COM-CFHB6

COM Express Module

User's Manual 1st Ed

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Packing List

Before setting up your product, please make sure the following items have been shipped:

Item		Quantity
●	COM-CFHB6-A10	1

If any of these items are missing or damaged, please contact your distributor or sales representative immediately.

About this Document

This User’s Manual contains all the essential information, such as detailed descriptions and explanations on the product’s hardware and software features (if any), its specifications, dimensions, jumper/connector settings/definitions, and driver installation instructions (if any), to facilitate users in setting up their product.

Users may refer to the product page at AAEON.com for the latest version of this document.

Safety Precautions

Please read the following safety instructions carefully. It is advised that you keep this manual for future references

1. All cautions and warnings on the device should be noted.
2. Make sure the power source matches the power rating of the device.
3. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
4. Always completely disconnect the power before working on the system's hardware.
5. No connections should be made when the system is powered as a sudden rush of power may damage sensitive electronic components.
6. If the device is not to be used for a long time, disconnect it from the power supply to avoid damage by transient over-voltage.
7. Always disconnect this device from any AC supply before cleaning.
8. While cleaning, use a damp cloth instead of liquid or spray detergents.
9. Make sure the device is installed near a power outlet and is easily accessible.
10. Keep this device away from humidity.
11. Place the device on a solid surface during installation to prevent falls
12. Do not cover the openings on the device to ensure optimal heat dissipation.
13. Watch out for high temperatures when the system is running.
14. Do not touch the heat sink or heat spreader when the system is running
15. Never pour any liquid into the openings. This could cause fire or electric shock.
16. As most electronic components are sensitive to static electrical charge, be sure to ground yourself to prevent static charge when installing the internal components. Use a grounding wrist strap and contain all electronic components in any static-shielded containers.

17. If any of the following situations arises, please the contact our service personnel:

    i. Damaged power cord or plug

    ii. Liquid intrusion to the device

    iii. Exposure to moisture

    iv. Device is not working as expected or in a manner as described in this manual

    v. The device is dropped or damaged

    vi. Any obvious signs of damage displayed on the device

18. DO NOT LEAVE THIS DEVICE IN AN UNCONTROLLED ENVIRONMENT WITH TEMPERATURES BEYOND THE DEVICE'S PERMITTED STORAGE TEMPERATURES (SEE CHAPTER 1) TO PREVENT DAMAGE.

FCC Statement

Warning!

This device complies with Part 15 FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received including interference that may cause undesired operation.

Caution:

There is a danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions and your local government's recycling or disposal directives.

Attention:

Il y a un risque d'explosion si la batterie est remplacée de façon incorrecte.
Ne la remplacer qu'avec le même modèle ou équivalent recommandé par le constructeur.
Recycler les batteries usées en accord avec les instructions du fabricant et les directives gouvernementales de recyclage.

China RoHS Requirements (CN)

产品中有毒有害物质或元素名称及含量

AAEON Main Board/ Daughter Board/ Backplane

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板 及其电子组件	○	○	○	○	○	○
外部信号 连接器及线材	○	○	○	○	○	○

O：表示该有毒有害物质在该部件所有均质材料中的含量均在
SJ/T 11363-2006 标准规定的限量要求以下。

X：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出
SJ/T 11363-2006 标准规定的限量要求。

备注：此产品所标示之环保使用期限，系指在一般正常使用状况下。

China RoHS Requirement (EN)

Poisonous or Hazardous Substances or Elements in Products

AAEON Main Board/ Daughter Board/ Backplane

Component	Poisonous or Hazardous Substances or Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
PCB & Other Components	O	O	O	O	O	O
Wires & Connectors for External Connections	O	O	O	O	O	O

O：The quantity of poisonous or hazardous substances or elements found in each of the component's parts is below the SJ/T 11363-2006-stipulated requirement.

X: The quantity of poisonous or hazardous substances or elements found in at least one of the component's parts is beyond the SJ/T 11363-2006-stipulated requirement.

