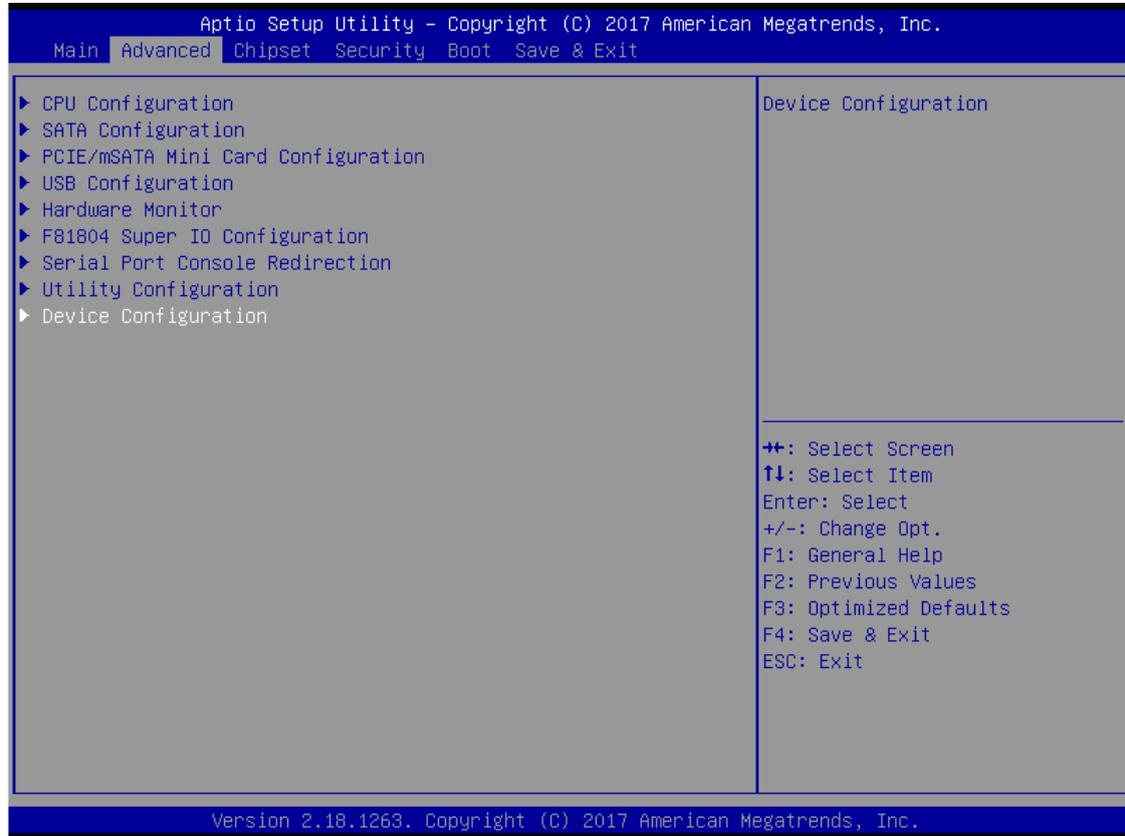


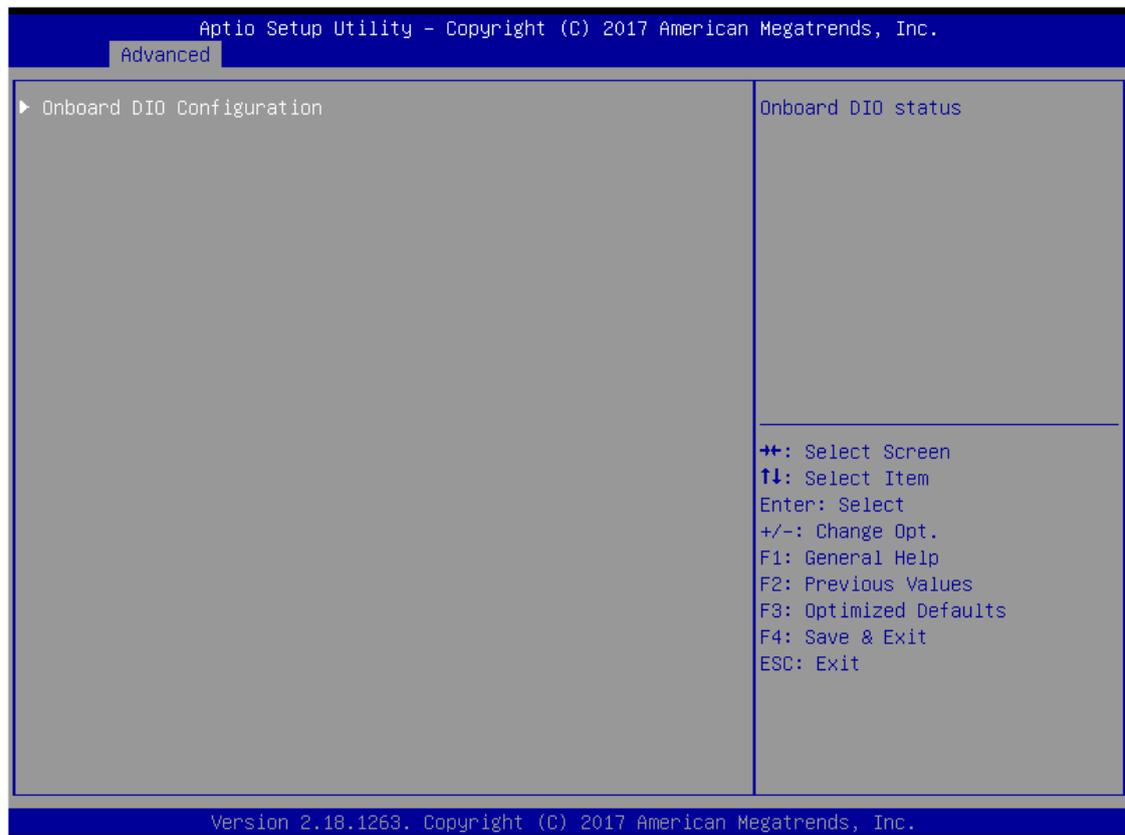
