



®

AXIOMTEK

UST500-517-FL Series

Embedded System

User's Manual



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Safety Precautions

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

1. The UST500-517-FL does not come with an operating system which must be loaded first before installation of any software into the computer.
2. Be sure to ground yourself to prevent static charge when installing any 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 UST500-517-FL prior to making any installation. Be sure both the system and all external devices are turned OFF. Sudden surge of power could ruin sensitive components. Make sure the UST500-517-FL is properly grounded.
4. Make sure the voltage of the power source is correct before connecting it to any power outlet.
5. Turn OFF 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 equipment in an uncontrolled environment where the storage temperature is below -40°C or above 80°C as 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 discharge any static electricity on human body.
 - When handling boards and components, wear a grounding wrist strap available from most electronic component stores.

Classifications

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

General Cleaning Tips

Please keep the following precautions in mind while understanding the details fully before and during any cleaning of the computer and any components within.

A piece of dry cloth is ideal to clean the device.

1. Be cautious of any tiny removable components when using a vacuum cleaner to absorb dirt on the floor.
2. Turn the system off before clean up the computer or any components within.
3. Avoid dropping any components inside the computer or getting circuit board damp or wet.
4. For cleaning, be cautious of all kinds of cleaning solvents or chemicals which may cause allergy to certain individuals.
5. Keep foods, drinks or cigarettes away from the computer.

Cleaning Tools:

Although many companies have created products to help improve the process of cleaning computer and peripherals, users can also use house hold items accordingly for cleaning. Listed below are items available for cleaning computer or computer peripherals.

Pay special attention to components requiring designated products for cleaning as mentioned below.

- 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, it is recommended to use a piece of cloth.
- Water or rubbing alcohol: A piece of cloth may be somewhat moistened with water or rubbing alcohol before being rubbed on the computer. Unknown solvents may be harmful to plastic parts.
- Vacuum dust, dirt, hair, cigarette and other particles out of a computer can be one of the best methods of cleaning a computer. Over time these items may restrict the airflow in a computer and cause circuitry to corrode.
- Cotton swabs: Cotton swabs moistened with rubbing alcohol or water are applicable to reach areas in keyboard, mouse and other areas.
- Foam swabs: If possible, it is better to use lint free swabs such as foam swabs.



【Note】 : *It is strongly recommended that the user should shut down the system before starting to clean any single component.*

Please follow the steps below:

1. Close all application programs;
2. Close operating software;
3. Turn off power switch;
4. Remove all devices;
5. Pull out the power cable.

Scrap Computer Recycling

Please inform the nearest Axiomtek distributor as soon as possible for suitable solutions in case computers require maintenance or repair; or for recycling in case computers are out of order.

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#

SECTION 1 INTRODUCTION



▲ Front view



▲ Rear View 1 (16 RJ-45 LAN)

This section contains general information and detailed specifications of the UST500-517-FL. Section 1 consists of the following sub-sections:

- General Descriptions
- System Specifications
- Dimensions
- I/O Outlets
- Packing List
- Model List

1.1 General Descriptions

The UST500-517-FL is a fanless embedded system powered by 7th / 6th generation Intel® Core™ i7/i5/i3 and Celeron® processor (formally codenamed: Kaby Lake / Skylake) processor and comes with flexible I/O design. To fulfill different application needs, the flexible embedded system supports WE8S, WES7, Windows® 10 and Linux, and can be wall-mounted or Din-rail mounted as an optional request.

The UST500-517-FL is built with an IP40-rated heavy-duty aluminum extrusion, enabling reliable operation in harsh environments. Moreover, it features a wide range of 9 to 36V DC power input with power protection and -40 °C to +70 °C extended operating temperature. To help minimize deployment time, this fanless embedded PC supports one optional I/O door for customers to easily install additional I/O output, making it perfectly suitable for any industrial grade applications.

Features

- LGA1151 socket 7th / 6th generation Intel® Core™ i7/i5/i3 & Celeron® processor (Kaby Lake / Skylake) with Intel® Q170
- Supporting wide range of DC power input from 9 to 36VDC
- One DVI-D ,one HDMI and VGA with triple view supported
- Multiple flexible I/O modules supported

Reliable and Stable Design

The UST500-517-FL embedded system supports 7th / 6th generation Intel® Core™ i7/i5/i3 and Celeron® processors, high flexibility and multi-functional design is the best solution for any industrial field applications.

Flexible Connectivity

The UST500-517-FL comes with rich I/O interfaces including two RS-232/422/485 ports, four USB 3.0 ports, 6-CH digital I/O, and sixteen GbE LAN ports.

Embedded O.S. Supported

With Skylake processor, UST500-517-FL can support WIN 7/8/10 and Linux; with KabyLake processor, UST500-517-FL can support Windows® 10 64 Bit.

1.2 System Specifications

1.2.1 CPU

- **CPU**
 - LGA1151 socket 7th / 6th generation Intel® Core™ i7/i5/i3 & Celeron® processor, CPU TDP max. up to 35W/65W
 - Intel® Core™ i7-6700TE/ 7700T/7700 processor
 - Intel® Core™ i5-6500TE/ 7500T/7500 processor
 - Intel® Core™ i3-6100TE/ 7101TE processor
 - Intel® Celeron® G3900TE / G4400TE processor
- **Chipset**
 - Intel® Q170
- **BIOS**
 - American Megatrends Inc. UEFI (Unified Extensible Firmware Interface) BIOS.
- **System Memory**
 - Two 260-pin unbuffered DDR4-2133 MHz SO-DIMM socket, up to 32 GB at the maximum for 6th generation Intel® Core™ processor
 - Two 260-pin unbuffered DDR4-2400 MHz SO-DIMM socket, up to 32 GB at the maximum for 7th generation Intel® Core™ processor

I/O System

- **Display**
 - 1 x HDMI (Resolution:4K/2K@60Hz)
 - 1 x DVI-D (Resolution:4K/2K@60Hz)
 - 1 x VGA (Resolution: 1920X1200@@60Hz)
- **Ethernet**
 - 16 x 10/100/1000 RJ45 Ethernet ports (16 x I211-AT)
 - 8 x 10/100/1000 RJ45 and 8 x 10/100/1000 M12 Ethernet ports(16 x I211-AT)
- **USB Ports**
 - 4 x USB USB 3.0
- **Serial Ports**
 - 2 x RS-232/422/485 (COM1~2)
- **DIO**
 - Isolated programmable 6DI/ 2DO
- **Audio**
 - 1 x Audio (Mic-in/Line-out)
- **Mini Card Interface**
 - 2 x full-size PCI Express Mini Card Slots (USB + PCI Express signal)
 - 1 x half-size PCI Express Mini Card Slots(mSATA+USB + PCI Express signal)
 - 1 x half-size USB Mini Card Slots
- **Storage**
 - 2/4 x 2.5" SATA HDD/SSD drive tray1 x mSATA (optional)
 - 2 x SIM slot
- **Indicator**
 - 1 x Green LED as indicator for PWR status
 - 1 x Green LED as indicator for HDD active
 - 2 x Green LED as indicator for programmable
- **Switch**
 - 1 x AT Quick switch
 - 1 x Reset switch
- **Antenna**
 - 5 x SMA type connector openings for antenna

1.2.2 System Specifications

- **Watchdog Timer**
 - 1~255 seconds or minutes; up to 255 levels.
- **Power Supply**
 - 9~36VDC input (typical 24VDC input)
- **Operation Temperature**
 - -40 °C ~+70 °C (-40 °F ~ 158 °F), with W.T. SSD & Memory : Skylake/ Kaby Lake
- **Storage Temperature**
 - -40 °C ~+85 °C (-40 °F ~ 185 °F)
- **Humidity**
 - 10% ~ 95% (non-condensation)
- **Vibration Endurance**
 - 2Grm with SSD (5-500Hz, X, Y, Z directions)
- **Weight**
 - 4.92 kg (10.85 lb) without package
 - 5.75 kg (12.68 lb) with package
- **Dimension**
 - 4 SATA drive trays: 280 mm (11.02") (W) x 210.5 mm (8.27") (D) x 99.2 mm (3.91") (H)

1.2.3 Driver CD Contents

- Ethernet
- Chipset
- Graphic
- Serial Port
- USB 3.0
- Intel® ME
- Audio
- User's Manual
- Quick Manual

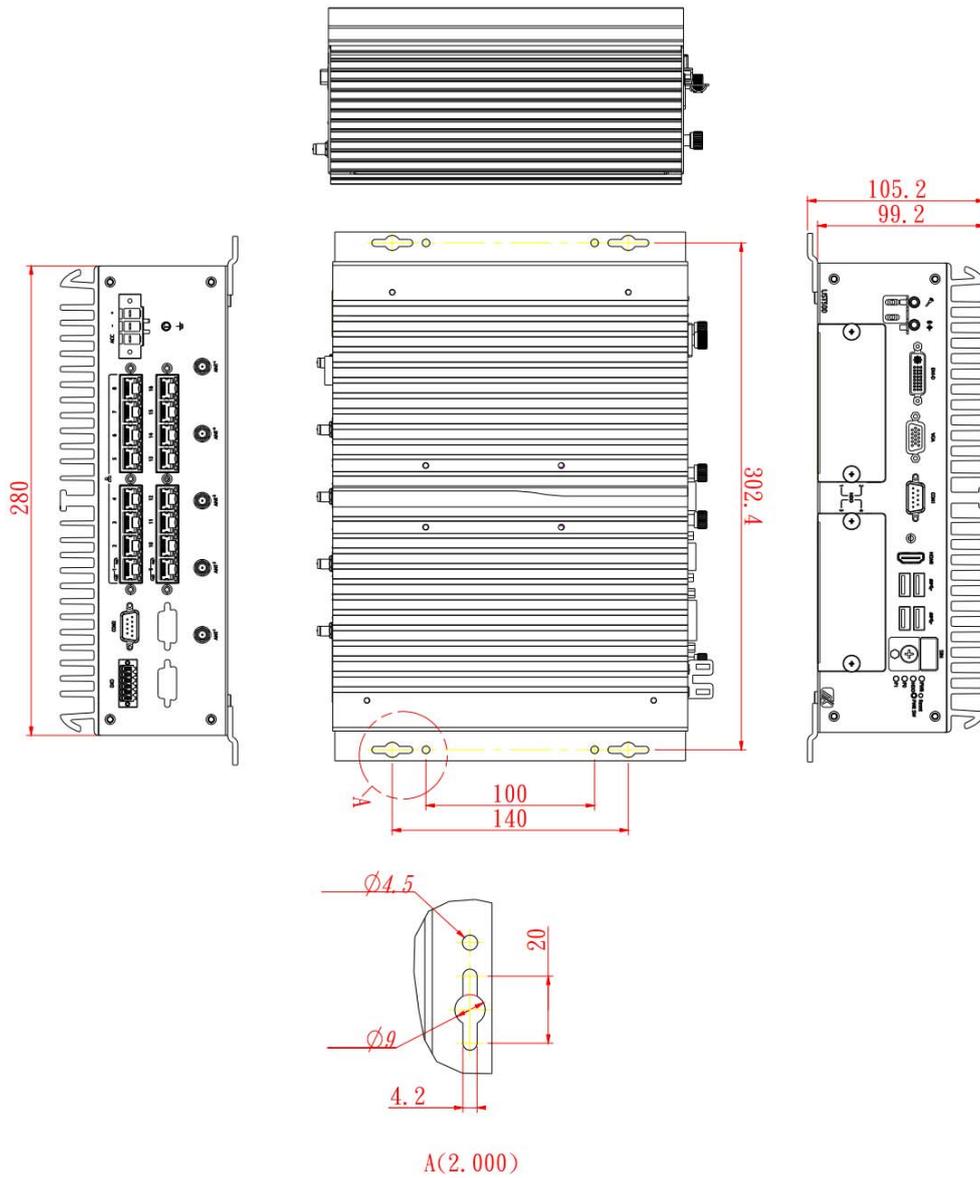


【Note】 : All specifications and images are subject to change without notice.

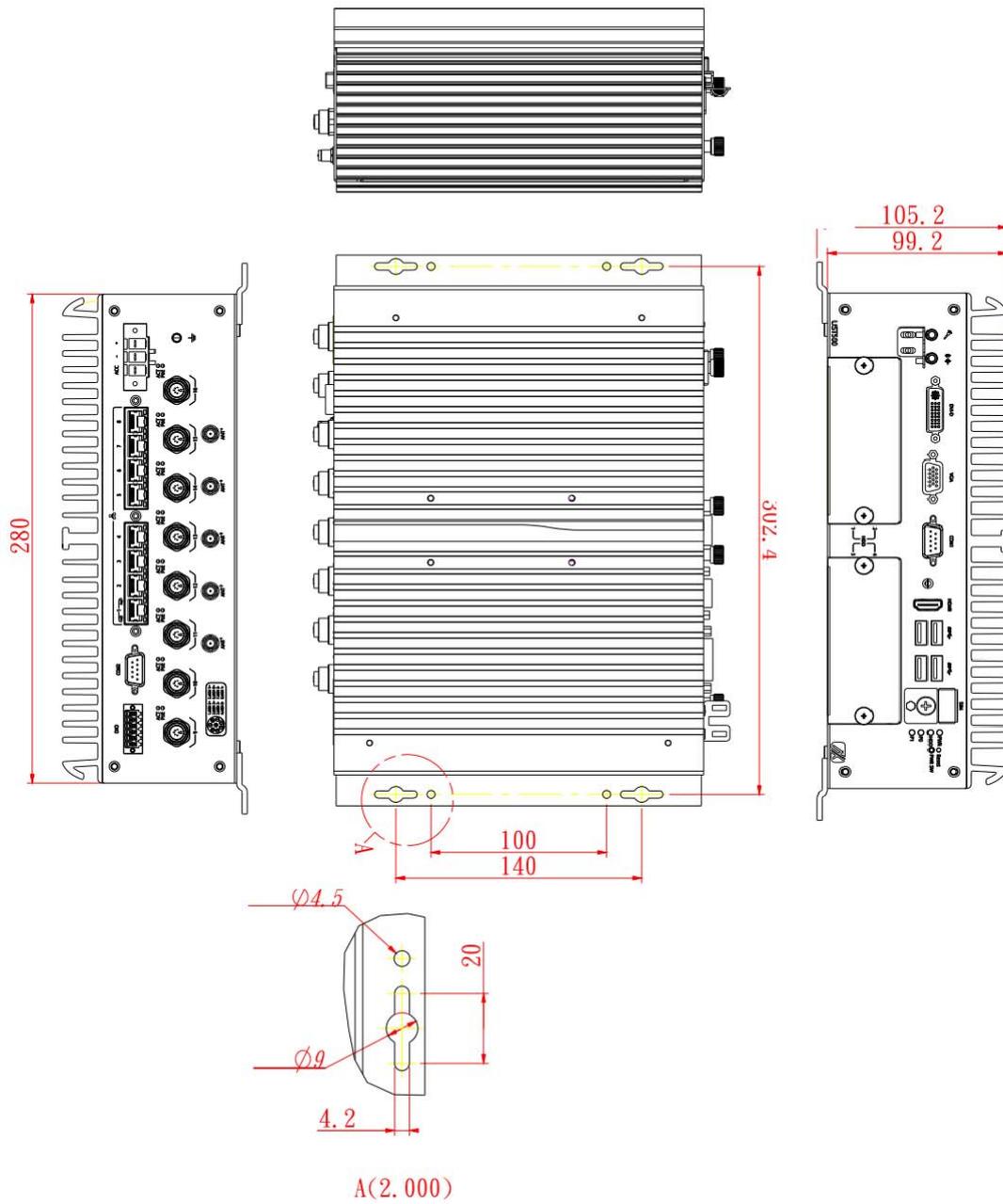
1.3 Dimensions

The following diagrams show the dimensions and outlines of the UST500-517-FL.

1.3.1 UST500-517-FL-16RJ-4SATA-TDC Dimensions



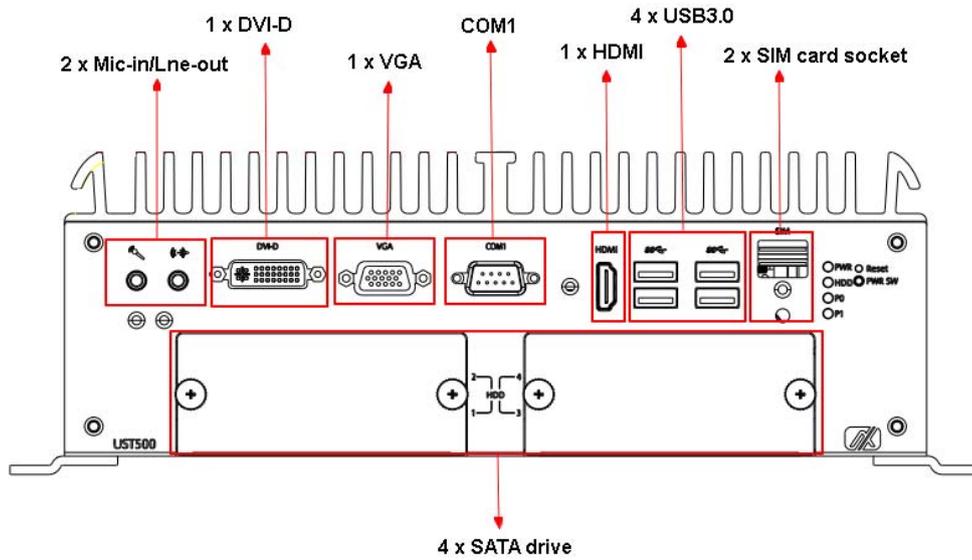
1.3.2 UST500-517-FL-8RJ8M12-4SATA-TDC Dimensions



1.4 I/O Outlets

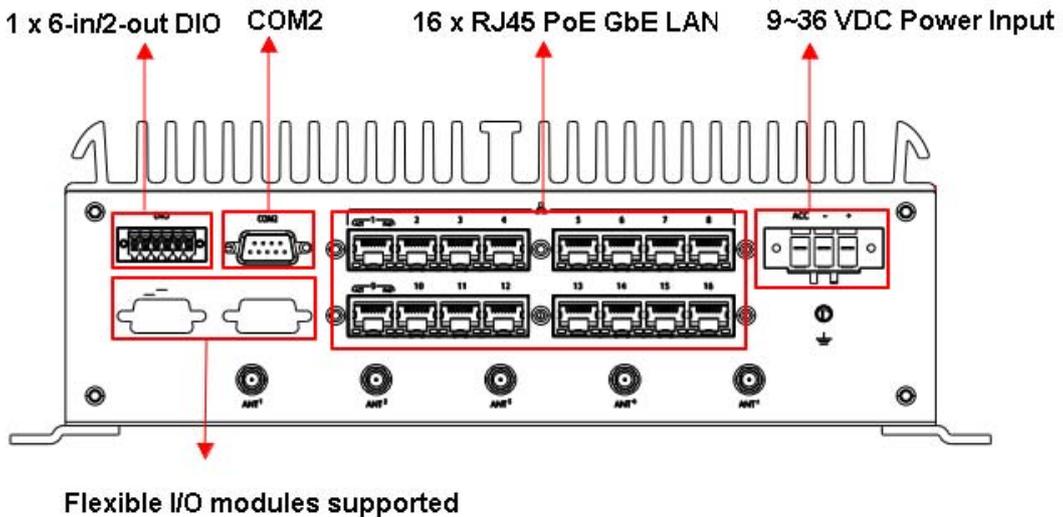
The following figures show I/O outlets on the UST500-517-FL.

Front View

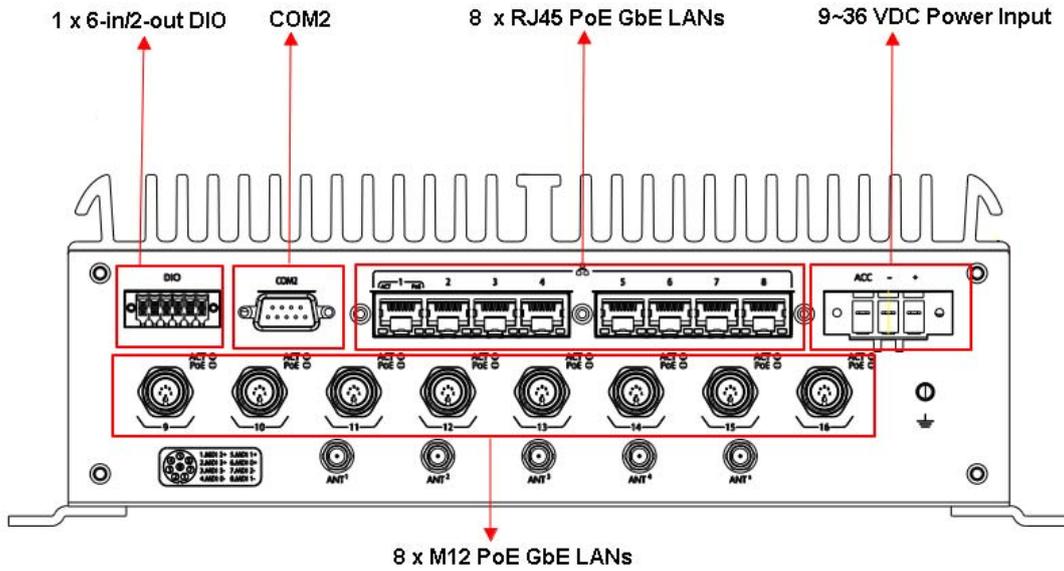


Rear View

UST500-517-FL-16RJ-4SATA-TDC



UST500-517-FL-8RJ8M12-4SATA-TDC



1.5 Packing List

The UST500-517-FL comes with the following bundle package:

- UST500-517-FL System Unit x 1
- Quick Installation Guide x 1
- DVD x 1 (For Drivers and Manual)
- CPU Grease x 1
- Audio Cable Fixed x 1
- HDMI Cable Fixed x 1
- Cable Fixed screws x 3
- Cable tie x 3
- HDD screws x 16
- Terminal Block x 1
- Programming DI/DO Connector x 1
- Wall mount kit x1
- Wall mount kit screw (round head) x 4
- Mini Card Slot screw x 8

1.6 Model List

UST500-517-FL-16RJ-4SATA-TDC	Fanless embedded system with 6/7th gen Intel® desktop processor (LGA1151), Q170, VGA, DVI-D, HDMI, 6-in/2-out DIO, 2 COM, 4 USB 3.0, 16 RJ-45 PoE GbE LAN, 4 SATA drives and ACC ignition.
UST500-517-FL-8RJ8M12-4SATA-TDC	Fanless embedded system with 6/7th gen Intel® desktop processor (LGA1151), Q170, VGA, DVI-D, HDMI, 6-in/2-out DIO, 2 COM, 4 USB 3.0, 8 M12 & 8 RJ-45 PoE GbE LAN, 4 SATA drives and ACC ignition.