Note: The Environment Friendly Use Period as labeled on this product is applicable under normal usage only

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Chapter 1

Product Specifications

1.1 Specifications

System	
Form Factor	COM Express Basic Size, Type 6
CPU	Coffee Lake-H, 45W Xeon E-2176M / i7-8850H / i5-8400H / i3-8100H
CPU Frequency	Up to Xeon E-2176M, 6c/2.7 GHz
Chipset	QM370 (with i7/i5/i3) CM246 (with E-2176M)
Memory Type	DDR4 SO-DIMM x 3
Max. Memory Capacity	Up to 48GB, with ECC support (CM246 Chipset only)
BIOS	AMI BIOS, Legacy free BIOS
Wake on LAN	Yes
Watchdog Timer	255 Levels
Power Requirement	Standard : +12V
Power Supply Type	AT/ATX Selection
H/W Status Monitoring	Support CPU temperature monitoring
Expansion Interface	PCIe [x1] x 8 PCIe [x16] x 1 LPC x 1 SMBUS x 1 2-wire UART x 2

System

Power Consumption (Typical)	Intel ® Xeon ® E-2176M CPU @2.70GHz, DDR4 16GB x3 Full load : 62.4W, 5.2A@12V during 100% loading burn in test
Dimension (L x W)	4.92" x 3.75" (125mm x 95mm)
Gross Weight	520g
Operation Temperature	32˚F~ 140˚F (0˚C ~ 60˚C)
Storage Temperature	-4˚F ~ 158˚F (-20˚C ~ 70˚C)
Operation Humidity	10% ~ 95% relative humidity, non-condensing
MTBF	80,000
Certification	CE/FCC Class A

Display

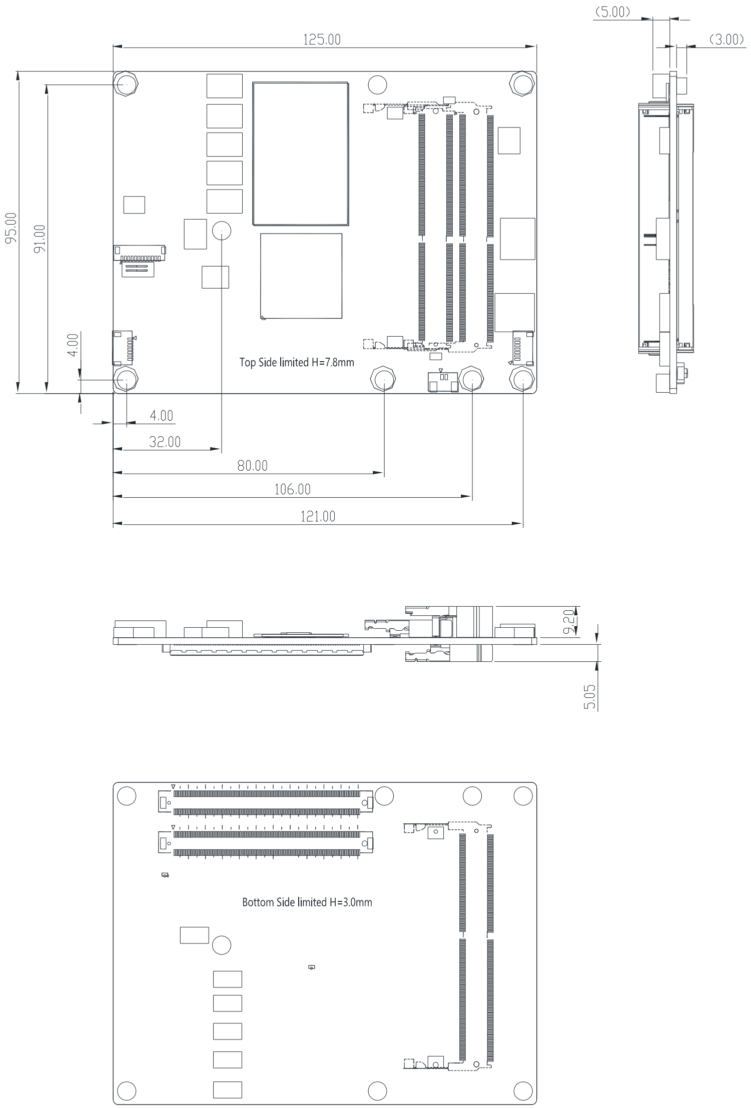
Display Controller	Intel HD Graphic GT2-P630 (E-2176M) / GT2-630 (I7/I5/I3 Series) Supports CRT/LCD/DDI Simultaneous/ 3 way view display
Video Output	VGA: 2048x1152 LVDS/eDP: up to 1920x1200
LVDS Interface	Supports 18bit and 24bit dual channel up to WUXGA 1920x1200
Others	DDI x 2, (x 3 optional without VGA)