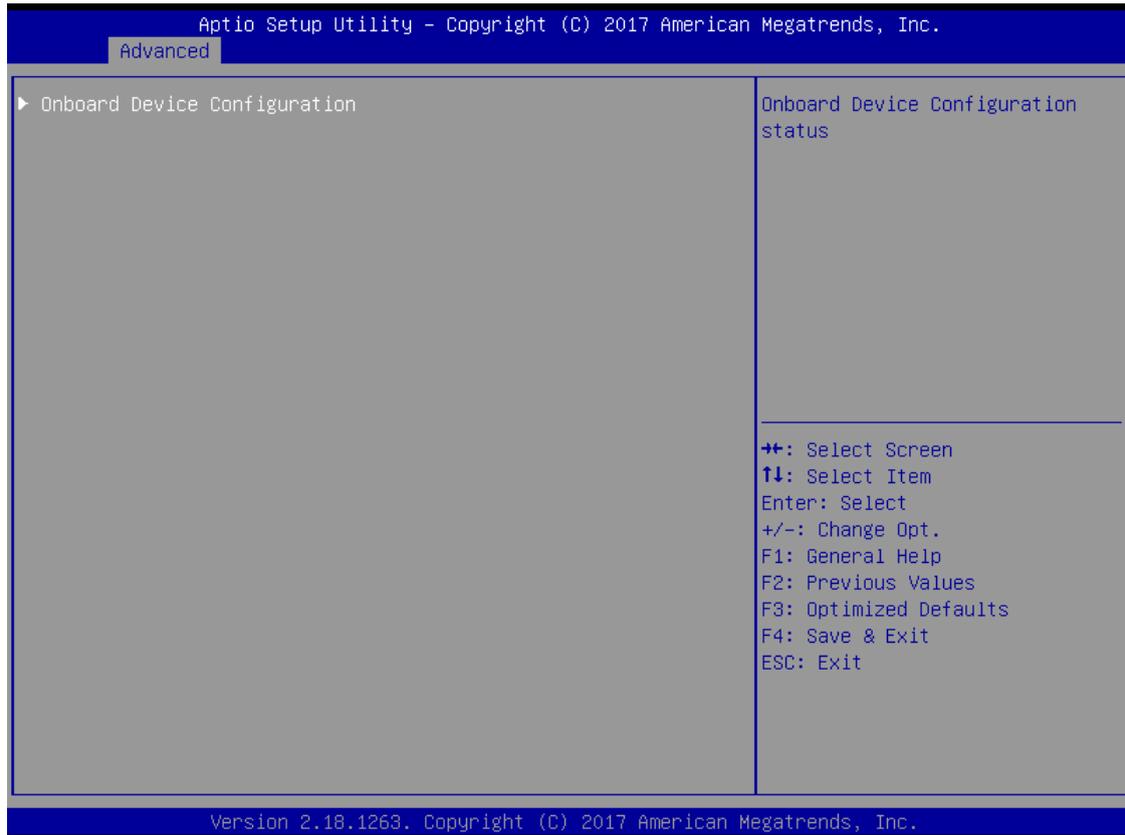
## DIO Configuration

