



AXIOMTEK

MANO521 Series

**Intel® Socket 1151 Core™ i7/ i5/ i3
Processors Mini ITX Motherboard**

User's Manual



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ESD Precautions

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

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

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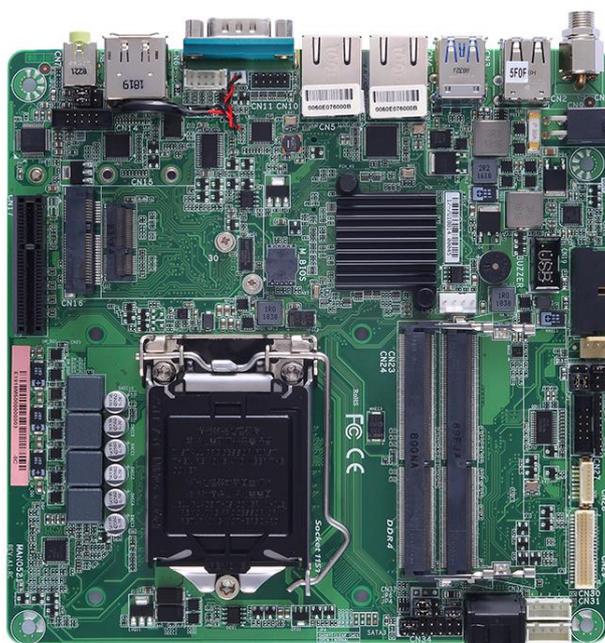
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Chapter 1

Introduction



The MANO521 Mini-ITX motherboard supports the new 14nm 8th Generation Intel® Core™ i7/ i5/ i3 and Pentium® processors in LGA1151 package. Featuring the new Intel® H310 Express chipset with two DDR4 2666MHz memory support, this motherboard is built to perform best stability and reliability for industrial applications.

It comes with two SATA 3.0, four USB 3.0, four USB 2.0 and two serial ports (one RS-232/422/485, one RS-232) providing robust storage and I/O options. Users also can increase board functionality with PCI-Express x4 and mSATA slot. The high quality MANO521 allows four display interfaces via HDMI, DisplayPort, VGA and LVDS in quadruplicate views, making it an ideal solution for gaming, workstation, digital signage, medical and other IoT&M2M applications.

1.1 Features

- LGA1151 Socket for 8th Generation Intel® Core™ i7/ i5/ i3 and Pentium® processors (Coffee Lake)
- 2 DDR4 2400/2666MHz memory with maximum capacity up to 32 GB
- 1 PCI-Express x4
- 1 PCI-Express Mini Card and 1 SIM card slots (support SATA, USB 2.0 signal, PCIE x1)
- 1 M.2 Key E, size: 22x30 for WiFi (support PCIE x1, USB 2.0 signal)
- 1 M.2 Key M (support SATA, PCIE x2 signal)
- 2 SATA-600
- 4 USB 3.0 and 4 USB 2.0

1.2 Specifications

- **CPU**
 - LGA1151 Socket for 8th Generation Intel® Core™ i7/ i5/ i3 and Pentium® processors.
- **Chipset**
 - Intel® H310/Q370 (optional).
- **BIOS**
 - AMI BIOS via SPI interface.
- **System Memory**
 - Two 260-pin SO-DIMM sockets.
 - Maximum up to 32GB DDR4 memory.
 - Support 2400/2666MHz.
- **Onboard Multi I/O**
 - Controller: ITE8625.
 - Two serial ports:
 - COM1 supports RS-232/422/485; COM2 supports RS-232 only.
 - COM1 on the rear I/O; COM2 in wafer connector.
- **USB Interface**
 - Two USB 3.0 ports (on the rear I/O).
 - Two USB 2.0 ports (on the rear I/O).
 - Two USB 3.0 ports in wafer connector (internal).
 - Two USB 2.0 ports in wafer connector (internal).
- **Ethernet**
 - LAN1: 1000/100/10Mbps Gigabit/Fast Ethernet supports Wake-on-LAN, PXE with Intel® i211AT.
 - LAN2: 1000/100/10Mbps Gigabit/Fast Ethernet supports Wake-on-LAN, PXE with Intel® i219V/i219LM (optional).
- **Serial ATA**
 - Two SATA 3.0 ports (6Gb/s).
 - One mSATA/Mini Card slot.
 - One M.2 Key M slot.
- **Audio**
 - Realtek ALC662 5.1 channel HDA codec.
 - Support line-out (on the rear I/O).
 - Support MIC-in/line-out/line-in in box header (internal).
- **Display**
 - One VGA connector in wafer connector. Resolution max. up to 1920x1200.
 - One HDMI with resolution max. up to 3840x2160 @30Hz.
 - One DisplayPort++ with resolution max. up to 4096x2304 @60Hz.
 - One 18/24-bit dual channel LVDS and one 8-pin inverter connector. LVDS resolution is max. up to 1920x1200.
 - One Embedded DisplayPort (eDP) with resolution max. up to 4096x2304 @60Hz; co-layout with LVDS (optional).

- **Expansion Interface**
 - One PCI-Express x4 slot.
 - One PCI-Express Mini Card slot.
 - One M.2 key M slot.
 - One M.2 Key E slot.
 - One SIM card slot.

- **Power Input**
 - One 12V,19~24V ATX 4-pin power input connector.
 - One 12V,19~24V DC jack power input connector.

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

- **Storage Temperature**
 - -20°C ~ 65°C.

- **Form Factor**
 - Mini ITX (6.7" x 6.7", 17.0cm x 17.0cm).



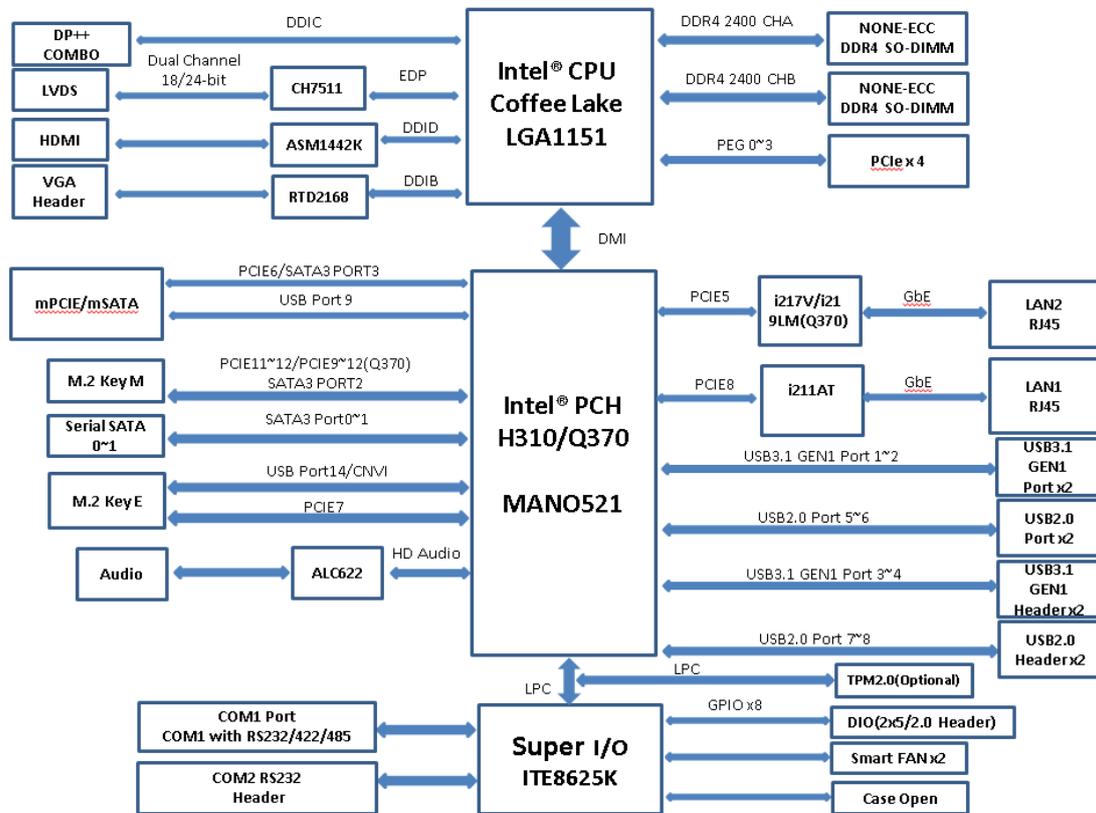
All specifications and images are subject to change without notice.

Note

1.3 Utilities Supported

- Chipset driver
- Graphics driver
- Intel ME driver
- Ethernet driver
- Audio driver
- Chipset_serialio driver
- Intel_Rapid_Storage_Technology driver

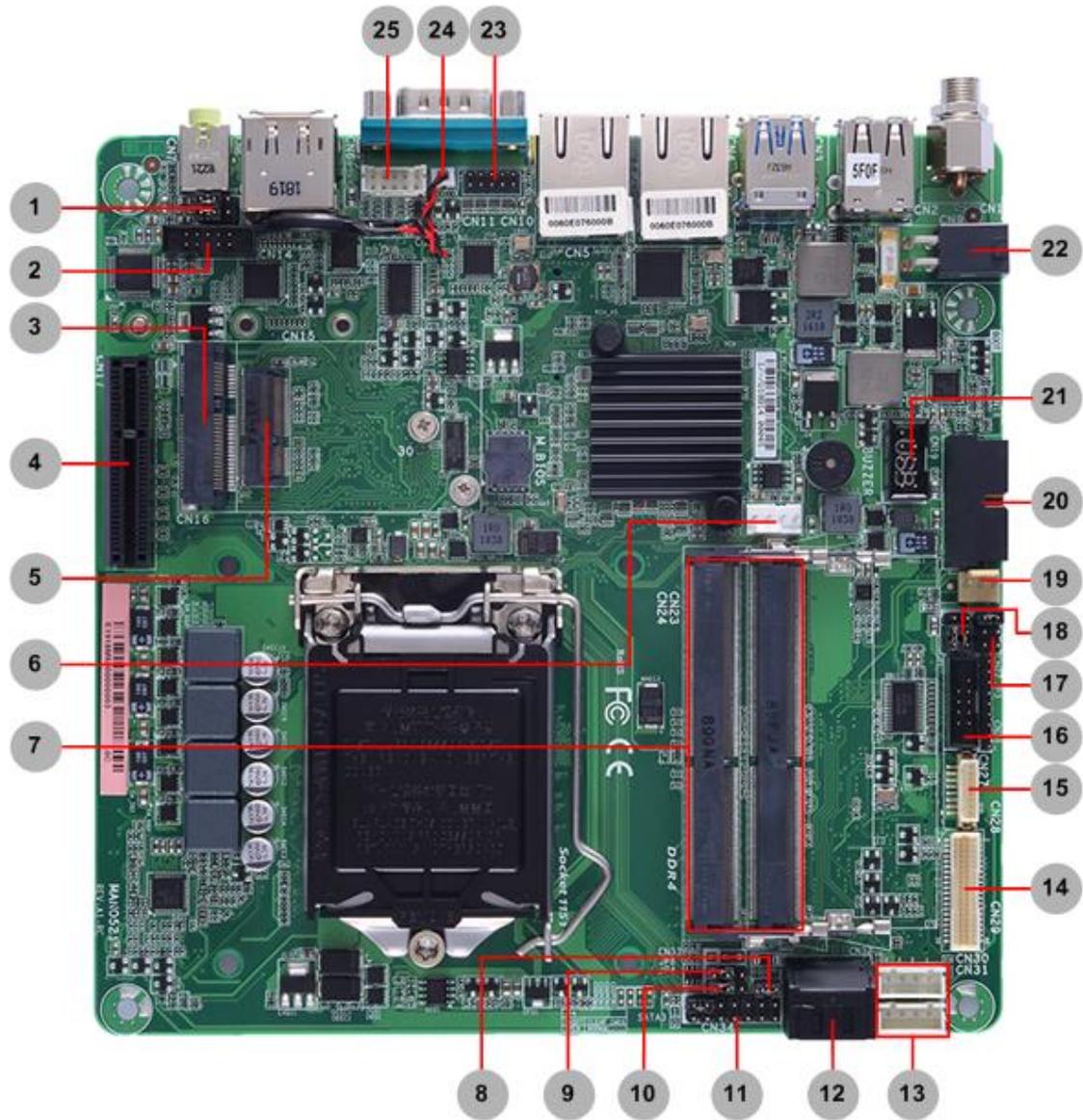
1.4 Block Diagram



Chapter 2

Board and Pin Assignments

2.1 Board Layout

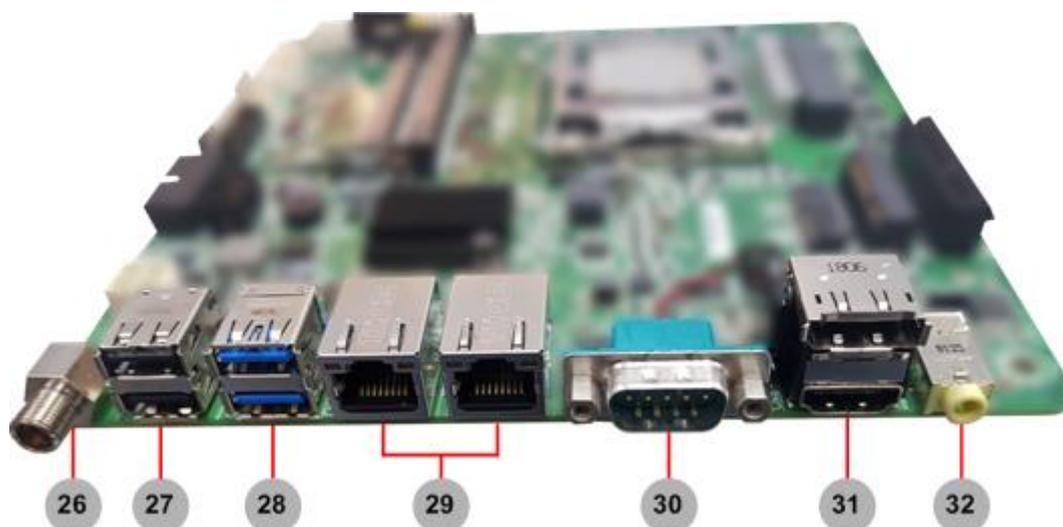


Top View



Bottom View

2.2 Rear I/O



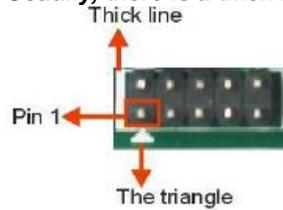
Jumpers/Headers/Connectors			
1	Audio Output Select Jumper (JP2) (Optional)	19	System Fan Connector (CN22)
2	Front Audio Connector (CN14)	20	USB 3.0 Wafer Connector (CN18)
3	mSATA/Mini Card Connector (CN16)	21	USB 2.0 Wafer Connector (CN19)
4	PCI-Express x4 Slot (CN17)	22	ATX Power Input 90 Angle Connector (CN9) (Co-layout with 180 Angle Connector, CN38)
5	M.2 Key E Connector (CN15)	23	GPIO Header (CN10)
6	CPU Fan Connector (CN21)	24	CMOS Battery Connector (CN11)
7	DDR4 SO-DIMM Connectors (CN23, CN24)	25	VGA Wafer Connector (CN12)
8	Case Open Select Jumper (JP5)	26	DC Jack Power Connector (CN1)
9	AT/ATX Power Mode Select Jumper (JP6)	27	USB 2.0 Stack Port (CN2)
10	Clear CMOS Jumper (JP4)	28	USB 3.0 Stack Port (CN3)
11	Front Panel Connector (CN34)	29	Ethernet Ports (CN4, CN5)
12	SATA 3.0 Combo Connector (CN32)	30	COM1 D-Sub Connector (CN6)
13	SATA Power Connectors (CN30, CN31)	31	DisplayPort and HDMI Connector (CN8)
14	LVDS Signal Header (CN29)	32	Audio Jack (CN7)
15	LVDS Backlight Control Header (CN28)	33	M.2 Key M Connector (CN35)
16	COM2 Wafer Connector (CN27)	34	SIM Card Slot (CN36)
17	LVDS VDD Select Jumper (JP3)	35	eDP Connector (CN37)
18	COM2 Data/Power Select Jumper (JP1)		



Note

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

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



2.3 Jumper Settings

Jumper is a small component consisting of jumper clip and jumper pins. Install jumper clip on 2 jumper pins to close. And remove jumper clip from 2 jumper pins to open. The following illustration shows how to set up jumper.

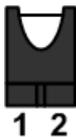
jumper clip



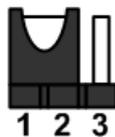
open



close



pin 1-2 close



all open



Before applying power to MANO521 Series, please make sure all of the jumpers are in factory default position. Below you can find a summary table of all jumpers and onboard default settings.



Note

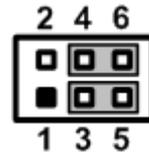
Once the default jumper setting needs to be changed, please do it under power-off condition.

Jumper	Description	Setting	
JP1	COM2 Data/Power Select Default: RS-232 Data	CN27 Pin 1: DCD#	3-5 Close
		CN27 Pin 8: RI#	4-6 Close
JP2 (Optional)	Audio Output Select Default: Line-out	1-3, 2-4 Close	
JP3	LVDS VDD Select Default: +3.3V	1-2 Close	
JP4	Clear CMOS Default: Normal Operation	1-2 Close	
JP5	Case Open Select Default: Close	1-2 Close	
JP6	AT/ATX Power Mode Select Default: ATX Mode	1-2 Close	

2.3.1 COM2 Data/Power Select (JP1)

The COM2 port has +5V level power capability on DCD# and +12V level on RI# by setting JP1.

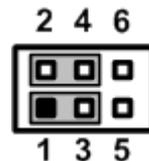
Function	Setting
Power: Set CN27 pin 1 to +5V level	1-3 close
Data: Set CN27 pin 1 to DCD# (Default)	3-5 close
Power: Set CN27 pin 8 to +12V level	2-4 close
Data: Set CN27 pin 8 to RI# (Default)	4-6 close



2.3.2 Audio Output Select (JP2) (Optional)

Use this jumper to select line-out or speaker out as source for audio output on audio connector. If speaker out is used, it will deliver 2W/channel continuous at 8Ω loads.

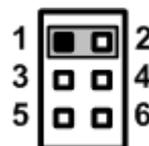
Function	Setting
Line-out (Default)	1-3, 2-4 close
Speaker out	3-5, 4-6 close



2.3.3 LVDS VDD Select (JP3)

The motherboard supports voltage selection for flat panel displays. Use this jumper to set up VDD power of the LVDS connector. To prevent hardware damage, before connecting please make sure that the input voltage of LVDS panel is correct.

Function	Setting
+3.3V (Default)	1-2 close
+5V	3-4 close
+12V	5-6 close



2.3.4 Clear CMOS (JP4)

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

To erase the RTC RAM:

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

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



2.3.5 Case Open Select (JP5)

Use this jumper for chassis intrusion detection feature.

Function	Setting
Close (Default)	1-2 close
Active case open	1-2 open



2.3.6 AT/ATX Power Mode Select (JP6)

Use this jumper to select AT or ATX power mode.

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



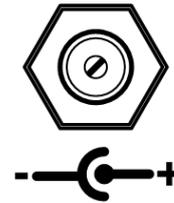
2.4 Connectors

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

Connector	Description
CN1	DC Jack Power Connector
CN2	USB 2.0 Stack Port
CN3	USB 3.0 Stack Port
CN4	Ethernet LAN1 Port (i211AT)
CN5	Ethernet LAN2 Port (i219V)
CN6	COM1 D-Sub Connector
CN7	Audio Jack
CN8	DisplayPort (Upper) and HDMI (Lower) Connector
CN9/CN38	ATX Power Input 90 Angle Connector. Co-layout with a 180 Angle Connector, CN38 (Optional)
CN10	GPIO Header
CN11	CMOS Battery Connector
CN12	VGA Wafer Connector
CN14	Front Audio Connector
CN15	M.2 Key E Connector
CN16	mSATA/Mini Card Connector
CN17	PCI-Express x4 Slot
CN18	USB 3.0 Wafer Connector
CN19	USB 2.0 Wafer Connector
CN21~CN22	Fan Connectors
CN23~CN24	DIMM1~DIMM2 DDR4 SO-DIMM Connectors
CN27	COM2 Wafer Connector
CN28	LVDS Backlight Control Header
CN29	LVDS Signal Header
CN30~CN31	SATA Power Connectors
CN32	SATA 3.0 Combo Connector
CN34	Front Panel Connector
CN35	M.2 Key M Connector
CN36	SIM Card Slot
CN37 (Optional)	eDP Connector

2.4.1 DC Jack Power Connector (CN1)

The CN1 is a DC jack with screw supporting 12V, 19~24VDC power input connector. Firmly insert at least 90W adapter into this connector. Loose connection may cause system instability and make sure all components/devices are properly installed before connecting.



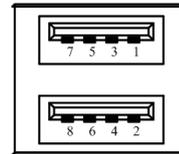
Note

Screw metric thread size: M8.0x0.75.

2.4.2 USB 2.0 Stack Port (CN2)

The motherboard comes with one stacked Universal Serial Bus (compliant with USB 2.0) connector on the rear I/O for installing USB peripherals such as keyboard, mouse, scanner, etc.

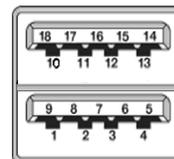
Pin	Signal	Pin	Signal
1	USB_PWR	2	USB_PWR
3	USB#5_D-	4	USB#6_D-
5	USB#5_D+	6	USB#6_D+
7	GND	8	GND



2.4.3 USB 3.0 Stack Port (CN3)

The motherboard comes with one stacked Universal Serial Bus (compliant with USB 3.0) connector on the rear I/O for installing USB peripherals such as keyboard, mouse, scanner, etc.

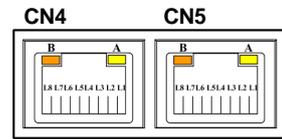
Pin	Signal	Pin	Signal
1	USB_PWR	10	USB_PWR
2	USB#1_D-	11	USB#2_D-
3	USB#1_D+	12	USB#2_D+
4	GND	13	GND
5	SSRX1-	14	SSRX2-
6	SSRX1+	15	SSRX2+
7	GND	16	GND
8	SSTX1-	17	SSTX2-
9	SSTX1+	18	SSTX2+



2.4.4 Ethernet Ports (CN4 and CN5)

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

Pin	1000 Base-T	100/10 Base-T	Description
L1	BI_DA+	TX+	Bidirectional or Transmit Data+
L2	BI_DA-	TX-	Bidirectional or Transmit Data-
L3	BI_DB+	RX+	Bidirectional or Receive Data+
L4	BI_DC+	N.C.	Bidirectional or Not Connected
L5	BI_DC-	N.C.	Bidirectional or Not Connected
L6	BI_DB-	RX-	Bidirectional or Receive Data-
L7	BI_DD+	N.C.	Bidirectional or Not Connected
L8	BI_DD-	N.C.	Bidirectional or Not Connected
A	Active Link LED (Yellow) Off: No link Blinking: Data activity detected		
B	Speed LED 1000: Orange 100/10: Green/OFF		



CN4: LAN1 with Intel® i211AT

CN5: LAN2 with Intel® i219V



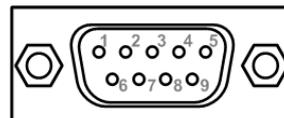
Note

- **Speed LED turns orange for 1000Mbps or green for 100Mbps.**
- **Both CN4 and CN5 support Wake-on-LAN. When the motherboard chipset is Intel® Q370, CN5 (LAN2) is changed to i219LM and with AMT supported.**

2.4.5 COM1 D-Sub Connector (CN6)

This connector is a standard D-Sub connector for COM1 serial port interface which is selectable for RS-232/422/485 mode by BIOS setting (see section 4.4). The pin assignments of RS-232/422/485 are listed in table below.