I/O	
Ethernet	Intel® Jacksonville, I219 GbE x 1
Storage	SATA III x 4,
USB	USB 2.0 x 8 USB 3.1 x 4 (Gen 2)
Audio	HD Audio x 1
GPIO	8 bit
Serial Port	x 2, Tx/Rx only
TPM (Optional)	TPM 1.2 / 2.0

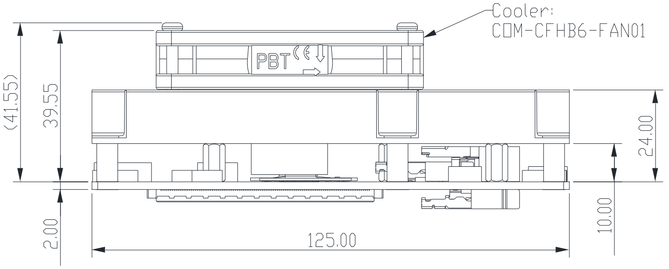
Chapter 2

Hardware Information

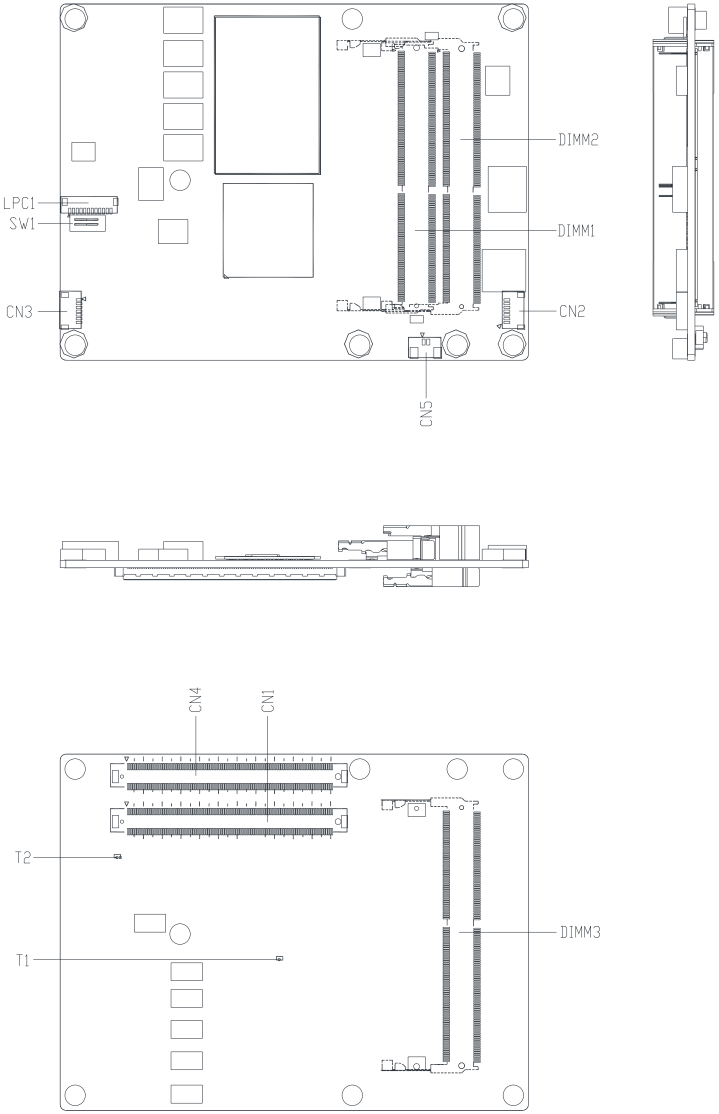
2.1 Dimensions, Jumpers and Connectors



With Fan



Jumpers, Switches and Connectors:



2.2 Jumper: SW1 AT/ATX Mode

Mode	1	2
ATX (Default)	OFF	OFF
AT Mode	ON	OFF
Clear CMOS	OFF	ON

2.3 List of Connectors

This section details the board's connectors and their configuration. Please use this reference to determine the best setup for your application.