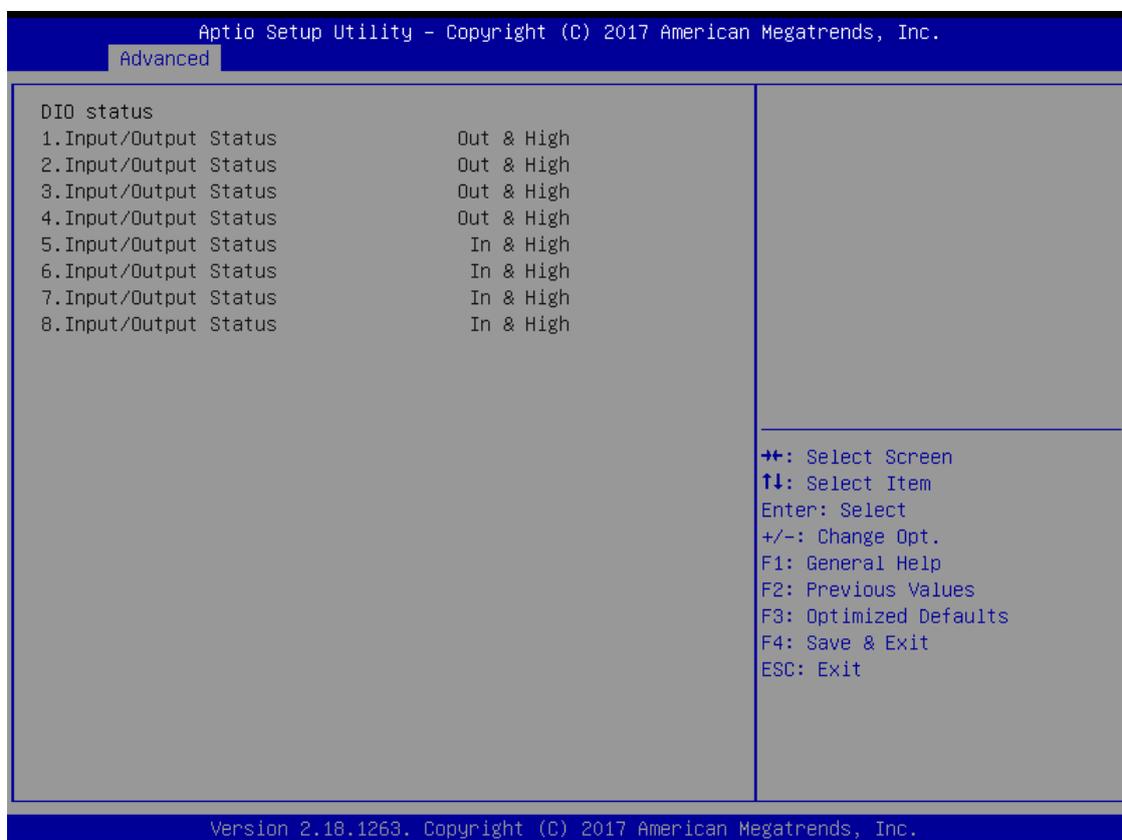
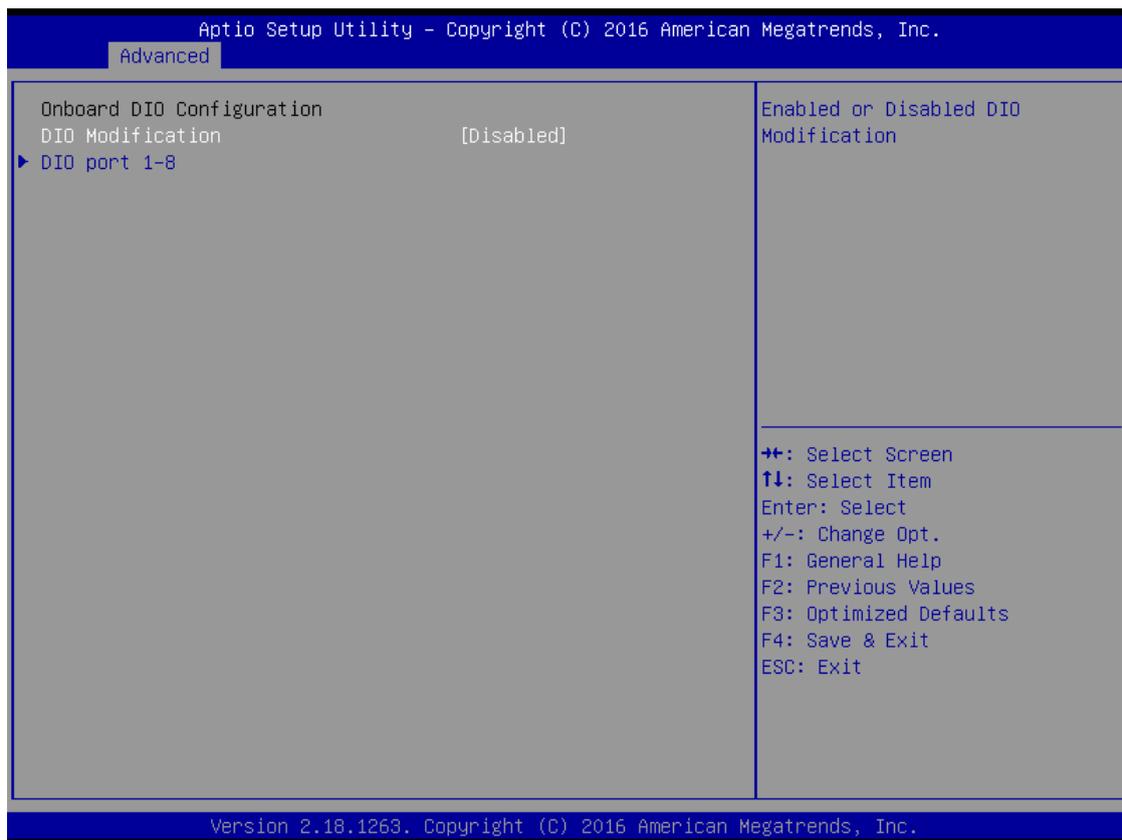
The DIO Modification default setting is “disable”.