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



2.4.6 Audio Jack (CN7)

The motherboard provides HD audio jack for line-out on the rear I/O. Install audio driver, and then attach audio devices to CN7.

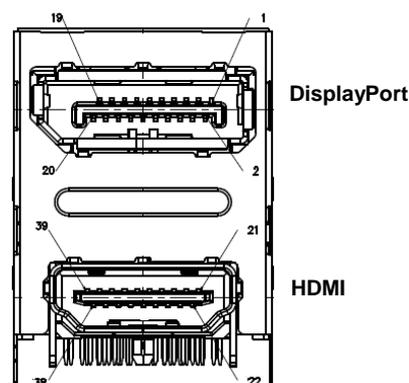
Pin Color	Signal
Green	Line-out



2.4.7 DisplayPort and HDMI Connector (CN8)

The CN8 is a stacked connector comprising an upper connector for DisplayPort++ interface and a lower connector for HDMI interface.

Pin	Signal	Pin	Signal
1	DP_TX0_P	21	HDMI OUT_DATA2+
2	GND	22	GND
3	DP_TX0_N	23	HDMI OUT_DATA2-
4	DP_TX1_P	24	HDMI OUT_DATA1+
5	GND	25	GND
6	DP_TX1_N	26	HDMI OUT_DATA1-
7	DP_TX2_P	27	HDMI OUT_DATA0+
8	GND	28	GND
9	DP_TX2_N	29	HDMI OUT_DATA0-
10	DP_TX3_P	30	HDMI OUT_Clock+
11	GND	31	GND
12	DP_TX3_N	32	HDMI OUT_Clock-
13	GND	33	NC
14	GND	34	NC
15	DP_AUXP	35	HDMI OUT_SCL
16	GND	36	HDMI OUT_SDA
17	DP_AUXN	37	GND
18	DP_HPD	38	+5V
19	GND	39	HDMI_HTPLG
20	+3.3V		



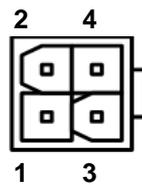
2.4.8 ATX Power Input Connector (CN9)

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

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

By default, the motherboard comes with a 4-pin ATX 90 angle connector (CN9) for DC +12V, +19~24V power input. Co-layout with a 180 angle connector, CN38 (optional).

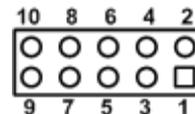
Pin	Signal
1	GND
2	GND
3	+ 12V IN
4	+ 12V IN



2.4.9 GPIO Header (CN10)

The motherboard comes with a 2x5-pin (pitch=2.00mm) header for GPIO interface.

Pin	Signal	Pin	Signal
1	SIO_GPI70 (0xA06, Bit0, H) ^[1]	2	SIO_GPI71 (0xA06, Bit1, H) ^[1]
3	SIO_GPI72 (0xA06, Bit2, H) ^[1]	4	SIO_GPI73 (0xA06, Bit3, H) ^[1]
5	SIO_GPI74 (0xA06, Bit4, H) ^[1]	6	SIO_GPI75 (0xA06, Bit5, H) ^[1]
7	SIO_GPI76 (0xA06, Bit6, H) ^[1]	8	SIO_GPI77 (0xA06, Bit7, H) ^[1]
9	+5V	10	GND



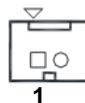
Note

^[1]: “H” or “L” means the default voltage is High or Low level, and GPIO output is 5V.

2.4.10 CMOS Battery Connector (CN11)

This is a 2-pin connector for CMOS battery interface.

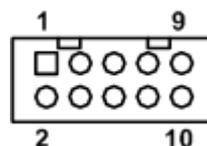
Pin	Signal
1	+3V
2	GND



2.4.11 VGA Wafer Connector (CN12)

This is a 2x5-pin (pitch=2.00mm) wafer connector for VGA interface.

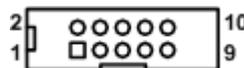
Pin	Signal	Pin	Signal
1	G_VGA_R	2	VGA_VCC
3	G_VGA_G	4	GND
5	G_VGA_B	6	GND
7	G_HSYNC	8	G_VSYNC
9	VGA_SCL	10	VGA_SDA



2.4.12 Front Audio Connector (CN14)

This is a 2x5-pin (pitch=2.00mm) connector for convenient connection and control of audio devices.

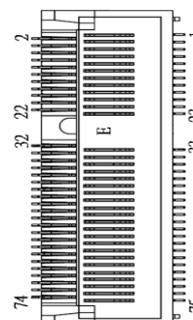
Pin	Signal	Pin	Signal
1	MIC_IN	2	GND
3	LINE_IN_L	4	GND
5	LINE_IN_R	6	GND
7	AUD_OUT_L	8	GND
9	AUD_OUT_R	10	GND



2.4.13 M.2 Key E Connector (CN15)

The motherboard comes with one M.2 Key E connector (Wi-Fi & Bluetooth).

Pin	Signal	Pin	Signal	Pin	Signal
1	GND	26	N/C	51	GND
2	+3.3V	27	N/C	52	BUF_PLT_RST
3	USB#14_D+	28	N/C	53	NGFF_CLKREQ3
4	+3.3V	29	N/C	54	BT_KILL1
5	USB#14_D-	30	N/C	55	PCH_WAKE
6	N/C	31	N/C	56	WLAN_KILL1
7	GND	32	CNV_RGI_DT ^[*]	57	GND
8	N/C	33	GND	58	N/C
9	CNV_WR_1_DN ^[*]	34	CNV_RGI_RSP ^[*]	59	CNV_WT_1_DN ^[*]
10	PCM_CRF_RST ^[*]	35	PCIE12_TX_DP ^[*]	60	N/C
11	CNV_WR_1_DP ^[*]	36	CNV_BRI_DT ^[*]	61	CNV_WT_1_DP ^[*]
12	N/C	37	PCIE12_TX_DN	62	N/C
13	GND	38	CL_RST ^[*]	63	GND
14	PCMOUT_CLKREQ0 ^[*]	39	GND	64	M2_REFCLK
15	CNV_WR_0_DN ^[*]	40	CL_DATA ^[*]	65	CNV_WT_0_DN ^[*]
16	N/C	41	PCIE12_RX_DP	66	N/C
17	CNV_WR_0_DP ^[*]	42	CL_CLK ^[*]	67	CNV_WT_0_DP ^[*]
18	GND	43	PCIE12_RX_DN	68	N/C
19	GND	44	CNV_PA_BLANKING ^[*]	69	GND
20	UART_BT_WAKE ^[*]	45	GND	70	N/C
21	CNV_WR_CLK_DN ^[*]	46	CNV_MFUART2_TXD ^[*]	71	CNV_WT_CLK_DN ^[*]
22	CNV_BRI_RSP ^[*]	47	CLKOUT_PCIE_P3	72	+3.3V
23	CNV_WR_CLK_DP ^[*]	48	CNV_MFUART2_RXD ^[*]	73	CNV_WT_CLK_DP ^[*]
24	N/C	49	CLKOUT_PCIE_N3	74	+3.3V
25	N/C	50	PCH_SUSCLK	75	GND



Support CNVI module.
^[*]: These pins are for CNVI module.

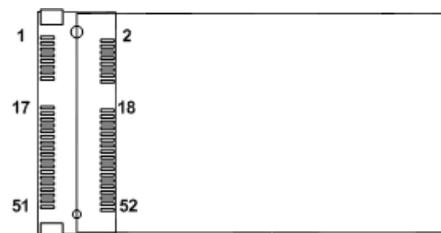


Note

2.4.14 mSATA/Mini Card Connector (CN16)

The mSATA interface is available through connector CN16.

Pin	Signal	Pin	Signal
1	WAKE#	2	+3.3VAUX
3	N/C	4	GND
5	N/C	6	+1.5V
7	CLKREQ#	8	UIM_PWR
9	GND	10	UIM_DAT
11	REFCLK-	12	UIM_CLK
13	REFCLK+	14	UIM_REST
15	GND	16	UIM_VPP
17	N/C	18	GND
19	N/C	20	+3.3VAUX
21	GND	22	PERST#
23	SATA0_RX_DP	24	+3.3VAUX
25	SATA0_RX_DN	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	SATA0_TX_DN	32	SMB_DATA
33	SATA0_TX_DP	34	GND
35	GND	36	USB#9_D-
37	GND	38	USB#9_D+
39	+3.3VAUX	40	GND
41	+3.3VAUX	42	N/C
43	GND	44	N/C
45	N/C	46	N/C
47	N/C	48	+1.5V
49	N/C	50	GND
51	+3.3VAUX	52	+3.3VAUX



2.4.15 PCI-Express x4 Slot (CN17)

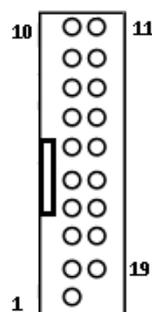
This motherboard comes with one PCI-Express x4 slot.

Pin	Signal	Pin	Signal
B1	+12V	A1	PRSNT1#
B2	+12V	A2	+12V
B3	RSVD	A3	+12V
B4	GND	A4	GND
B5	SMCLK	A5	NC
B6	SMDAT	A6	NC
B7	GND	A7	NC
B8	+3.3V	A8	NC
B9	NC	A9	+3.3V
B10	3.3Vaux	A10	+3.3V
B11	WAKE#	A11	PERST#
B12	NC	A12	GND
B13	GND	A13	REFCLK+
B14	HSOP0	A14	REFCLK-
B15	HSOP0	A15	GND
B16	GND	A16	HSIP0
B17	PRSNT2	A17	HSIN0
B18	GND	A18	GND
B19	HSOP1	A19	N/C
B20	HSOP1	A20	GND
B21	GND	A21	HSIP1
B22	GND	A22	HSIN1
B23	HSOP2	A23	GND
B24	HSOP2	A24	GND
B25	GND	A25	HSIP2
B26	GND	A26	HSIN2
B27	HSOP3	A27	GND
B28	HSOP3	A28	GND
B29	GND	A29	HSIP3
B30	N/C	A30	HSIN3
B31	PRSNT2	A31	GND
B32	GND	A32	N/C

2.4.16 USB 3.0 Wafer Connector (CN18)

The CN12 is a 10x2-pin (pitch=2.00mm) internal connector for installing versatile USB 3.0 compliant peripherals.

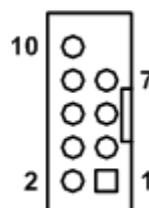
Pin	Signal	Pin	Signal
1	+5V	20	
2	P3_SSRX1-	19	+5V
3	P3_SSRX+	18	P4_SSRX-
4	GND	17	P4_SSRX+
5	P3_SSTX-	16	GND
6	P3_SSTX+	15	P4_SSTX-
7	GND	14	P4_SSTX+
8	USB#3_D-	13	GND
9	USB#3_D+	12	USB#4_D-
10	N/C	11	USB#4_D+



2.4.17 USB 2.0 Wafer Connector (CN19)

This is a 5x2-pin (pitch=2.00mm) connector for USB 2.0 interface.

Pin	Signal	Pin	Signal
1	+5V	2	+5V
3	USB#8_D-	4	USB#7_D-
5	USB#8_D+	6	USB#7_D+
7	GND	8	GND
		10	N/C

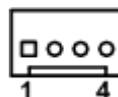


2.4.18 Fan Connectors (CN21 and CN22)

The motherboard has two fan connectors. You can find fan speed option within BIOS Setup Utility if fan is installed. For further information, see BIOS Setup Utility: Advanced\Hardware Monitor\PC Health Status in section 4.4.

CN21: 4-pin (pitch=2.54mm)

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



CN22: 3-pin (pitch=2.54mm)

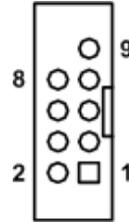
Pin	Signal
1	GND
2	+12V
3	FAN Speed Detection



2.4.19 COM2 Wafer Connector (CN27)

The motherboard comes with one 5x2-pin (pitch=2.00mm) wafer connector for COM2 serial port interface. It has power capability on DCD# and RI# pins by setting jumper JP1.

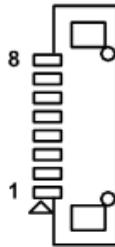
Pin	Signal	Pin	Signal
1	DCD#	2	DSR#
3	RXD	4	RTS#
5	TXD	6	CTS#
7	DTR#	8	RI#
9	GND		



2.4.20 LVDS Backlight Control Header (CN28)

This is an 8-pin (pitch=1.25mm) connector which is compliant with Hirose DF13-8P-1.25V for inverter. We strongly recommend you to use the matching connector, DF13-8S-1.25C, to avoid malfunction.

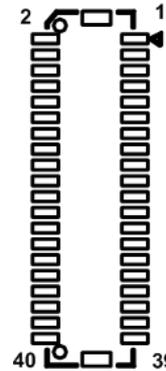
Pin	Signal
1	+12V
2	+12V
3	+5V
4	LVDS_BKL_EN
5	GND
6	GND
7	GND
8	LVDS_BKL_CTL



2.4.21 LVDS Signal Header (CN29)

The motherboard comes with a 2x20-pin (pitch=1.0mm) connector which is compliant with JST SM40B-SRDS-G-TF for LVDS LCD interface. It is strongly recommended to connect it with matching connector, SHDR-40VS-B.

Pin	Signal	Pin	Signal
1	VDD ^[*]	2	VDD ^[*]
3	VDD ^[*]	4	VDD ^[*]
5	VDD ^[*]	6	VDD ^[*]
7	N/C	8	N/C
9	GND(Detect) ^[**]	10	GND
11	LVDS_B_DATA3-	12	LVDS_B_DATA0-
13	LVDS_B_DATA3+	14	LVDS_B_DATA0+
15	GND	16	GND
17	LVDS_B_CLK-	18	LVDS_B_DATA1-
19	LVDS_B_CLK +	20	LVDS_B_DATA1+
21	GND	22	GND
23	LVDS_A_DATA0-	24	LVDS_B_DATA2-
25	LVDS_A_DATA0+	26	LVDS_B_DATA2+
27	GND	28	GND
29	LVDS_A_DATA1-	30	LVDS_A_DATA3-
31	LVDS_A_DATA1+	32	LVDS_A_DATA3+
33	LVDS_PRSENT#	34	GND
35	LVDS_A_DATA2-	36	LVDS_A_CLK-
37	LVDS_A_DATA2+	38	LVDS_A_CLK +
39	GND(Detect) ^[**]	40	GND



Note

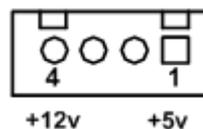
^[*]: Panel power VDD is 3.3V by default, 5V or 12V is selectable by jumper JP3, see section 2.3.3.

^[**]: Grounding of this pin is required to ensure normal LVDS output.

2.4.22 SATA Power Connectors (CN30 and CN31)

This is a 4-pin (pitch=2.54mm) connector for DC +12V and +5V power output.

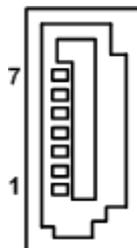
Pin	Signal
1	+5V
2	GND
3	GND
4	+12V



2.4.23 SATA 3.0 Combo Connector (CN32)

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

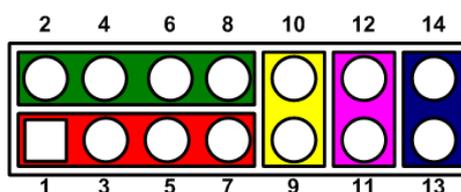
Pin	Signal
1	GND
2	SATA_TX+
3	SATA_TX-
4	GND
5	SATA_RX-
6	SATA_RX+
7	GND



2.4.24 Front Panel Connector (CN34)

The CN34 is a 2x7-pin (pitch=2.54mm) header for front panel interface.

Pin	Signal
1	Power LED+
2	SPK-
3	N/C
4	Buzzer
5	Power LED-
6	N/C
7	N/C
8	SPK+
9	PWR-
10	PWR+
11	RESET-
12	RESET+
13	HD LED-
14	HD LED+



Power LED

Pin 1 connects anode(+) of LED and pin 5 connects cathode(-) of LED. The power LED lights up when the system is powered on.

External Speaker and Internal Buzzer

Pin 2, 4, 6 and 8 connect the case-mounted speaker unit or internal buzzer. While connecting the board to an internal buzzer, please set pin 2 and 4 closed; while connecting to an external speaker, you need to set pins 2 and 4 opened and connect the speaker cable to pin 8(+) and pin 2(-).

Power On/Off Button

Pin 9 and 10 connect the power button on front panel to the board, which allows users to turn on or off power supply.

System Reset Switch

Pin 11 and 12 connect the case-mounted reset switch that reboots your computer without turning off the power switch. It is a better way to reboot your system for a longer life of system power supply.

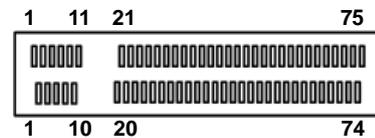
HDD Activity LED

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

2.4.25 M.2 Key M Connector (CN35)

The motherboard comes with one M.2 Key M connector suitable for mounting SATA/PCIE storage card.

Pin	Signal	Pin	Signal	Pin	Signal
1	GND	26	N/C	51	GND
2	+3.3V	27	GND	52	CLKREQ
3	GND	28	N/C	53	REFCLKN
4	+3.3V	29	PCIE#11_RXN	54	N/C
5	PCIE#9_RXN ^[1]	30	N/C	55	REFCLKP
6	N/C	31	PCIE#11_RXP	56	N/C
7	PCIE#9_RXP ^[1]	32	N/C	57	GND
8	N/C	33	GND	58	N/C
9	GND	34	N/C	59	N/C
10	M2_LED	35	PCIE#11_TXN	60	N/C
11	PCIE#9_TXN ^[1]	36	N/C	61	N/C
12	+3.3V	37	PCIE#11_TXP	62	N/C
13	PCIE#9_TXP ^[1]	38	N/C	63	N/C
14	+3.3V	39	GND	64	N/C
15	GND	40	N/C	65	N/C
16	N/C	41	PERN0/SATA_B+	66	N/C
17	PCIE#10_RXN ^[1]	42	N/C	67	N/C
18	+3.3V	43	PERP0/SATA_B-	68	N/C
19	PCIE#10_RXP ^[1]	44	N/C	69	PEDET
20	N/C	45	GND	70	+3.3V
21	GND	46	N/C	71	GND
22	N/C	47	PETN0/SATA_A-	72	+3.3V
23	PCIE#10_TXN ^[1]	48	N/C	73	GND
24	N/C	49	PETP0/SATA_A+	74	+3.3V
25	PCIE#10_TXP ^[1]	50	PERST	75	M_DETECT



Note

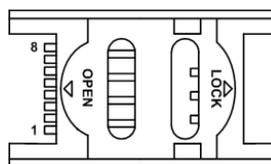
CN35 supports GEN2 x2 NVMe-based SSD.

^[1]: When the motherboard chipset is changed to Intel® Q370, these pins support GEN3 x4 NVMe-based SSD.

2.4.26 SIM Card Slot (CN36)

The CN36 is for inserting SIM Card and mainly used in 3G/4G wireless network application. In order to work properly, the SIM Card must be used together with 3G/4G module inserted to CN16.

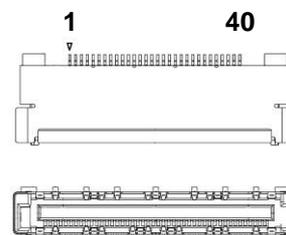
Pin	Signal
1	PWR
2	RST
3	CLK
4	NC
5	GND
6	VPP
7	I/O
8	NC



2.4.27 eDP Connector (CN37) (Optional)

The embedded DisplayPort (eDP) interface is available through 40-pin connector (CN37), which is compliant with I-PEX-CABLIN II HT1 20143. The eDP is a design to replace internal digital LVDS links in computer monitor panels and TV panels.

Pin	Signal	Pin	Signal
1	VDD ^[1]	2	VDD ^[1]
3	VDD ^[1]	4	VDD ^[1]
5	N/C	6	GND
7	GND	8	GND
9	GND	10	EMB_HPDP
11	GND	12	EDP_TXN3C
13	EDP_TXP3_C	14	GND
15	EDP_TXN2_C	16	EDP_TXP2_C
17	GND	18	EDP_TXN1_C
19	EDP_TXP1_C	20	GND
21	EDP_TXN0_C	22	EDP_TXP0_C
23	GND	24	EMB_AUXP
25	EMB_AUXN	26	GND
27	VSS_EDP_AMOLED	28	VSS_EDP_AMOLED
29	VSS_EDP_AMOLED	30	VSS_EDP_AMOLED
31	N/C	32	EDP_BKLTCTL
33	EDP_BKLTEN	34	N/C
35	N/C	36	VCC_EDP_BKLT
37	VCC_EDP_BKLT	38	VCC_EDP_BKLT
39	VCC_EDP_BKLT	40	N/C



Note

- **CN37 is co-layout with LVDS signal header (CN29); they can't be accessed simultaneously.**
- **eDP connector P/N: Aces Electronics 50203-40**

^[1]: Panel power VDD is +3.3V by default, +5V or 12V is selectable by jumper JP3, see section 2.3.3.

Chapter 3

Hardware Description

3.1 Microprocessors

The MANO521 Series supports Intel® Core™ i7/ i5/ i3, Pentium® and Celeron® processors, which enable your system to operate under Windows® 10 and Linux environments. The system performance depends on the microprocessor. Make sure all correct settings are arranged for your installed microprocessor to prevent the CPU from damages.

3.2 BIOS

The MANO521 Series uses AMI Plug and Play BIOS with a single SPI Flash.

3.3 System Memory

The MANO521 supports two 260-pin DDR4 SO-DIMM sockets for maximum memory capacity up to 32GB DDR4 SDRAMs. The memory module comes in sizes of 2GB, 4GB, 8GB and 16GB.



Note

- *For single memory channel configuration, install memory module in channel 0 (CN23) DDR4 SO-DIMM socket.*
- *For dual memory channel configuration, install memory modules of the same size, chip width, density and rank in both channel 0 (CN23) and channel 1 (CN24) DDR4 SO-DIMM sockets.*

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Chapter 4

AMI BIOS Setup Utility

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

4.1 Starting

To enter the setup screens, follow the steps below:

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



Note

If your computer cannot boot after making and saving system changes with BIOS setup, you can restore BIOS optimal defaults by setting JP4 (see section 2.3.4).