Label	Function
LPC1	LPC debug card Connector
DIMM1	SO-DIMMCOM Connector
DIMM2	SO-DIMMCOM Connector
DIMM3	SO-DIMMCOM Connector
CN1	Express ROW C/D Connector
CN2	SPI Flash Programming Connector
CN3	EC Flash Programming Connector
CN4	Express ROW A/B Connector
CN5	RTC Battery Connector

2.3.1 Express ROW C/D Connector (CN1)

Row C		Row D	
Pin	Signal	Pin	Signal
C1	GND (FIXED)	D1	GND (FIXED)
C2	GND (FIXED)	D2	GND (FIXED)
C3	USB_SSRX0-	D3	USB_SSTX0-
C4	USB_SSRX0+	D4	USB_SSTX0+
C5	GND (FIXED)	D5	GND (FIXED)
C6	USB_SSRX1-	D6	USB_SSTX1-
C7	USB_SSRX1+	D7	USB_SSTX1+
C8	GND (FIXED)	D8	GND (FIXED)
C9	USB_SSRX2-	D9	USB_SSTX2-
C10	USB_SSRX2+	D10	USB_SSTX2+
C11	GND (FIXED)	D11	GND (FIXED)
C12	USB_SSRX3-	D12	USB_SSTX3-
C13	USB_SSRX3+	D13	USB_SSTX3+
C14	GND (FIXED)	D14	GND (FIXED)
C15	DDI1_PAIR6+(NC)	D15	DDI1_CTRLCLK_AUX+
C16	DDI1_PAIR6-(NC)	D16	DDI1_CTRLDATA_AUX-
C17	RSVD	D17	RSVD
C18	RSVD	D18	RSVD
C19	PCIE_RX6+	D19	PCIE_TX6+
C20	PCIE_RX6-	D20	PCIE_TX6-
C21	GND (FIXED)	D21	GND (FIXED)
C22	PCIE_RX7+	D22	PCIE_TX7+
C23	PCIE_RX7-	D23	PCIE_TX7-

Row C		Row D	
Pin	Signal	Pin	Signal
C24	DDI1_HPD	D24	RSVD
C25	DDI1_PAIR4+(NC)	D25	RSVD
C26	DDI1_PAIR4-(NC)	D26	DDI1_PAIR0+
C27	RSVD	D27	DDI1_PAIR0-
C28	RSVD	D28	RSVD
C29	DDI1_PAIR5+(NC)	D29	DDI1_PAIR1+
C30	DDI1_PAIR5-(NC)	D30	DDI1_PAIR1-
C31	GND (FIXED)	D31	GND (FIXED)
C32	DDI2_CTRLCLK_AUX+	D32	DDI1_PAIR2+
C33	DDI2_CTRLDATA_AUX-	D33	DDI1_PAIR2-
C34	DDI2_DDC_AUX_SEL	D34	DDI1_DDC_AUX_SEL
C35	RSVD	D35	RSVD
C36	DDI3_CTRLCLK_AUX+	D36	DDI1_PAIR3+
C37	DDI3_CTRLDATA_AUX-	D37	DDI1_PAIR3-
C38	DDI3_DDC_AUX_SEL	D38	RSVD
C39	DDI3_PAIR0+	D39	DDI2_PAIR0+
C40	DDI3_PAIR0-	D40	DDI2_PAIR0-
C41	GND (FIXED)	D41	GND (FIXED)
C42	DDI3_PAIR1+	D42	DDI2_PAIR1+
C43	DDI3_PAIR1-	D43	DDI2_PAIR1-
C44	DDI3_HPD	D44	DDI2_HPD
C45	RSVD	D45	RSVD
C46	DDI3_PAIR2+	D46	DDI2_PAIR2+
C47	DDI3_PAIR2-	D47	DDI2_PAIR2-
C48	RSVD	D48	RSVD

Row C		Row D	
Pin	Signal	Pin	Signal
C49	DDI3_PAIR3+	D49	DDI2_PAIR3+
C50	DDI3_PAIR3-	D50	DDI2_PAIR3-
C51	GND (FIXED)	D51	GND (FIXED)
C52	PEG_RX0+	D52	PEG_TX0+
C53	PEG_RX0-	D53	PEG_TX0-
C54	TYPE0#(NC)	D54	PEG_LAN_RV#
C55	PEG_RX1+	D55	PEG_TX1+
C56	PEG_RX1-	D56	PEG_TX1-
C57	TYPE1#(NC)	D57	TYPE2#
C58	PEG_RX2+	D58	PEG_TX2+
C59	PEG_RX2-	D59	PEG_TX2-
C60	GND (FIXED)	D60	GND (FIXED)
C61	PEG_RX3+	D61	PEG_TX3+
C62	PEG_RX3-	D62	PEG_TX3-
C63	RSVD	D63	RSVD
C64	RSVD	D64	RSVD
C65	PEG_RX4+	D65	PEG_TX4+
C66	PEG_RX4-	D66	PEG_TX4-
C67	RSVD	D67	GND (FIXED)
C68	PEG_RX5+	D68	PEG_TX5+
C69	PEG_RX5-	D69	PEG_TX5-
C70	GND (FIXED)	D70	GND (FIXED)
C71	PEG_RX6+	D71	PEG_TX6+
C72	PEG_RX6-	D72	PEG_TX6-
C73	GND (FIXED)	D73	GND (FIXED)