Please contact an Axiomtek distributor immediately if any of the abovementioned item is missing.

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SECTION 2 HARDWARE INSTALLATION

The UST500-517-FL is convenient for various hardware configurations, such as CPU, DRAM, HDD (Hard Disk Drive), SSD (Solid State Drive), and PCI Express Mini card modules. Section 2 contains guidelines for hardware installation.

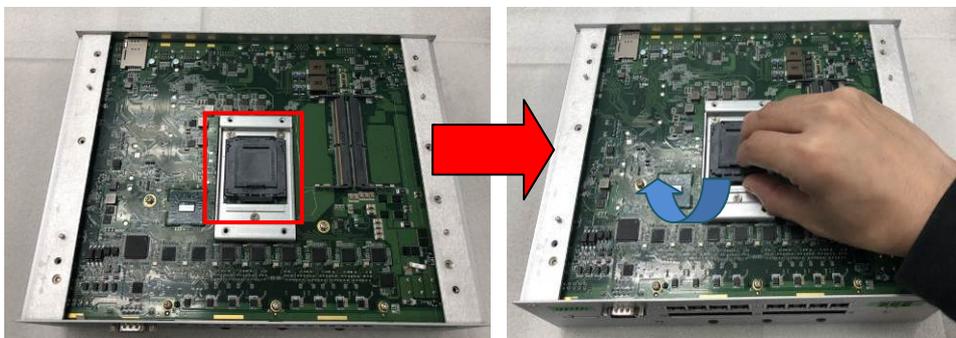
2.1 Installing of CPU

Step 1 Turn off the system and unplug the power cord.

Step 2 Loosen all screws to remove the top cover.



Step 3 Take the protective cover down carefully.

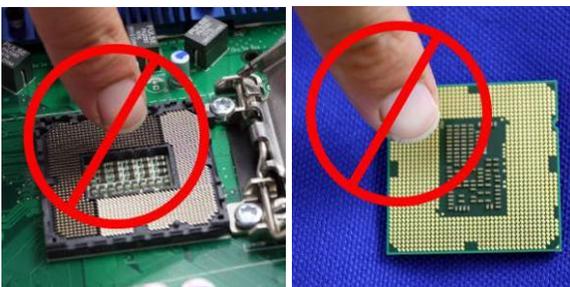
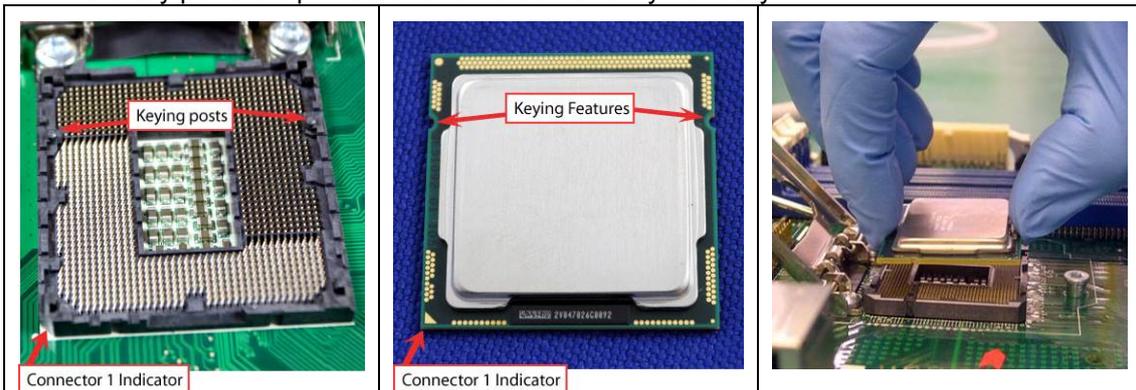


Step 4 CPU installation steps:

- Lift the processor package from shipping media by grasping the substrate edges.



- Scan the processor package gold pads for any presence of foreign material.
- Locate connection 1 indicator on the processor which aligns with connection 1 indicator chamfer on the socket, and notice processor keying features that line up with posts along socket walls.
- Grasp the processor with the thumb and index finger along the top and bottom edges. The socket will have cutouts for your fingers to fit into.
- Carefully place the processor into the socket body vertically.

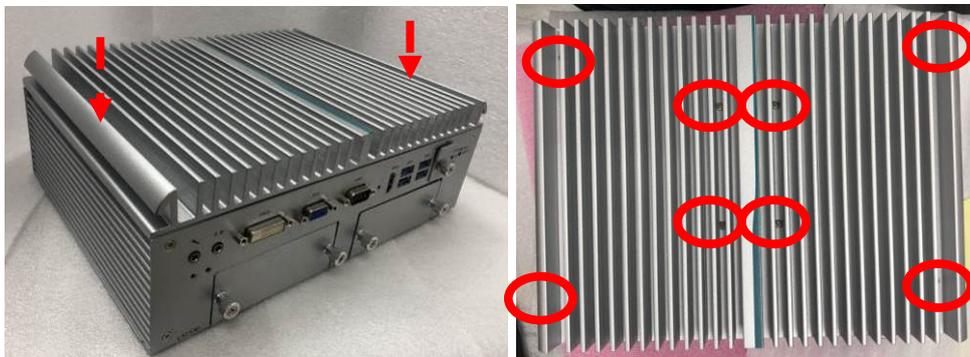


To avoid damage, never touch the fragile contacts of the socket and the processor at any time during installation.

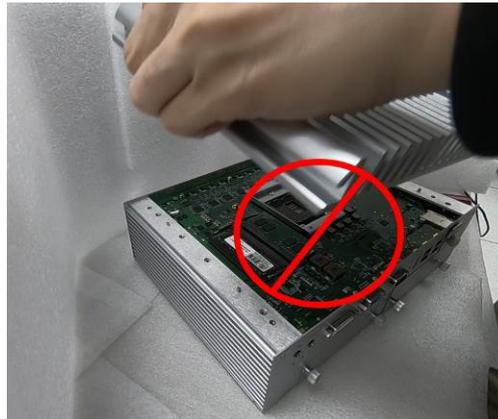
Step 5 When installing the CPU, pay attention to the CPU's orientation and align the arrow mark on the CPU with the arrow key on the socket (Step 4). And apply the thermal grease evenly on top of the processor.



Step 6 Put the top cover and fasten four screws back onto the system.



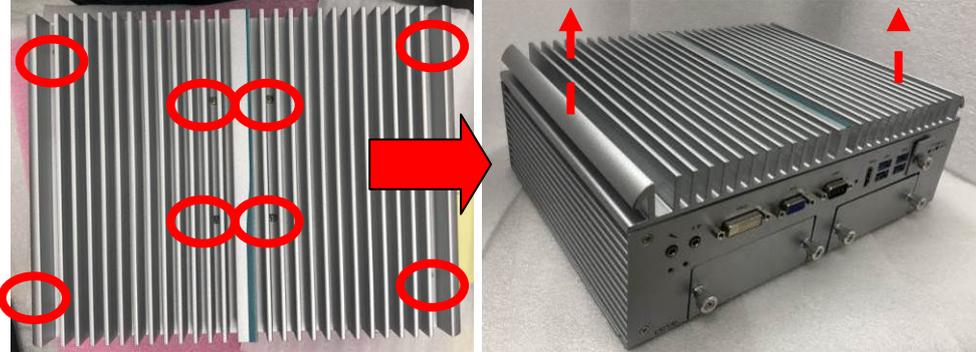
【Note】 When removing the top cover to change accessories, the CPU will stick on the underside of the cover. To avoid damaging the CPU by squeezing, please take it down carefully by holding the edges of the CPU and follow section 2.1 to reinstall..



2.2 Installing of SO-DIMM

Step 1 Turn off the system and unplug the power cord.

Step 2 Loosen all screws to remove the top cover.



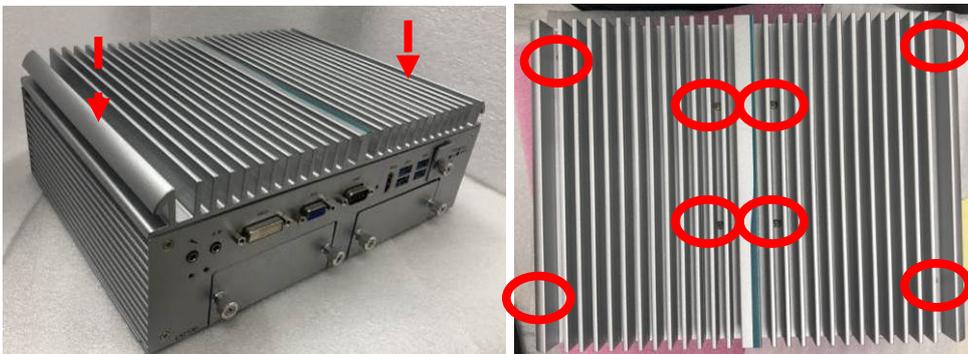
Step 3 Located the dual SO-DIMM sockets on the main board.



Step 4 Insert the gold colored contact of the memory module into the socket and push the module's two end latches down until locked.



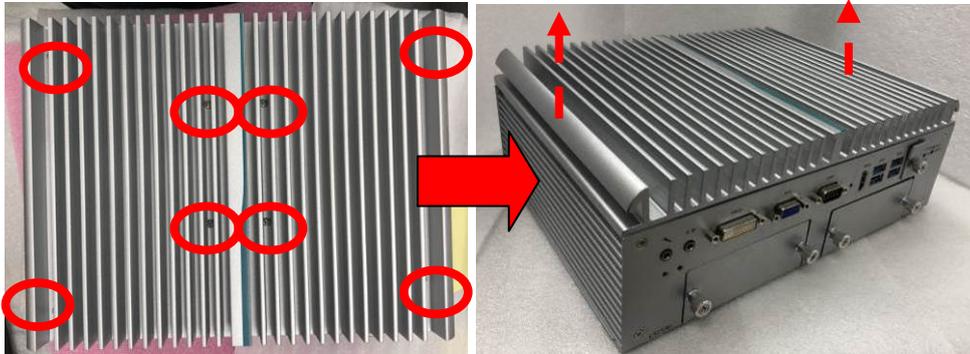
Step 5 Put the top cover and fasten all screws back onto the system.



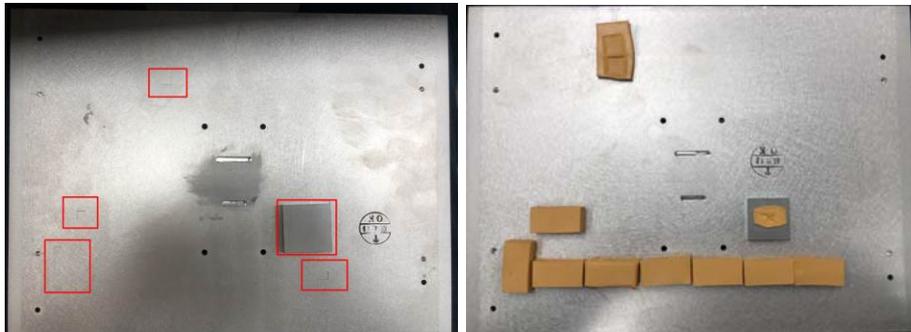
2.3 Installing of thermal pad

Step 1 Turn off the system and unplug the power cord.

Step 2 Loosen all screws to remove the top cover.



Step 3 Put the thermal pads on the secant locations.



【Note】 It is suggested that the thermal pads be put on the motherboard's corresponding positions as shown.



2.4 Installing of 2.5" SATA Device

Step 1 Turn off the system and unplug the power cord.

Step 2 Loosen all of the SATA drive tray's screws.



Step 3 Extract the SATA drive tray. Each drive tray can install two storage drives.



Step 4 Turn the SATA drive tray upside down to install SSD/HDD and fasten the eight screws to secure the SATA drive tray.



Step 5 Slide the secured SATA drive tray back into the system and fasten the screws tight to complete the installation.



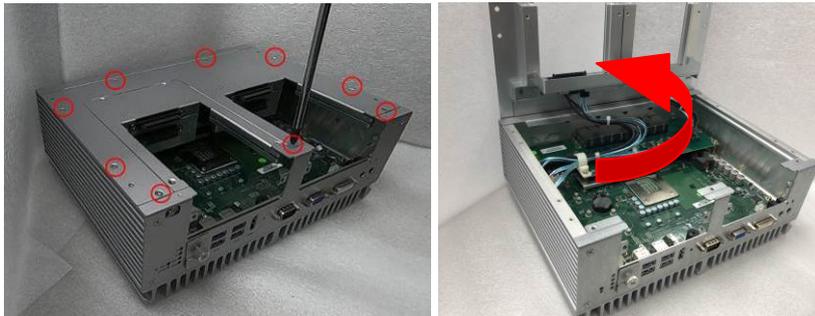
2.5 Installing of Mini PCIe Module

Step 1 Turn off the system and unplug the power cord.

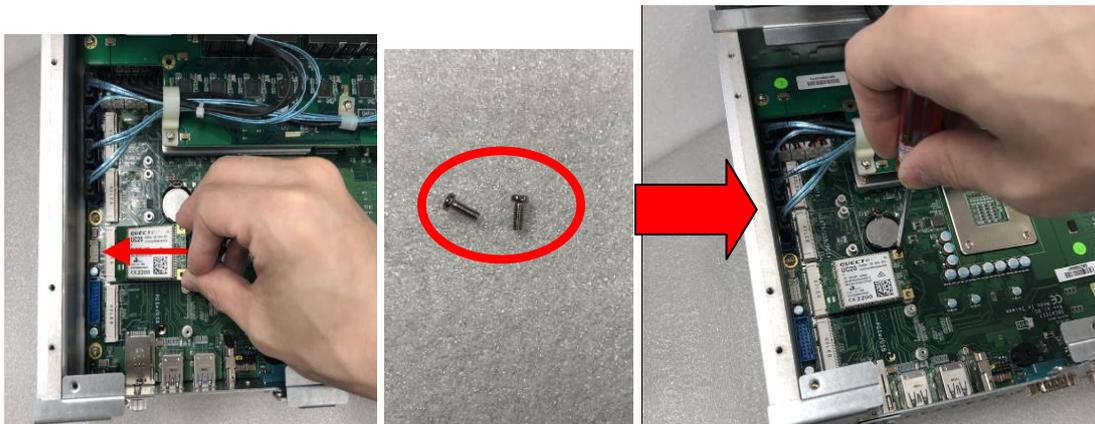
Step 2 Turn the system upside down and loosen the SATA tray screws.

Step 3 Extract the SATA tray on the left side as shown.

Step 4 Loosen all screws and open the cover carefully.



Step 5 Insert the PCIe card and fasten the screws as shown



Step 6 Secure the cover back to original position and fasten all screws tight.



Step 7 Slide the secured SATA tray back and fasten screws tight to complete the installation.



2.6 Installing 4G/3G Module

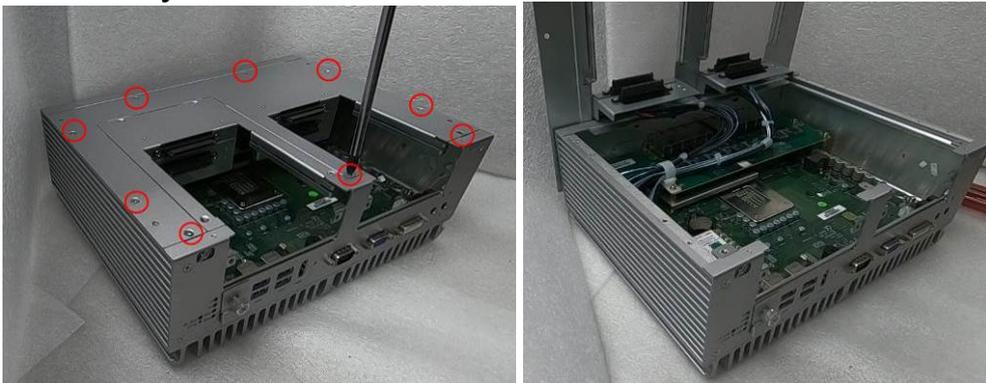
Step 1 Turn off the system and unplug the power cord.

Step 2 Turn the system upside down, and loosen the SATA tray screws



Step 3 Extract all SATA trays.

Step 4 Loosen nine bottom cover screws as shown and open the cover carefully



Step 5 Insert the wireless module(3G/4G/BT/GPS module etc.) into the slot with the marking "PCIe / USB".

Step 6 For instance, insert the 3G module and screws it tight.



Step 7 Remove the black plastic antenna plug cover from the rear panel.



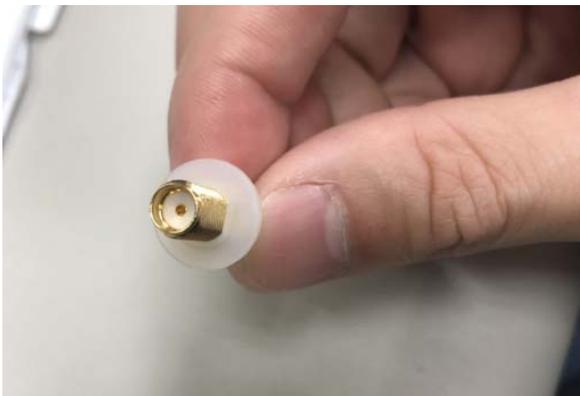
Step 8 Connect the RF cable to the connector of the 3G module marked with "MAIN".



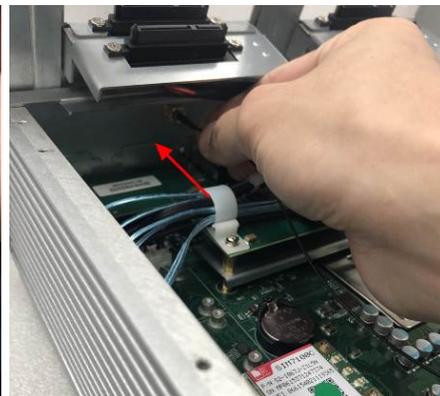
Step 9 Take plastic spacers to RF cable (Figure 1) (Figure 2) and make the other end of the RF cable through the antenna hole (Figure 3).



(Figure 1)



(Figure 2)



(Figure 3)

Step 10 Setting another plastic spacers(Figure 5) and screw it tight with the fastening nutsparts(Figure 4)(Figure 6) (Figure 7).



(Figure 4)



(Figure 5)

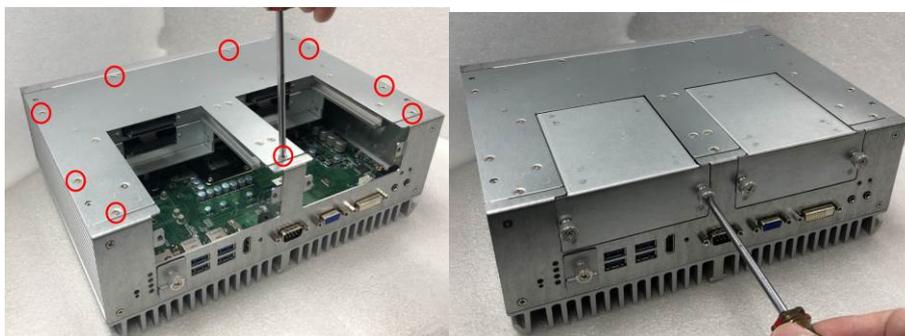
(Figure 6)



(Figure 7)

Step11 Put the cover back onto the system, and fasten nine bottom screws tight.

Step12 Slide and secure SATA trays back to complete the installation.



Step13 Turn the system upside down, and screw the RF antenna tight.



Step14 Loosen the SIM cover screws and insert the SIM card.



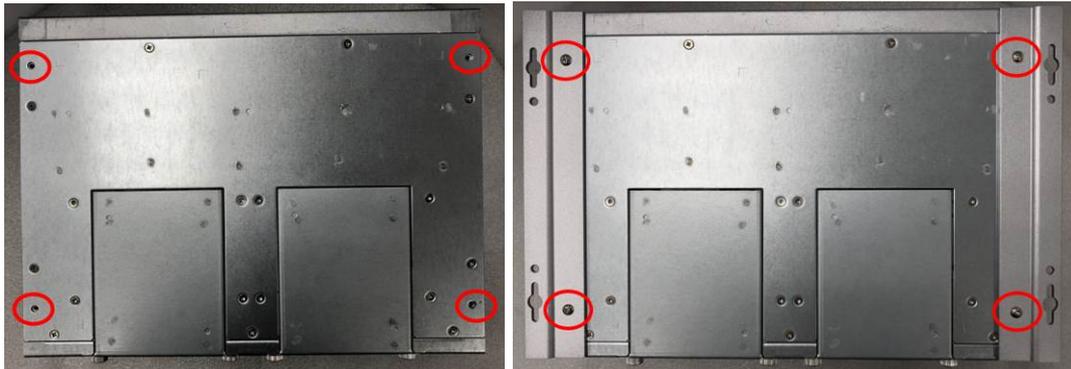
【Note】 The system provides two PCIe slots for SIM card installation. Pay attention to the orientation when inserting a SIM card: The SIM card's contacts must face downward when the card is being inserted into the SIM1 slot; the card's contacts must face upward when it is being inserted into the SIM2 slot.