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

4.2 Navigation Keys

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



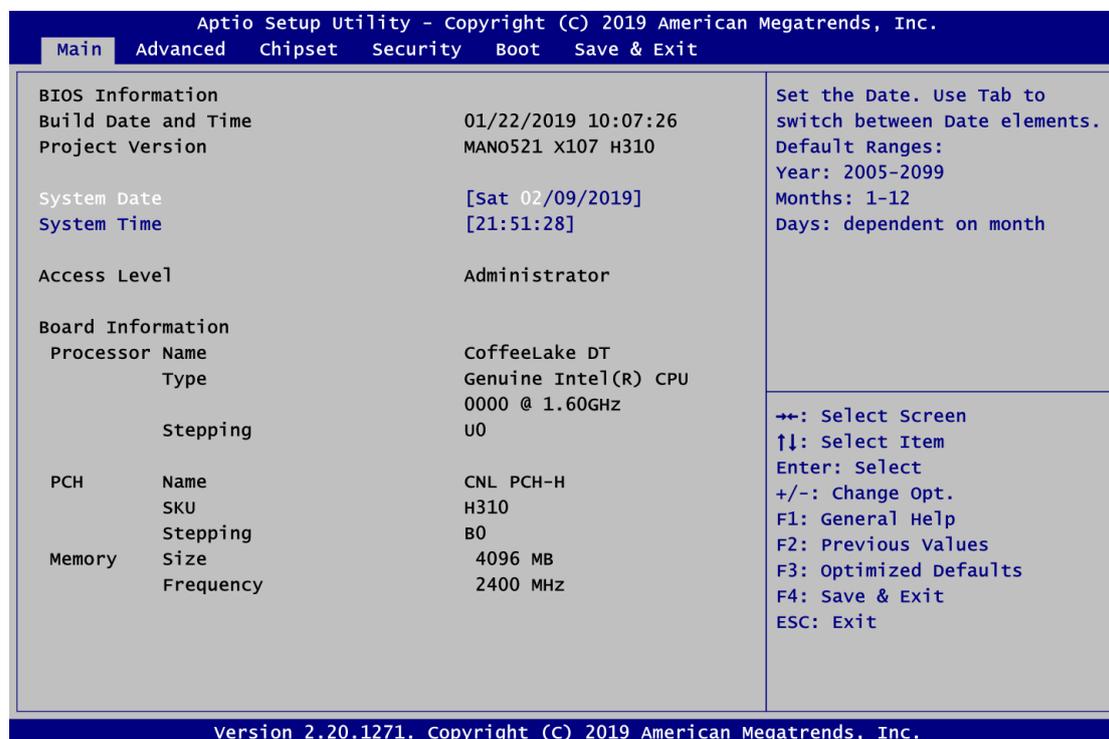
Note

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

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

4.3 Main Menu

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



BIOS Information

Display the BIOS information.

System Date/Time

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

Access Level

Display the access level of current user.

Board Information

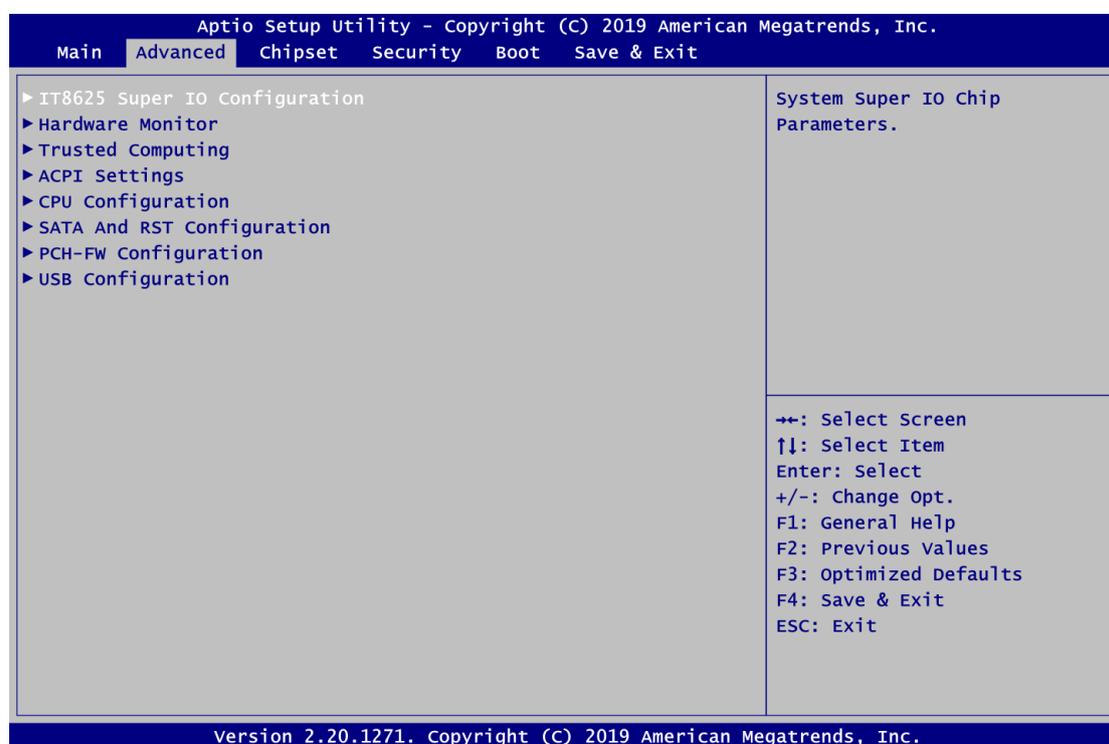
Display the board information.

4.4 Advanced Menu

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

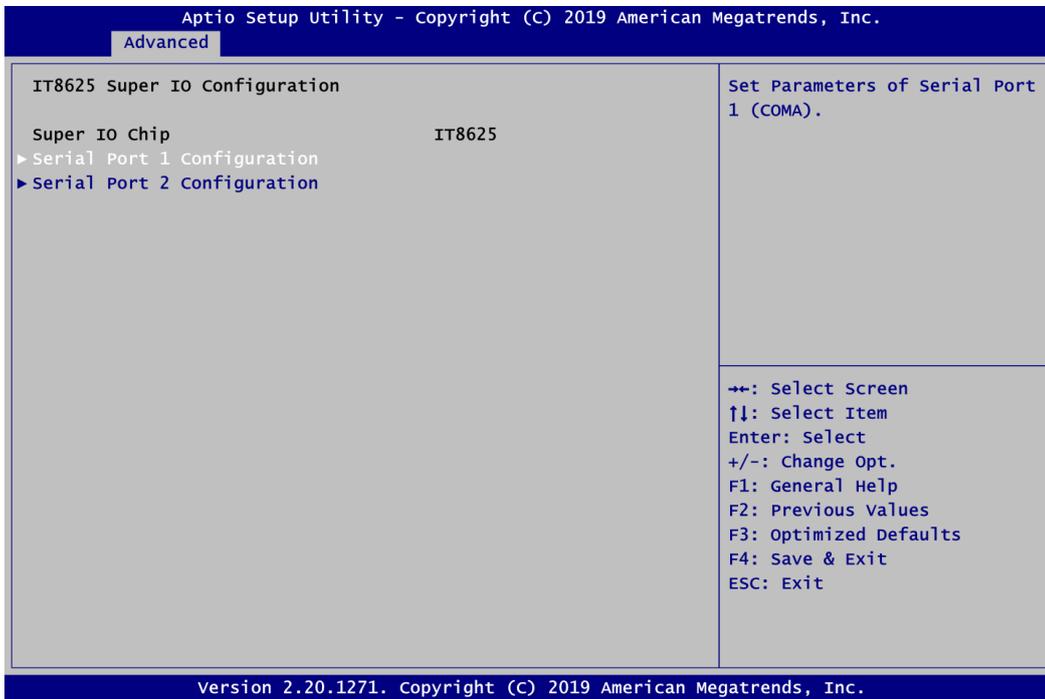
- ▶ IT8625 Super IO Configuration
- ▶ Hardware Monitor
- ▶ Trusted Computing
- ▶ ACPI Settings
- ▶ CPU Configuration
- ▶ SATA And RST Configuration
- ▶ PCH-FW Configuration
- ▶ USB Configuration

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



- **IT8786 Super IO Configuration**

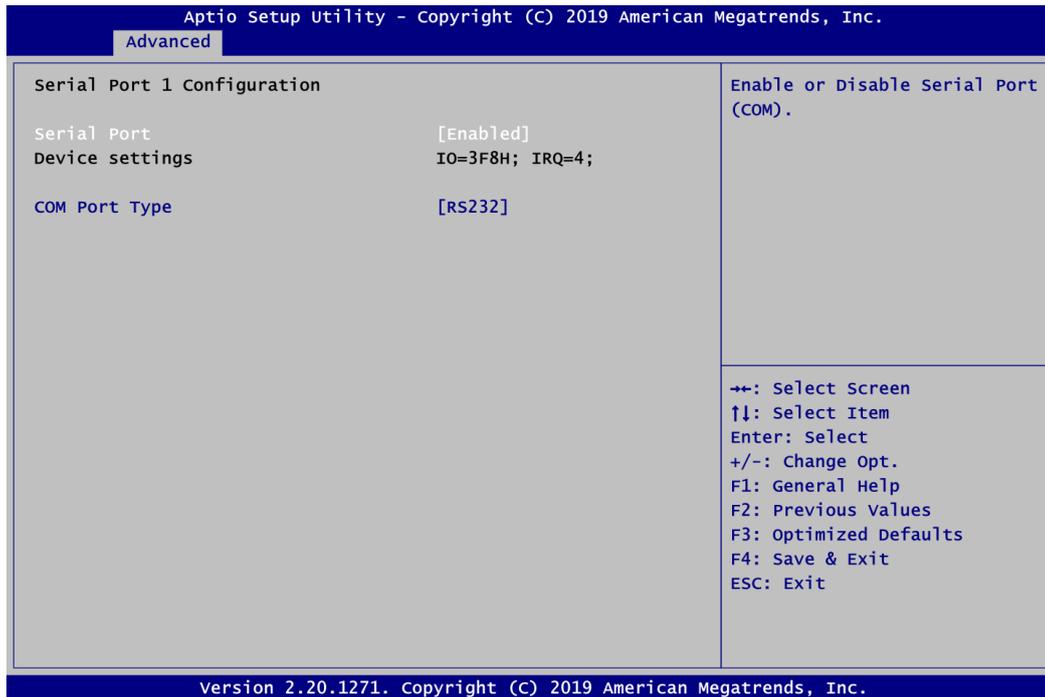
You can use this screen to select options for the Super IO Configuration, and change the value of the selected option. A description of the selected item appears on the right side of the screen. For items marked with "▶", please press <Enter> for more options.



Serial Port 1~2 Configuration

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

- **Serial Port 1 Configuration**



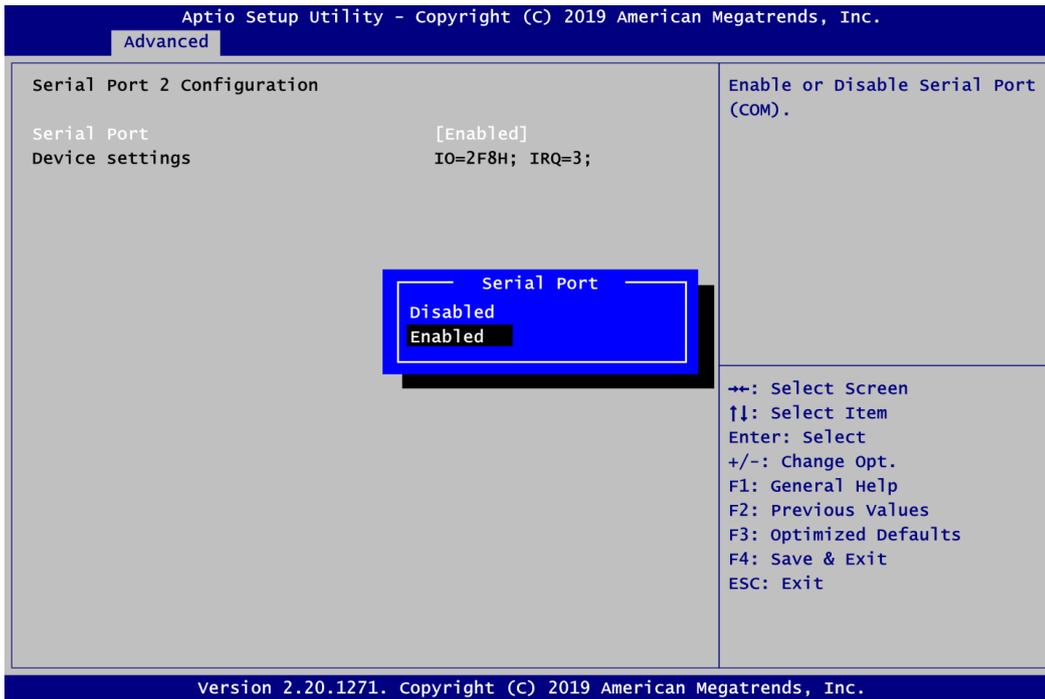
Serial Port

Enable or disable serial port 1. The optimal setting for base I/O address is 3F8h and for interrupt request address is IRQ4.

COM Port Type

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

- **Serial Port 2 Configuration**

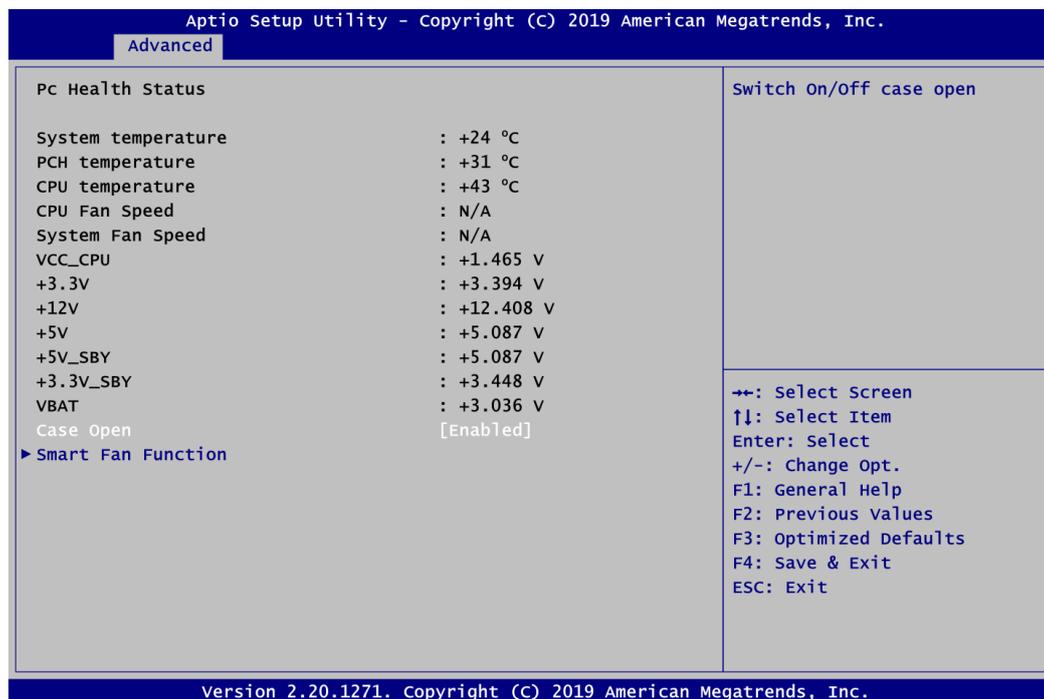


Serial Port

Enable or disable serial port 2. The optimal setting for base I/O address is 2F8h and for interrupt request address is IRQ3.

- **Hardware Monitor**

This screen monitors hardware health status.



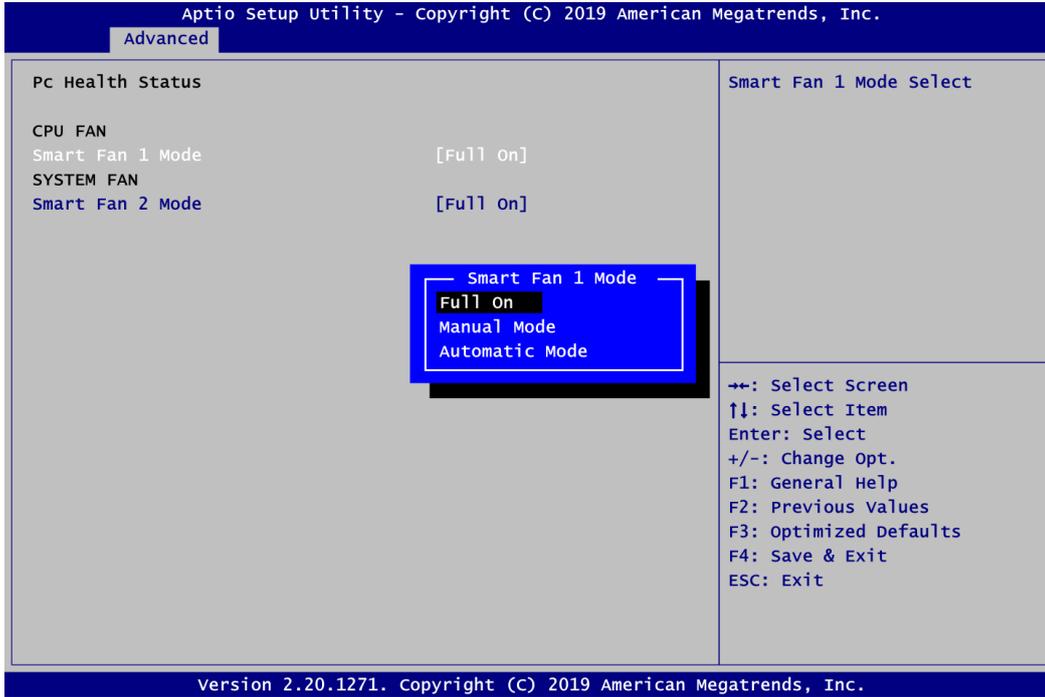
This screen displays the temperature of system and CPU, cooling fans speed in RPM and system voltages (VCC_CPU, +3.3V, +12V, +5V, +5V standby, +3.3V standby and VBAT).

Case Open

Switch on or off case open.

● **Smart Fan Function**

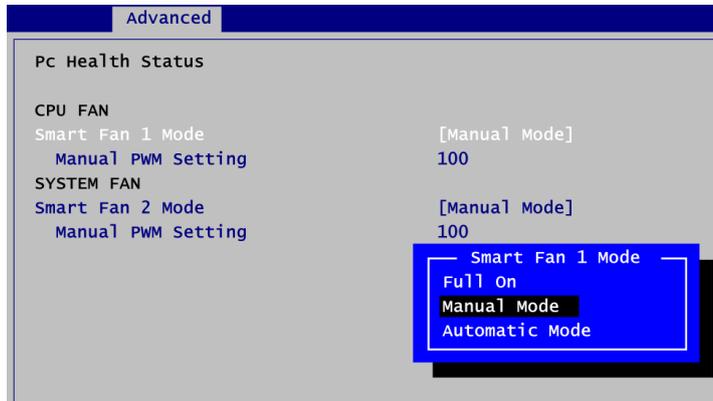
This screen allows you to configure CPU fan and system fan mode.



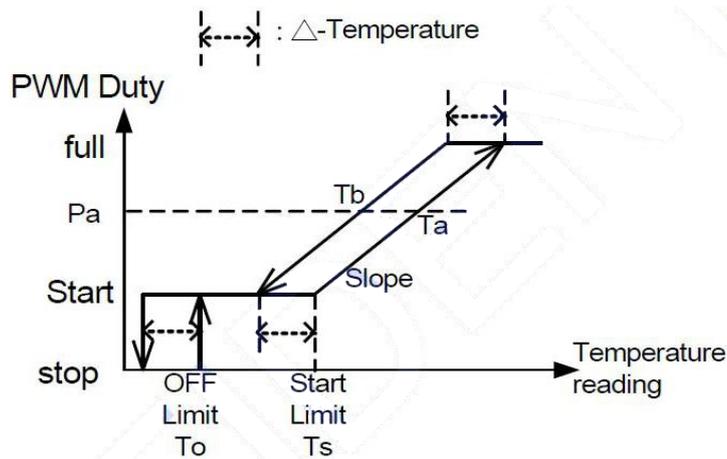
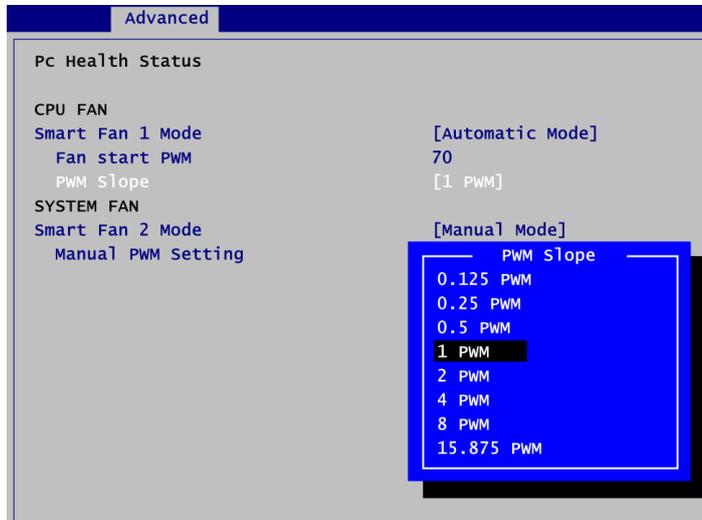
Smart Fan 1 Mode\Smart Fan 2 Mode

This item allows you to select Smart Fan Mode:

- Full On: The fan always runs at full speed.
- Manual Mode: Use the Manual PWM Setting to determine fan speed manually. The range is from 0 (minimum speed) to 255 (maximum speed).

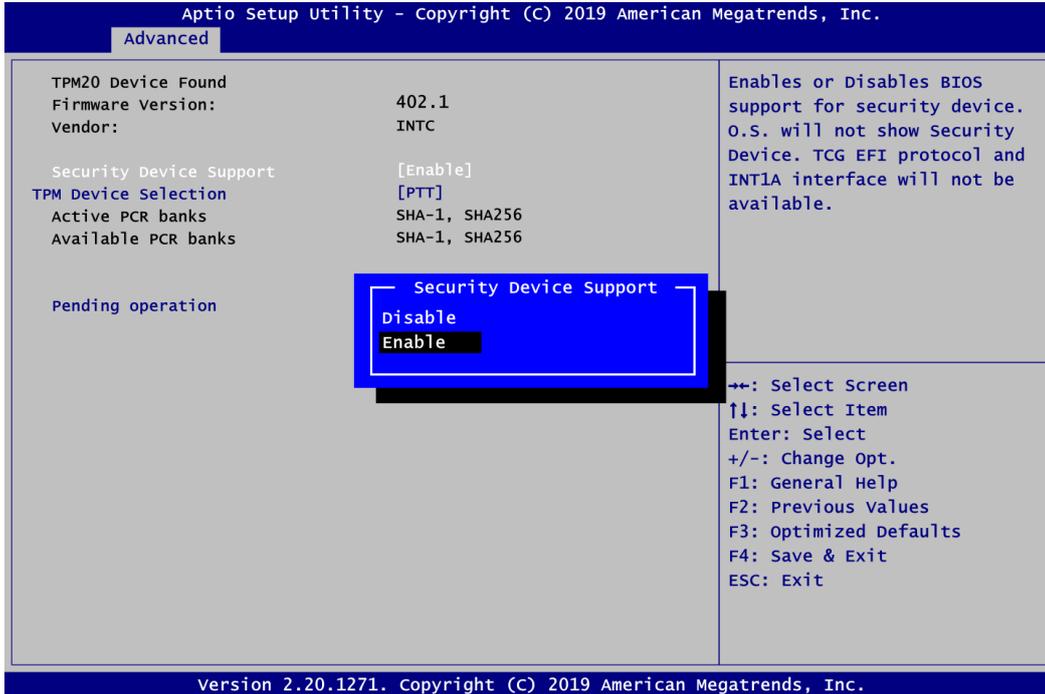


- Automatic Mode: The following option selections appear only in Automatic Mode. The initial spinning speed of fan is determined according to start PWM value. The PWM Slope is used to control how fast the fan speeds up or slows down; larger value means faster. When temperature gets higher, the fan increases its speed according to PWM Slope.