Row C		Row D	
Pin	Signal	Pin	Signal
C74	PEG_RX7+	D74	PEG_TX7+
C75	PEG_RX7-	D75	PEG_TX7-
C76	GND (FIXED)	D76	GND (FIXED)
C77	RSVD	D77	RSVD
C78	PEG_RX8+	D78	PEG_TX8+
C79	PEG_RX8-	D79	PEG_TX8-
C80	GND (FIXED)	D80	GND (FIXED)
C81	PEG_RX9+	D81	PEG_TX9+
C82	PEG_RX9-	D82	PEG_TX9-
C83	RSVD	D83	RSVD
C84	GND (FIXED)	D84	GND (FIXED)
C85	PEG_RX10+	D85	PEG_TX10+
C86	PEG_RX10-	D86	PEG_TX10-
C87	GND (FIXED)	D87	GND (FIXED)
C88	PEG_RX11+	D88	PEG_TX11+
C89	PEG_RX11-	D89	PEG_TX11-
C90	GND (FIXED)	D90	GND (FIXED)
C91	PEG_RX12+	D91	PEG_TX12+
C92	PEG_RX12-	D92	PEG_TX12-
C93	GND	D93	GND
C94	PEG_RX13+	D94	PEG_TX13+
C95	PEG_RX13-	D95	PEG_TX13-
C96	GND (FIXED)	D96	GND (FIXED)
C97	RSVD	D97	RSVD
C98	PEG_RX14+	D98	PEG_TX14+

Row C		Row D	
Pin	Signal	Pin	Signal
C99	PEG_RX14-	D99	PEG_TX14-
C100	GND (FIXED)	D100	GND (FIXED)
C101	PEG_RX15+	D101	PEG_TX15+
C102	PEG_RX15-	D102	PEG_TX15-
C103	GND (FIXED)	D103	GND
C104	VCC_12V	D104	VCC_12V
C105	VCC_12V	D105	VCC_12V
C106	VCC_12V	D106	VCC_12V
C107	VCC_12V	D107	VCC_12V
C108	VCC_12V	D108	VCC_12V
C109	VCC_12V	D109	VCC_12V
C110	GND (FIXED)	D110	GND (FIXED)

2.3.2 Express ROW A/B Connector (CN4)

Row A		Row B	
Pin	Signal	Pin	Signal
A1	GND (FIXED)	B1	GND (FIXED)
A2	GBE0_MDI3-	B2	GBE0_ACT#
A3	GBE0_MDI3+	B3	LPC_FRAME#
A4	GBE0_LINK100#	B4	LPC_AD0
A5	GBE0_LINK1000#	B5	LPC_AD1
A6	GBE0_MDI2-	B6	LPC_AD2
A7	GBE0_MDI2+	B7	LPC_AD3
A8	GBE0_LINK	B8	LPC_DRQ0#(NC)

Row A		Row B	
Pin	Signal	Pin	Signal
A9	GBE0_MDI1-	B9	LPC_DRQ1#(NC)
A10	GBE0_MDI1+	B10	LPC_CLK
A11	GND (FIXED)	B11	GND (FIXED)
A12	GBE0_MDI0-	B12	PWRBTN#
A13	GBE0_MDI0+	B13	SMB_CK
A14	GBE0_CTREF	B14	SMB_DAT
A15	SUS_S3#	B15	SMB_ALERT#
A16	SATA0_TX+	B16	SATA1_TX+
A17	SATA0_TX-	B17	SATA1_TX-
A18	SUS_S4#	B18	SUS_STAT#
A19	SATA0_RX+	B19	SATA1_RX+
A20	SATA0_RX-	B20	SATA1_RX-
A21	GND (FIXED)	B21	GND (FIXED)
A22	SATA2_TX+	B22	SATA3_TX+
A23	SATA2_TX-	B23	SATA3_TX-
A24	SUS_S5#	B24	PWR_OK
A25	SATA2_RX+	B25	SATA3_RX+
A26	SATA2_RX-	B26	SATA3_RX-
A27	BATLOW#	B27	WDT
A28	ATA_ACT#	B28	AC_SDIN2(NC)
A29	AC_SYNC	B29	AC_SDIN1
A30	AC_RST#	B30	AC_SDIN0
A31	GND (FIXED)	B31	GND (FIXED)
A32	AC_BITCLK	B32	SPKR
A33	AC_SDOUT	B33	I2C_CK