2.7 Installing the Wall Mount Kit

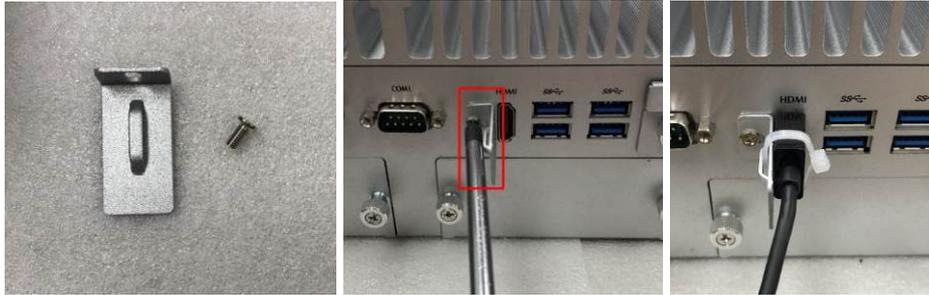
- Step 1 Turn off the system and unplug the power cord.
- Step 2 Turn the system upside down to locate four screw holes reserved for the wall mount at the bottom.
- Step 3 Take the wall mount with the high side facing up and fasten screws tightly as below shown to complete the installation.



2.8 Installing the Cable Fixing Plate

2.8.1 Installing the HDMI Cable Fixing Plate

- Step 1** Turn off the system and unplug the power cord.
- Step 2** To fasten the HDMI cable fixing plate to the system, position the hole on the plate against the hole on the system, insert the screw into the holes, and turn the screw tightly to fasten the plate, as shown below.
- Step 3** Insert the HDMI cable through the loop of the plate, and then use a cable tie to bind the HDMI cable together.



2.8.2 Audio Cable Installation

- Step 1** Turn off the system and unplug the power cord.
- Step 2** To fasten the audio cable fixing plate to the system, position the hole on the plate against the hole on the system, insert the screw into the holes, and turn the screw tightly to fasten the plate, as shown below.
- Step 3** Insert the audio cable through the loop of the plate, and then use a cable tie to bind the audio cable together



SECTION 3

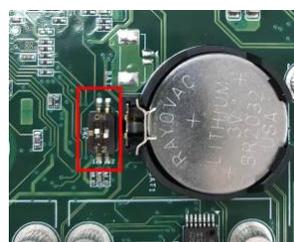
DIP SWITCH & CONNECTOR SETTINGS

Proper DIP Switch settings configure the UST500-517-FL to meet various application needs. Hereby all jumper settings along with their default settings are listed for devices onboard.

3.1 Summary of DIP Switch Settings

Proper DIP Switch settings configure the UST500-517-FL to meet various application purposes. The table below lists all jumpers and their default settings.

SW2	Descriptions	Settings
SW2 (1)	For CN15 mSATA mode (Defaults) Default: SW2 switches PIN1 ON	ON
SW2 (1)	For CN15 PCIe mode (Optional) Default: SW2 switches PIN1 Off	OFF
SW2 (2)	Restore BIOS Optimal Defaults Default: SW2 switches PIN2 ON	ON
SW2 (2)	BIOS Normal Operation (Default Setting)	OFF



3.2 Connectors

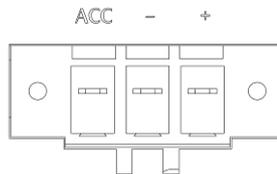
Please refer to pin assignments below:

External Connectors	Sections
DC-in Phoenix Power Connector	3.2.1
HDMI Connector	3.2.2
DVI-D Connector	3.2.3
VGA	3.2.4
Serial Port Connector	3.2.5
Ethernet Connector	3.2.6
USB 3.0 Connector	3.2.7
Audio Connector	3.2.8
Digital I/O Connector	3.2.9
ATX Power On/Off Button	3.2.10
Rest Button	3.2.11
Internal Connectors	Sections
Serial ATA (SATA) Connector	3.2.12
SATA Power Connector	3.2.13
SIM Card Slot (S1~S2)	3.2.14
Full-Size Express Mini Card slot (CN10,CN12)	3.2.15
Half-Size Express Mini Card slot (CN15,CN16)	3.2.16

3.2.1 DC-in Phoenix Power Connector

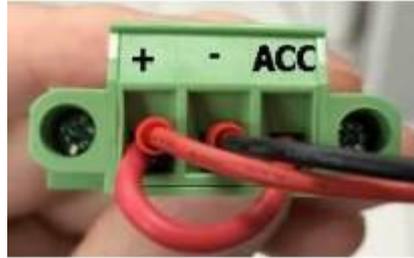
The system supports the 9~36V (Default 12/24V) Phoenix DC-in connector for system power input.

Pins	Signals
1	DC+
2	GND
3	ACC (Accessory Power)





【 Note 】 When not using ACC, please refer to the connection mode illustrated below. When system up to 150w, suggest to use 16AWG power wire

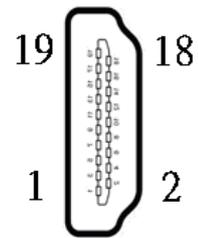


(ACC connects to DC+ to disable the ACC function)

3.2.2 HDMI Connector

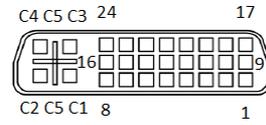
The HDMI (High-Definition Multimedia Interface) is a compact digital interface which is capable of transmitting high-definition video and high-resolution audio over a single cable.

Pins	Signals	Pins	Signals
1	HDMI OUT_DATA2+	11	GND
2	GND	12	HDMI OUT Clock-
3	HDMI OUT_DATA2-	13	N.C.
4	HDMI OUT_DATA1+	14	N.C.
5	GND	15	HDMI OUT_SCL
6	HDMI OUT_DATA1-	16	HDMI OUT_SDA
7	HDMI OUT_DATA0+	17	GND
8	GND	18	+5V
9	HDMI OUT_DATA0-	19	HDMI_HTPLG
10	HDMI OUT Clock+		



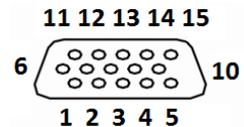
3.2.3 DVI-D

Pins	Signals	Pins	Signals
1	TMDS Data 2-	2	TMDS Data 2+
3	GND	4	CRT_SPD_Clock
5	CRT_SPD_Data	6	DVI_SPD_Clock
7	DVI_SPD_Data	8	Analog Vsync
9	TMDS Data 1-	10	TMDS Data 1+
11	GND	12	N.C
13	N.C	14	+5V
15	GND	16	Hot Plug Detect
17	TMDS Data 0-	18	TMDS Data 0+
19	GND	20	N.C
21	N.C	22	GND
23	TMDS Clock+	24	TMDS Clock-
C1	Analog RED	C2	Analog Green
C3	Analog Blue	C4	Analog Hsync
C5	GND		



3.2.4 VGA

Pins	Signals	Pins	Signals
1	Red	2	Green
3	Blue	4	N.C.
5	GND	6	GND
7	GND	8	GND
9	VCC	10	GND
11	N.C.	12	DDC DATA
13	Horizontal Sync	14	Vertical Sync
15	DDC CLK		





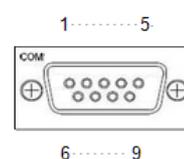
【Note】 While using HDMI as a main monitor and VGA as a secondary monitor in

dual monitors scenario, a keyboard is needed  +   to move “Graphics control panel settings” to main monitor in order to set the priorities of monitors.

3.2.5 Serial Port Connector(COM1~COM2)

The system has four serial ports. COM1~COM2 are RS-232/422/485 ports. Please refer to Chapter 4 for detailed BIOS settings.

Pins	RS-232	RS-422	RS-485
1	DCD, Data carrier detect	TX-	Data-
2	RXD, Receive data	TX+	Data+
3	TXD, Transmit data	RX+	NC
4	DTR, Data terminal ready	RX-	NC
5	GND, ground	GND, ground	GND, ground
6	DSR, Data set ready	NC	NC
7	RTS, Request to send	NC	NC
8	CTS, Clear to send	NC	NC
9	RI, Ring indicator	NC	NC
10	NC	NC	NC



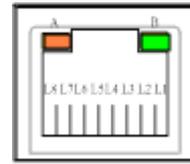
3.2.6 Ethernet Connector (LAN1~LAN16)

RJ45

The UST500-517-FL-16RJ-4SATA-TDC board has sixteen RJ-45 connectors for LAN1~LAN16 Ethernet (Intel i211-AT) connectivity.

The UST500-517-FL-8RJ8M12-4SATA-TDC board has eight RJ-45 connectors for LAN1~LAN8 Ethernet (Intel i211-AT) connectivity.

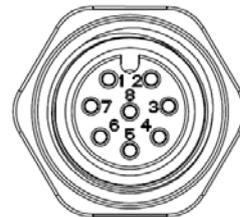
Pins	LAN Signal	Pins	LAN Signal
L1	MDI0+	L5	MDI2+
L2	MDI0-	L6	MDI2-
L3	MDI1+	L7	MDI3+
L4	MDI1-	L8	MDI3-
A	Activity link LED (Orange) OFF: No link Blinking: Link established; data activity detected		
B	PoE LED Green: PoE Activity LED		



M12 A Code

The UST500-517-FL-8RJ8M12-4SATA-TDC board has eight M12 connectors for LAN9~LAN16 Ethernet (Intel i211-AT) connectivity.

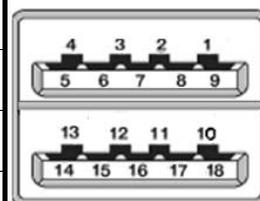
Pins	LAN Signal	Pins	LAN Signal
1	MDI 2+	5	MDI 1+
2	MDI 3+	6	MDI 0+
3	MDI 3-	7	MDI 2-
4	MDI 0-	8	MDI 1-
ACT	Activity link LED(Orange) OFF: No link Blinking: Link established; data activity detected		
PoE	PoE LED Green: PoE Activity LED		



3.2.7 USB 3.0 Connector

The Universal Serial Bus connectors are compliant with USB 3.0 (5 GB/s), ideal for connecting USB peripherals such as scanners, cameras and other USB devices.

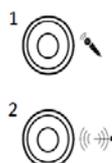
Pins	Signal USB Port 0	Pins	Signal USB Port 1
1	USB_VCC (+5V level standby power)	10	USB_VCC (+5V level standby power)
2	USB_Data-	11	USB_Data-
3	USB_Data+	12	USB_Data+
4	GND	13	GND
5	SSRX-	14	SSRX-
6	SSRX+	15	SSRX+
7	GND	16	GND
8	SSTX-	17	SSTX-
9	SSTX+	18	SSTX+



3.2.8 Audio Connector

These two audio jacks ideal are for Audio Mic-In and Audio Line-out.

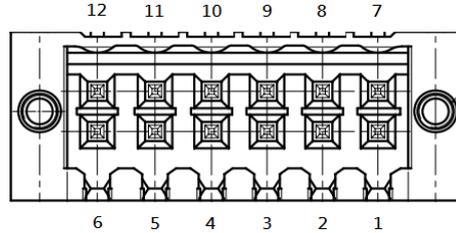
Pins	Signals
1	Line Out
2	Microphone In



3.2.9 Digital I/O

The UST500-517-FL is supported an isolated 6-in/2-out Digital I/O (DIO)

Pins	Signals	Pins	Signals
1	COM+	7	IN 0
2	OUT0	8	IN 1
3	OUT1	9	IN 2
4	COM-	10	IN 3
5	DIO_GND	11	IN 4
6	Ext Power	12	IN 5



NOTE: Please refer to Appendix B for more information about Digital I/O

3.2.10 ATX Power On/OFF

The ATX power button is on the I/O side. It allows users to control power on/off state of the UST500-517-FL.

Functions	Descriptions
On	Turn on/off system
Off	Keep system status



3.2.11 Reset Button

The reset button allows users to reset UST500-517-FL.

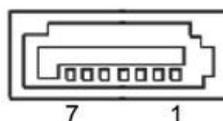
Functions	Descriptions
On	Reset system
Off	Keep system status



3.2.12 SATA Connector (SATA 1~4)

These Serial Advanced Technology Attachment (Serial ATA or SATA) connectors are for high-speed SATA interfaces. They are computer bus interfaces for connecting to devices such as hard disk drives. This board has two SATA 3.0 ports with 6Gb/s performance.

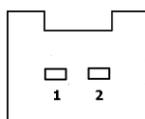
Pins	Signals
1	GND
2	SATA_TX+
3	SATA_TX-
4	GND
5	SATA_RX-
6	SATA_RX+
7	GND



3.2.13 SATA Power Connector

Use CN8、CN9 for interfacing to SATA 2.5" HDD power supply.

Pins	Signals
1	+5V level
2	GND



3.2.14 SIM Card Slots (S1~S2)

The UST500-517-FL includes one SIM slots on the front side of the system for inserting SIM Card. It is mainly used in 3G/LTE wireless network application on CN10 and CN12.

Pins	Signals
1	PWR
2	RST
3	CLK
4	NC
5	GND
6	VPP
7	I/O
8	NC

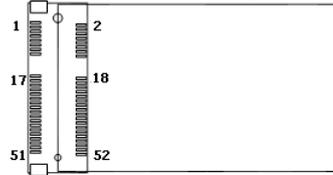


3.2.15 Full-Size PCI Express Mini Card Slot (CN10 & CN12)

The UST500-517-FL supports dual full-size PCI-Express Mini Card slots. CN10 and CN12 apply to either PCI-Express or USB 2.0 signals, and comply with PCI-Express Mini Card Spec. V1.2.

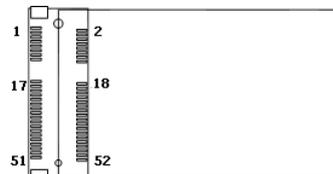
CN10

Pins	Signals	Pins	Signals
1	WAKE#	2	+3.3VSB
3	No use	4	GND
5	No use	6	+1.5V
7	CLKREQ#	8	No use
9	GND	10	No use
11	REFCLK-	12	No use
13	REFCLK+	14	No use
15	GND	16	No use
17	No use	18	GND
19	No use	20	W_DISABLE#
21	GND	22	PERST#
23	PCIE20_RXN	24	+3.3VSB
25	PCIE20_RXP	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	PCIE20_TXN	32	SMB_DATA
33	PCIE20_TXP	34	GND
35	GND	36	USBP_10N
37	GND	38	USBP_10P
39	+3.3VSB	40	GND
41	+3.3VSB	42	No use
43	GND	44	No use
45	No use	46	No use
47	No use	48	+1.5V
49	No use	50	GND
51	No use	52	+3.3VSB



CN12

Pins	Signals	Pins	Signals
1	WAKE#	2	+3.3VSB
3	No use	4	GND
5	No use	6	+1.5V
7	CLKREQ#	8	No use
9	GND	10	No use
11	REFCLK-	12	No use
13	REFCLK+	14	No use
15	GND	16	No use
17	No use	18	GND
19	No use	20	W_DISABLE#
21	GND	22	PERST#
23	PCIE19_RXN	24	+3.3VSB
25	PCIE19_RXP	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	PCIE19_TXN	32	SMB_DATA
33	PCIE19_TXP	34	GND
35	GND	36	USB_D8-
37	GND	38	USB_D8+
39	+3.3VSB	40	GND
41	+3.3VSB	42	No use
43	GND	44	No use
45	No use	46	No use
47	No use	48	+1.5V
49	No use	50	GND
51	No use	52	+3.3VSB



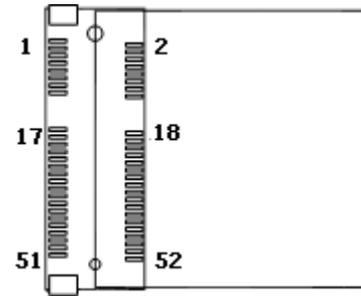
3.2.16 Half-Size Mini Card Slot (CN15 & CN16)

CN15 applies to PCI-Express and SATA (mSATA) signals and complies with PCI-Express Mini Card Spec. V1.2. Thus, users can install an mSATA card into this slot. Please refer to chapter 3.1 DIP Switch Mode.

CN16 only applies to USB 2.0 signals and complies with PCI-Express Mini Card Spec. V1.2.

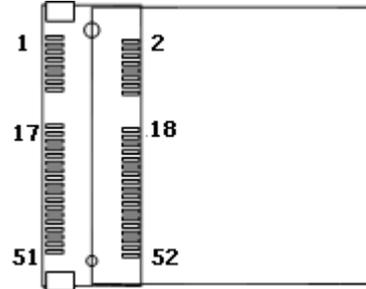
CN15

Pins	Signals	Pins	Signals
1	WAKE#	2	+3.3VSB
3	No use	4	GND
5	No use	6	+1.5V
7	CLKREQ#	8	No use
9	GND	10	No use
11	REFCLK-	12	No use
13	REFCLK+	14	No use
15	GND	16	No use
17	No use	18	GND
19	No use	20	W_DISABLE#
21	GND	22	PERST#
23	PCIE18_RXN/mAT A5_RXN	24	+3.3VSB
25	PCIE18_RXP/mAT A5_RXP	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	PCIE18_TXN/mAT A5_TXN	32	SMB_DATA
33	PCIE18_TXP/mAT A5_TXP	34	GND
35	GND	36	USB_D8-
37	GND	38	USB_D8+
39	+3.3VSB	40	GND
41	+3.3VSB	42	No use
43	GND	44	No use
45	No use	46	No use
47	No use	48	+1.5V
49	No use	50	GND
51	No use	52	+3.3VSB



CN16

Pins	Signals	Pins	Signals
1	WAKE#	2	+3.3VSB
3	No use	4	GND
5	No use	6	+1.5V
7	CLKREQ#	8	No use
9	GND	10	No use
11	No use	12	No use
13	No use	14	No use
15	GND	16	No use
17	No use	18	GND
19	No use	20	W_DISABLE#
21	GND	22	PERST#
23	No use	24	+3.3VSB
25	No use	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	No use	32	SMB_DATA
33	No use	34	GND
35	GND	36	USBP_11N
37	GND	38	USBP_11N
39	+3.3VSB	40	GND
41	+3.3VSB	42	No use
43	GND	44	No use
45	No use	46	No use
47	No use	48	+1.5V
49	No use	50	GND
51	No use	52	+3.3VSB



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SECTION 4

BIOS SETUP UTILITY

This section provides users with detailed descriptions in terms of how to set up basic system configurations through the BIOS setup utility.

4.1 Starting

To enter the setup screens, follow the steps below:

1. Turn on the computer and press the key immediately.
2. After press the key, the main BIOS setup menu displays. Users can access to other setup screens, such as the Advanced and Chipset menus, from the main BIOS setup menu.

It is strongly recommended that users should avoid changing the chipset's defaults. Both AMI and 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.

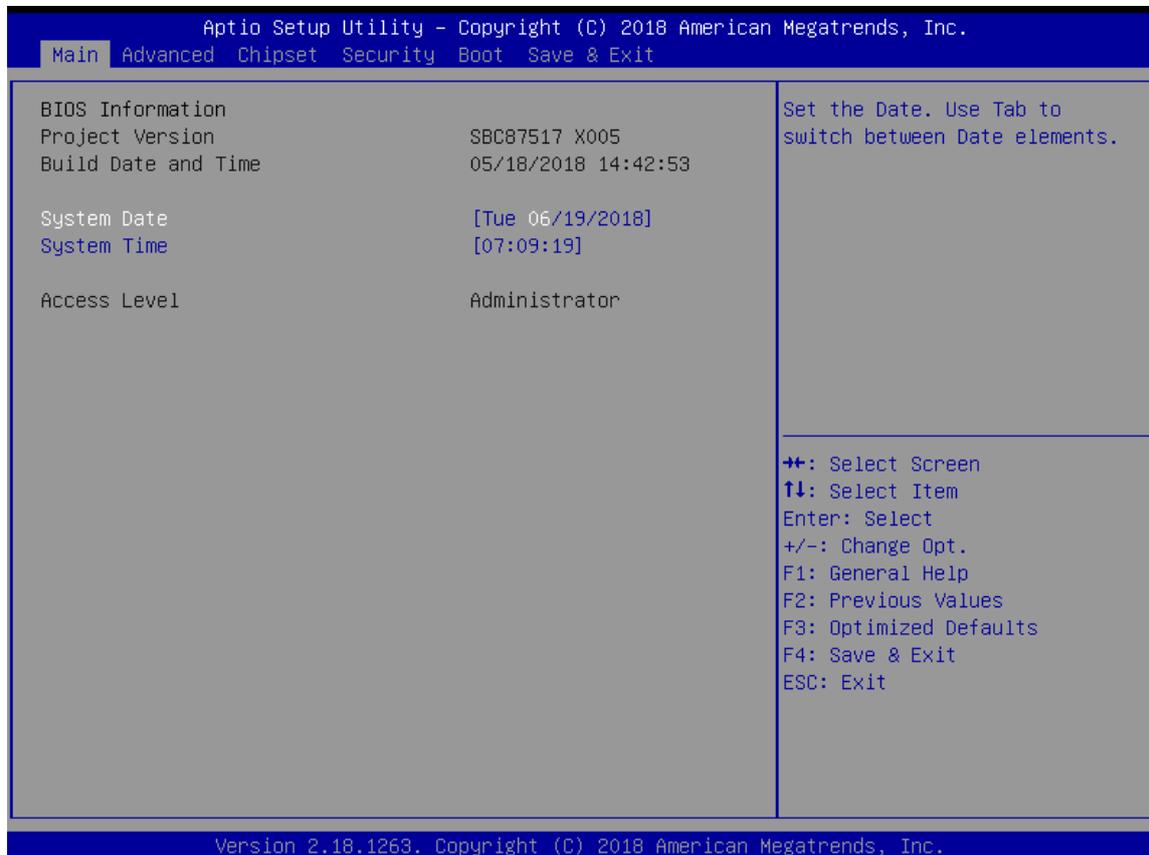


【Note】 : Some of the navigation keys differ from one screen to another.