● **Trusted Computing**

This screen provides function for specifying the TPM settings.



Security Device Support

Enable or disable BIOS support for security device. OS will not show security device. TCG EFI protocol and INT1A interface will not be available.

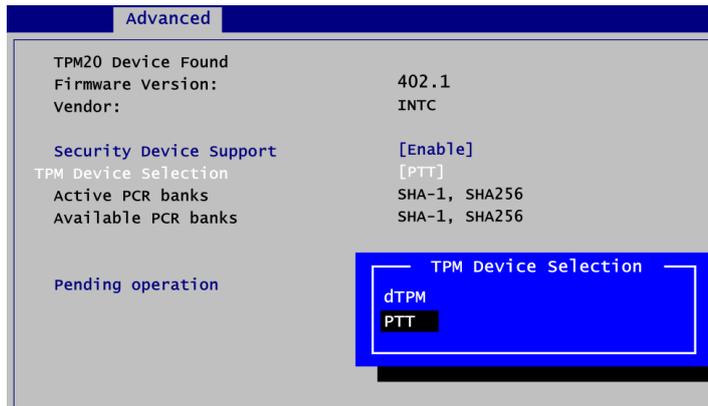
TPM Device Selection

Select TPM device:

- dTPM: External extended Infineon's TPM .



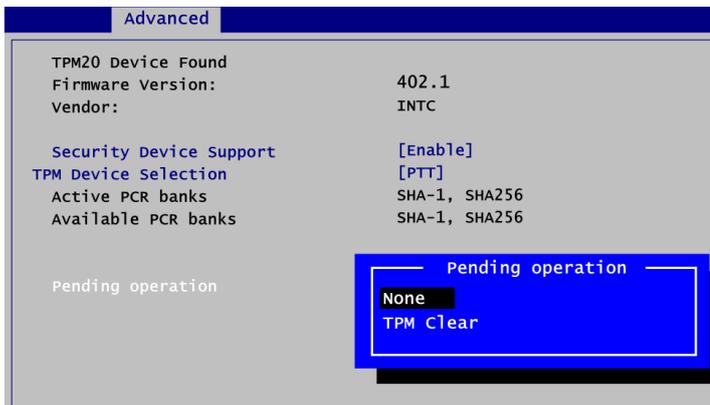
- PTT: Intel® built-in TPM.



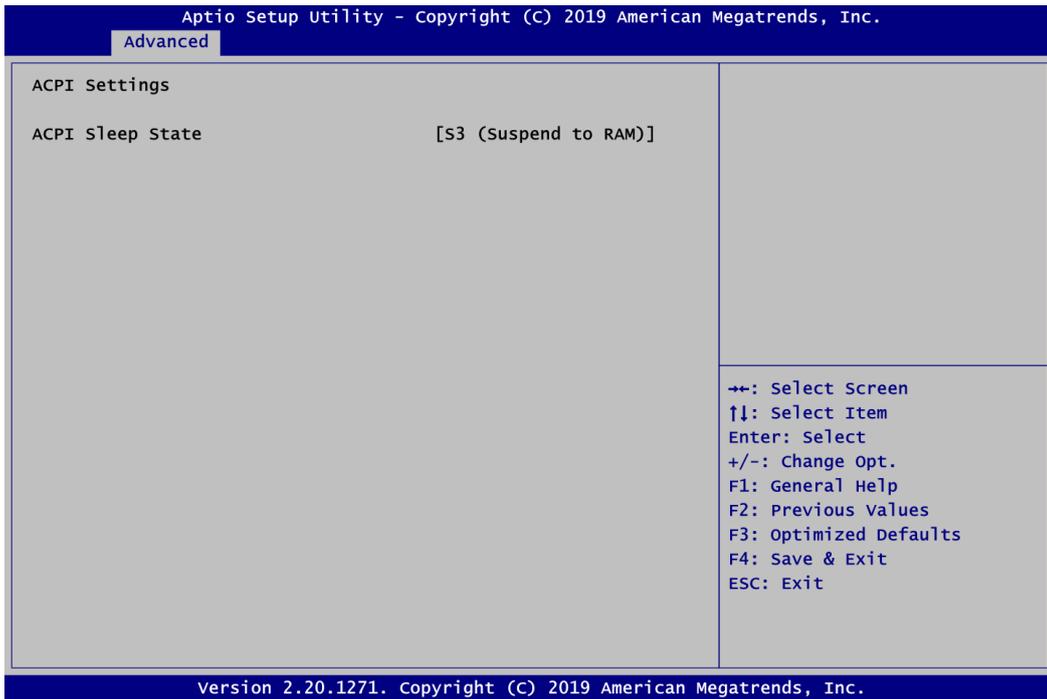
Pending operation

Schedule an operation for the security device, see image below.

- None
- TPM Clear: Clear all data secured by TPM.



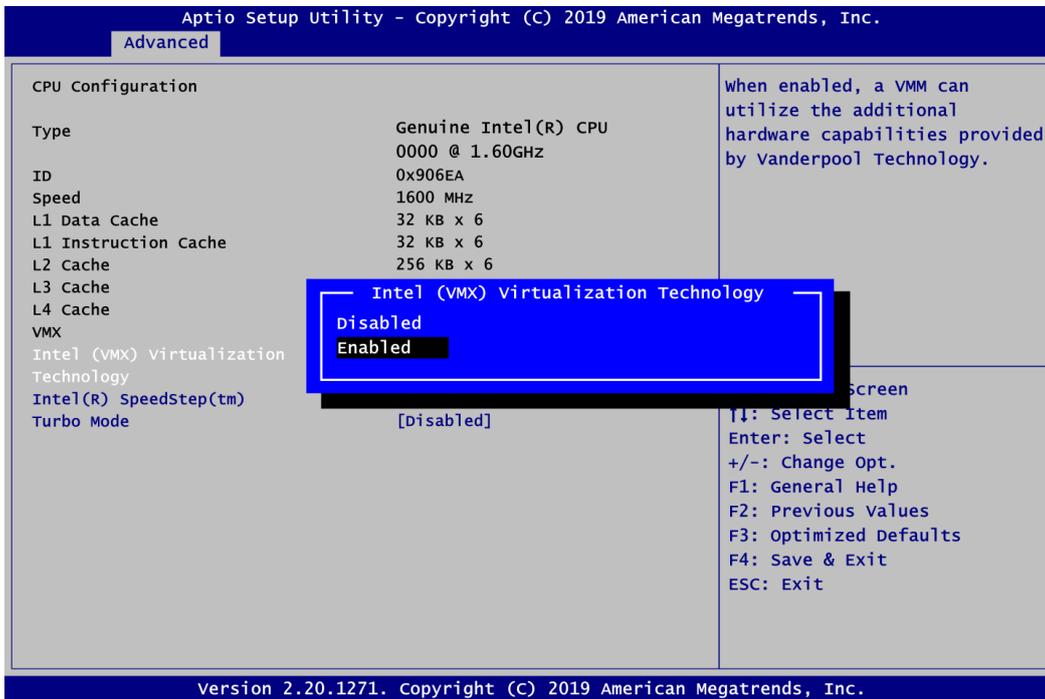
- **ACPI Settings**

**ACPI Sleep State**

When the suspend button is pressed, the ACPI (Advanced Configuration and Power Interface) sleep state is S3 (Suspend to RAM).

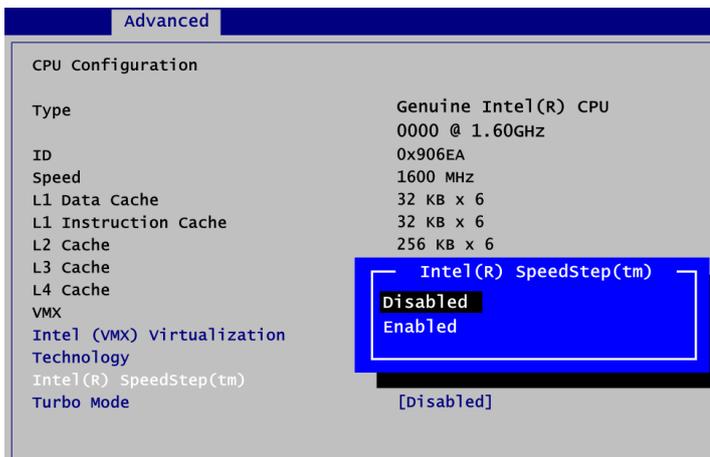
● **CPU Configuration**

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



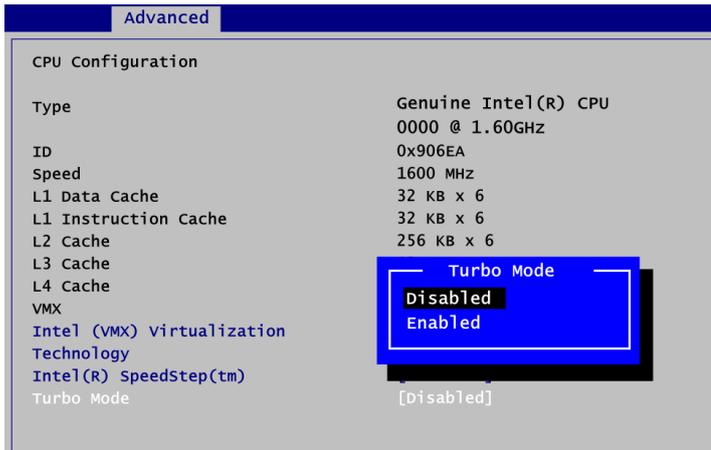
Intel (VMX) Virtualization Technology

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



Intel(R) SpeedStep(tm)

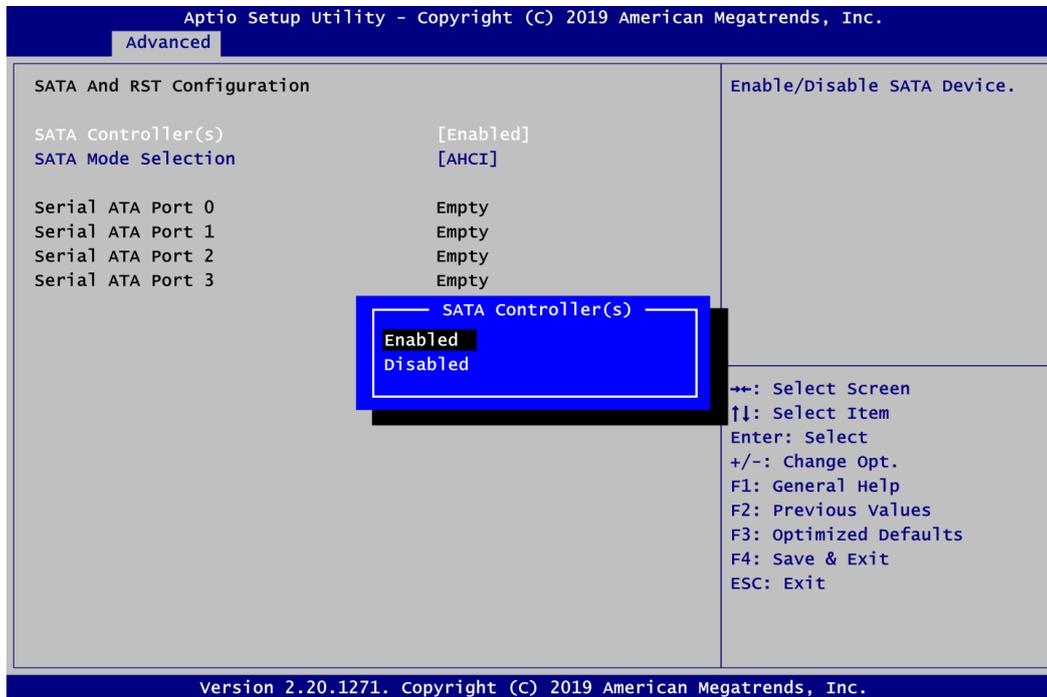
Enable or disable Intel® SpeedStep. It allows more than two frequency ranges to be supported.

**Turbo Mode**

Enable or disable Intel® turbo boost mode allowing processor cores to run faster but not exceed CPU defined frequency limits.

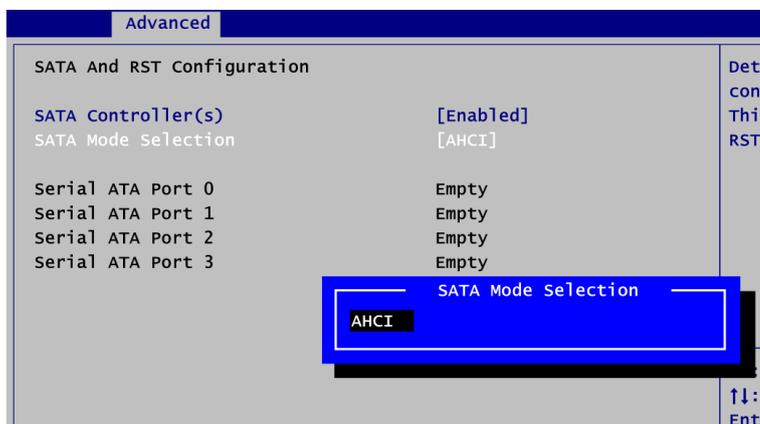
- **SATA and RST Configuration**

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



SATA Controller(s)

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



SATA Mode Selection

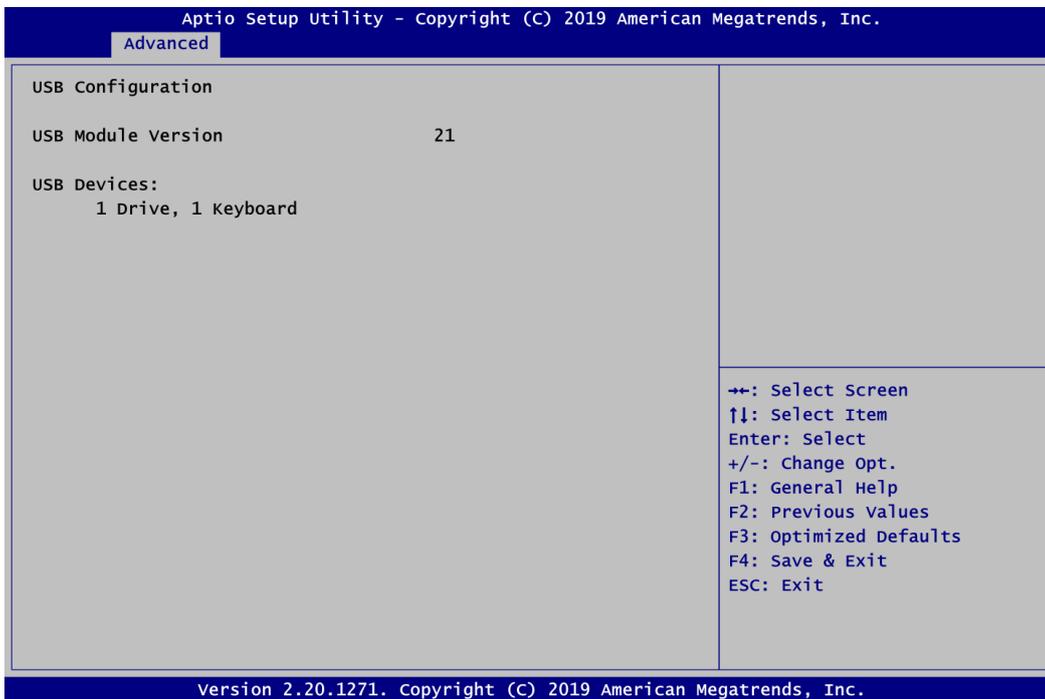
Determine how SATA controller(s) operate.

- **PCH-FW Configuration**

This screen displays ME Firmware information.



- **USB Configuration**



USB Devices

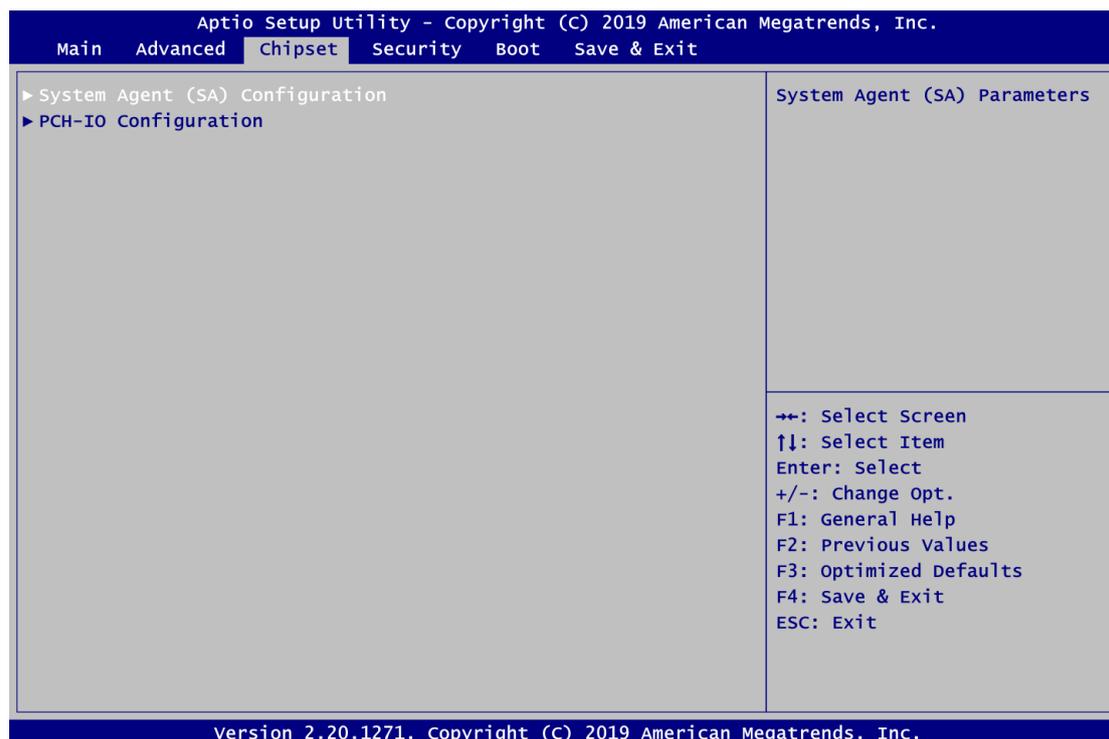
Display all detected USB devices.

4.5 Chipset Menu

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

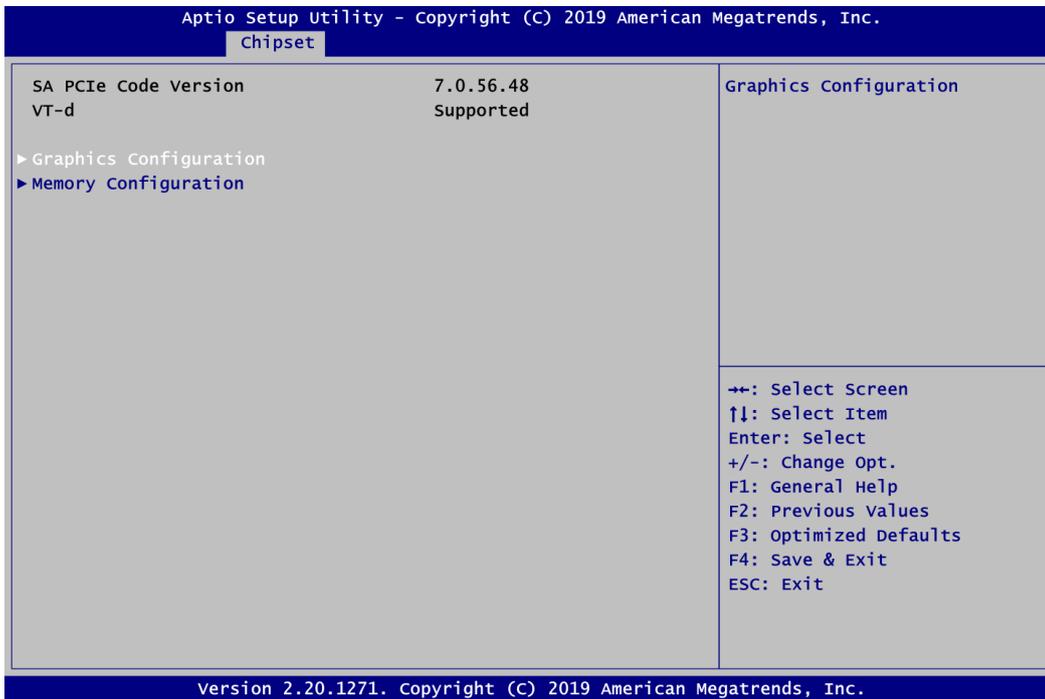
- ▶ System Agent (SA) Configuration
- ▶ PCH-IO Configuration

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



- **System Agent (SA) Configuration**

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



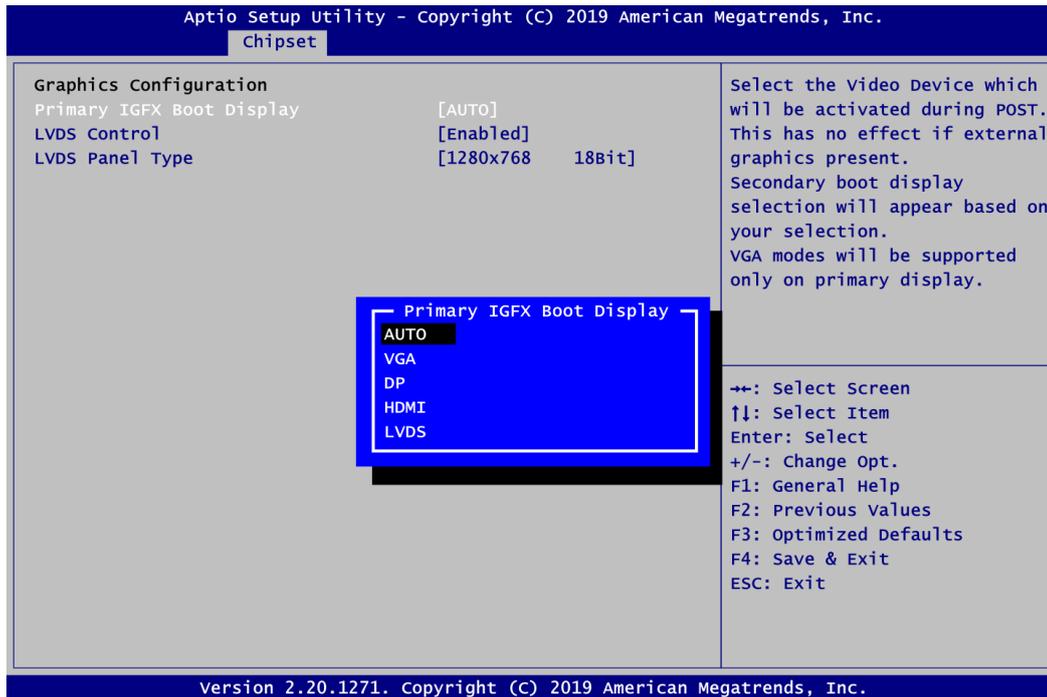
Graphics Configuration

Select to open sub menu for parameters related to graphics configuration.