Row A		Row B	
Pin	Signal	Pin	Signal
A34	BIOS_DIS0#	B34	I2C_DAT
A35	THRMTRIP#	B35	THRM#
A36	USB6-	B36	USB7-
A37	USB6+	B37	USB7+
A38	USB_6_7_OC#	B38	USB_4_5_OC#
A39	USB4-	B39	USB5-
A40	USB4+	B40	USB5+
A41	GND (FIXED)	B41	GND (FIXED)
A42	USB2-	B42	USB3-
A43	USB2+	B43	USB3+
A44	USB_2_3_OC#	B44	USB_0_1_OC#
A45	USB0-	B45	USB1-
A46	USB0+	B46	USB1+
A47	VCC_RTC	B47	EXCD1_PERST#
A48	EXCD0_PERST#	B48	EXCD1_CPPE#
A49	EXCD0_CPPE#	B49	SYS_RESET#
A50	LPC_SERIRQ	B50	CB_RESET#
A51	GND (FIXED)	B51	GND (FIXED)
A52	PCIE_TX5+	B52	PCIE_RX5+
A53	PCIE_TX5-	B53	PCIE_RX5-
A54	GPI0	B54	GPO1
A55	PCIE_TX4+	B55	PCIE_RX4+
A56	PCIE_TX4-	B56	PCIE_RX4-
A57	GND	B57	GPO2
A58	PCIE_TX3+	B58	PCIE_RX3+

Row A		Row B	
Pin	Signal	Pin	Signal
A59	PCIE_TX3-	B59	PCIE_RX3-
A60	GND (FIXED)	B60	GND (FIXED)
A61	PCIE_TX2+	B61	PCIE_RX2+
A62	PCIE_TX2-	B62	PCIE_RX2-
A63	GPI1	B63	GPO3
A64	PCIE_TX1+	B64	PCIE_RX1+
A65	PCIE_TX1-	B65	PCIE_RX1-
A66	GND	B66	WAKE0#
A67	GPI2	B67	WAKE1#
A68	PCIE_TX0+	B68	PCIE_RX0+
A69	PCIE_TX0-	B69	PCIE_RX0-
A70	GND (FIXED)	B70	GND (FIXED)
A71	LVDS_A0+	B71	LVDS_B0+
A72	LVDS_A0-	B72	LVDS_B0-
A73	LVDS_A1+	B73	LVDS_B1+
A74	LVDS_A1-	B74	LVDS_B1-
A75	LVDS_A2+	B75	LVDS_B2+
A76	LVDS_A2-	B76	LVDS_B2-
A77	LVDS_VDD_EN	B77	LVDS_B3+
A78	LVDS_A3+	B78	LVDS_B3-
A79	LVDS_A3-	B79	LVDS_BKLT_EN
A80	GND (FIXED)	B80	GND (FIXED)
A81	LVDS_A_CK+	B81	LVDS_B_CK+
A82	LVDS_A_CK-	B82	LVDS_B_CK-
A83	LVDS_I2C_CK	B83	LVDS_BKLT_CTRL

Row A		Row B	
Pin	Signal	Pin	Signal
A84	LVDS_I2C_DAT	B84	VCC_5V_SBY
A85	GPI3	B85	VCC_5V_SBY
A86	RSVD	B86	VCC_5V_SBY
A87	RSVD	B87	VCC_5V_SBY
A88	PCIE0_CK_REF+	B88	BISO_DIS1#
A89	PCIE0_CK_REF-	B89	VGA_RED
A90	GND (FIXED)	B90	GND (FIXED)
A91	SPI _POWER	B91	VGA_GRN
A92	SPI_MISO	B92	VGA_BLU
A93	GPO0	B93	VGA_HSYNC
A94	SPI_CLK	B94	VGA_VSYNC
A95	SPI_MOSI	B95	VGA_I2C_CK
A96	TPM_PP	B96	VGA_I2C_DAT
A97	TYPE10#(NC)	B97	SPI_CS#
A98	SER0_TX	B98	RSVD
A99	SER0_RX	B99	RSVD
A100	GND (FIXED)	B100	GND (FIXED)
A101	SER1_TX	B101	FAN_PWNOUT
A102	SER1_RX	B102	FAN_TACHIN
A103	LID#	B103	SLEEP#
A104	VCC_12V	B104	VCC_12V
A105	VCC_12V	B105	VCC_12V
A106	VCC_12V	B106	VCC_12V
A107	VCC_12V	B107	VCC_12V
A108	VCC_12V	B108	VCC_12V