If the setting is changed for “enable”, you can load manufacture default and program DIO setting.

(Please refer below graphics.)







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Advanced

Onboard DIO Configuration DIO Modification [Enabled] ▶ Load Manufacture Default ▶ DIO port 1-8	Enabled or Disabled DIO Modification          ++: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
---	--

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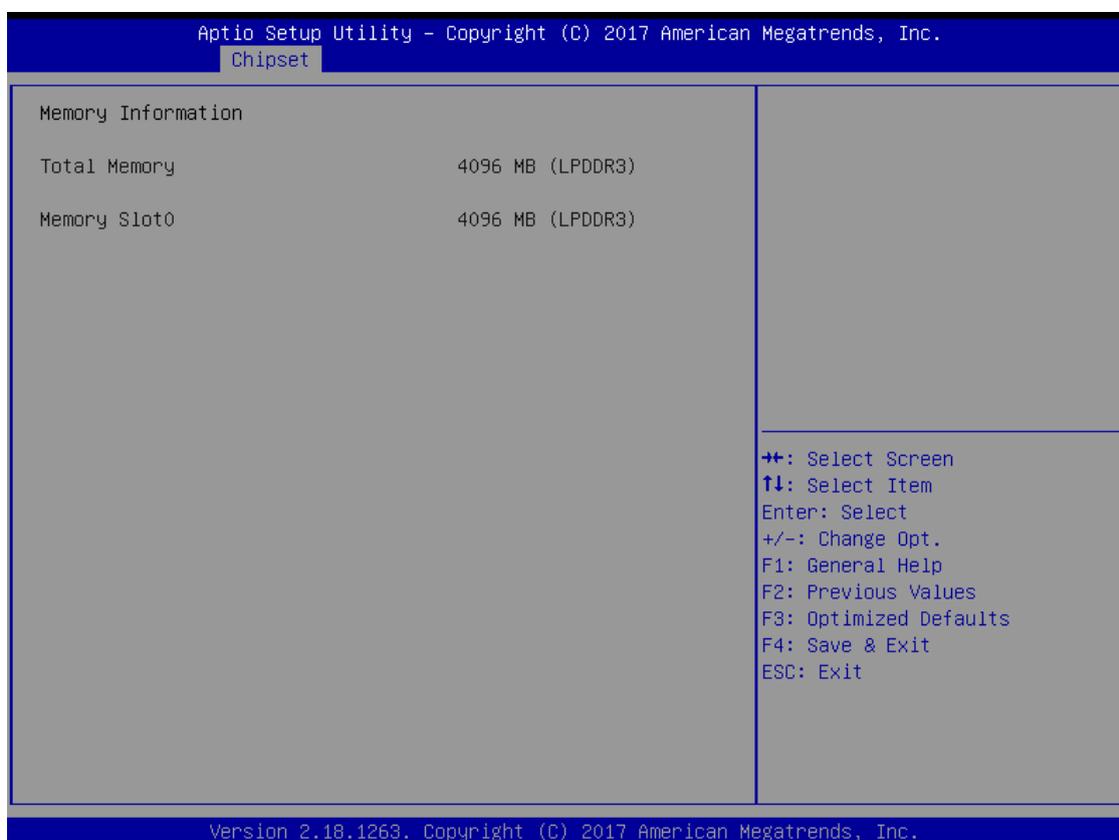
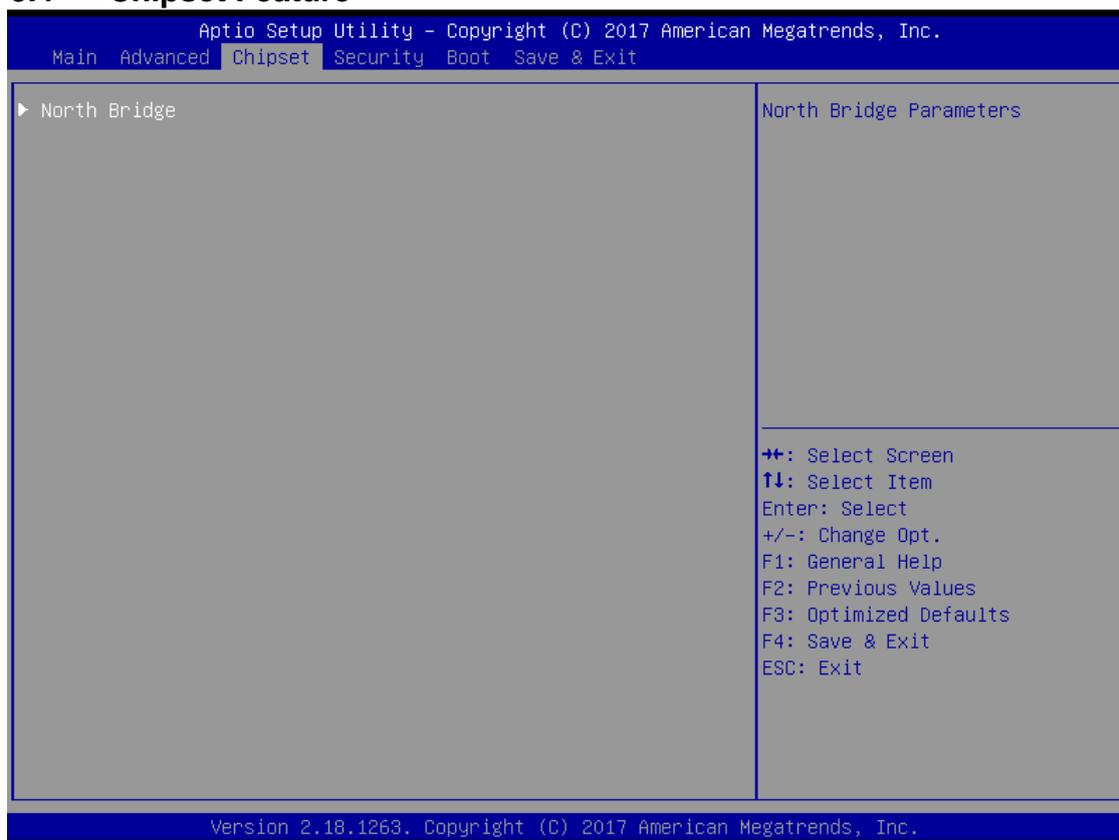
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Advanced