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

4.3 Main Menu

The Main Menu screen is the first screen users see when entering the setup utility. Users 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 also shown below.



BIOS Information

Display the auto-detected BIOS information.

System Language

Choose the system default language.

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

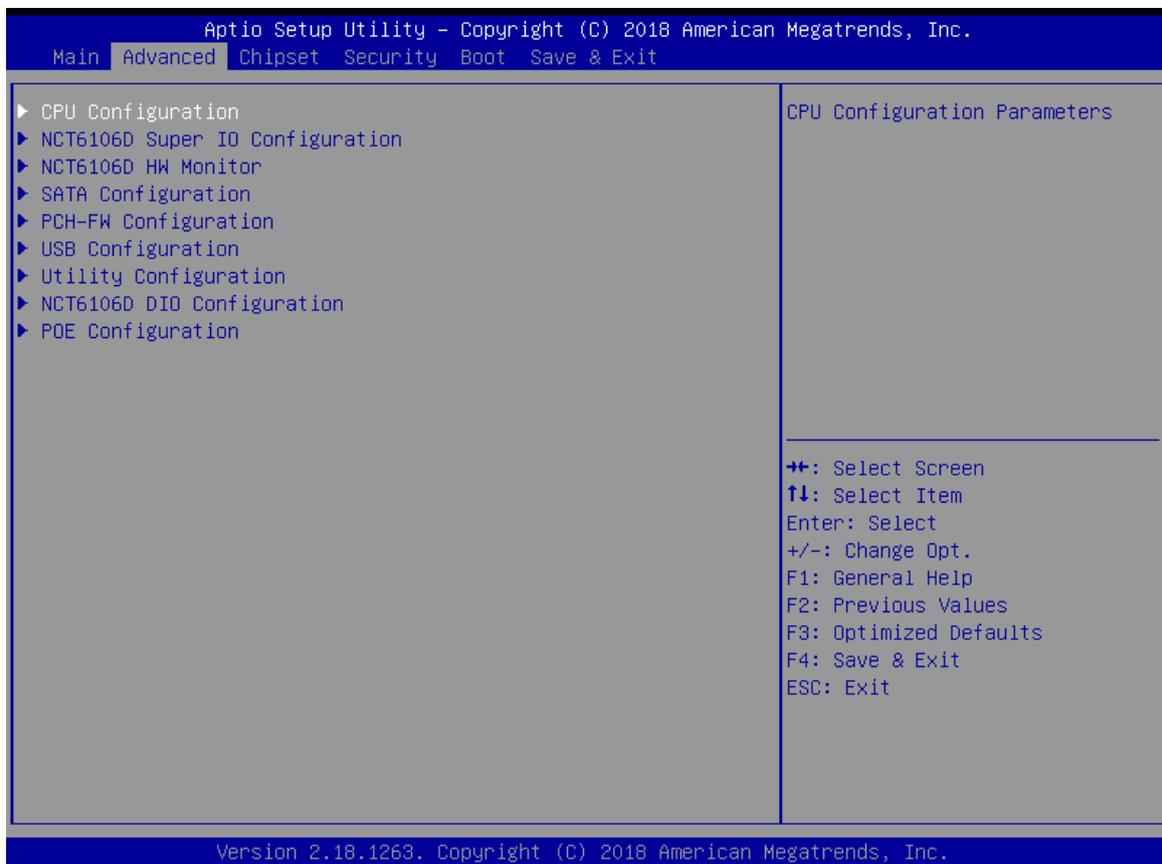
Display the access level of current user.

4.4 Advanced Menu

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

- ▶ CPU Configurations
- ▶ NCT6102D Super IO Configurations
- ▶ NCT6102D HW Monitor
- ▶ SATA Configurations
- ▶ PCH-FW Configuration
- ▶ USB Configuration
- ▶ Utility Configurations
- ▶ NCT6106D DIO Configurations
- ▶ PoE Configurations

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



CPU Configurations

This screen shows the CPU version and its detailed information.

The screenshot displays the 'Advanced' menu of the Aptio Setup Utility. The 'CPU Configuration' option is selected, showing the following details:

CPU Configuration		Enabled for Windows XP and Linux (OS optimized for Hyper-Threading Technology) and Disabled for other OS (OS not optimized for Hyper-Threading Technology).
Type	Intel(R) Core(TM) i7-6700TE CPU @ 2.40GHz	
ID	0x506E3	
Microcode Revision	C2	
Speed	2400 MHz	
L1 Data Cache	32 KB x 4	
L1 Instruction Cache	32 KB x 4	
L2 Cache	256 KB x 4	
L3 Cache	8 MB	
L4 Cache	N/A	
VMX	Supported	
SMX/TXT	Supported	
Hyper-Threading	[Enabled]	
Intel (VMX) Virtualization Technology	[Enabled]	

Navigation instructions on the right side of the screen:

- ←→: 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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Intel Virtualization Technology

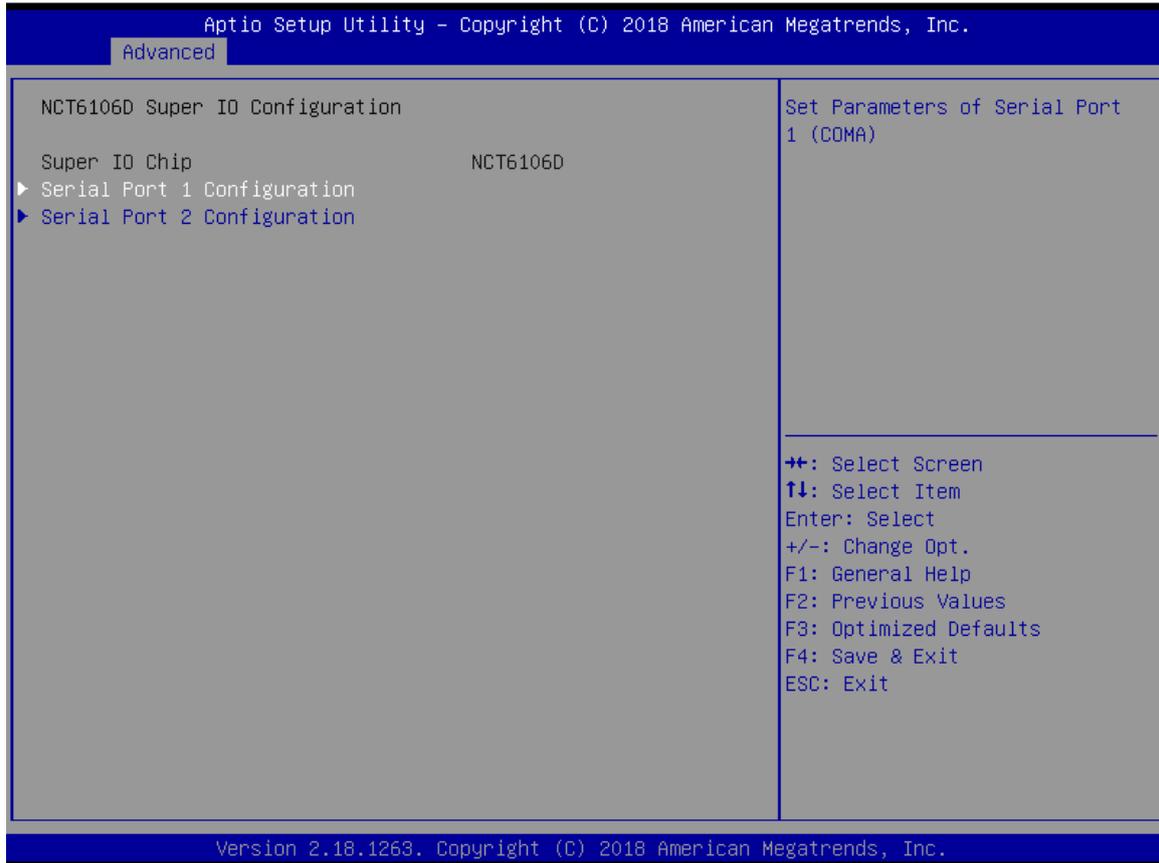
It allows a hardware platform to run multiple operating systems separately and simultaneously, enabling one system to virtually function as several systems.

NCT6106D Super IO Configurations

Use this screen to select options for the NCT6106D Super IO Configurations, 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

The default setting for all Serial Ports are RS232.

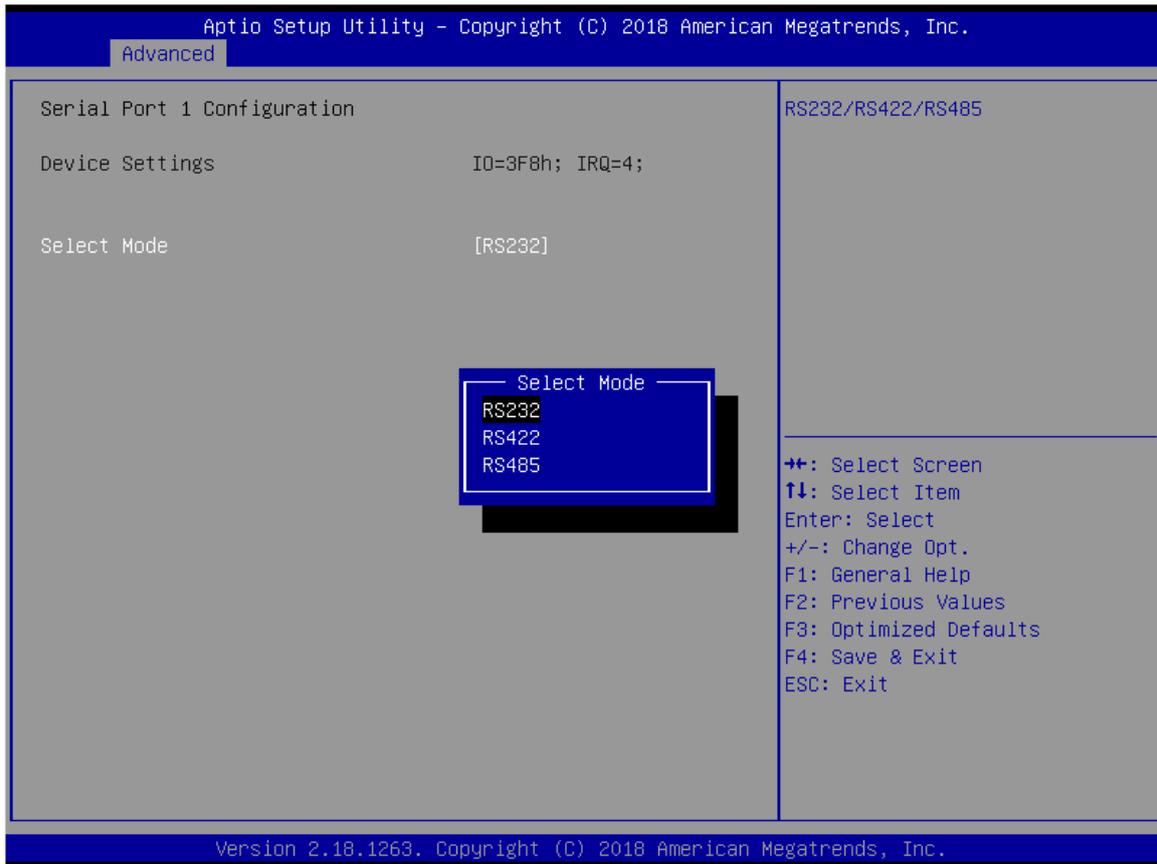
You can change the setting by selecting the value you want in each COM Port Type. Supports RS422 & RS485 mode and high speed mode



Serial Port 1~2 (COM1~2) Configurations

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

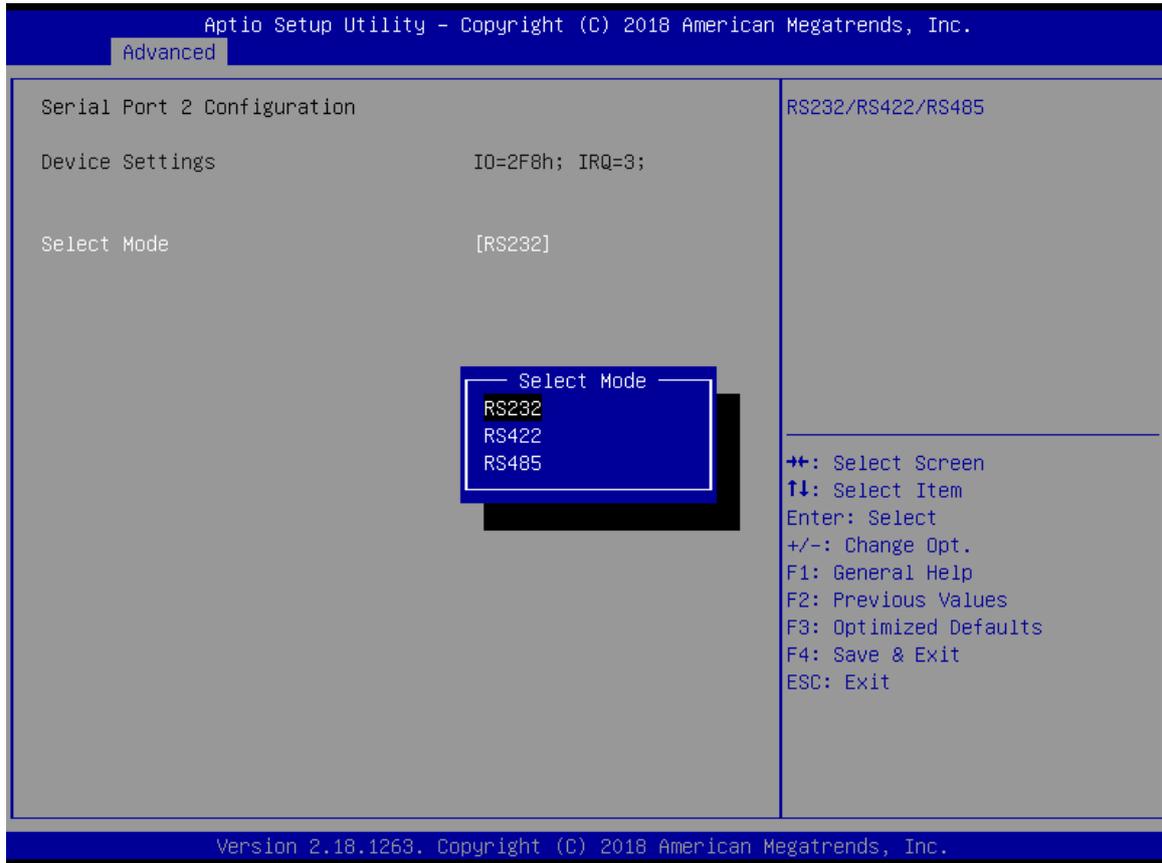
Serial Port 1



Select Mode

Use this option to set RS-232/RS-422/RS-485 mode.

Serial Port 2



Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.

Advanced

Serial Port 2 Configuration

Device Settings IO=2F8h; IRQ=3;

Select Mode [RS232]

Select Mode

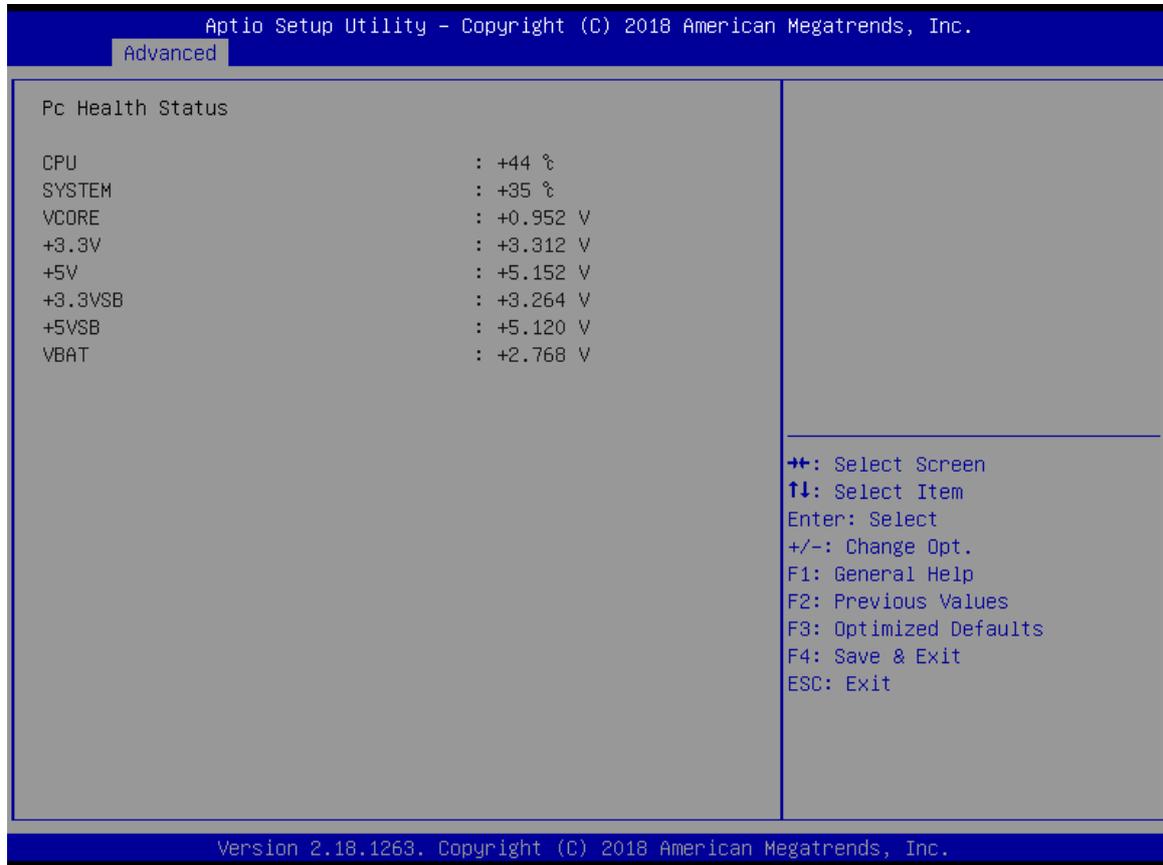
- RS232
- RS422
- RS485

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

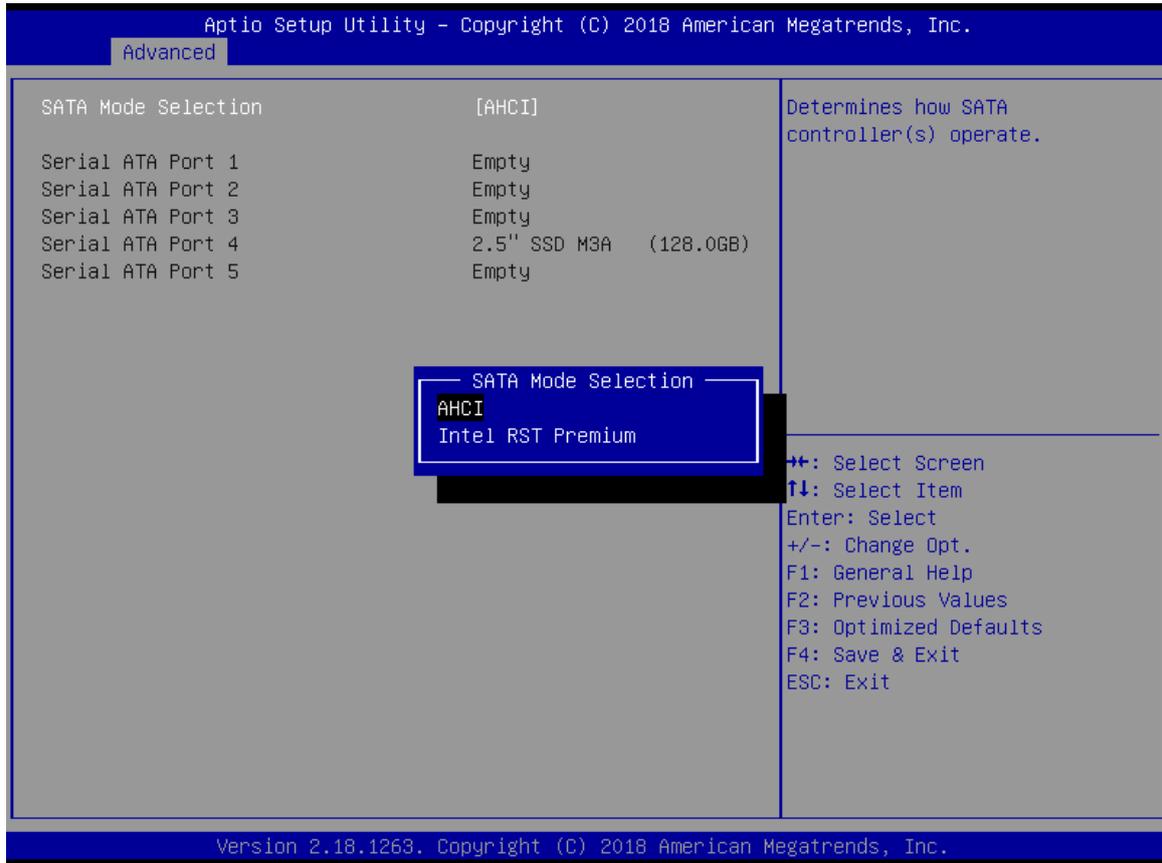
Version 2.18.1263. Copyright (C) 2018 American Megatrends, Inc.