Memory Configuration

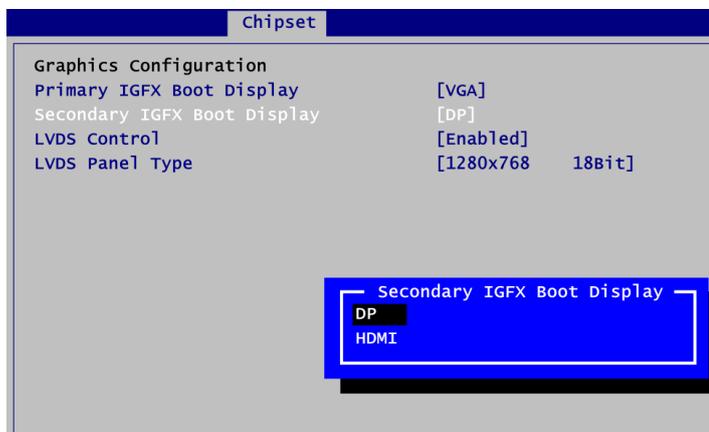
Select to open sub menu for information related to system memory.

- **Graphics Configuration**



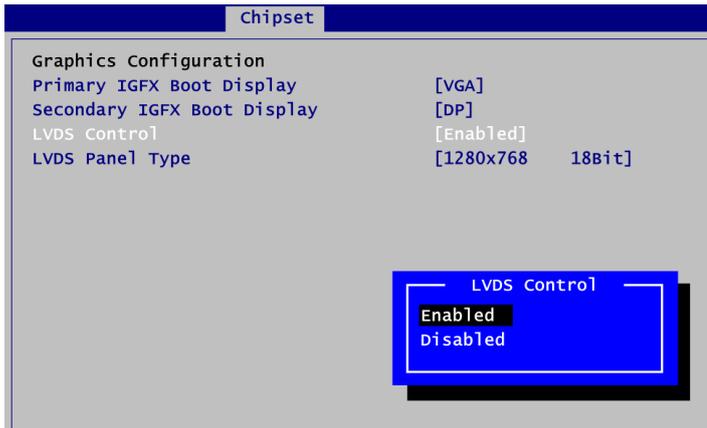
Primary IGFX Boot Display

Select the video device which will be activated during POST (Power-On Self Test). The secondary boot display selection will appear based on your selection.



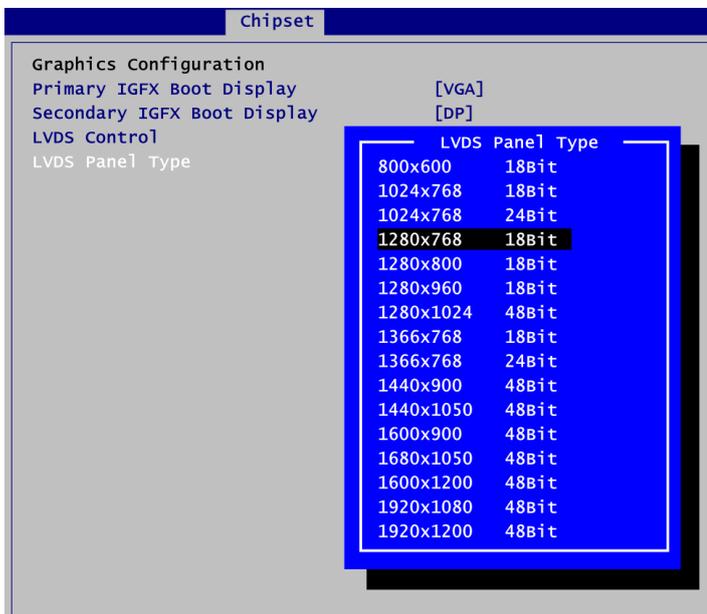
Secondary IGFX Boot Display

After selecting other than “AUTO” on “Primary IGFX Boot Display”, the Secondary IGFX Boot Display will show up and its options are DP and HDMI.



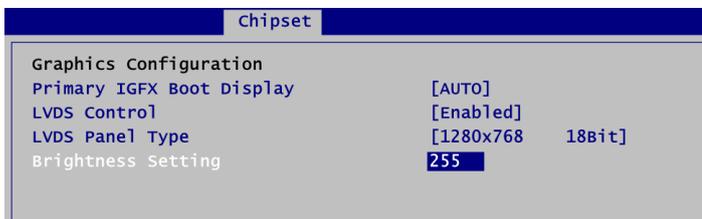
LVDS Control

Enable or disable LVDS Control. When installing Linux OS and if DP, HDMI or VGA display is connected to your system, make sure to set this option to Disabled.



LVDS Panel Type

Select the appropriate LVDS panel resolution; see the selection options in image above.



Brightness Setting

This option appears only when LVDS panel is connected. It allows user to adjust the brightness level of the LVDS panel.

- Range: 0~255
- Default: 255

- **Memory Configuration**

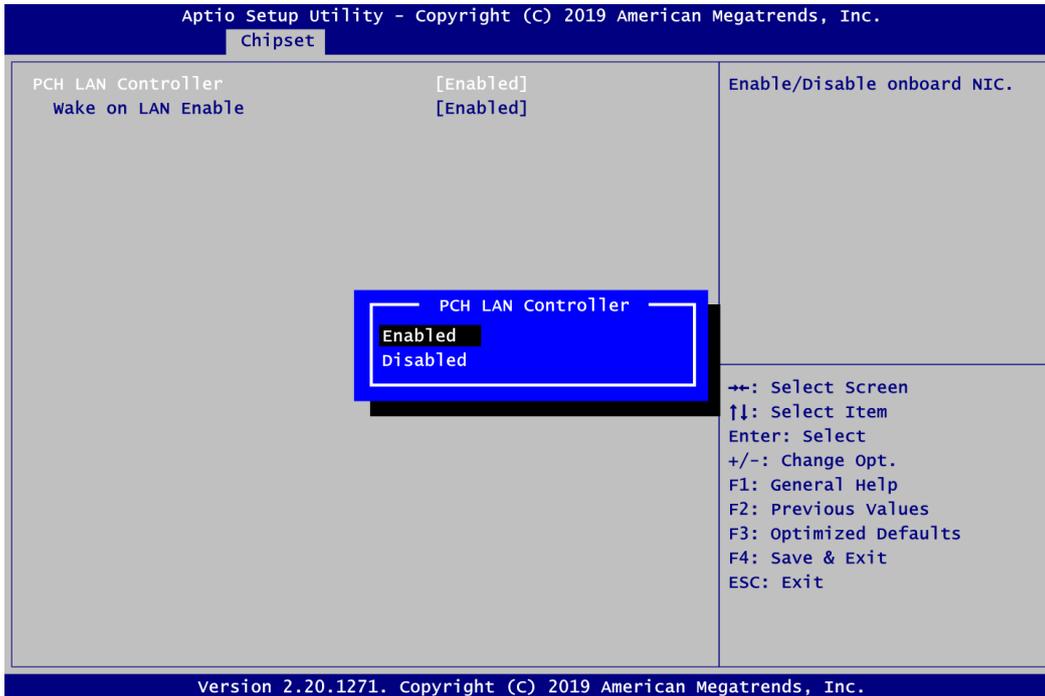
This screen shows the system memory information.

The screenshot displays the BIOS 'Memory Configuration' screen. At the top, it reads 'Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.' and 'Chipset'. The main area is divided into two columns. The left column lists memory details: 'Memory RC Version' (0.7.1.72), 'Memory Size' (4096 MB), 'Channel 0 Slot 0' (Not Populated / Disabled), 'Channel 1 Slot 0' (Populated & Enabled), 'Size' (4096 MB (DDR4)), 'Number of Ranks' (1), and 'Manufacturer' (UnKnown). The right column contains a legend for 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'. At the bottom, it shows 'Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.'

Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.	
Chipset	
Memory Configuration	
Memory RC Version	0.7.1.72
Memory Size	4096 MB
Channel 0 Slot 0	Not Populated / Disabled
Channel 1 Slot 0	Populated & Enabled
Size	4096 MB (DDR4)
Number of Ranks	1
Manufacturer	UnKnown
+/: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	
Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.	

- **PCH-IO Configuration**

This screen allows you to set PCH parameters.



PCH LAN Controller

Enable or disable onboard PCH LAN controller.

Wake on LAN Enable

After enabling PCH LAN Controller, enabling or disabling integrated LAN to wake the system.

4.6 Security Menu

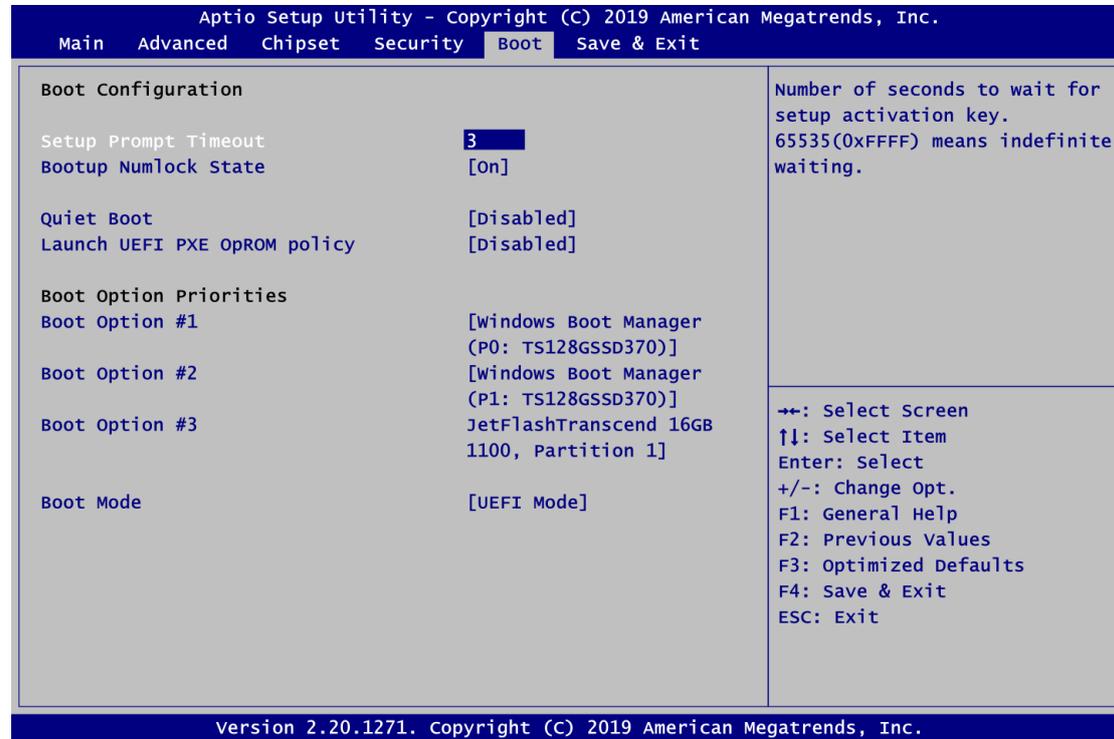
The Security menu allows users to change the security settings for the system.



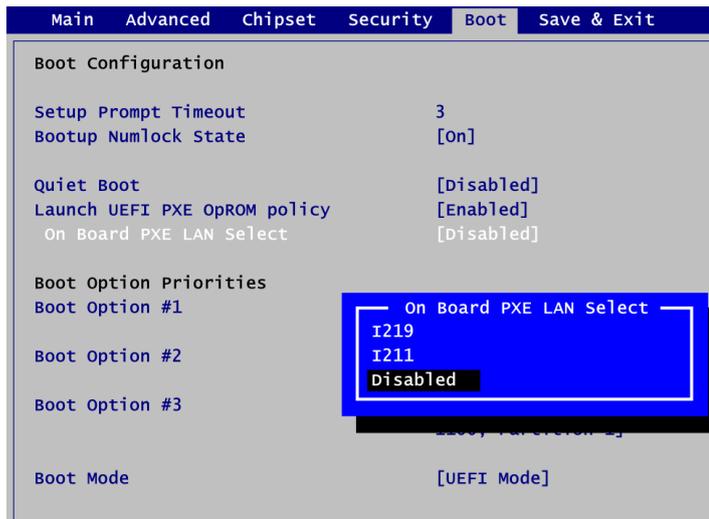
- **Administrator Password**
Set administrator password.
- **User Password**
Set user password.

4.7 Boot Menu

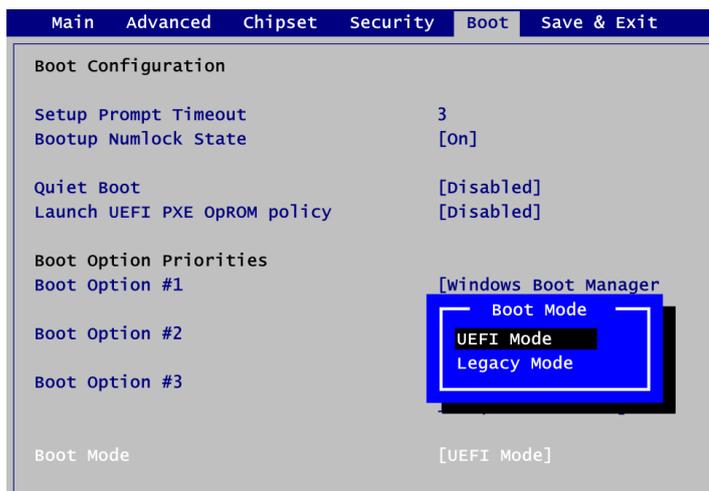
The Boot menu allows users to change boot options of the system.



- Setup Prompt Timeout**
 Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
- Bootup NumLock State**
 Use this item to select the power-on state for the keyboard NumLock.
- Quiet Boot**
 Select to display either POST output messages or a splash screen during boot-up.



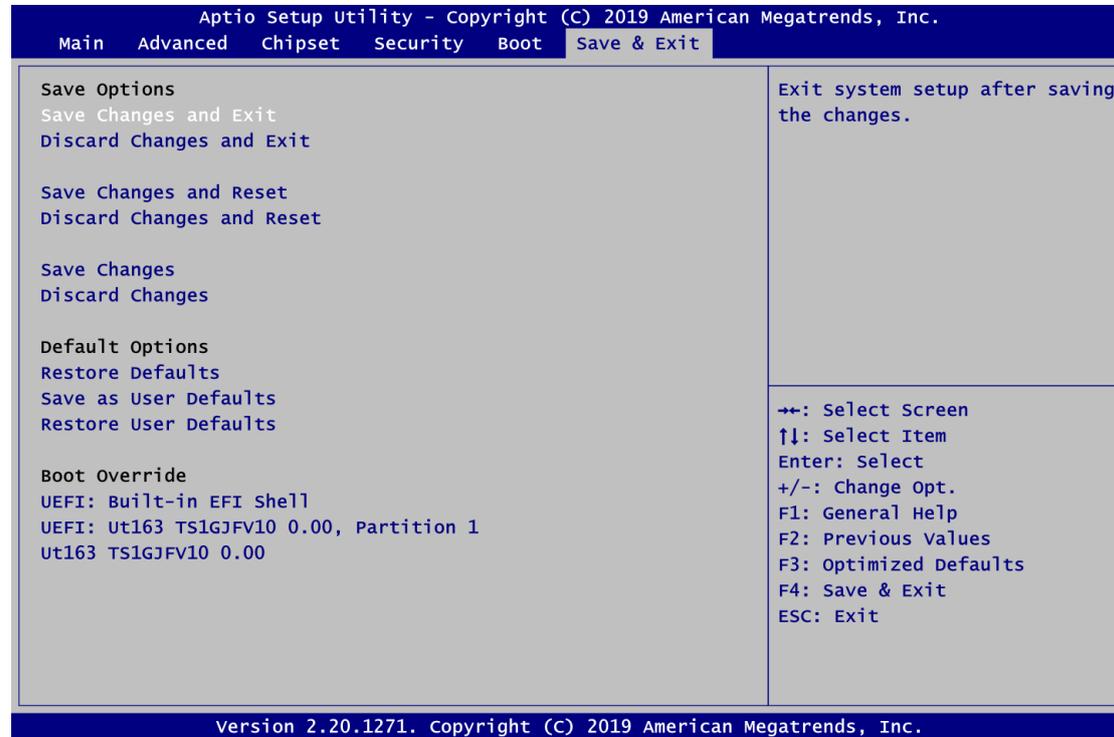
- Launch UEFI PXE OpROM policy**
 Control the execution of UEFI PXE OpROM. When enabled, you may select I219, I211 or Disabled as PXE LAN port.
- Boot Option Priorities**
 These are settings for boot priority. Specify the boot device priority sequence from the available devices.



- Boot Mode**
 Use this option for boot mode settings.
 - UEFI Boot: Select support to boot any UEFI-capable OS.
 - Legacy Boot: Select support to boot non UEFI-capable OS that expects a legacy BIOS interface.

4.8 Save & Exit Menu

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



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

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

Appendix A

Watchdog Timer

A.1 About Watchdog Timer

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

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

A.2 Sample Program

1. Enter **ADU**, and press <F4> to select the **superior ITE**
2. **PORT** setting **002E**, **002F**
3. Address **07h** setting **07 GPIO**
4. Address **72h** to set the countdown, for example Sec: **C0**, Min: **40**
5. Address **73h** set the countdown time, for example 10sec: **0A**

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Appendix B

Configuring SATA for RAID

B.1 Configuring SATA Hard Drive(s) for RAID Function

Before you begin the SATA configuration, please prepare:

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

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

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

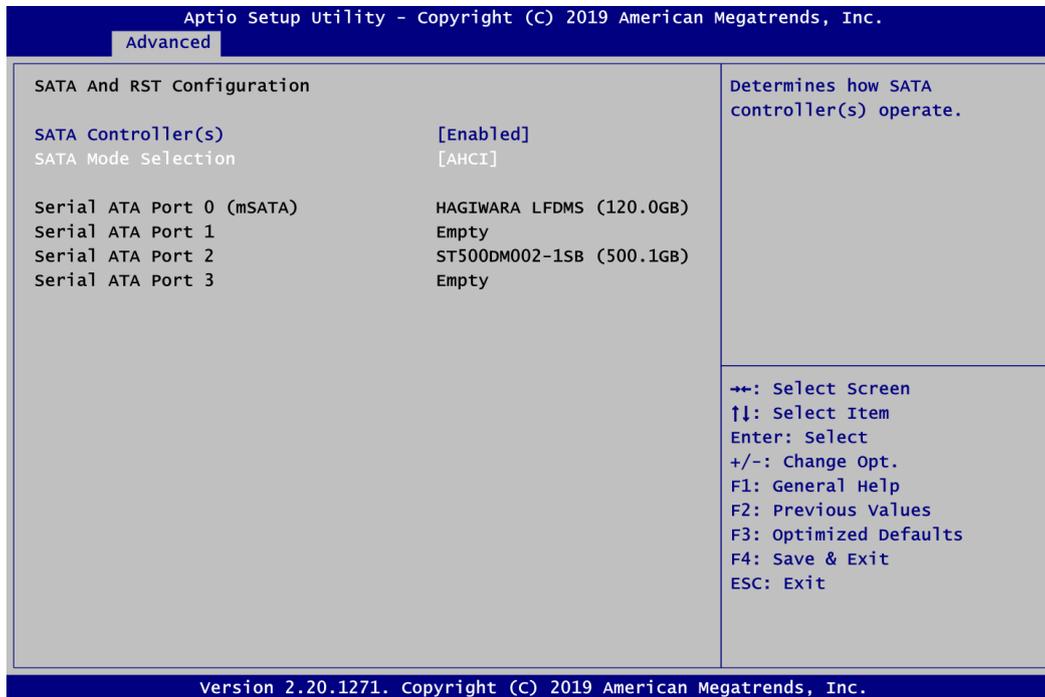
1. Installing SATA hard drive(s) in your system.

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

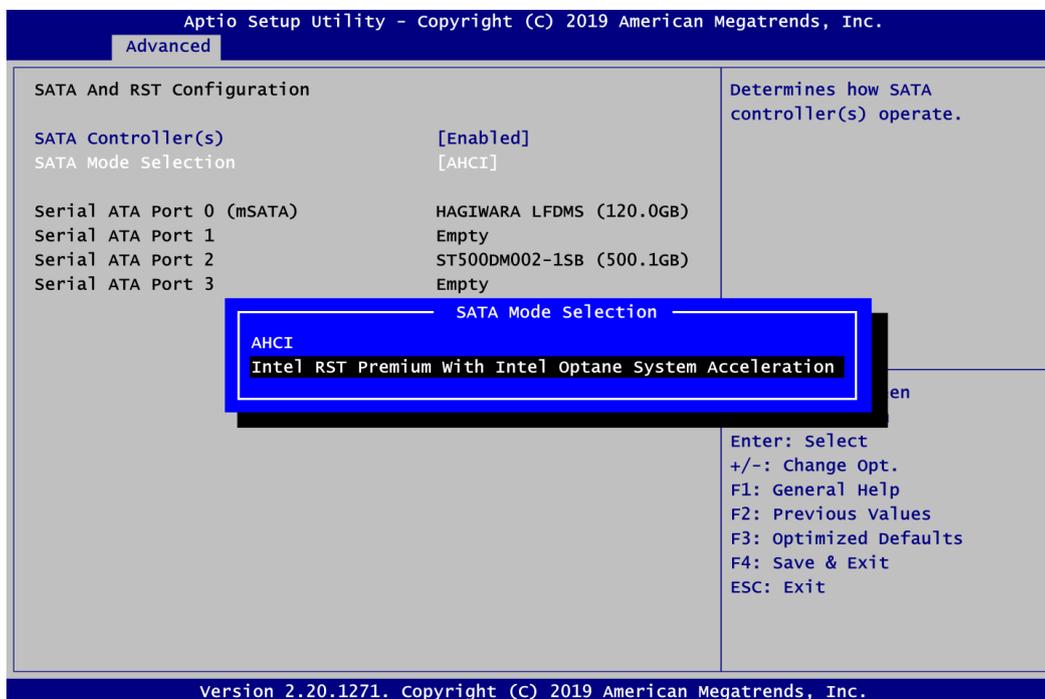
2. Configuring SATA controller mode and boot sequence by the BIOS Setup.