DIO status 1. Input/Output Status Out & High Input/Output Setting [Output] High/Low Setting [High] 2. Input/Output Status Out & High Input/Output Setting [Output] High/Low Setting [High] 3. Input/Output Status Out & High Input/Output Setting [Output] High/Low Setting [High] 4. Input/Output Status Out & High Input/Output Setting [Output] High/Low Setting [High] 5. Input/Output Status In & High Input/Output Setting [Input] 6. Input/Output Status In & High Input/Output Setting [Input] 7. Input/Output Status In & High Input/Output Setting [Input] 8. Input/Output Status In & High Input/Output Setting [Input]	Input/Output Setting          ++: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
--	--

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### 3.4 Chipset Feature



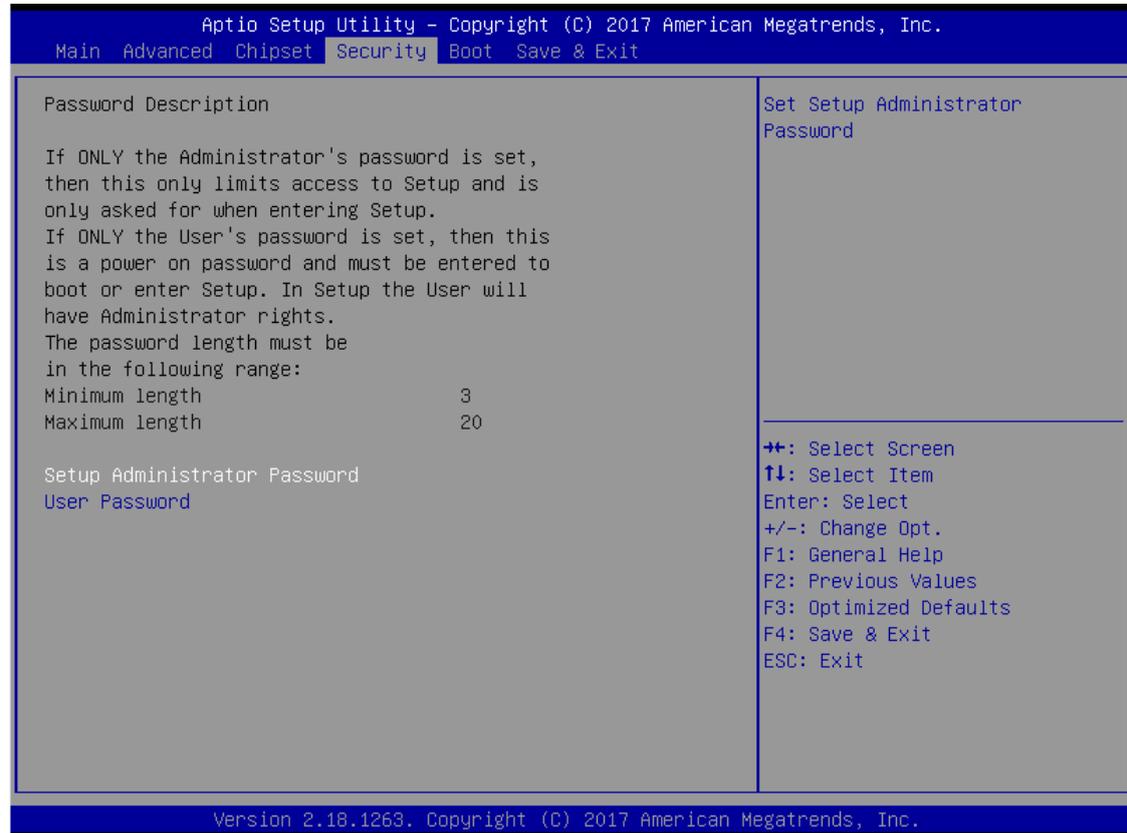
### 3.5 Security

The default setting for Administrator Password is “Not setting passwords”.

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

You can set the password for both Administrator Password and User Password.

(Please refer below graphics.)



**Note:** The BIOS default has no password, when user created the password, please remember the password number, if users forget password the RMA is the only solution.

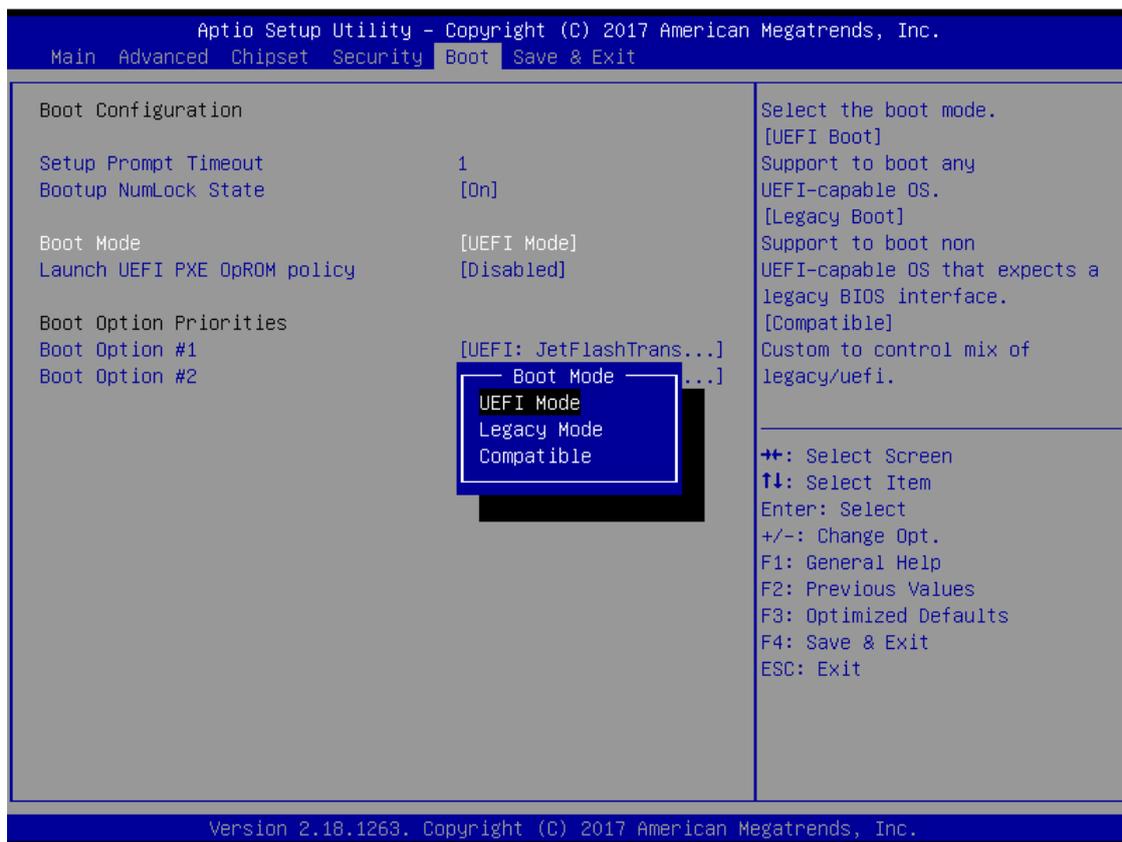
### 3.6 Boot Mode

Boot have UEFI,Legacy,Compatible mode can select .

The default setting boot mode is [UEFI Mode]

The default setting Launch UEFI PXE OpROM policy is [Disable]

(Please refer below graphics.)