NCT6106D Hardware Monitor

This screen displays the temperature of system and CPU and system voltages (V CORE, +3.3V, +12V and +5V).



SATA Configuration



SATA Mode Selection

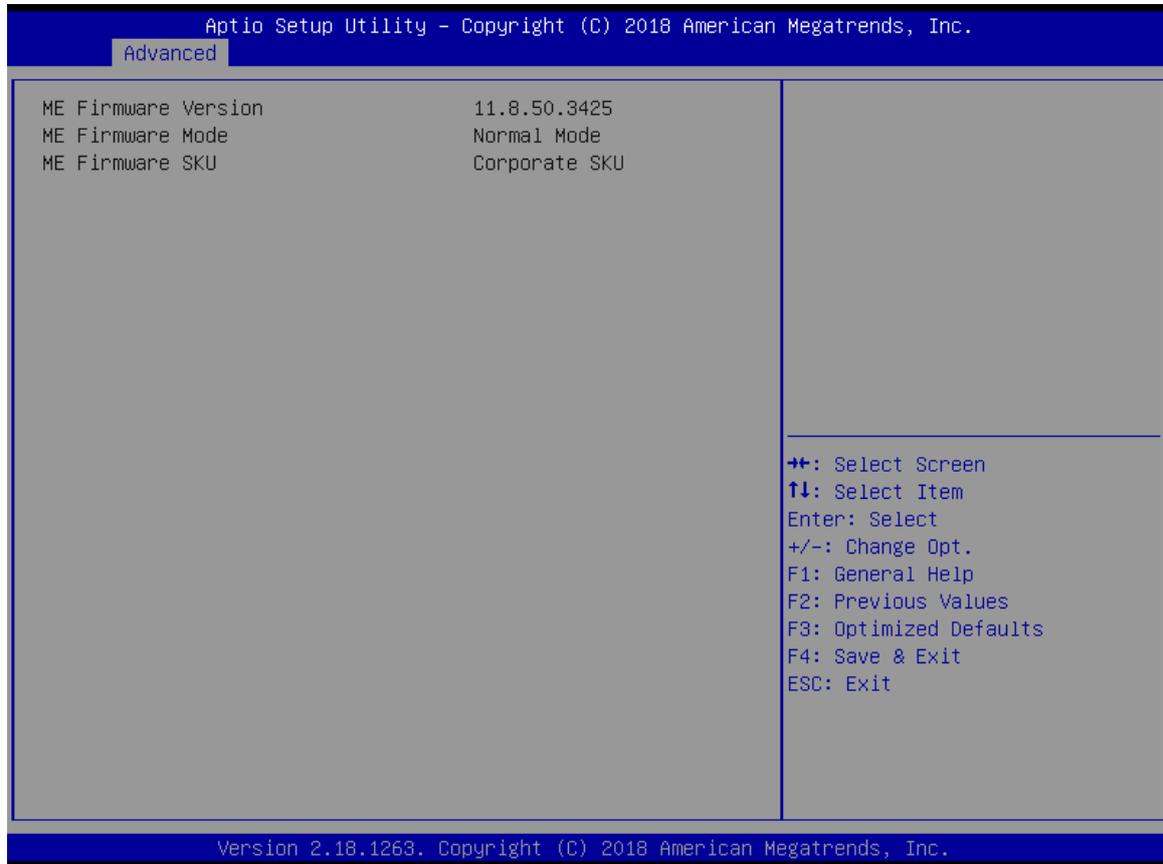
AHCI (Advanced Host Controller Interface) mode is how SATA controller(s) operate.

Serial ATA Port 0~5

It shows the device installed in connector SATA0~5

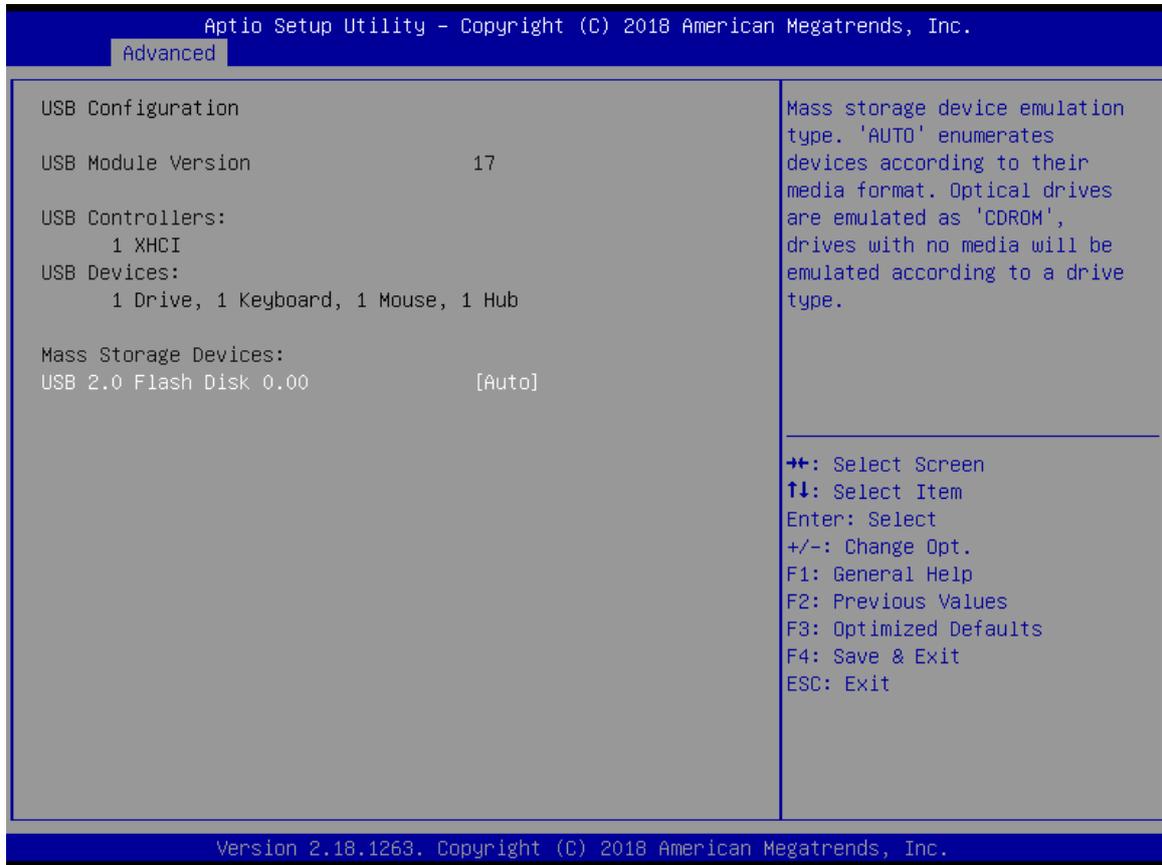
PCH-FW Configuration

This screen shows ME Firmware information.



USB Configurations

This screen specifies USB settings.



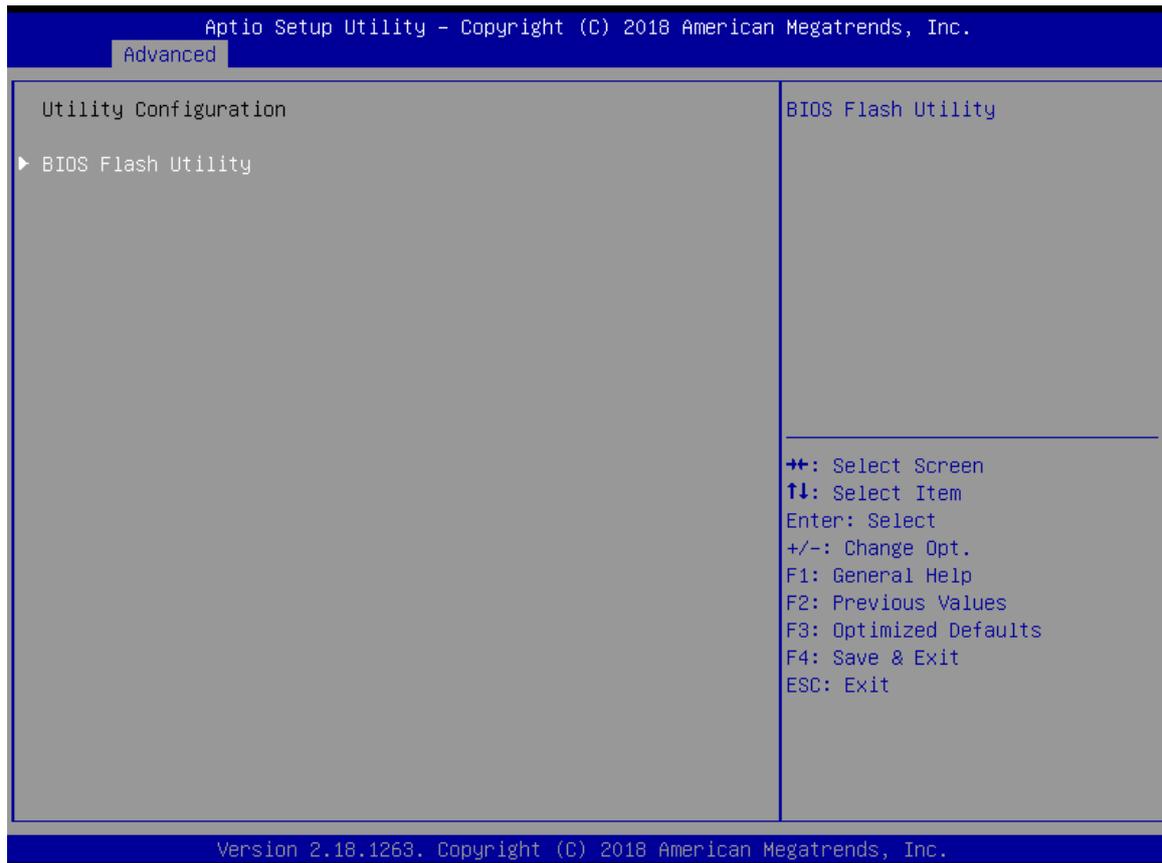
USB Devices

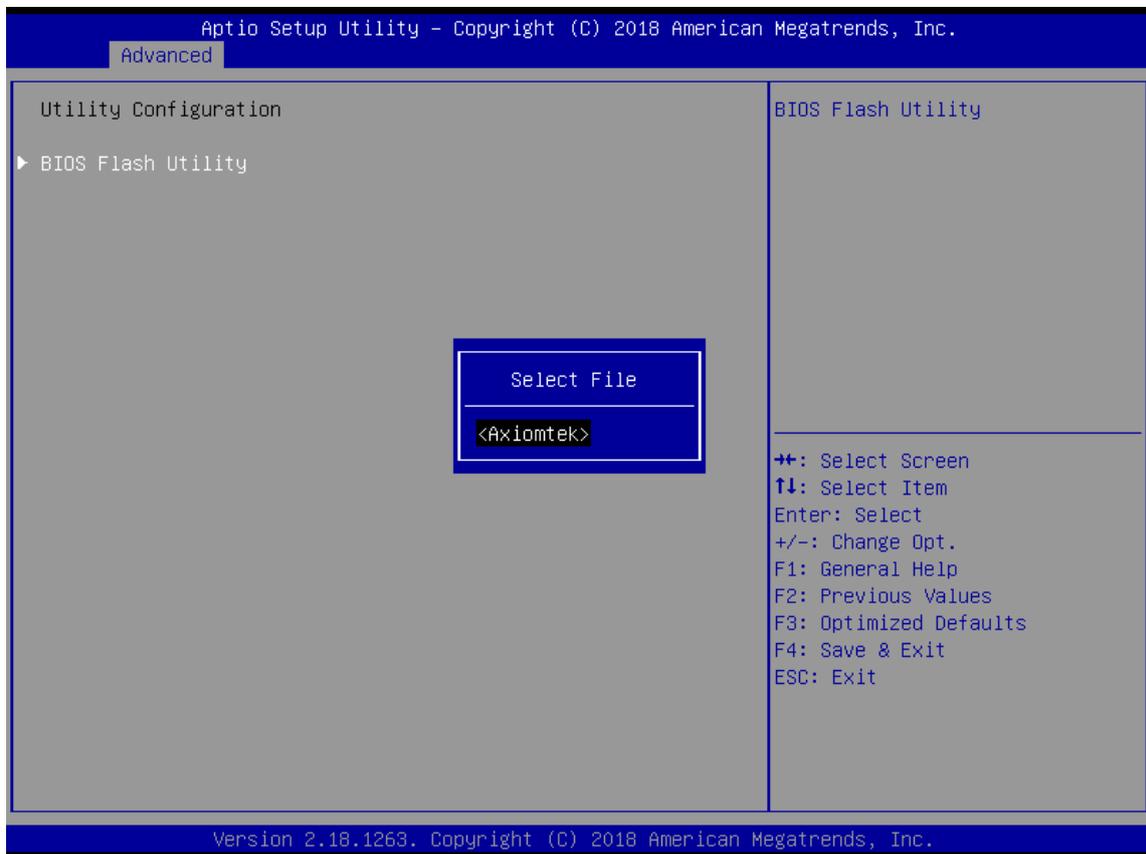
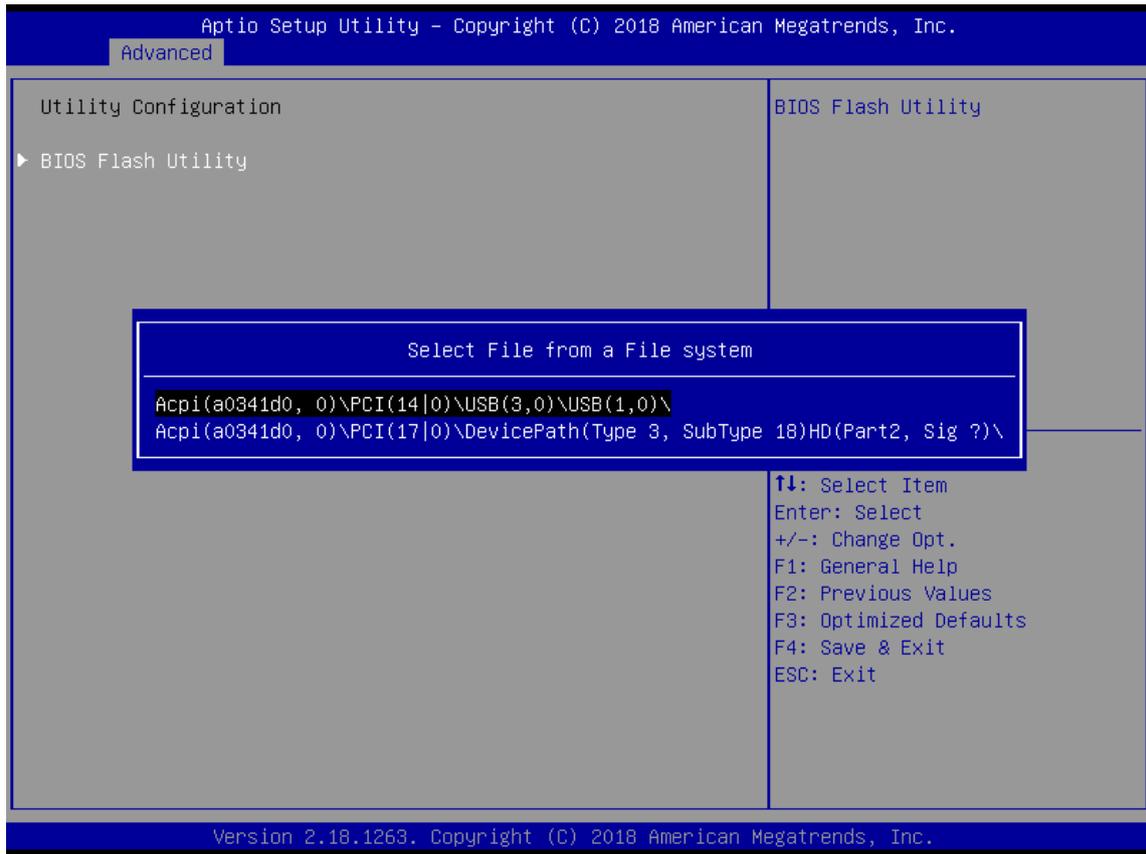
Display all detected USB devices.

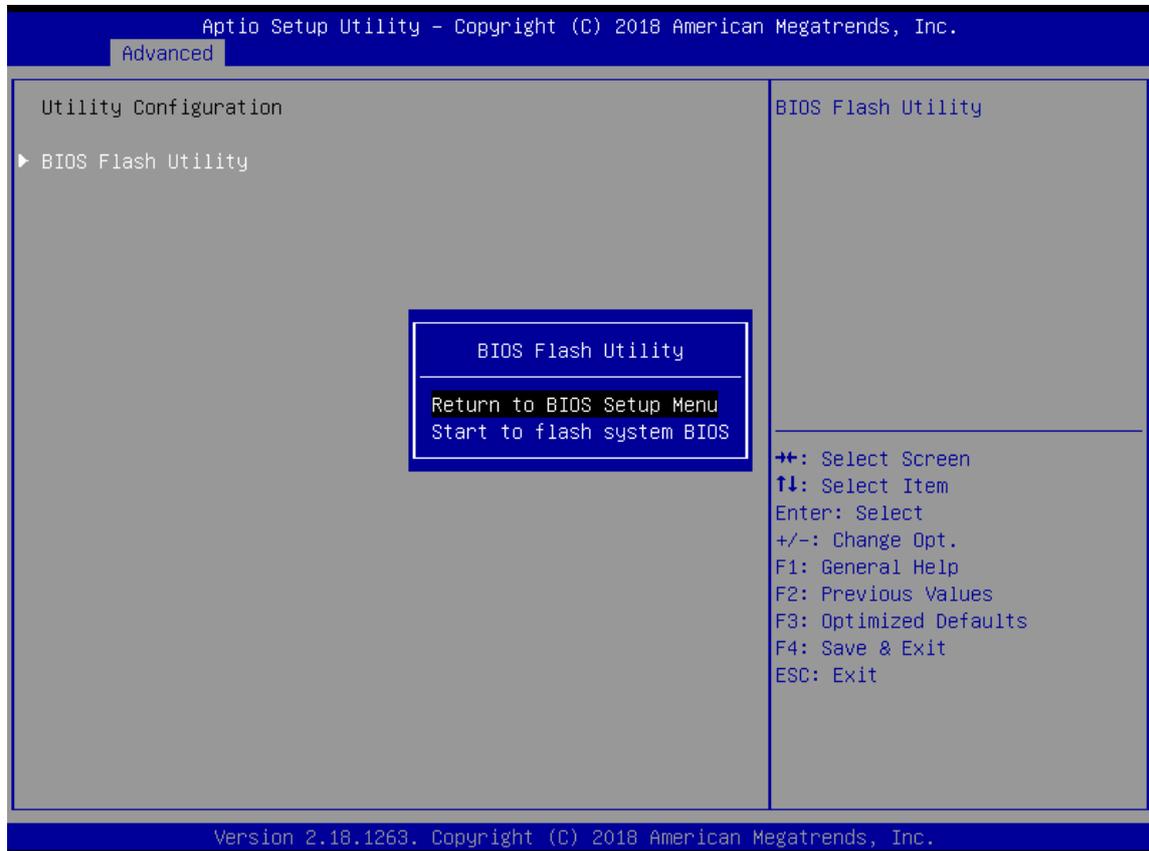
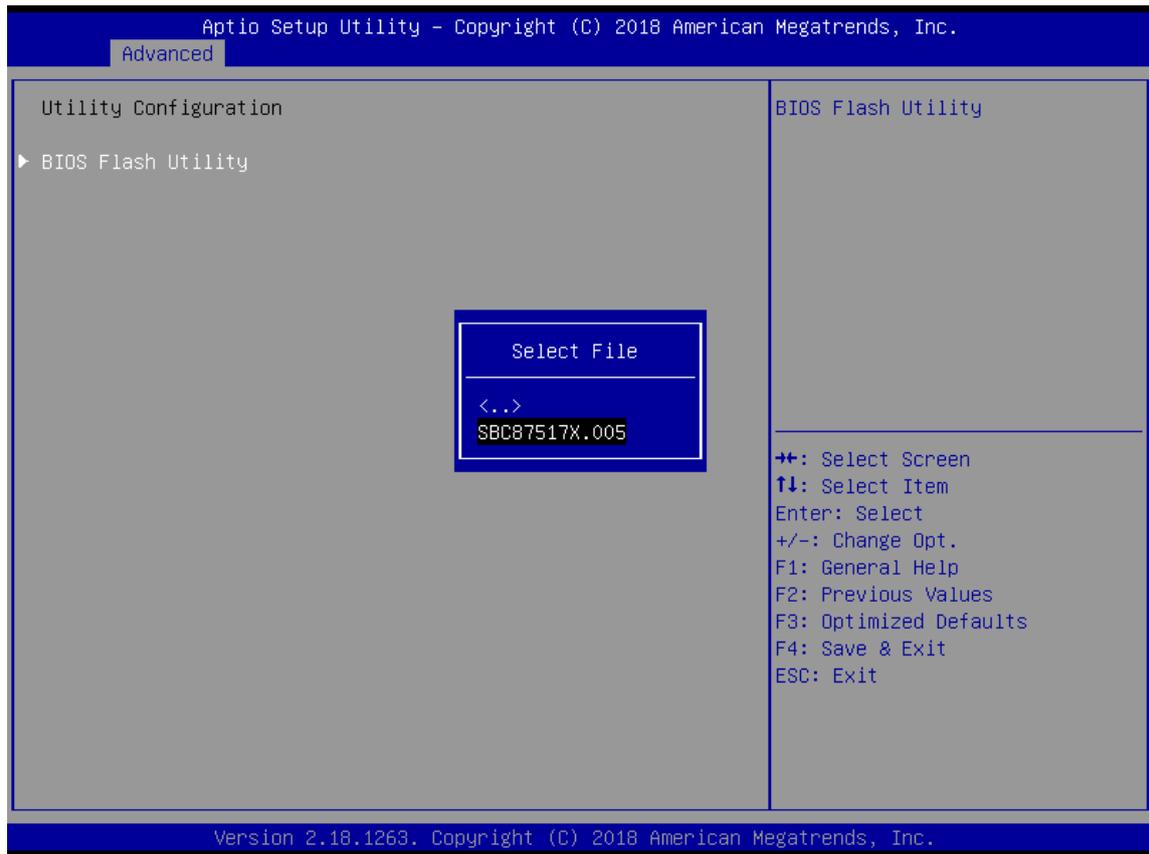
Utility Configuration