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

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



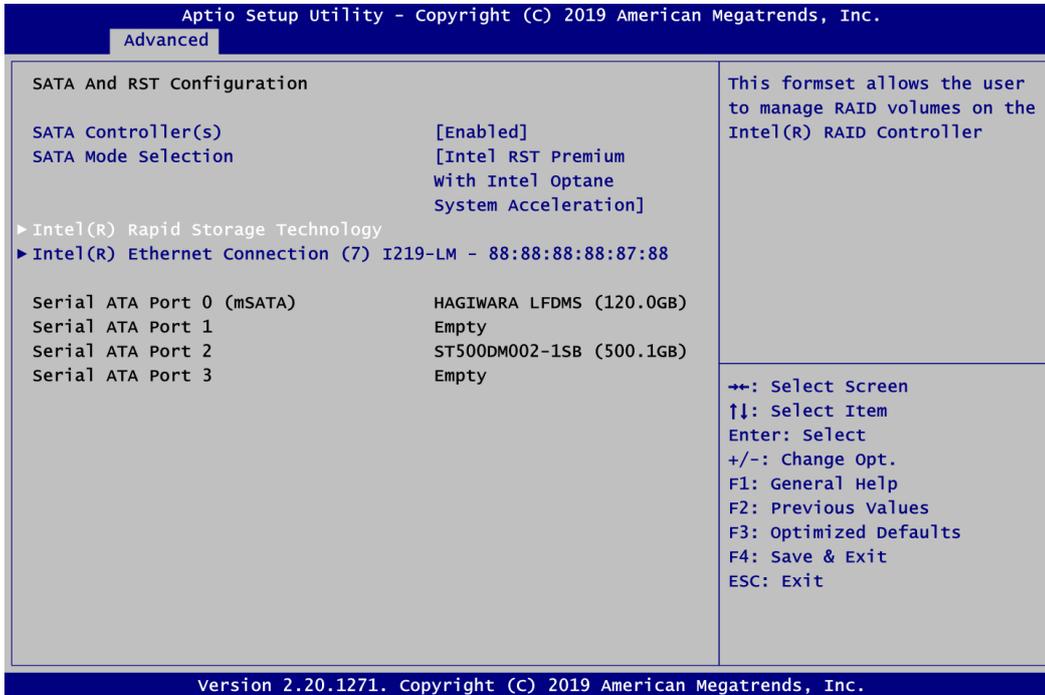
A list of options appears, please select "Intel RST Premium With Intel Optane System Acceleration".



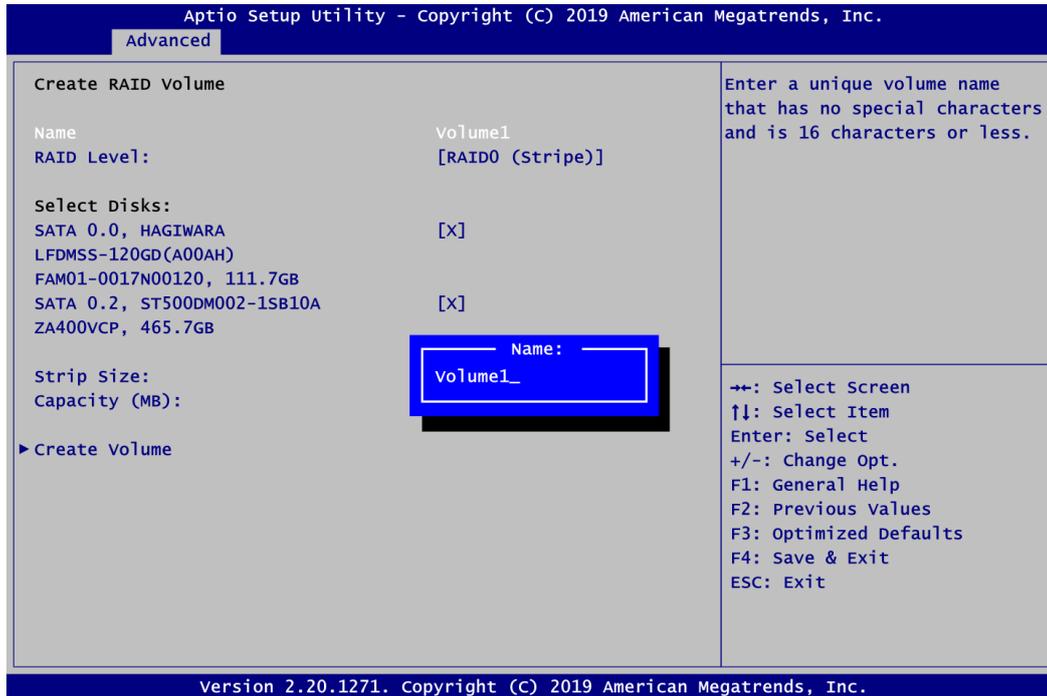
2.2. Set DVD-ROM for First Boot Option under the Boot Settings menu to boot DVD-ROM after system restarts.

3. Configuring RAID.

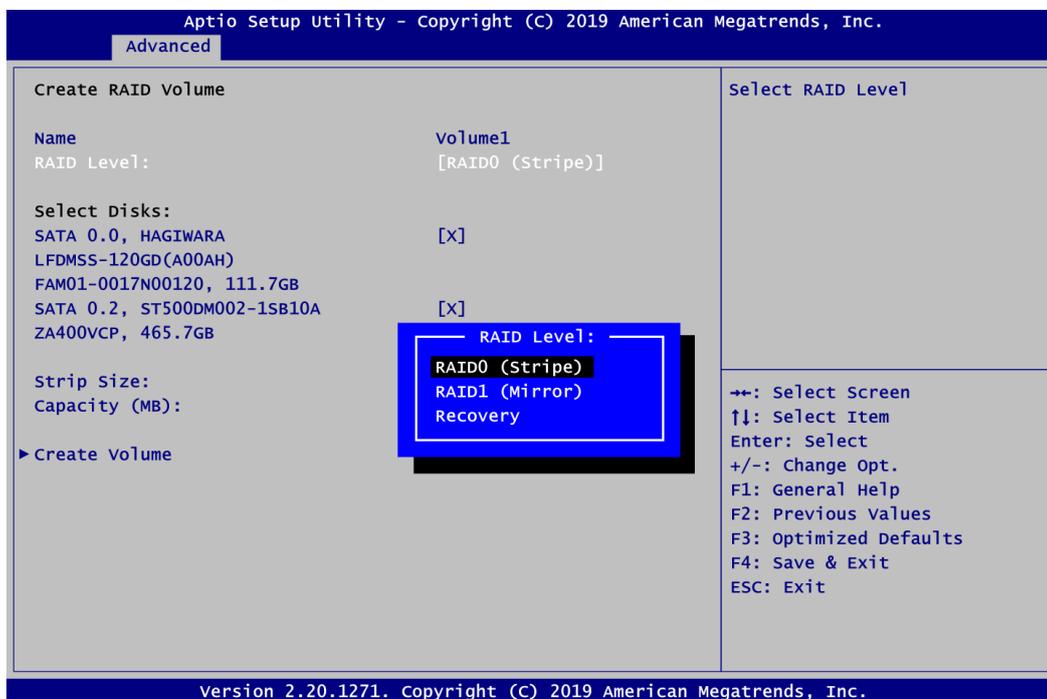
3.1. Configure a RAID array. If you want to create a RAID array, select the Intel(R) Rapid Storage Technology option and press <Enter>.



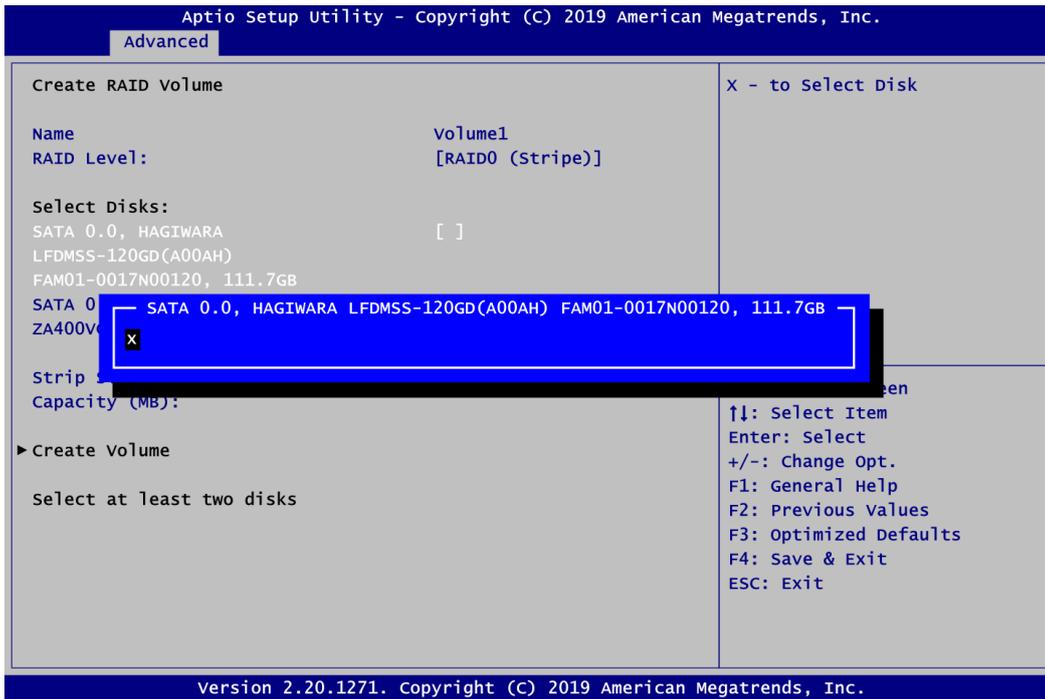
3.2. After entering the Create RAID Volume screen, you can type the disk array name with 1~16 letters or less (letters cannot be special characters) in the item "Name".



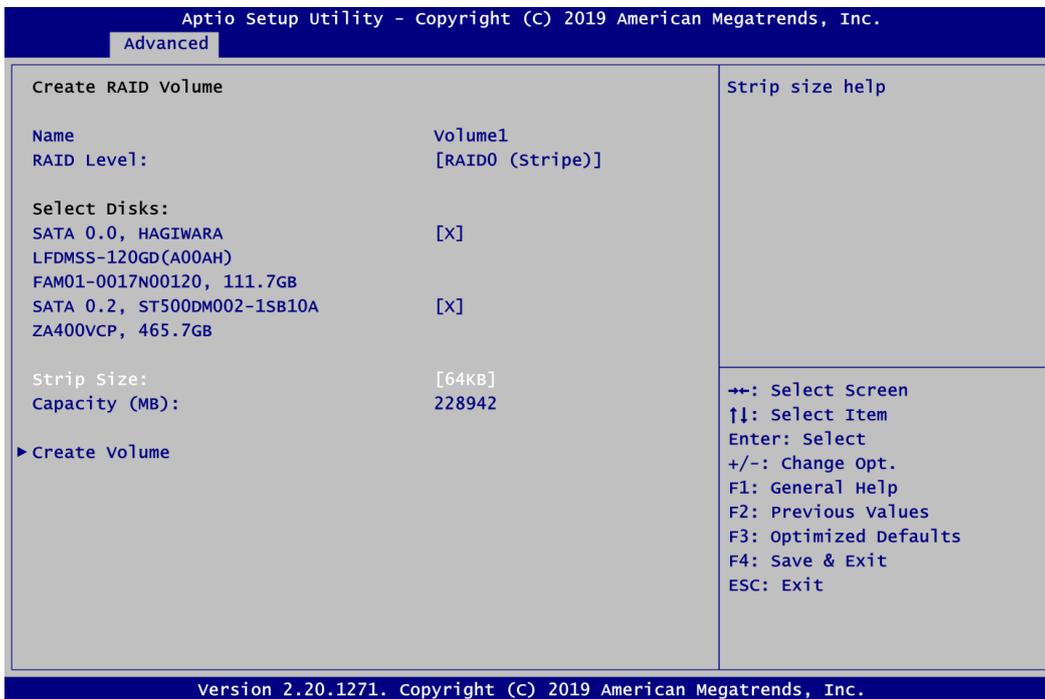
3.3. Then select a RAID level. There are three RAID levels: RAID0 (Stripe), RAID1 (Mirror) and Recovery. The RAID level option list varies according to the number of connected storage devices. For example, it can support RAID0, RAID1, RAID5 or RAID10 if 4 storages devices are connected to the system.



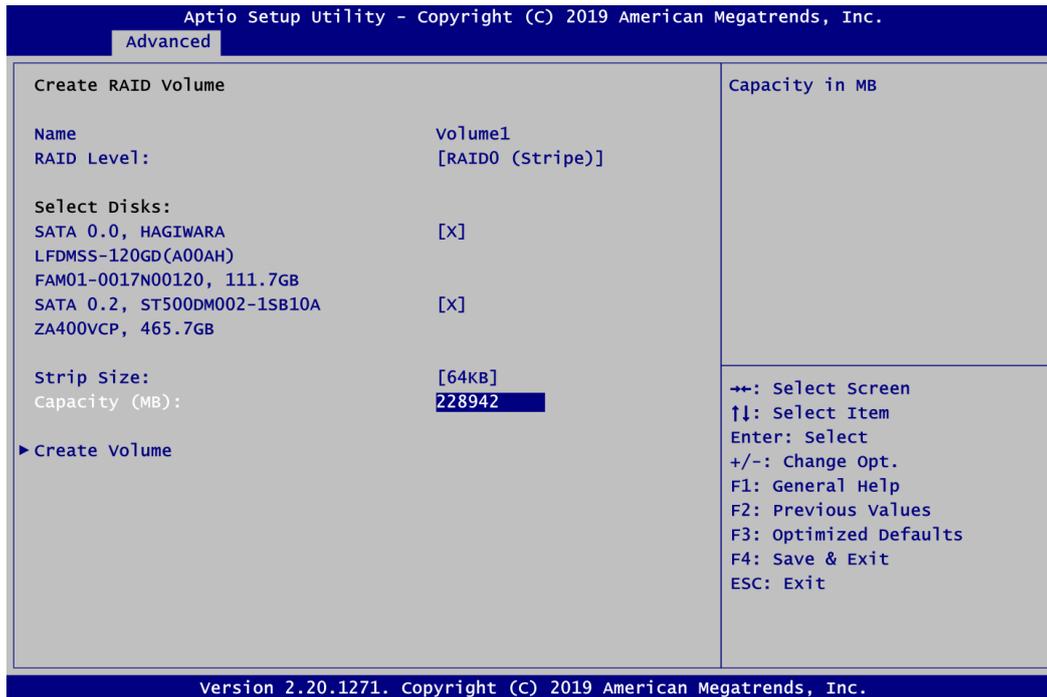
Don't forget to Select Disks by typing "X" as indicated in image below.



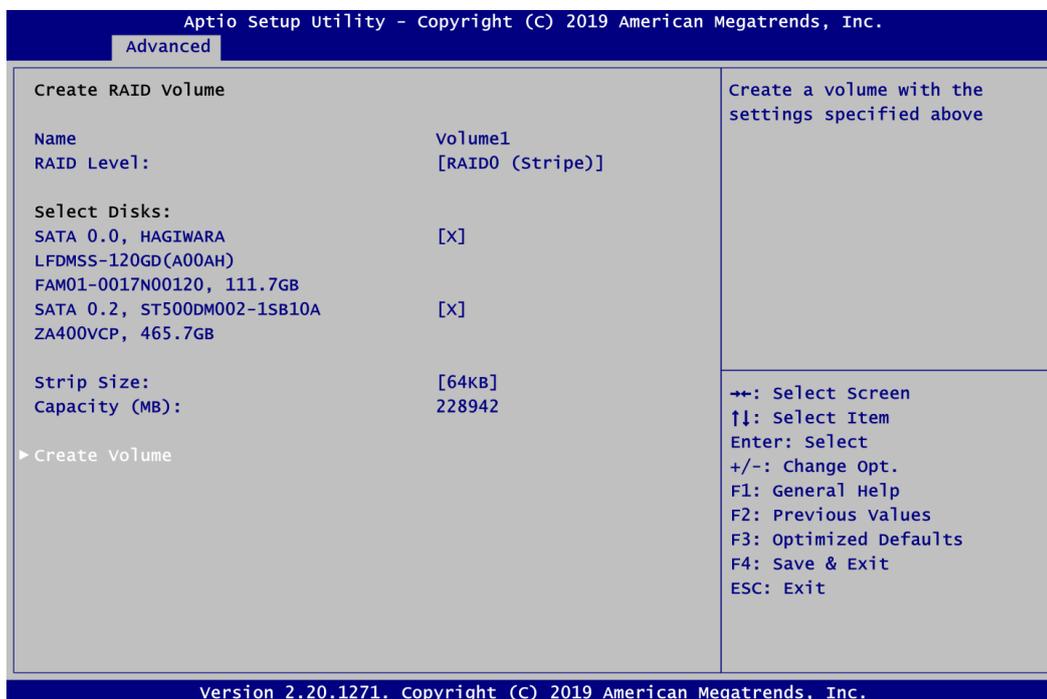
3.4. Set the stripe block size. The KB is the standard unit of stripe block size. The stripe block size can be 4KB to 128KB.



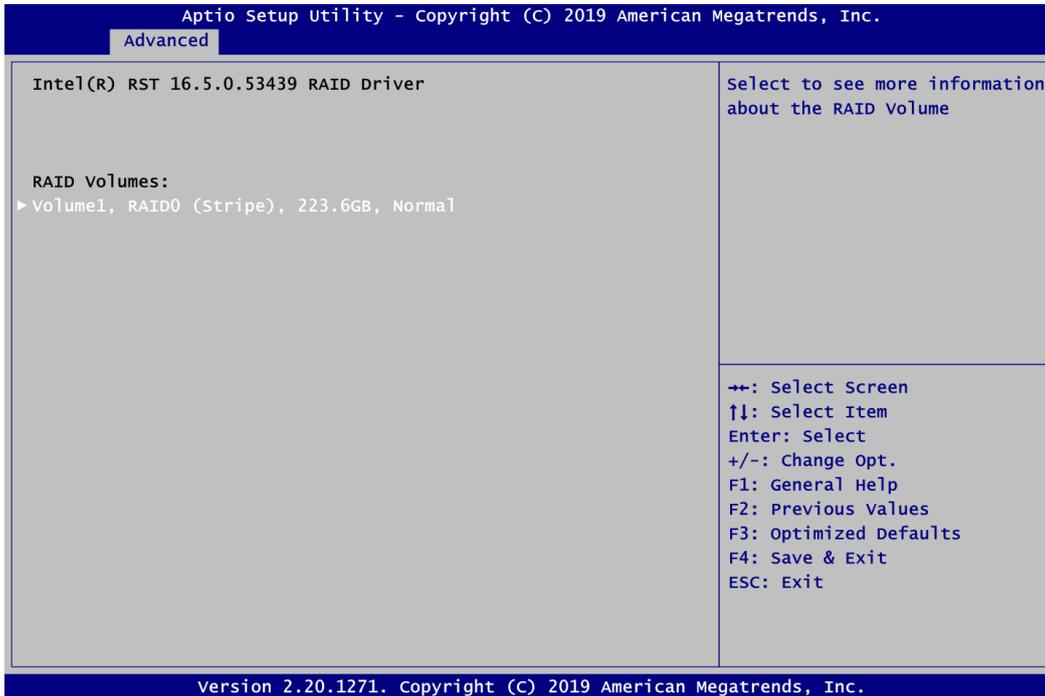
3.5. After the setting, proceed to next step for the array capacity setting.



3.6. After setting all the items on the screen, select Create Volume to start creating the RAID array.

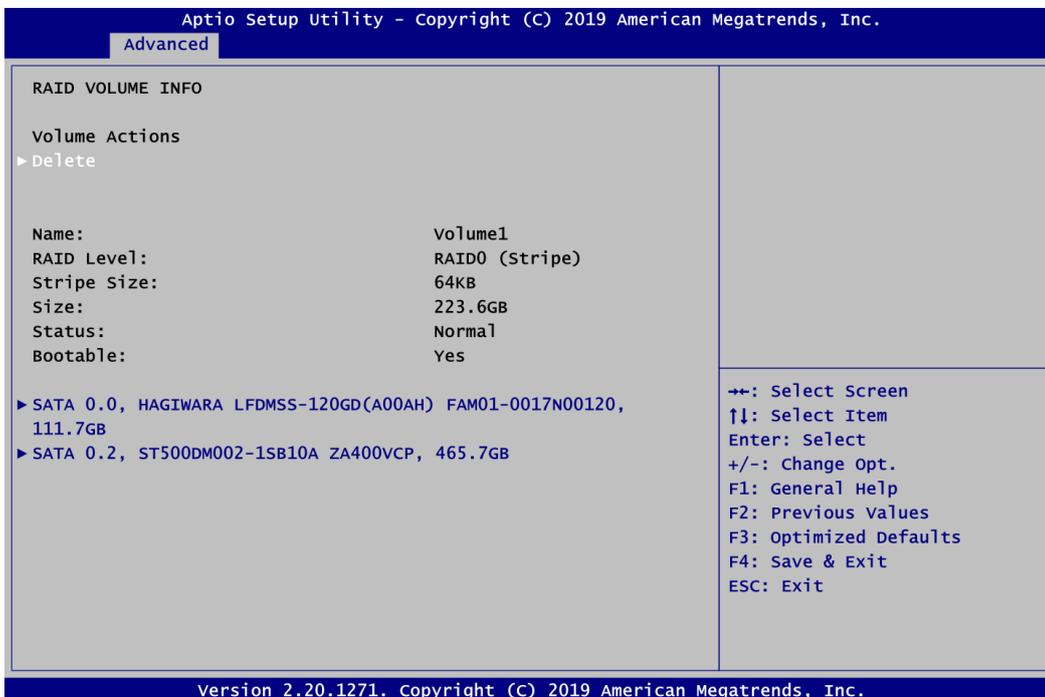


After the creation is completed, you can see detailed information about the RAID Array in the following screen, including disk name, RAID level, disk block size and disk capacity, etc.



Delete RAID volume

If you want to delete a RAID volume, select the Delete option and follow on-screen instructions.



Save and exit the BIOS Setup. Now, you can proceed to install a SATA driver controller and the operating system.

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Appendix C

iAMT Settings

Utilizing built-in platform capabilities and popular third-party management and security applications, the Intel® Active Management Technology (Intel® iAMT) has significantly lowered a major barrier to IT management efficiency, helping IT professionals discover, repair and better protect their networked computing assets.