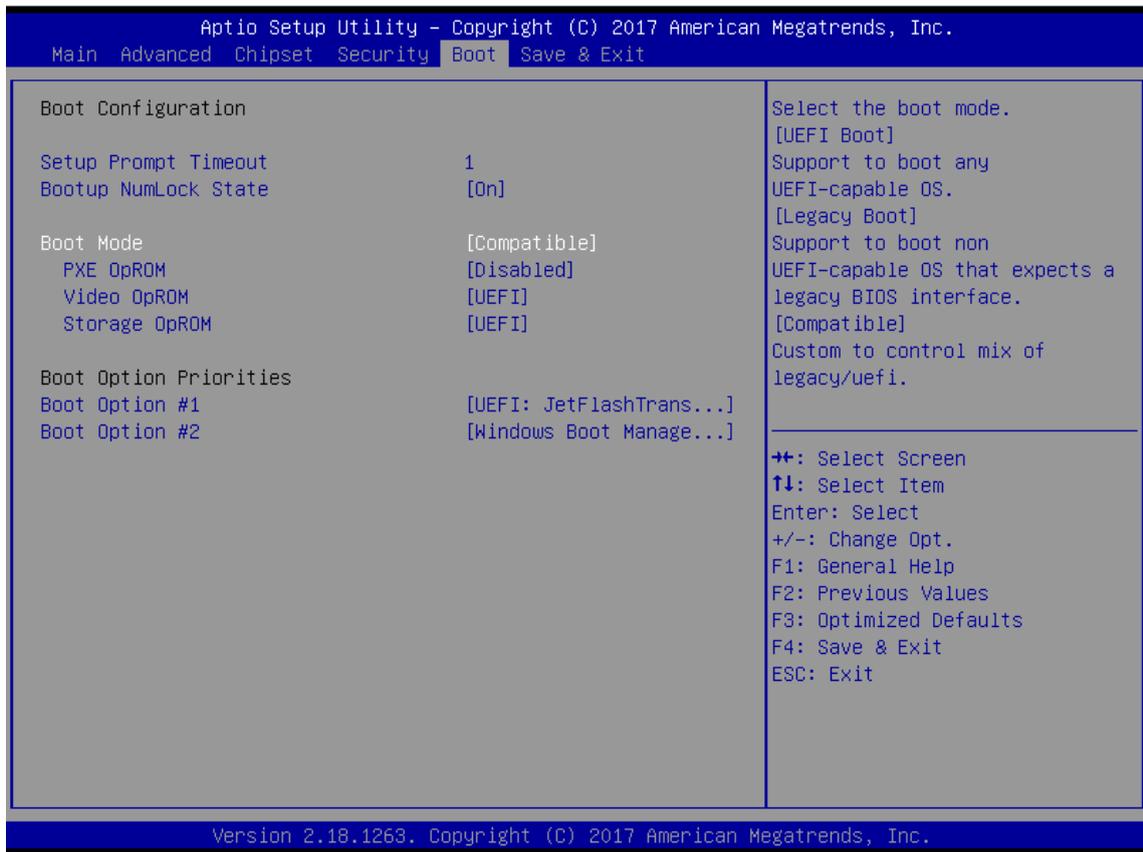
When select Compatible Mode

Compatiable Mode:When use PCIe to SATA device, option ROM can use this Mode setting.

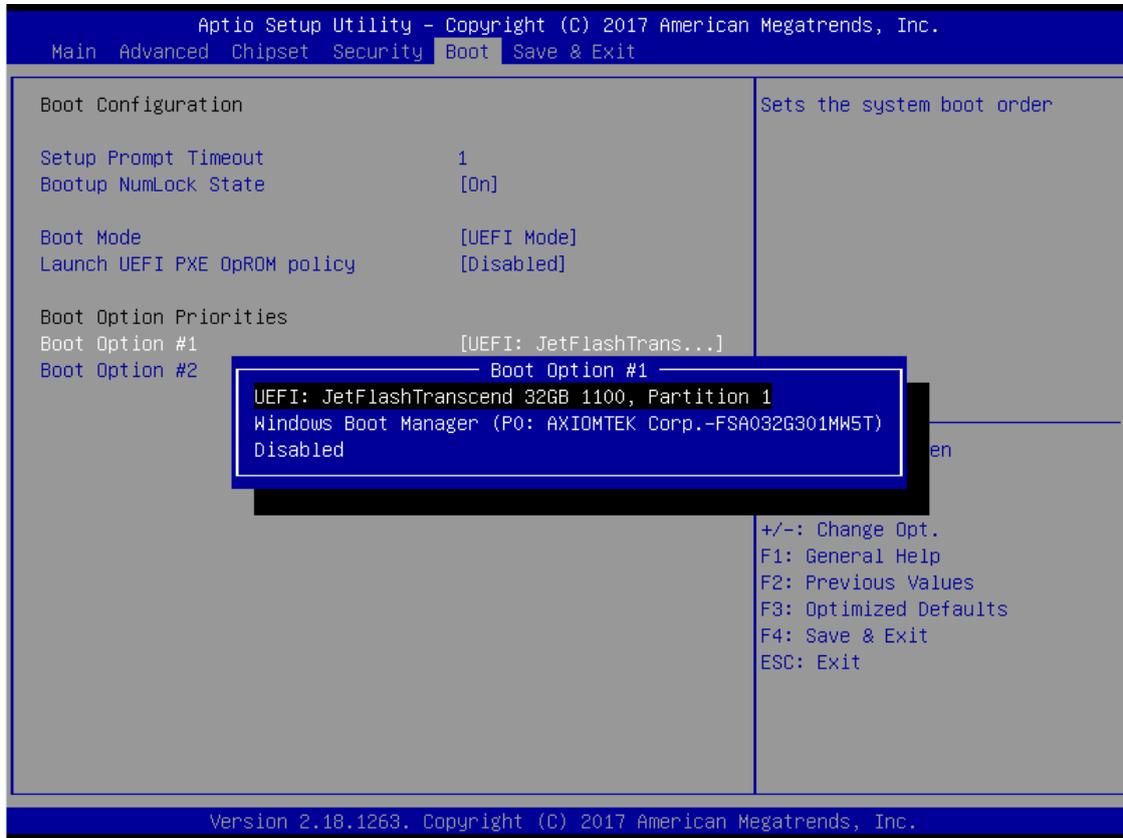
The default setting PXE OpROM is [Disable]