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

1. Create a folder and rename it to Axiomtek on the root of USB storage (Ex: X:\Axiomtek)
2. Copy the BIOS file to the Axiomtek folder (Ex: X:\Axiomtek\SBC87517X.005) (Note : The BIOS file name must contain the word SBC87517)
3. Enter the BIOS flash utility and locate the BIOS file
4. Push "Start flash system BIOS"

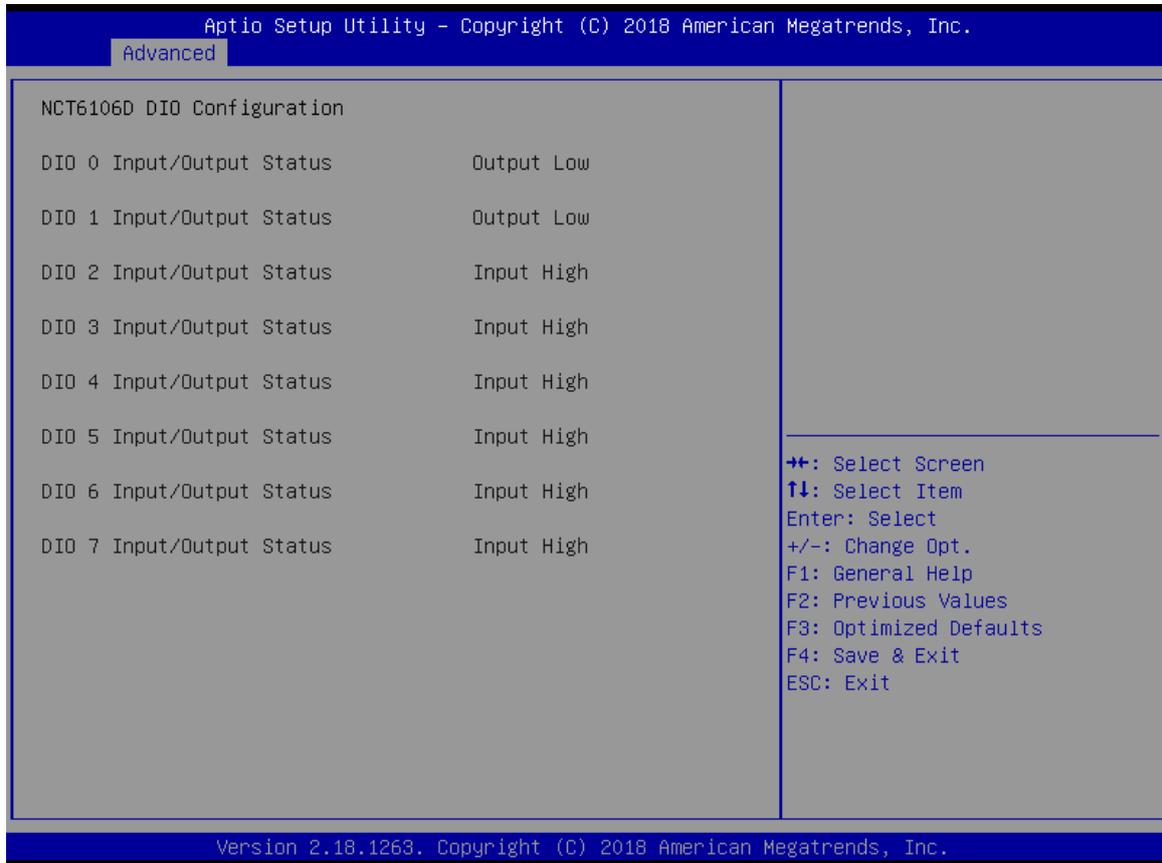






NCT6106D DIO Configurations

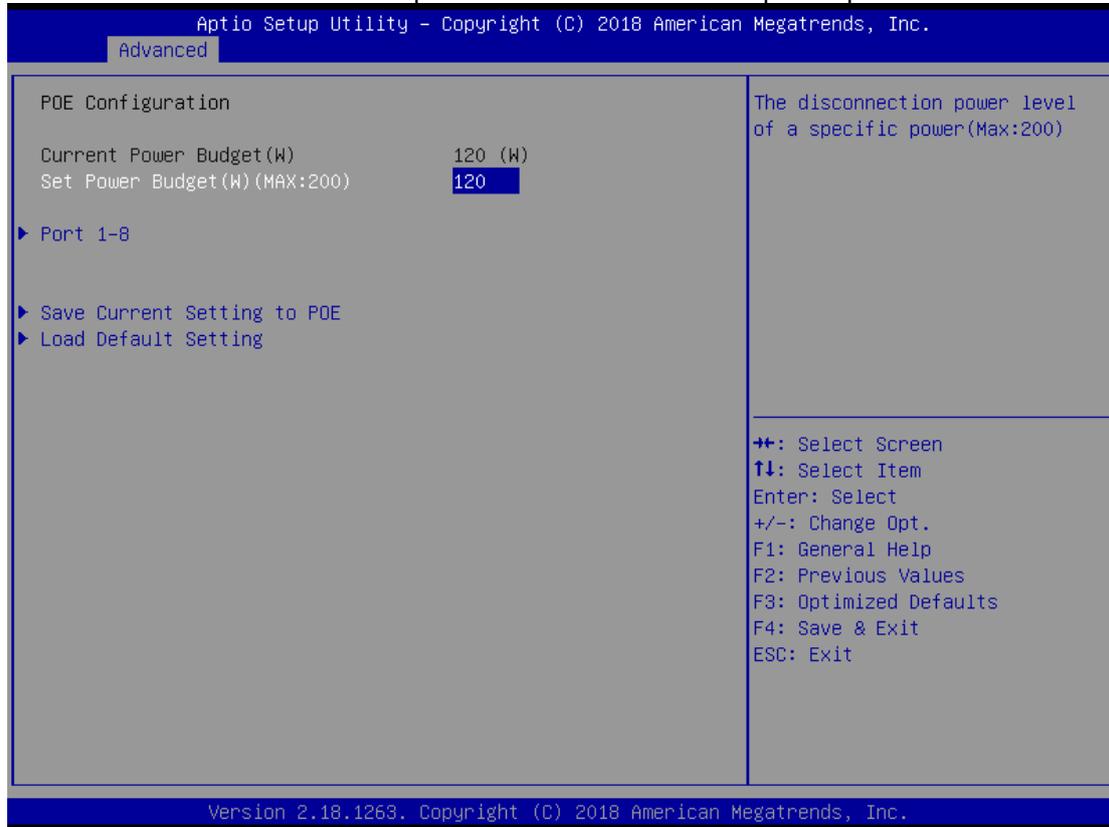
Use this screen to display DIO polarity and level



POE Configuration

Power over Ethernet (PoE) describes any of several standard or ad-hoc systems which pass electric power along with data on twisted pair Ethernet cabling.

This menu allows users to set the power and enable/disable a specific port.



Current Power Budget

Display current total power budget on all ports.

Set Power Budget

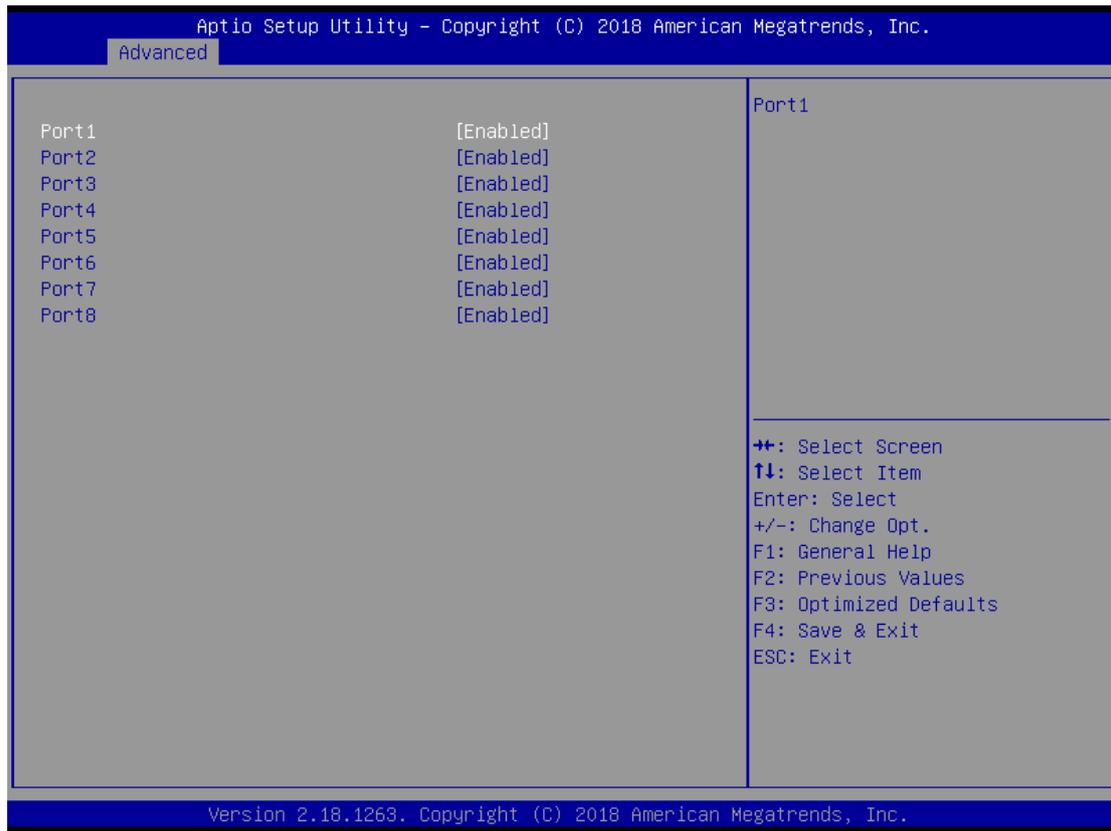
Set disconnection power level of a specific power (Max:200).

Save Current Setting to POE

Save the current setting from menu into the POE non-volatile memory and these user values become the defaults after any reset.

Load Default Setting

Restore to default setting and save to POE, Default : Power Budget 120w, all ports enabled.



Port1~Port#

Enable/Disable a specific POE port.

4.5 Chipset Menu

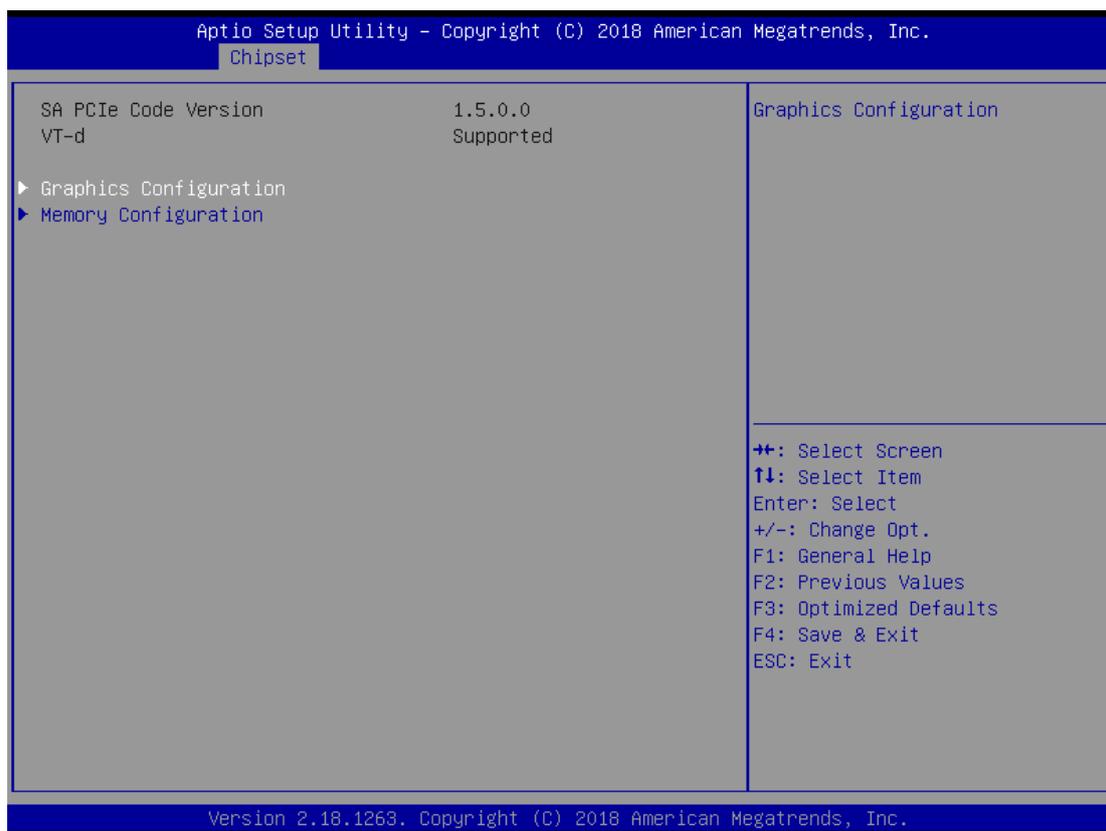
The Chipset menu allows users to change the advanced chipset settings. Users can select any of the items in the left frame of the screen to go to the sub menus:

- ▶ System Agent (SA) Configurations

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



System Agent (SA) Configurations



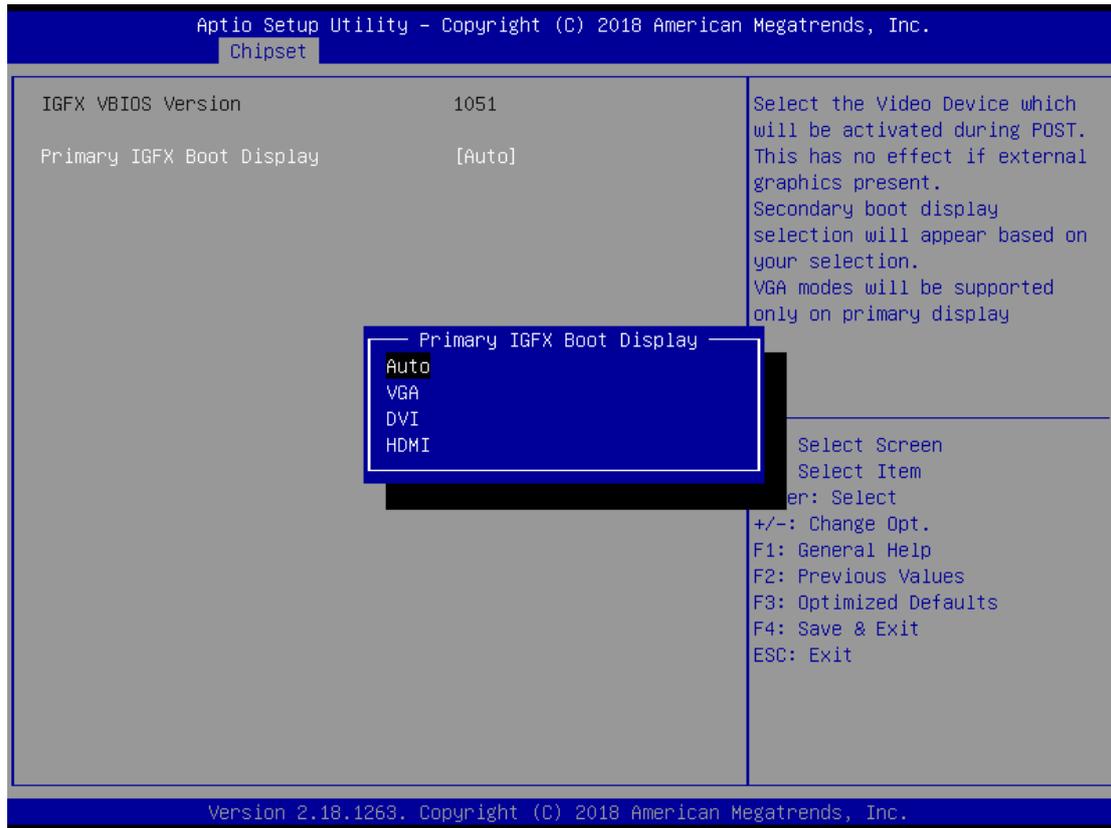
Graphics Configuration

Use this item to configure internal graphics controller.

Memory Configuration

Use this item to refer to the information related to system memory.

Graphic Configurations



Primary IGFX Boot Display

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

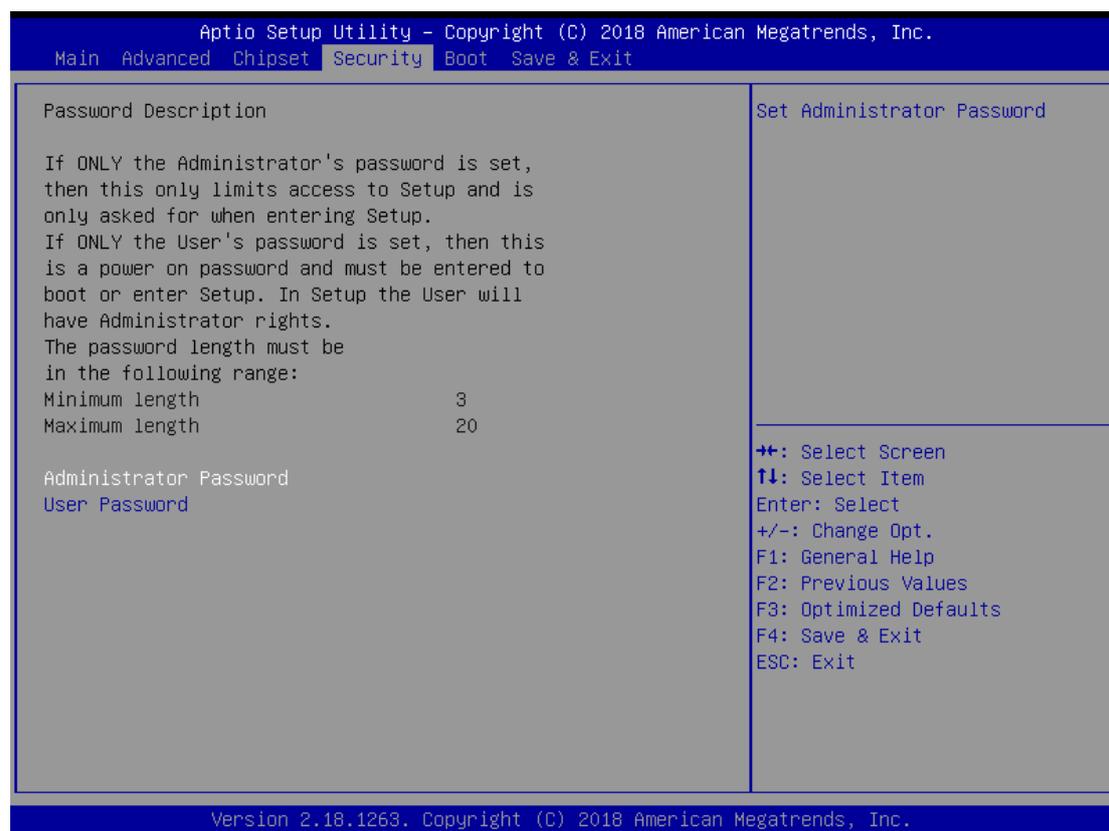
Memory Configurations

This screen shows the system memory information.

The screenshot displays the BIOS setup utility interface. At the top, a blue header bar contains the text "Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc." and a sub-menu "Chipset". The main area is a grey box with a blue border. On the left, it lists memory information: "Memory RC Version" (1.5.0.0), "Total Memory" (8192 MB), and "Size" (8192 MB (DDR4)). On the right, a legend lists navigation keys: "++: Select Screen", "↑↓: Select Item", "Enter: Select", "+/-: Change Opt.", "F1: General Help", "F2: Previous Values", "F3: Optimized Defaults", "F4: Save & Exit", and "ESC: Exit". A blue footer bar at the bottom contains the text "Version 2.18.1263. Copyright (C) 2018 American Megatrends, Inc."

Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.	
Chipset	
Memory RC Version	1.5.0.0
Total Memory	8192 MB
Size	8192 MB (DDR4)
++: 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) 2018 American Megatrends, Inc.	