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

C.1 Entering MEBx

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



Note

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

C.2 Set and Change Password

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

```
Intel(R) Management Engine BIOS Extension v9.0.0.0024/Intel(R) ME v9.0.3.1347
Copyright(C) 2003-12 Intel Corporation. All Rights Reserved.

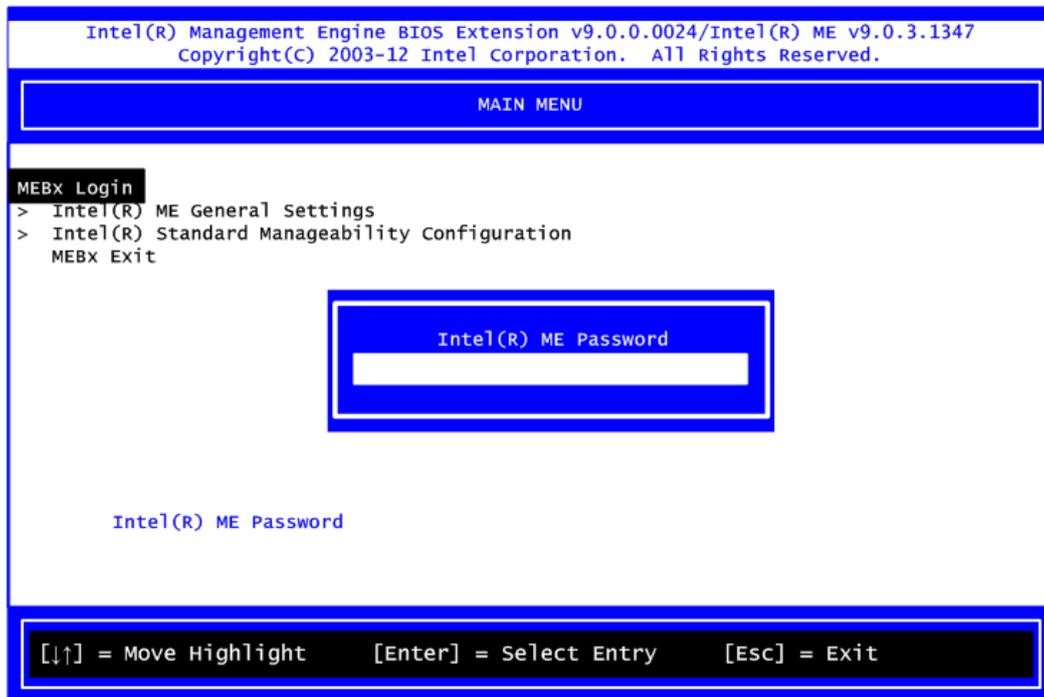
MAIN MENU

MEBx Login
> Intel(R) ME General Settings
> Intel(R) Standard Manageability Configuration
MEBx Exit

Intel(R) ME Password

[↑↓] = Move Highlight    [Enter] = Select Entry    [Esc] = Exit
```

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



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

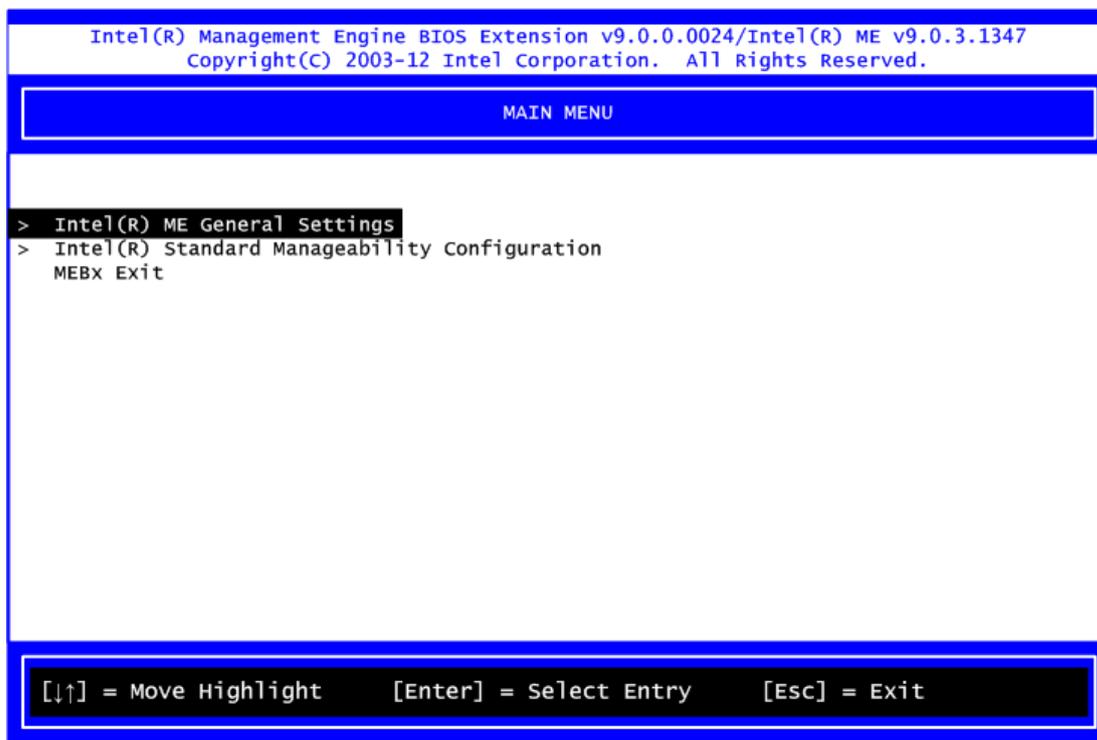
- One upper case
- One lower case
- One number
- One special symbol, such as ! , ` \$ or ; , (, " , , excepted)

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

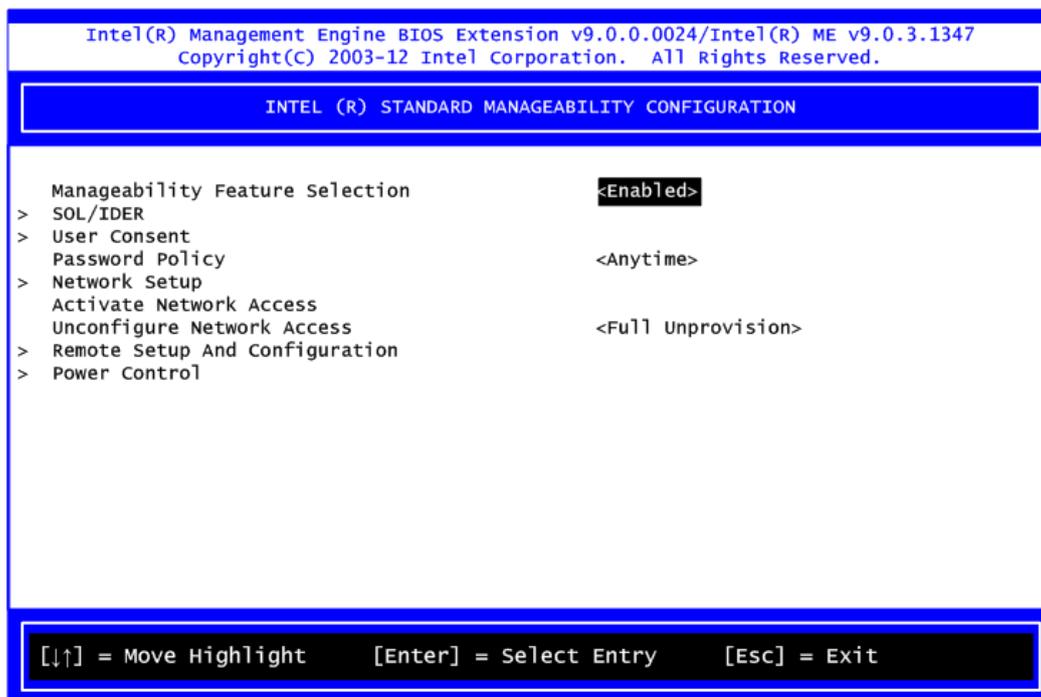
Underline (_) and space are valid characters for password, but they won't make higher complexity.

C.3 iAMT Settings

Select Intel® iAMT configuration and press <Enter>.

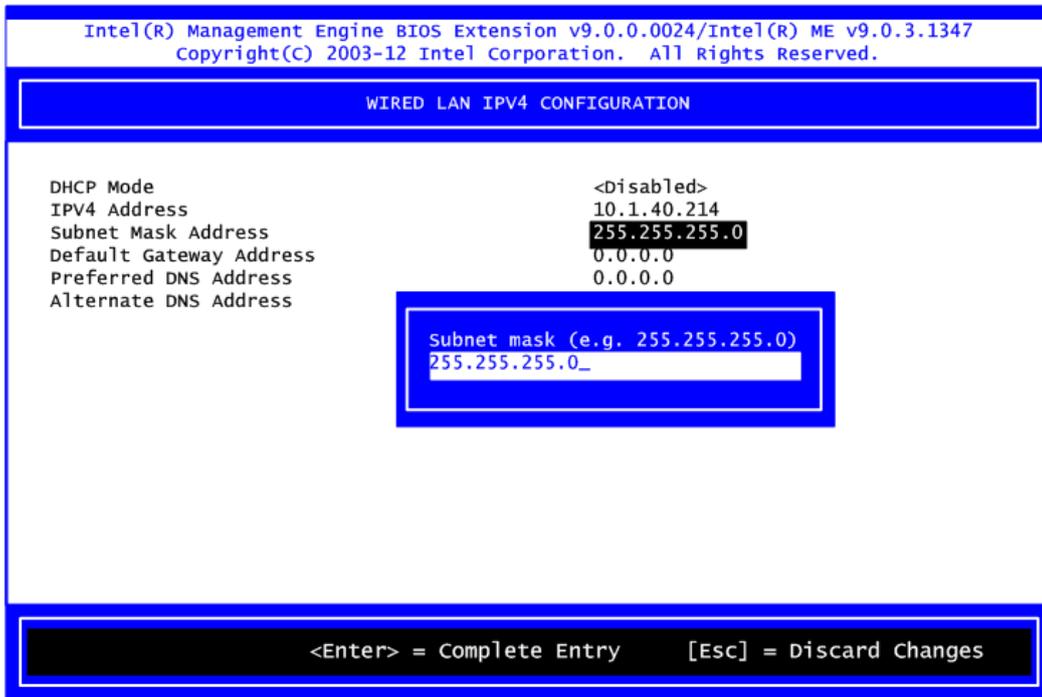


1. Select Network Setup to configure iAMT.

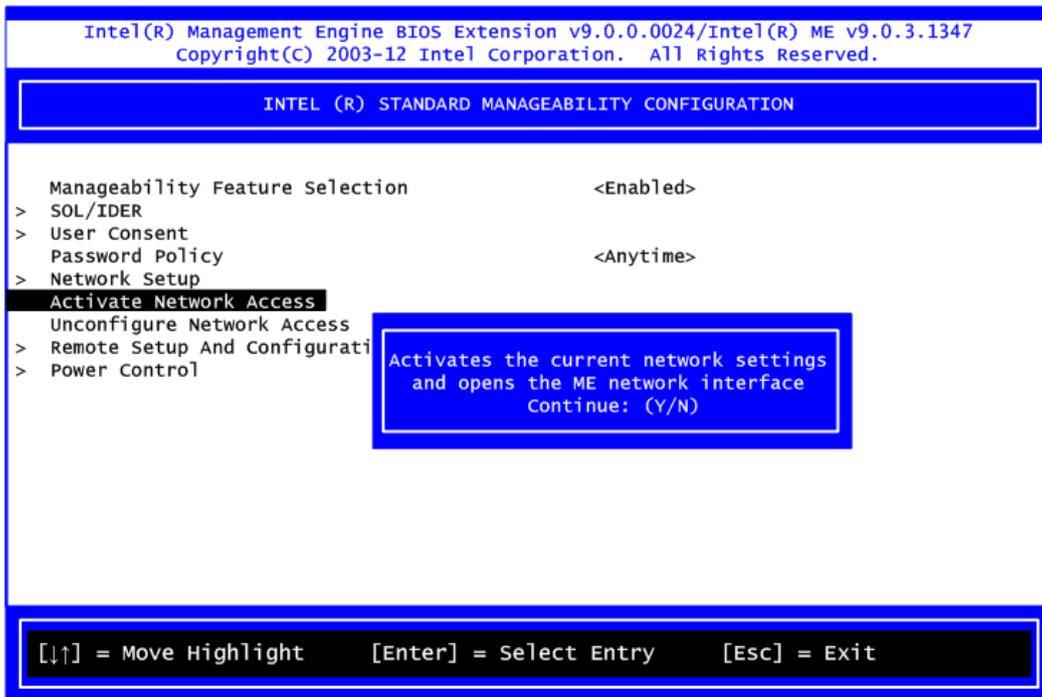


3. If DHCP Mode is disabled, set the following settings:

- IP address
- Subnet mask



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

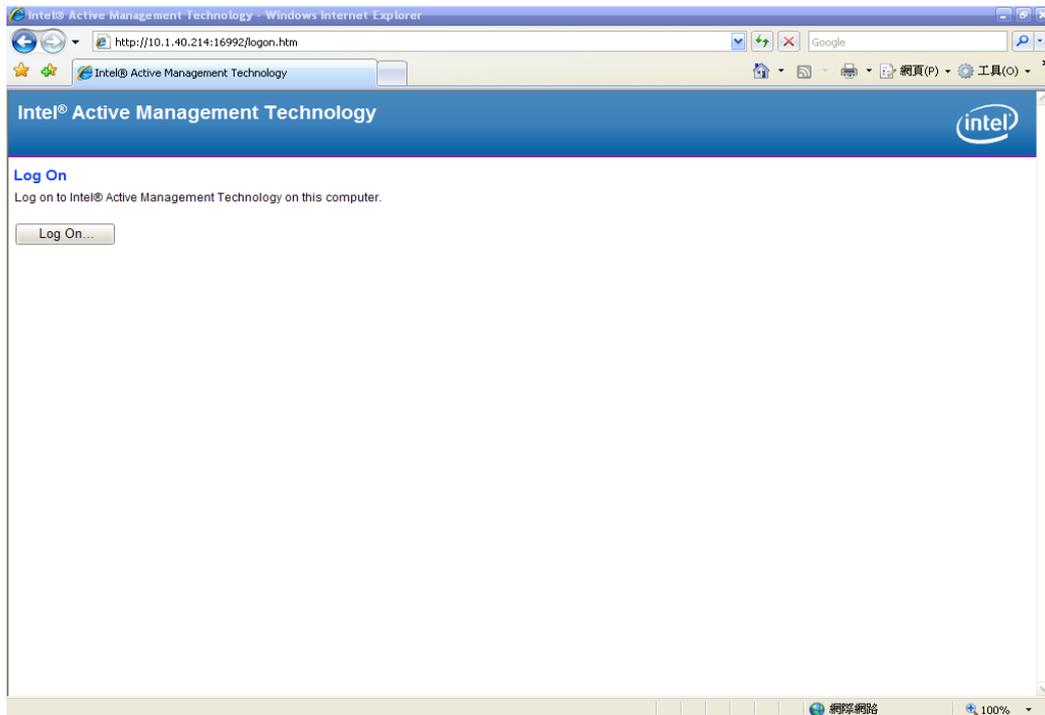


5. Exit from MEBx after completing the iAMT settings.

C.4 iAMT Web Console

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

Example: <http://10.1.40.214:16992>

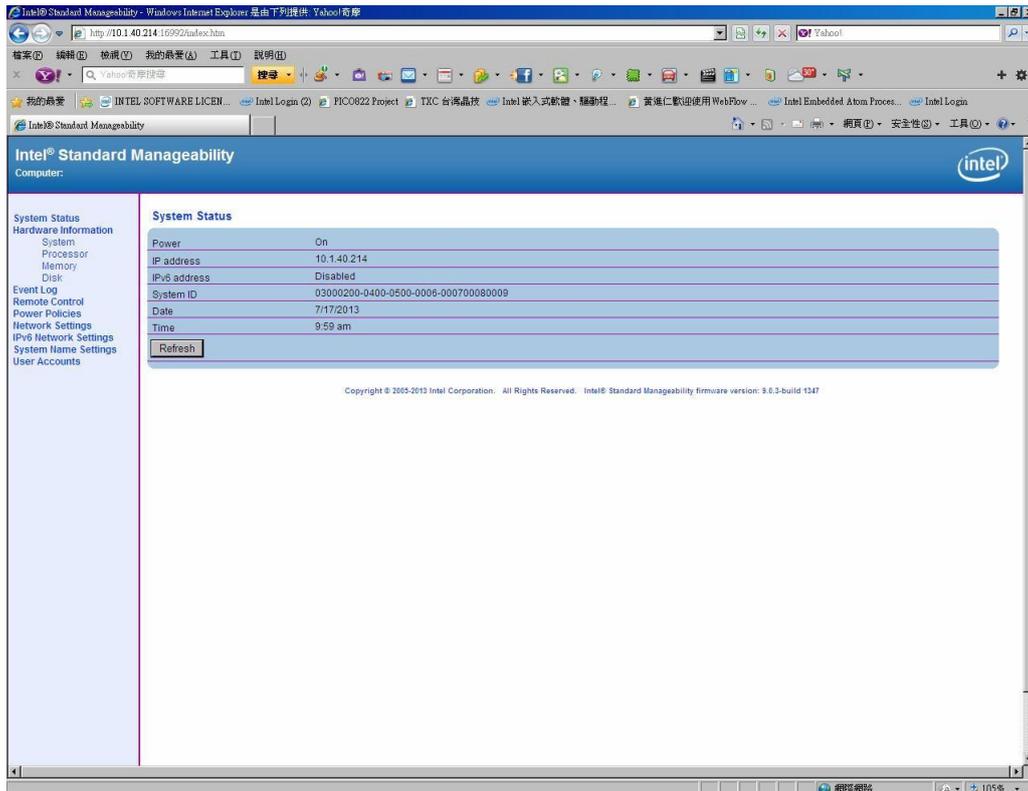


2. To log on, you will be required to type in username and password for access to the Web.

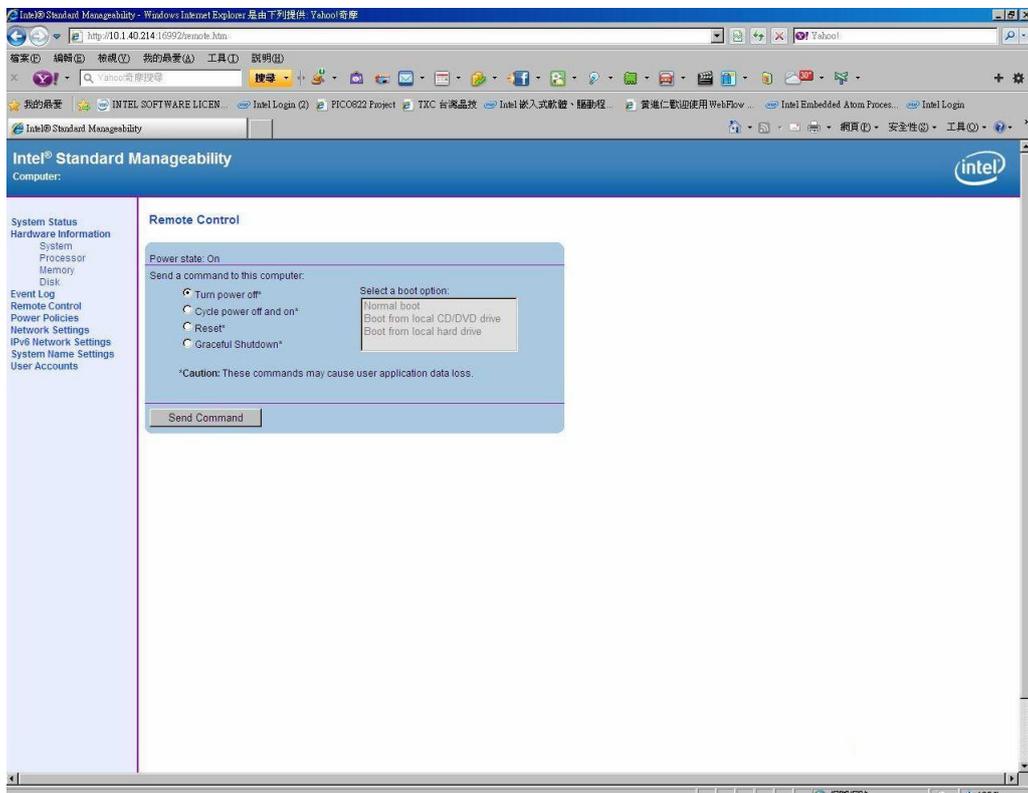
USER: admin (default value)

PASS: (MEBx password)

3. Enter the iAMT Web.



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



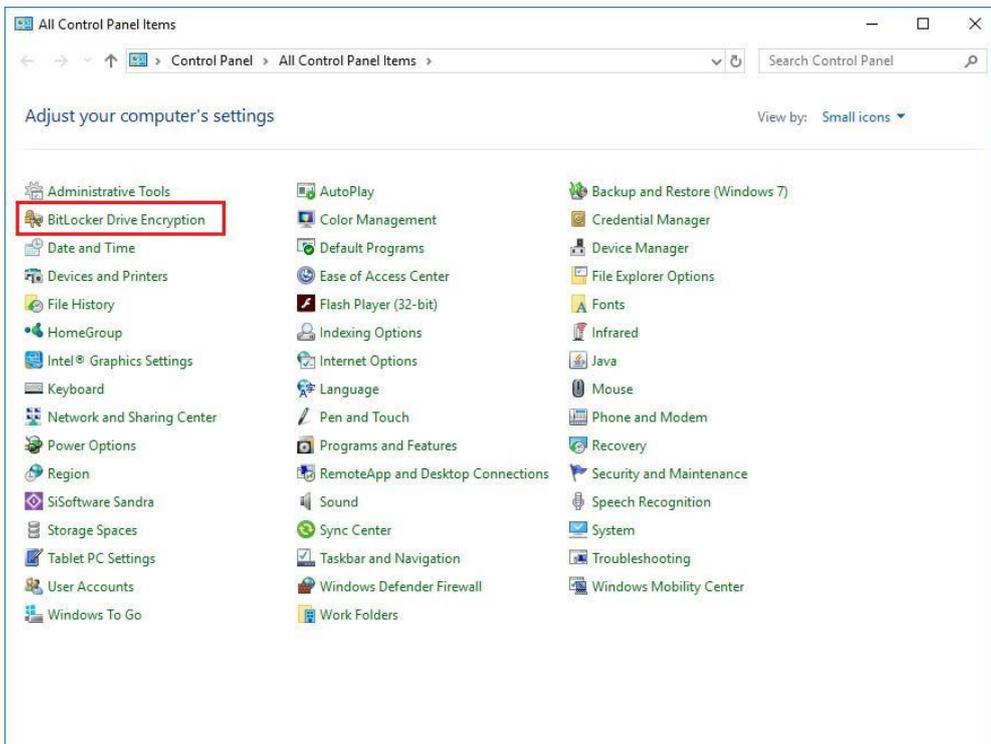
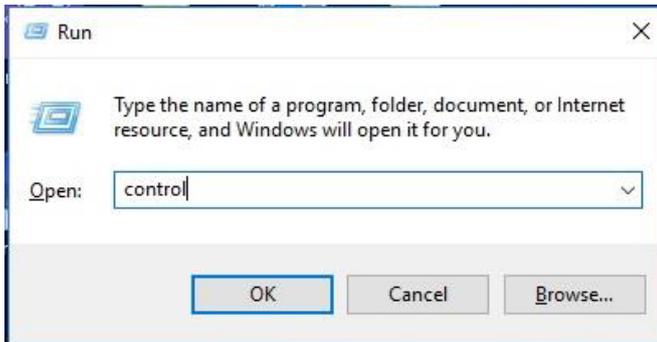
5. When you have finished using the iAMT Web console, close the Web browser.