The default setting Video OpROM is [UEFI]

The default setting Video OpROM is [UEFI]



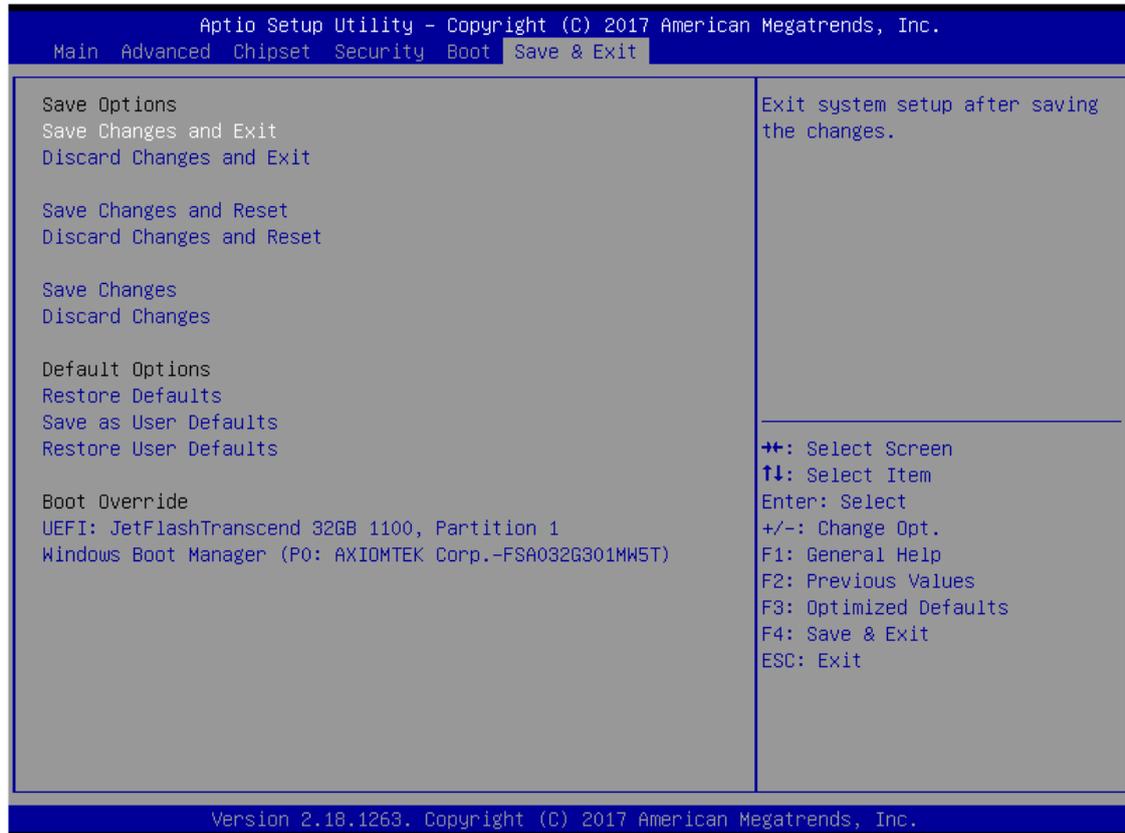
The Boot Option Priorities can select by Boot Option #1, #2..., If user is using a USB Device.  
(Please refer below graphics.)



### 3.7 Save & Exit

This section allows you to determine whether or not to accept your modifications. Type “Y” to quit the setup utility and save all changes. Type “N” to bring you back to the Previous Setup utility.

(Please refer below graphics.)



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## APPENDIX A WATCHDOG TIMER

### About Watchdog Timer

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

### How to Use Watchdog Timer

The following example enables configuration using debug tool.

Enable WDT



Enable configuration:

2E 87 ; Un-lock super I/O

2E 87



Select logic device:

2E 07 ; Select logic register

2F 07 ; Switch to WDT device



Set timer value:

2E F6 ; Select logic register

2F 05 ; Timer value 0~255 (Sec/Min) (Ex: 5)



Clear WDT status (optional):

2E F5 ;

2F 40



Set base timer:

2E F5

2F M ; M = 28h (Minute)

M = 20h (Second)