Row A		Row B	
Pin	Signal	Pin	Signal
A109	VCC_12V	B109	VCC_12V
A110	GND (FIXED)	B110	GND (FIXED)

Chapter 3

AMI BIOS Setup

3.1 System Test and Initialization

The board uses certain routines to test and initialize board hardware. If the routines encounter an error during the tests, you will either hear a few short beeps or see an error message on the screen. There are two kinds of errors: fatal and non-fatal. The system can usually continue the boot up sequence with non-fatal errors.

System configuration verification routines check the current system configuration stored in the CMOS memory and BIOS NVRAM. If a system configuration is not found or a system configuration data error is detected, the system will load the optimized default and re-boot with this default system configuration automatically.

There are four situations in which you will need to setup system configuration:

- You are starting your system for the first time.
- You have changed the hardware attached to your system.
- The system configuration is reset by Clear-CMOS jumper.
- The CMOS memory has lost power and the configuration information has been erased.

The COM-CFHB6 CMOS memory has an integral lithium battery backup for data retention. You will need to replace the complete unit when it runs down.

3.2 AMI BIOS Setup

The AMI BIOS ROM has a built-in Setup program that allows users to modify the basic system configuration. This information is stored in the battery-backed CMOS RAM and BIOS NVRAM so it retains the Setup information when the power is turned off.

To enter Setup, power on the computer and press <Del>or <ESC> immediately.

The function of each interface is as follows:

Main – Date and time can be set here. Use <Tab> to switch between date elements.

Advanced – Advanced configuration options including display, system, and AAEON features.

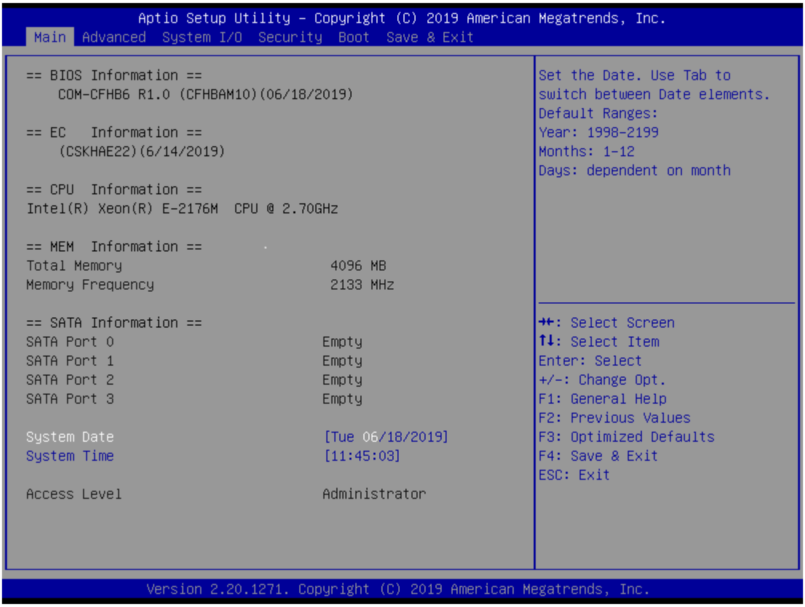
System I/O – Manage I/O port settings and configurations.

Security – Administrator password, Trusted Computing, and Secure Boot can be setup and configured here.

Boot – Boot options including Quiet Boot, PXE Boot, and Boot Priority.

Save & Exit – Save changes and exit Setup.