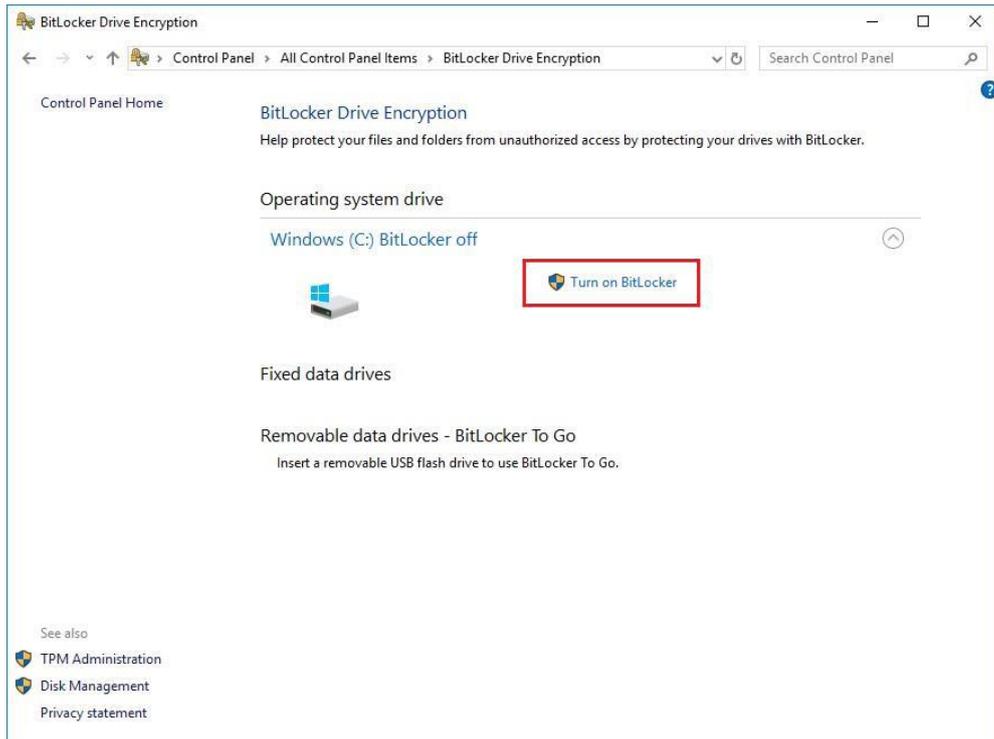
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Appendix D

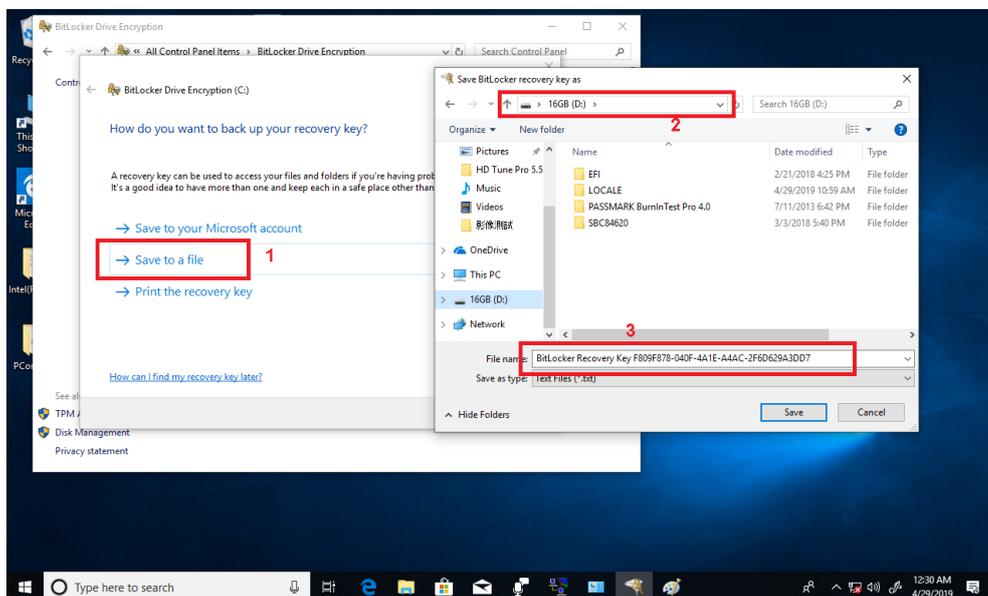
TPM Settings

1. Setup BitLocker Drive Encryption main storage. Press <Win + R> and type "Control Panel", then select BitLocker Drive Encryption.

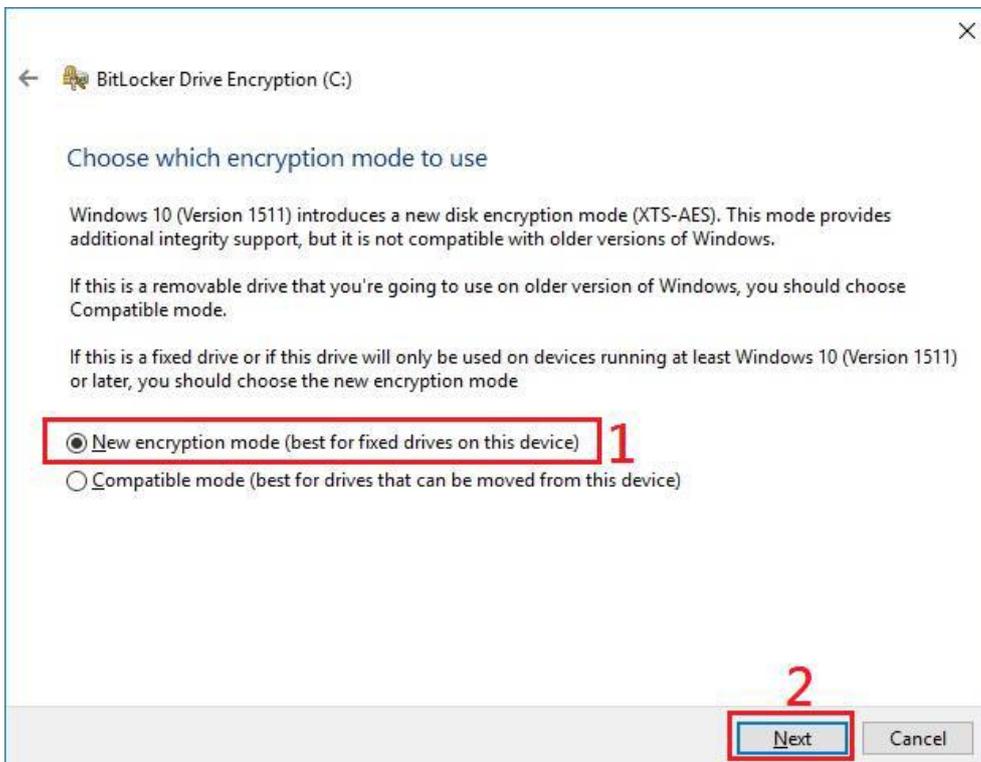
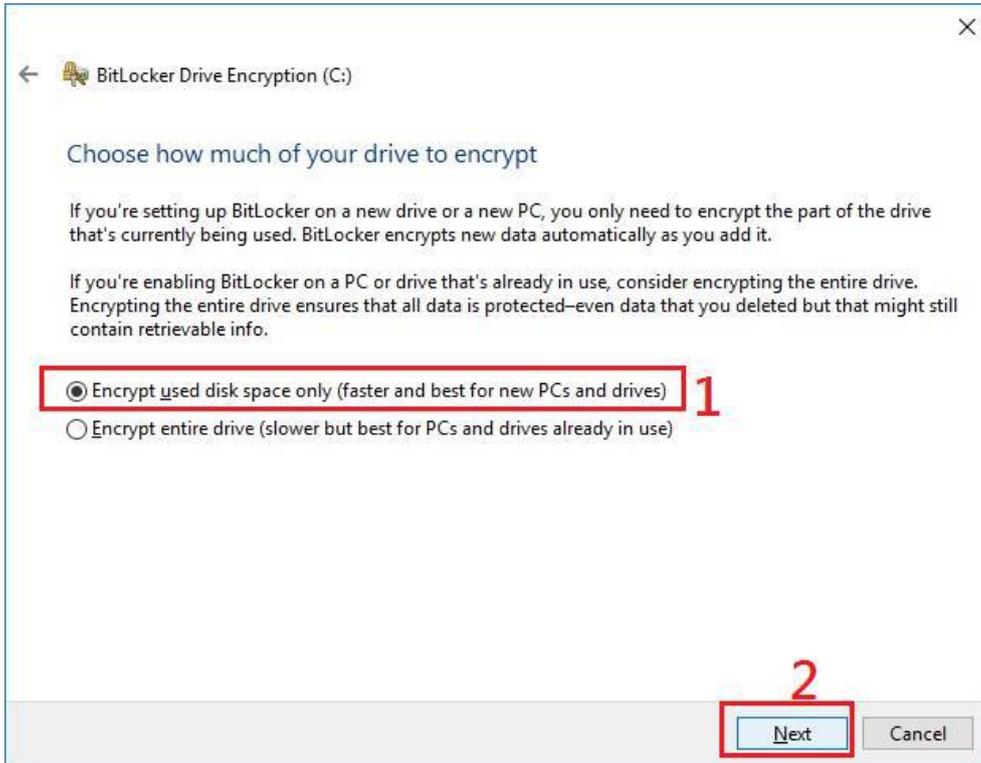


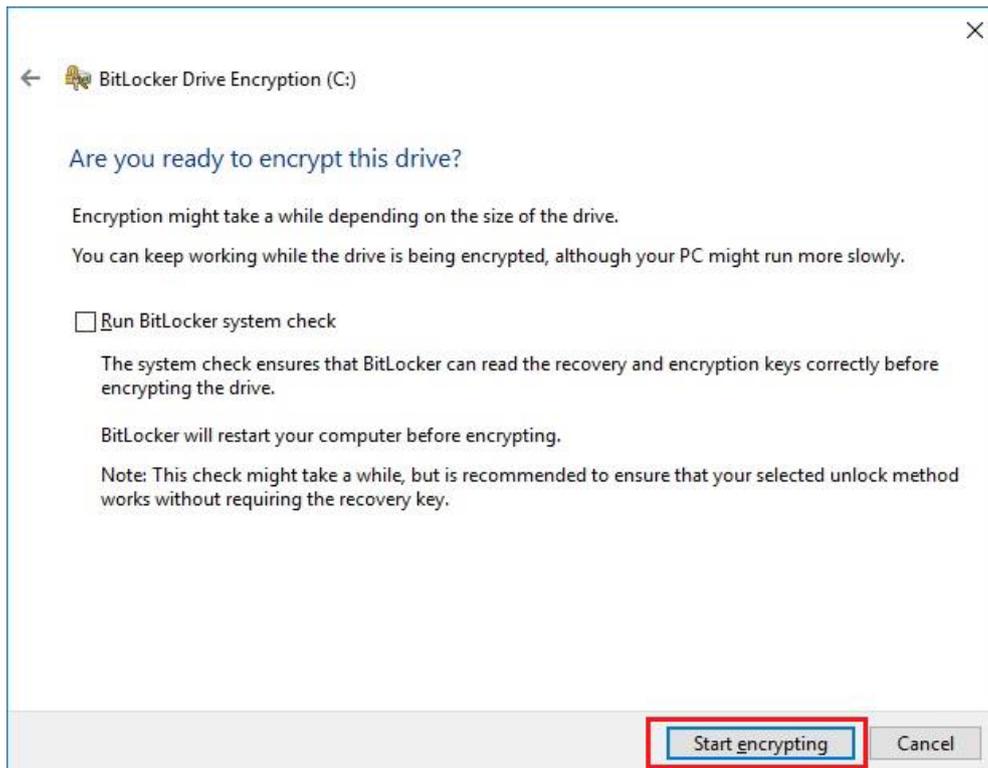


2. Insert an external storage device, for example USB Storage. Back up BitLocker recovery key in a new file and save it to the USB Storage.

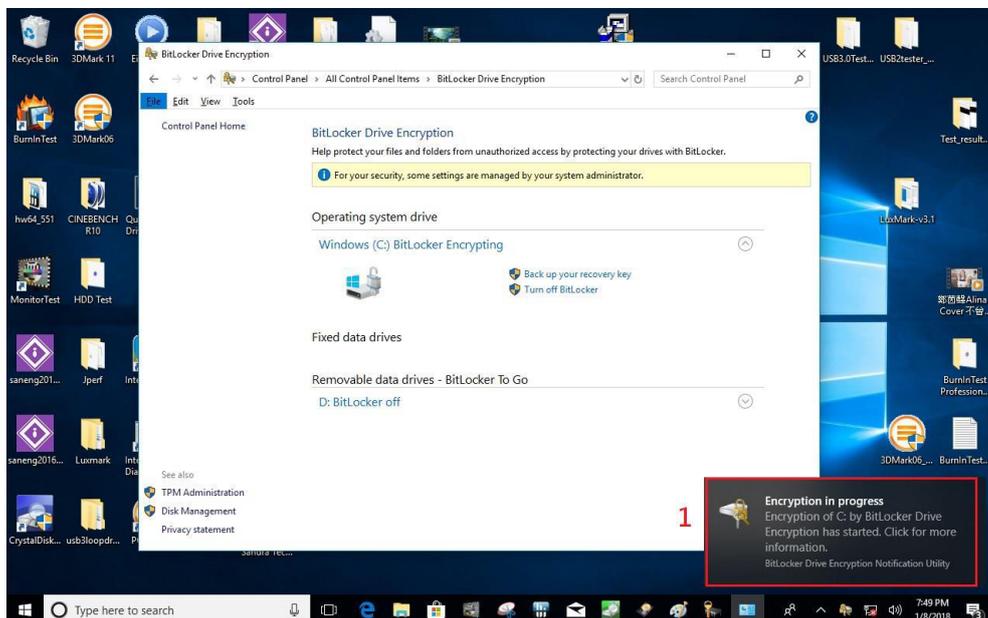


3. Please follow the steps below to encrypt your storage device:

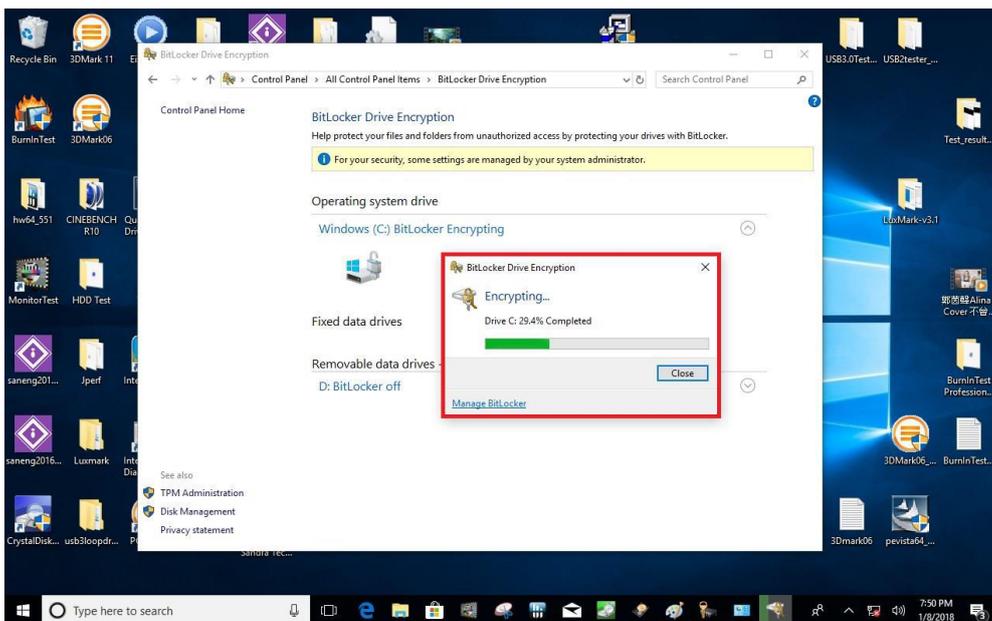
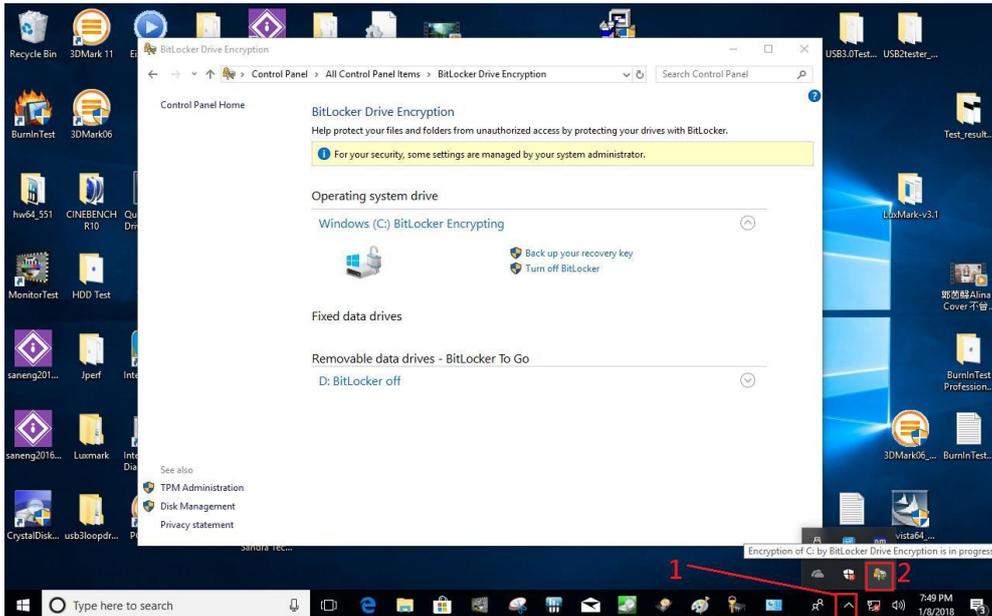


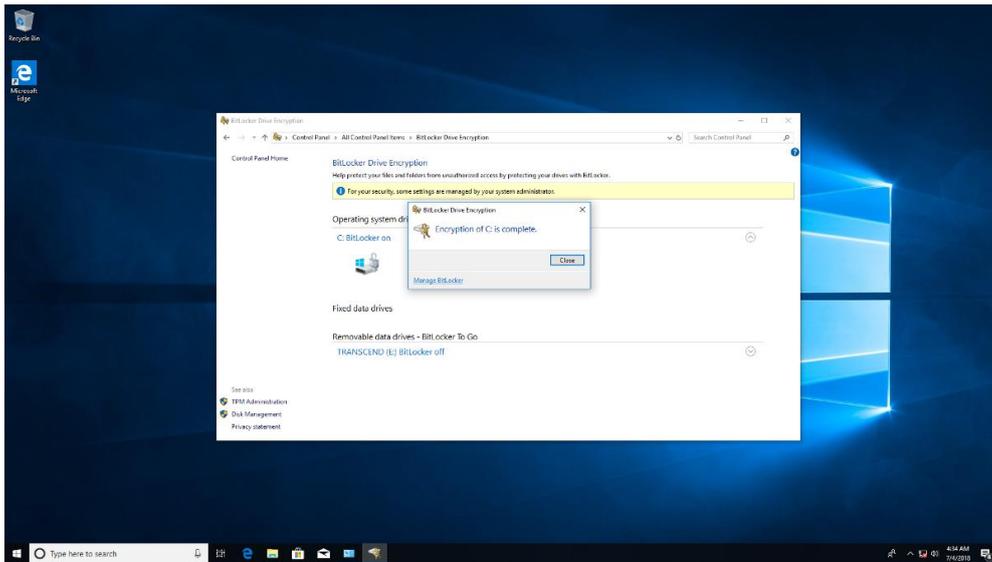


Now, the system prompts that the operating system drive encryption is in progress, and the encryption progress is checked.

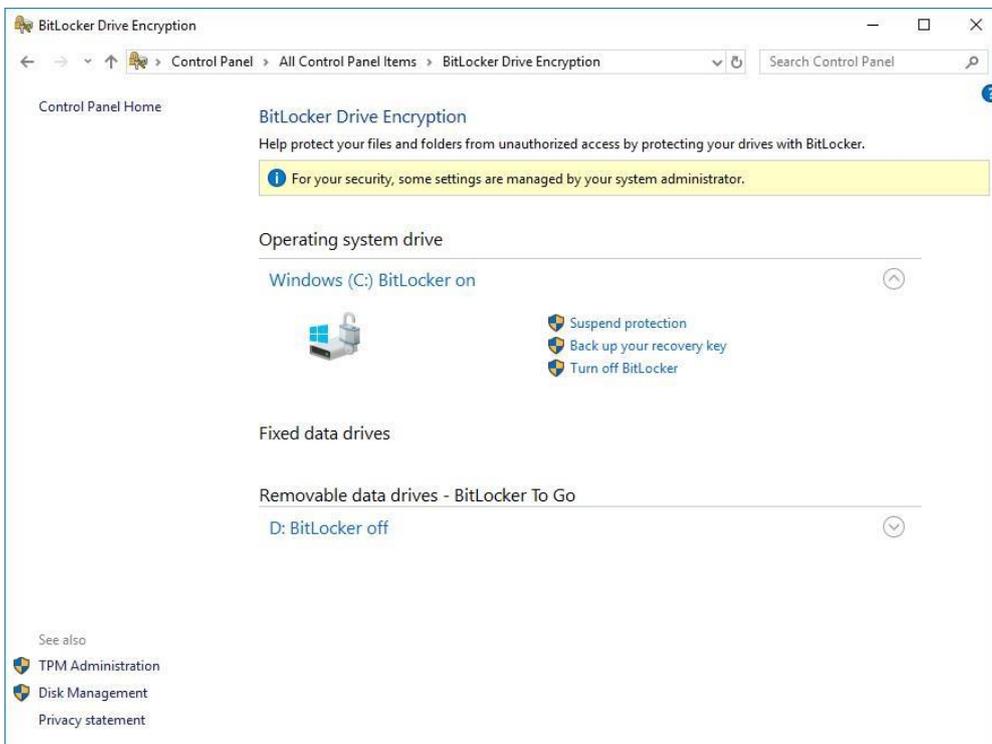


Select and click the icon in the lower right corner to complete the encryption.

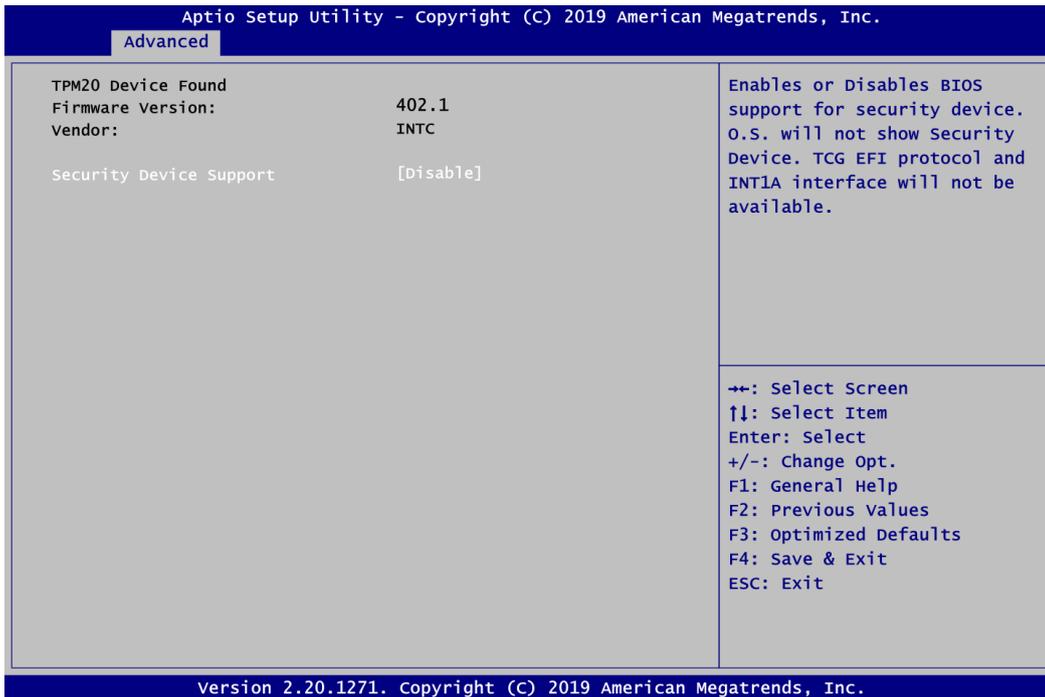




4. Confirm the completion of encryption.



5. Disable TPM function in BIOS Setup Utility.



6. When the system is powered on and you see the following screen, it means the TPM module function is working fine. Note that BitLocker cannot be executed if your system does not have TPM function.



System with no TPM function support is as below:



Note

1. **TPM information is not found in Device Manager.**



2. **When trying to turn on BitLocker, the following error message shows up.**