Security Menu



Administrator Password

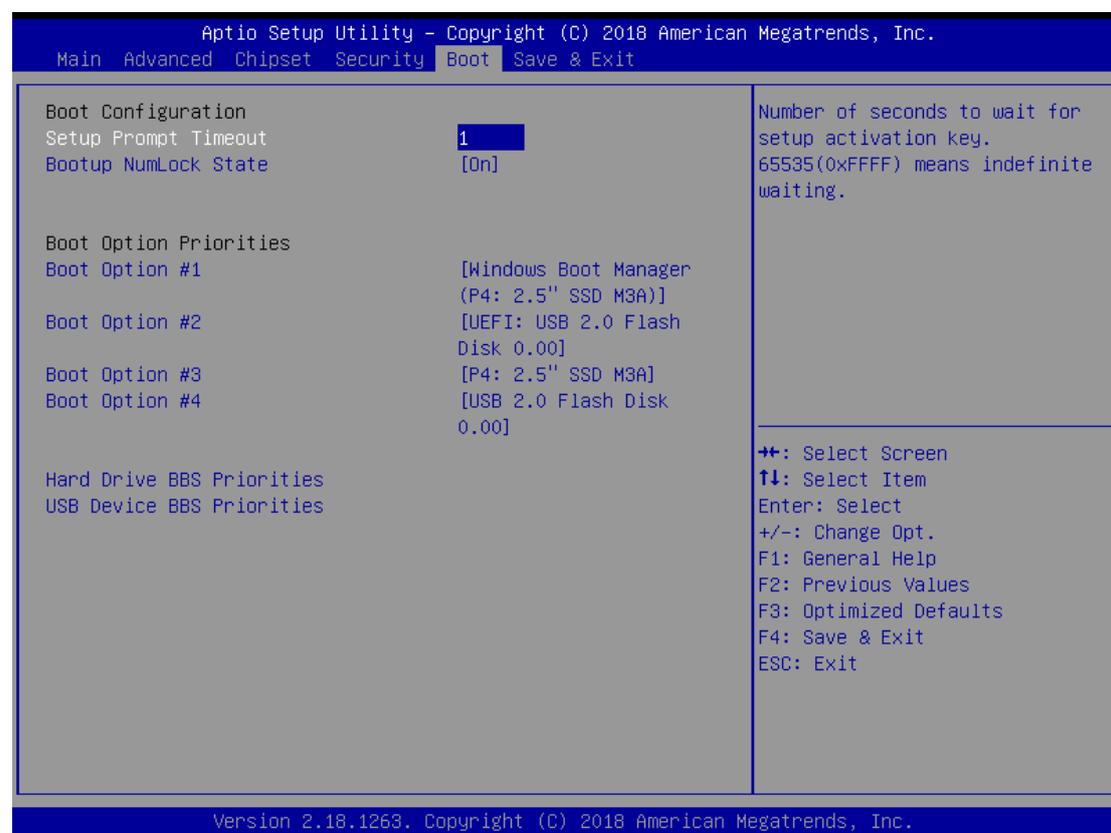
This item indicates whether an administrator password has been set (installed or uninstalled).

User Password

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

4.6 Boot Menu

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



Setup Prompt Timeout

Use this item to set up number of seconds to wait for setup activation key where 65535(0xFFFF) means indefinite waiting.

Bootup NumLock State

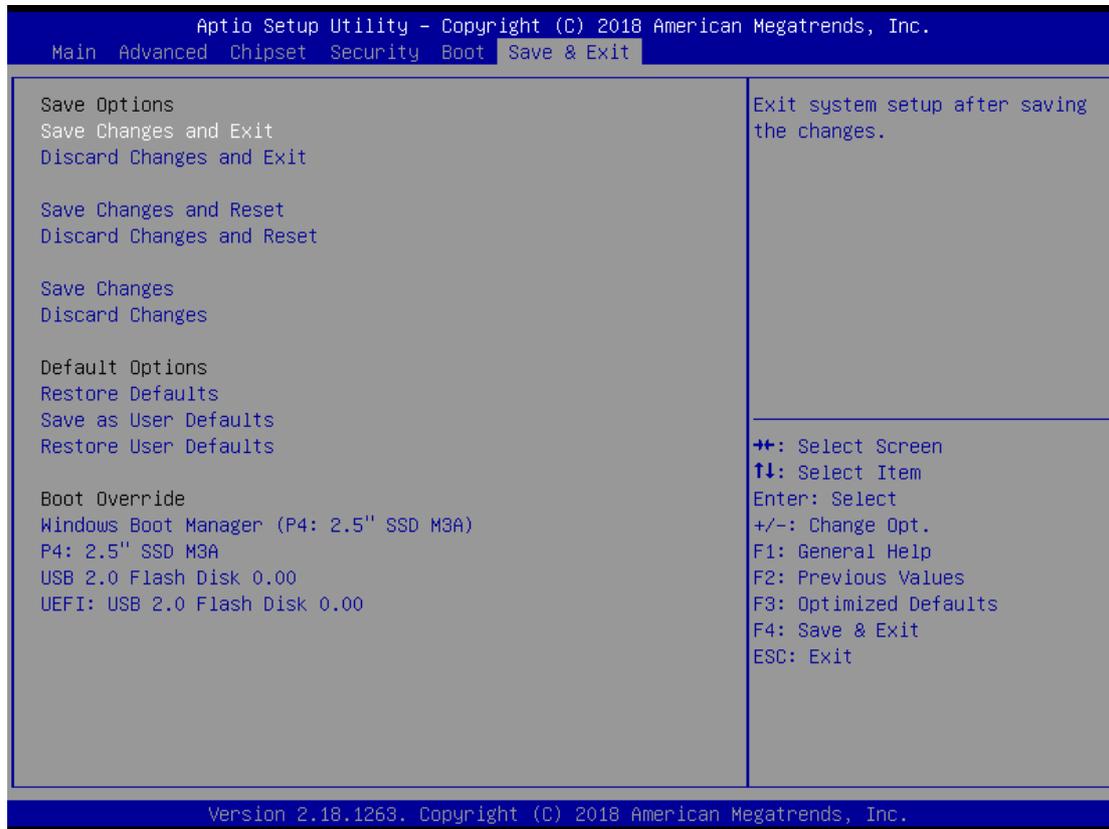
Use this item to select the power-on state for the keyboard NumLock.

Boot Option Priorities

These are settings for boot priority. Specify the boot device priority sequence from the available devices.

4.7 Save & Exit Menu

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



Save Changes and Exit

When users 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 configurations 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 users have completed the system configuration changes, select this option to leave Setup and reboot the computer so the new system configurations 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 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 configurations. 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 users 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 users 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 a computer hangs. The system needs to be able to reset automatically when things go wrong. The watchdog timer gives us solutions in this regard.

The watchdog timer is a counter that triggers a system to 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, it means the software has crashed, the system will reboot.

Sample Program

The following example enables configurations using debug tool.

Enable Watchdog timer

STEP	Sample code	Note
1. Enter configuration mode	0 2E 87	Un-lock super I/O
	0 2E 87	Un-lock super I/O
2. Select logic device	0 2E 07	Select logic register
	0 2F 08	Switch to WDT device
3. Enable WDT device	0 2E 30	Select register
	0 2F 01	Enable WDT
4. Set time unit	0 2E F0	Select logic register
	0 2F M	M = 08h (Minute) , M = 00h (Second)
5. Set timer	0 2E F1	Select logic register
	0 2F 0A	Set timer (where 0A (hex) = 10sec)

Disable Watchdog timer

STEP	Sample code	Note
1. Enter configuration mode	O 2E 87	Un-lock super I/O
	O 2E 87	Un-lock super I/O
2. Select logic device	O 2E 07	Select logic register
	O 2F 08	Switch to WDT device
3. Disable WDT device	O 2E 30	Select register
	O 2F 00	Disable WDT

APPENDIX B DIGITAL I/O

Digital I/O Specification

Digital Input:

Input channels: 6, sink/source type

Input voltage: 0 to 30VDC at 25Hz

Input level for dry contacts:

Logic level 0: close to ground

Logic level 1: open

Input level for wet contacts:

Logic level 1: +/-3VDC max.

Logic level 0: +/- 10VDC min. to +/-30VDC max. (source to digital input)

Digital output:

output channels: 2, sink type

output current: 200mA max. per channel

on-state voltage: 12~ 24VDC nominal

Isolation: 3.75 KV

Max voltage on COM+: 30VDC

Digital I/O Software Programming

- Super IO GPIO4 Group, Location: Address F1h
- GPIO40~41 is output,GPIO42~47 is input

CR F1h. GPIO4 Data Register

Location: Address F1h

Attribute: Read/Write

Power Well: VSB

Reset by: GP4X_MRST

Default : 00h

Size: 8 bits

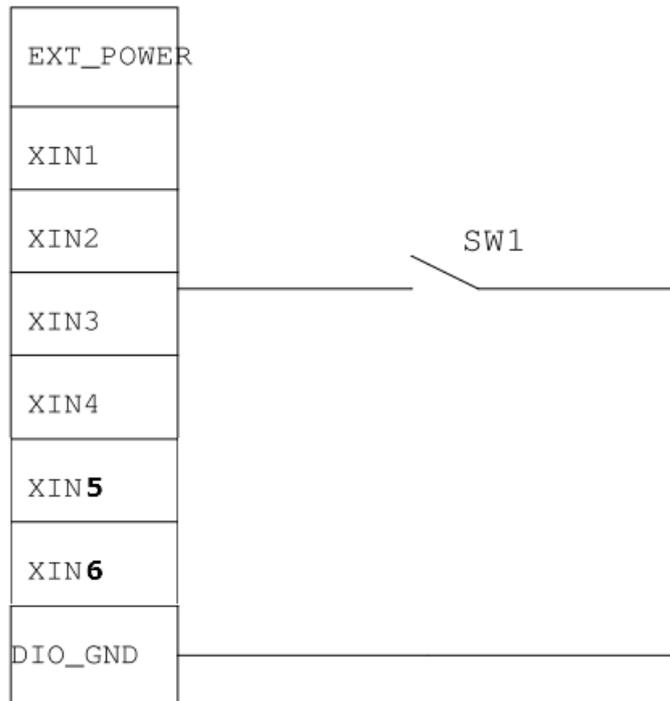
BIT	READ / WRITE	DESCRIPTION
7-0	R / W	GPIO4 Data register For output ports, the respective bits can be read/written and produced to pins.

Digital Input Wiring

DRY contact

Logic level 0: close to ground
Logic level 1: open

DRY



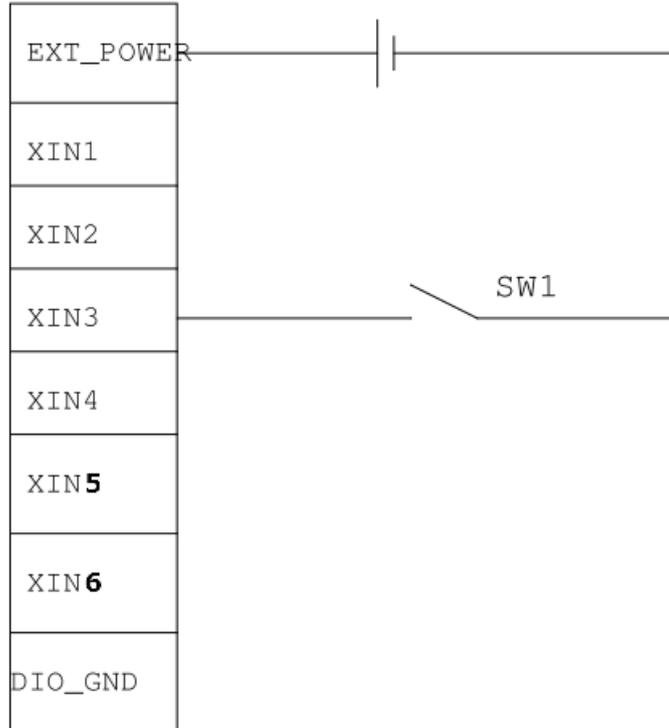
WET contact

Logic level 1: +/-3VDC max.

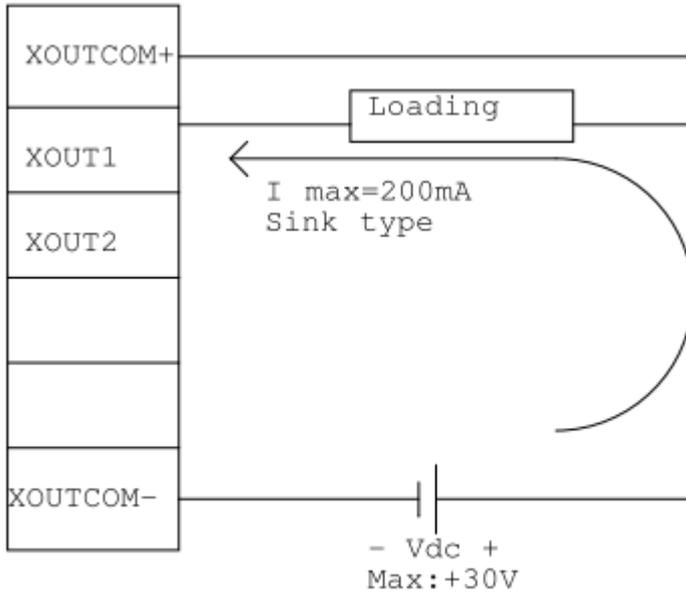
Logic level 0: +/- 10VDC min. to +/-30VDC max

WET

+ Vdc -
Max:+30V



Digital Output Wiring

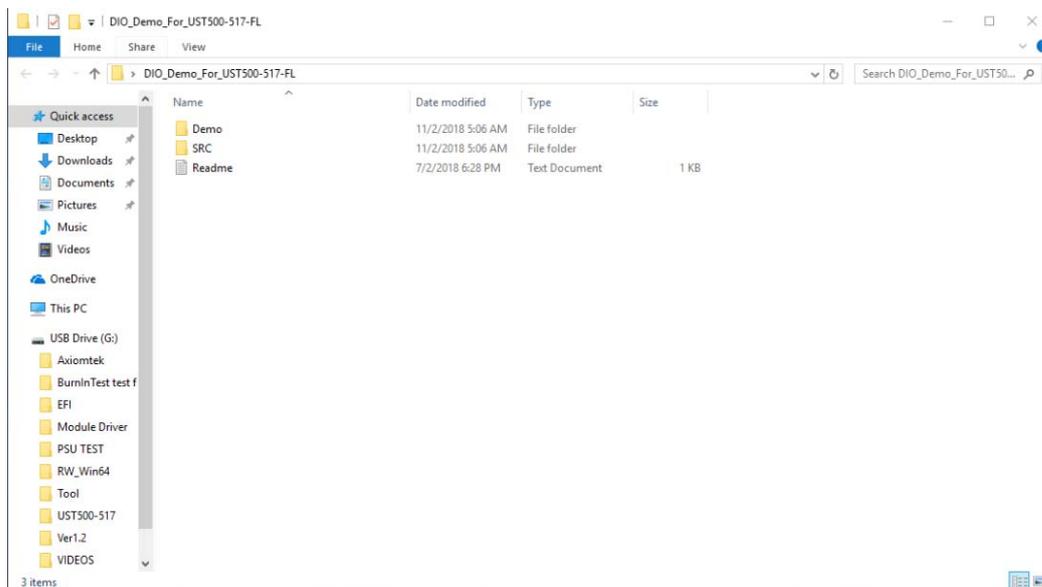


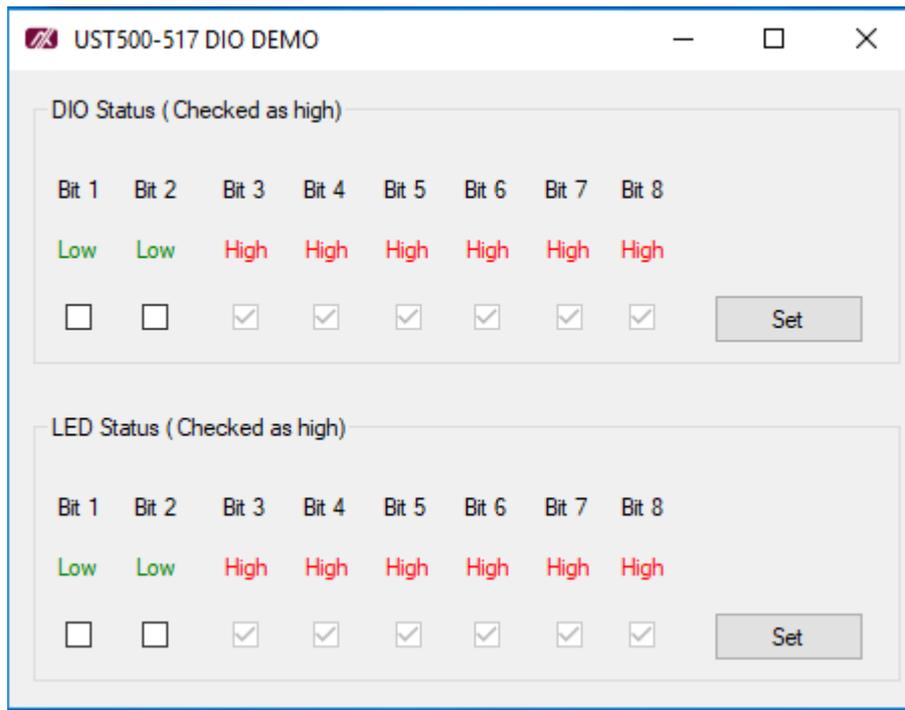
About Programmable Digital I/O

LED UST500-517-FL supports Isolated digital I/O which allows user to 6DI or 2DO. Please refer to Driver CD for sample code and demo tool.



【Note】 DIO Status Bit1~2 are DO. When select it, can check DO active low.LED bit1 correspond to front side P0 LED, LED bit2 correspond to front side P1 LED, When select it, can check LED off.





APPENDIX C CONFIGURING SATA FOR RAID

Configuring SATA Hard Drive(s) for RAID (Controller: Intel® Q170)

Before you begin the SATA configuration, please prepare four SATA hard drives (to ensure optimal performance, it is recommended that you use two hard drives with the 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 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 using the RAID BIOS.

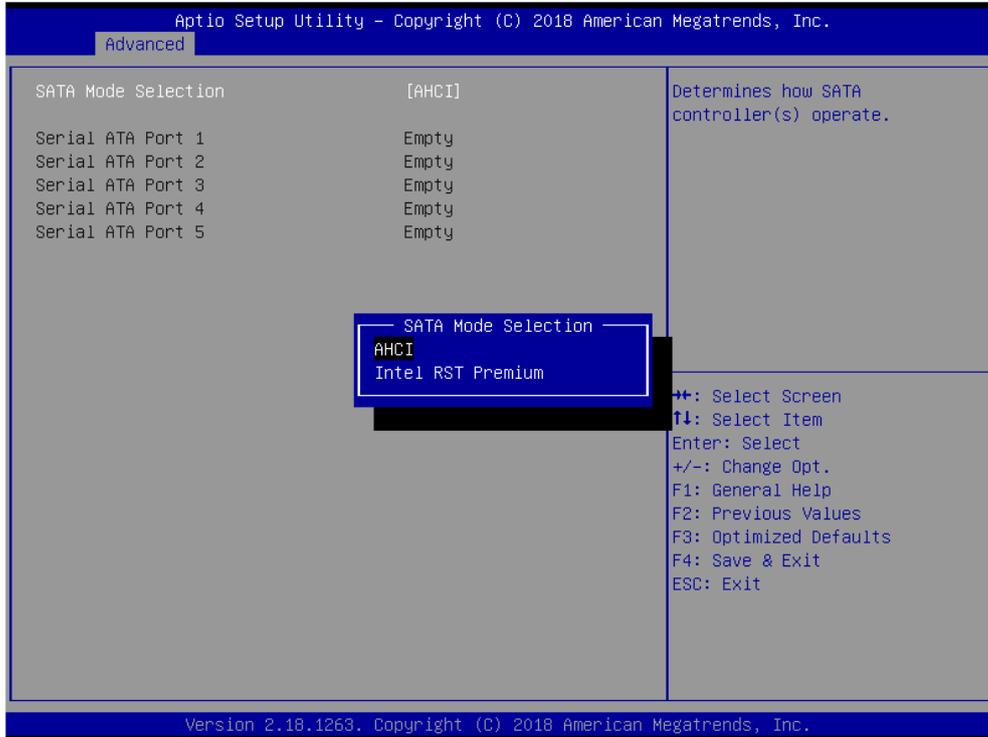
1. Installing SATA hard drive(s) in your system.

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

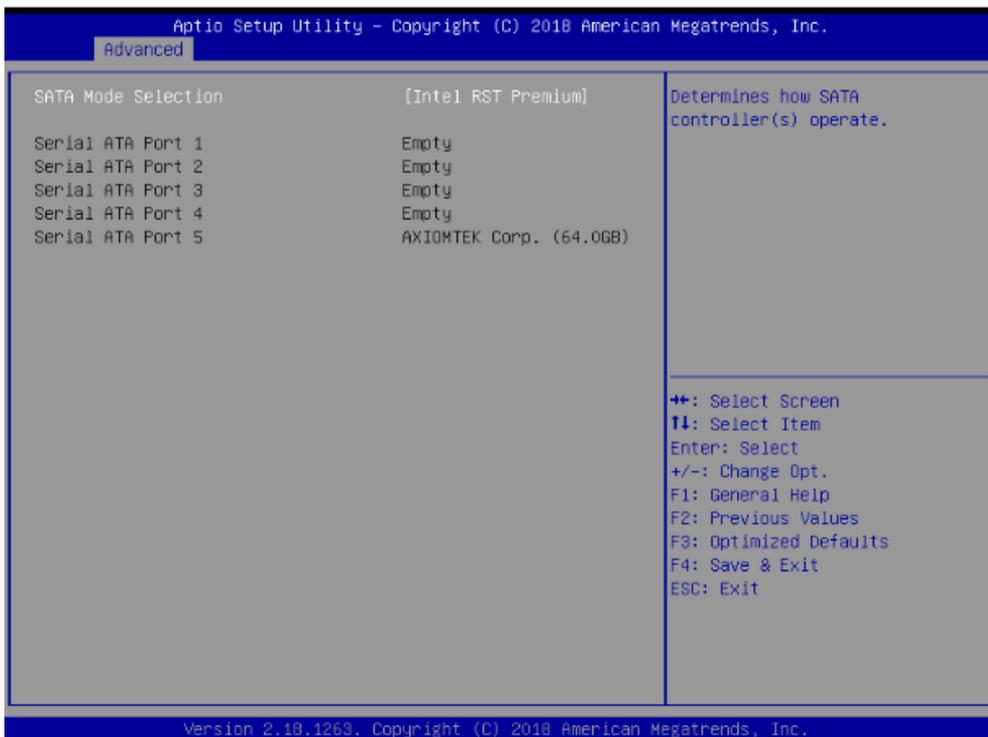
2. Configuring SATA controller mode and boot sequence by the BIOS Setup.

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 “Intel RST Premium”.

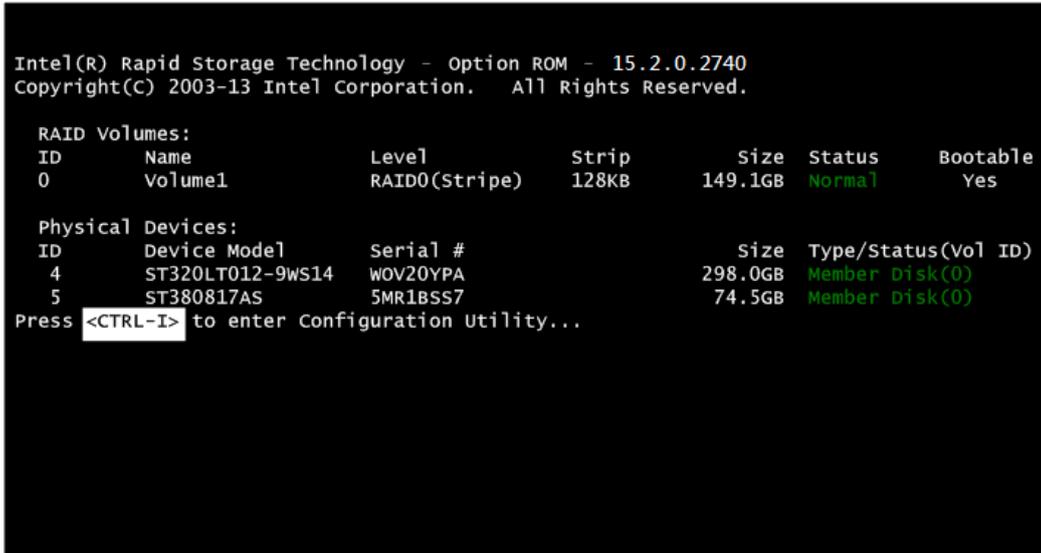


2.2. Save and exit the BIOS Setup.

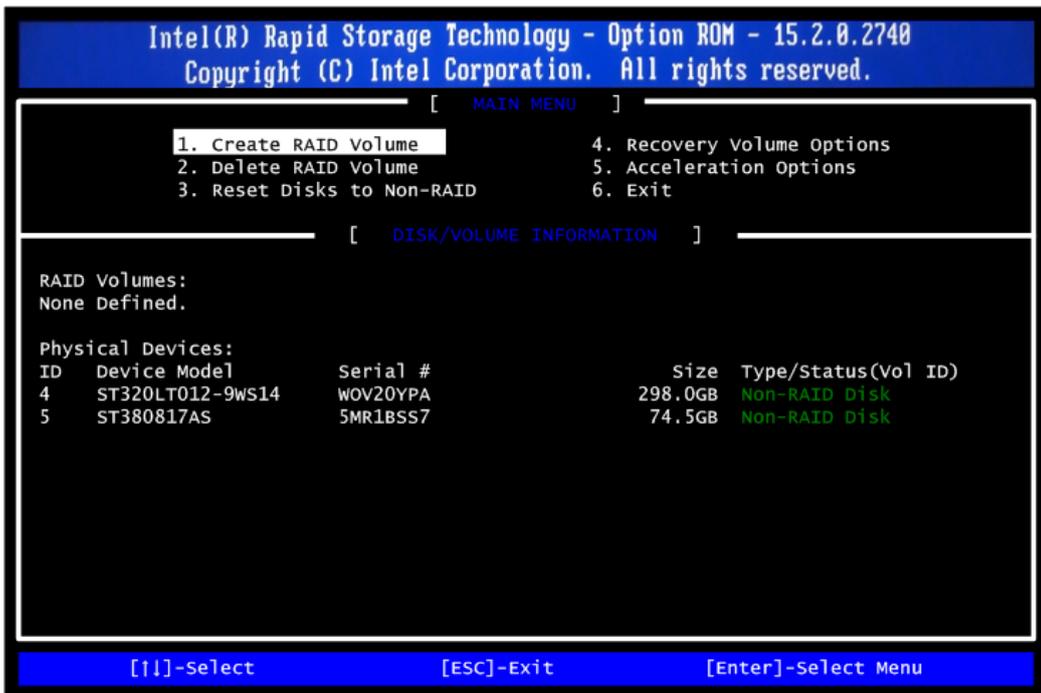
3. Configuring RAID by the RAID BIOS.

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.

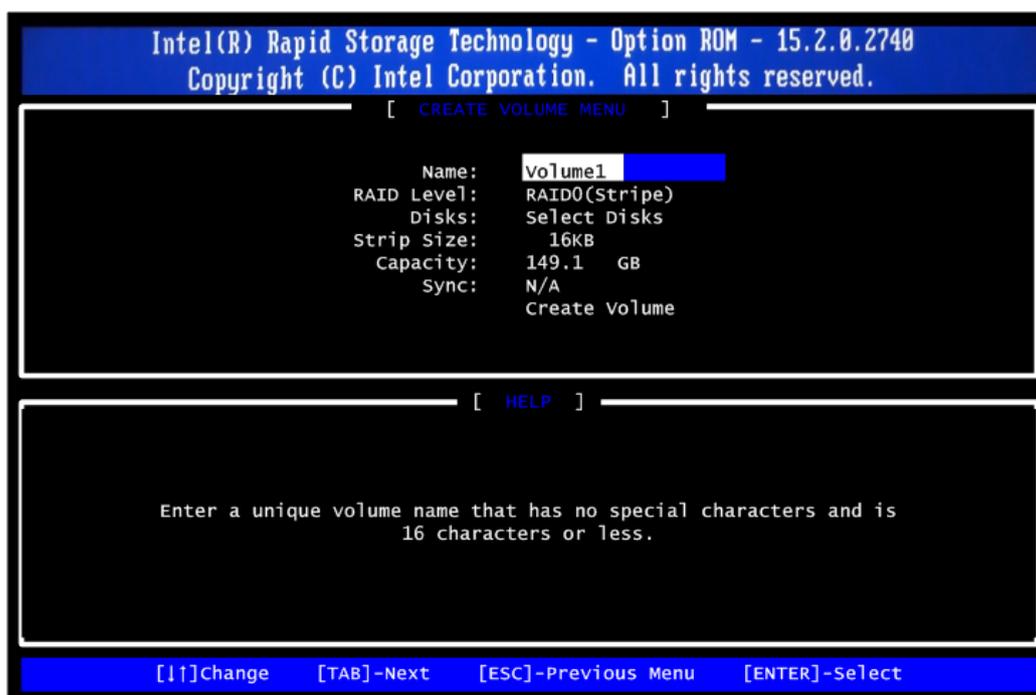
- 3.1. After the POST memory testing and before the operating system booting, a message "Press <Ctrl-I> to enter Configuration Utility" shows up. Press <Ctrl + I> to enter the RAID BIOS setup utility.



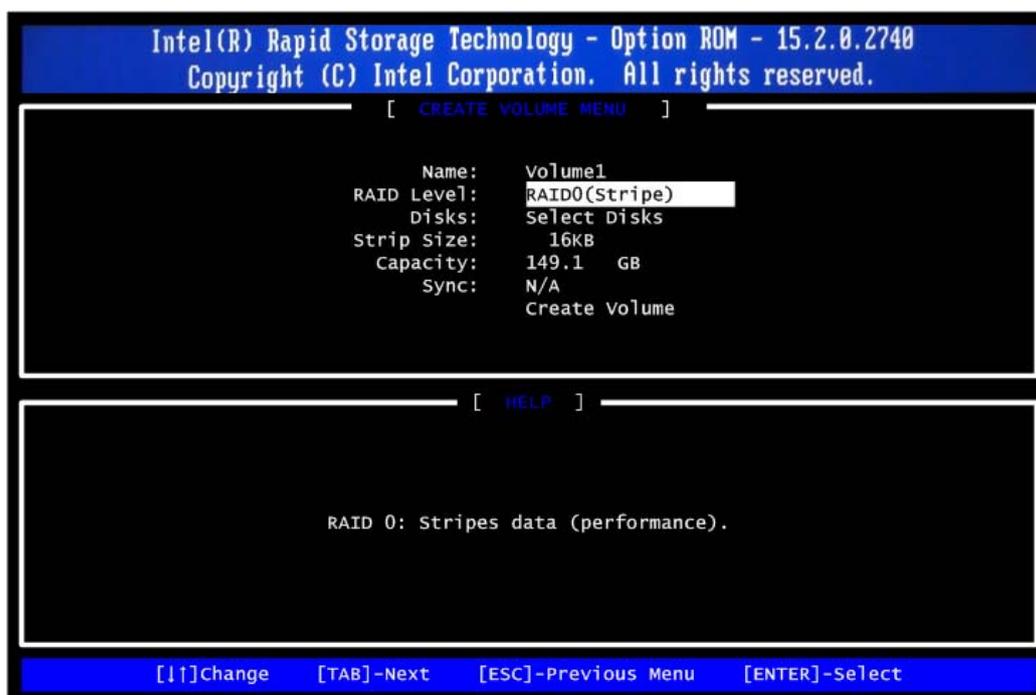
- 3.2. After you press <Ctrl + I>, the Create RAID Volume screen will appear. If you want to create a RAID array, select the Create RAID Volume option in the Main Menu and press <Enter>.



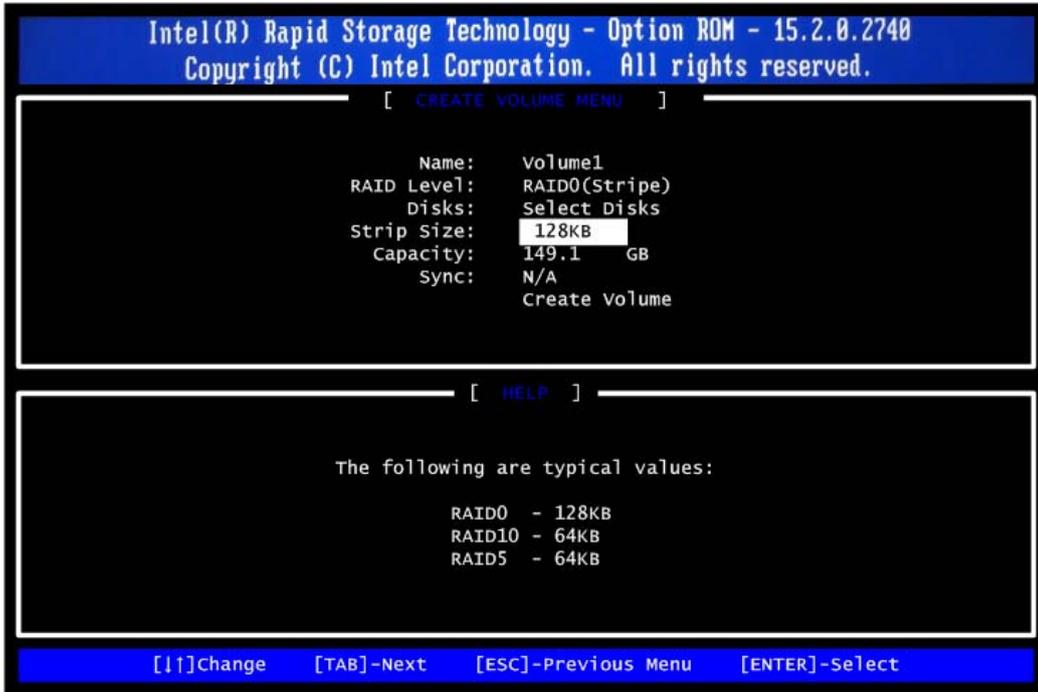
- 3.3. After entering the Create Volume Menu screen, you can type the disk array name with 1~16 letters (letters cannot be special characters) in the item "Name:".



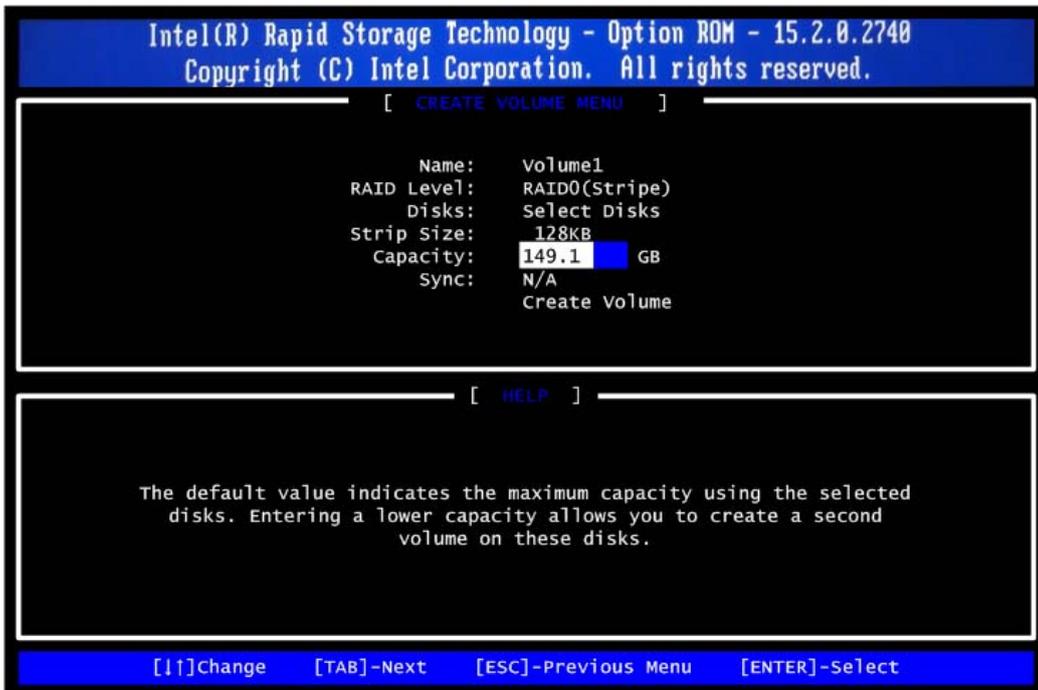
- 3.4. When finished, press <Enter> to select a RAID level. There are three RAID levels: RAID0, RAID1, RAID5 and RAID10. Select a RAID level and press <Enter>.



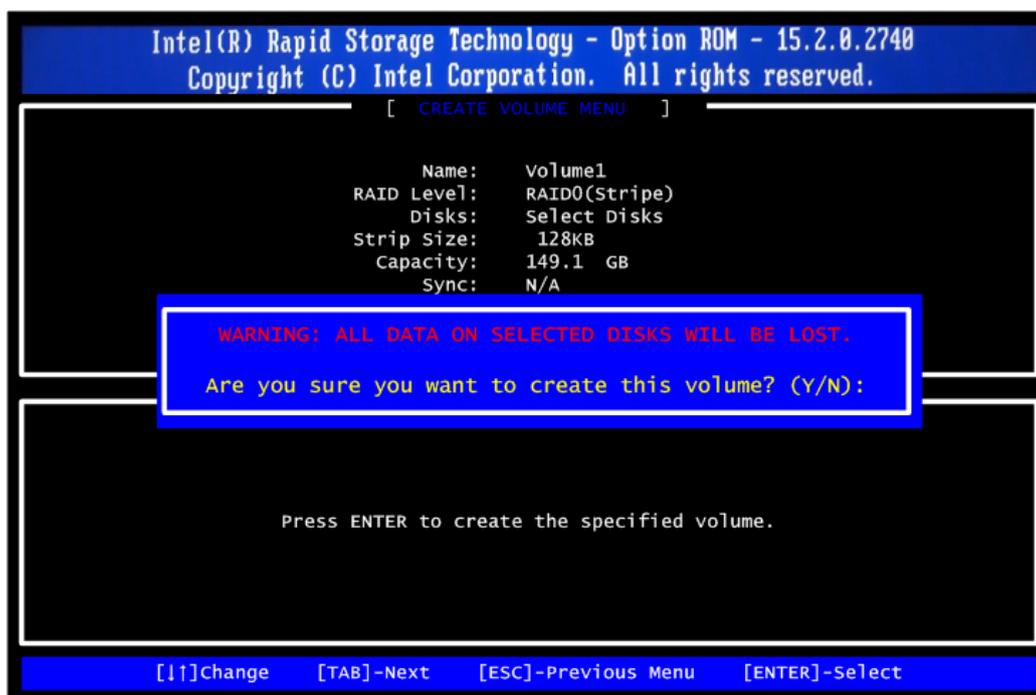
- 3.5. Set the stripe block size. The KB is the standard unit of stripe block size. The stripe block size can be 4KB to 128KB. After the setting, press <Enter> for the array capacity.



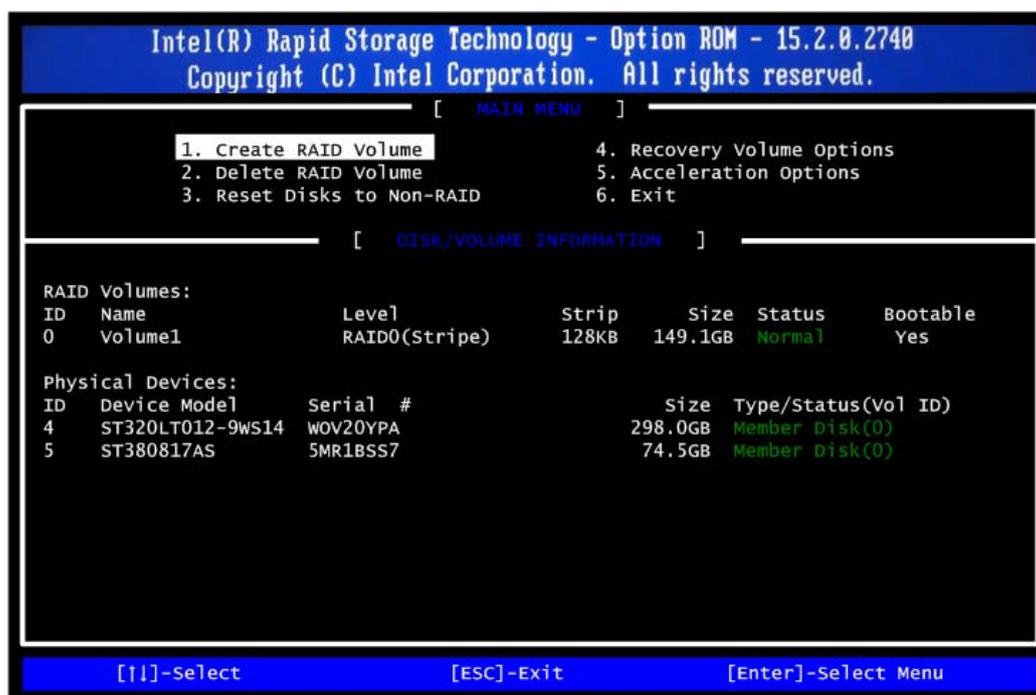
- 3.6. After setting all the items on the menu, select Create Volume and press <Enter> to start creating the RAID array.



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

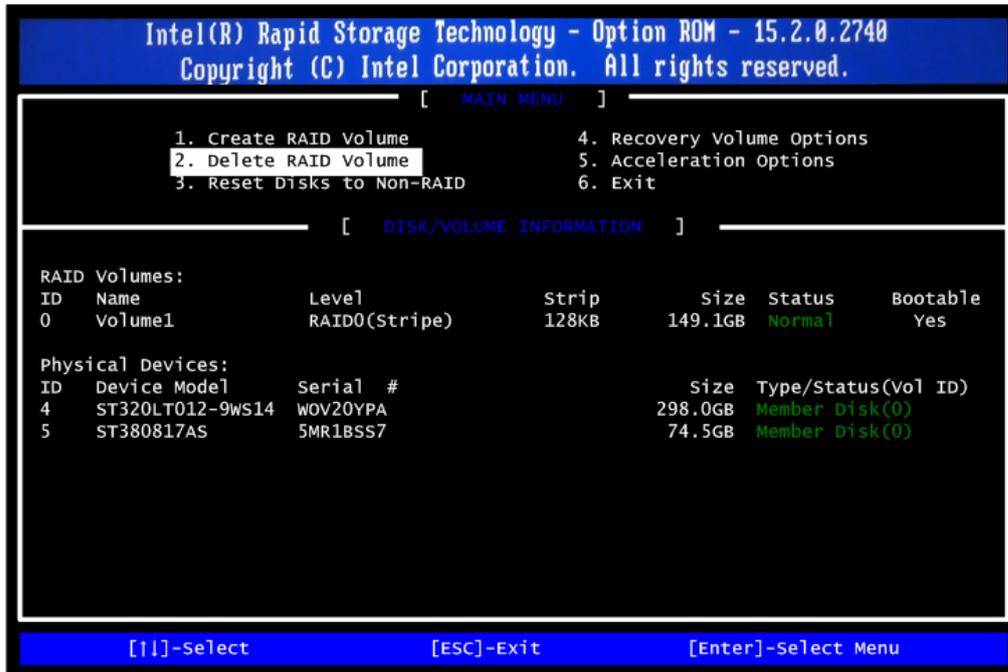


After the creation is completed, you will see detailed information about the RAID array in the Disk/Volume Information section, including RAID mode, disk block size, disk name, disk capacity, etc.



Delete RAID volume

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



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