3.3 Setup submenu: Main



```
                Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
   Main  Advanced  System I/O  Security  Boot  Save & Exit

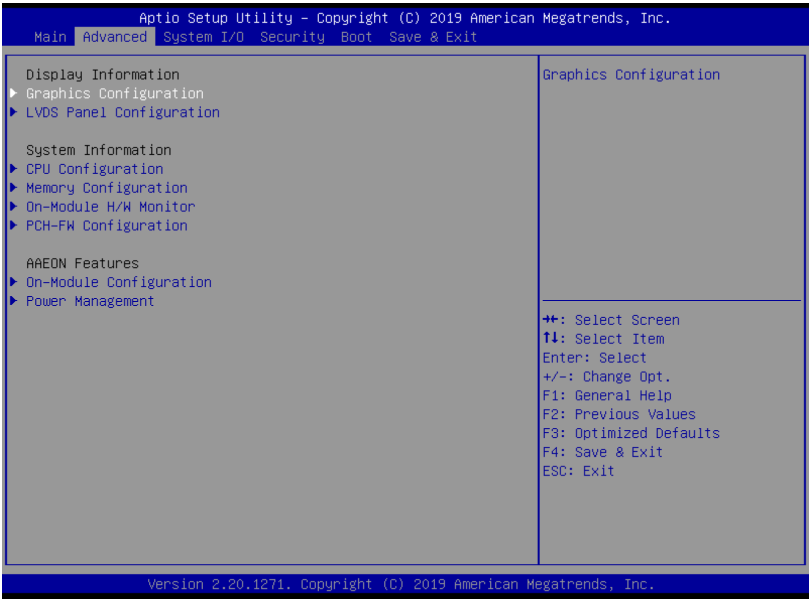
 == BIOS Information ==                                   Set the Date. Use Tab to
     COM-CFHB6 R1.0 (CFHBAM10)(06/18/2019)                switch between Date elements.
                                                          Default Ranges:
 == EC   Information ==                                   Year: 1998-2199
     (CSKHAE22)(6/14/2019)                                Months: 1-12
                                                          Days: dependent on month
 == CPU  Information ==
 Intel(R) Xeon(R) E-2176M  CPU @ 2.70GHz

 == MEM  Information ==
 Total Memory                          4096 MB
 Memory Frequency                      2133 MHz

 == SATA Information ==                                   →←: Select Screen
 SATA Port 0                          Empty               ↑↓: Select Item
 SATA Port 1                          Empty               Enter: Select
 SATA Port 2                          Empty               +/-: Change Opt.
 SATA Port 3                          Empty               F1: General Help
                                                          F2: Previous Values
 System Date                          [Tue 06/18/2019]    F3: Optimized Defaults
 System Time                          [11:45:03]          F4: Save & Exit
                                                          ESC: Exit
 Access Level                         Administrator

               Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.
```

3.4 Setup submenu: Advanced



```
          Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
    Main  Advanced  System I/O  Security  Boot  Save & Exit

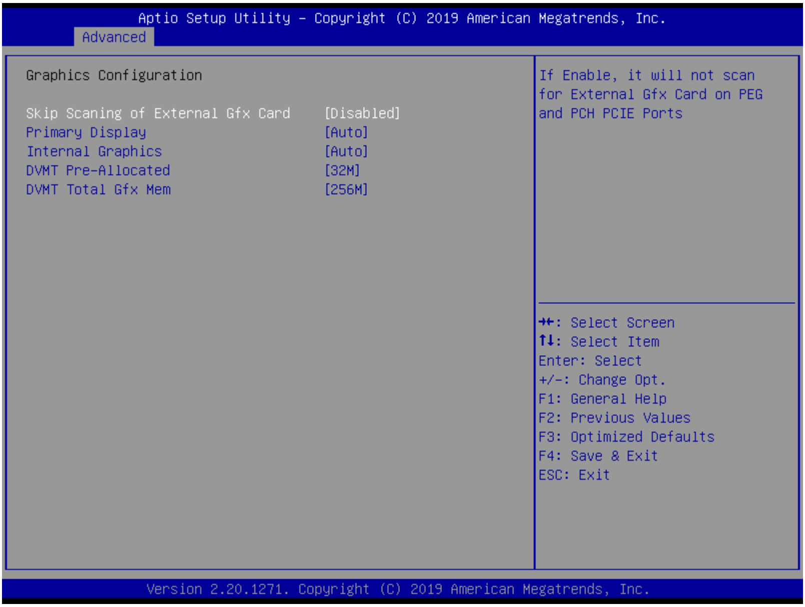
   Display Information                                  Graphics Configuration
 ▶ Graphics Configuration
 ▶ LVDS Panel Configuration

   System Information
 ▶ CPU Configuration
 ▶ Memory Configuration
 ▶ On-Module H/W Monitor
 ▶ PCH-FW Configuration

   AAEON Features
 ▶ On-Module Configuration
 ▶ Power Management
                                                        →←: 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.
```

3.4.1 Advanced: Graphics Configuration



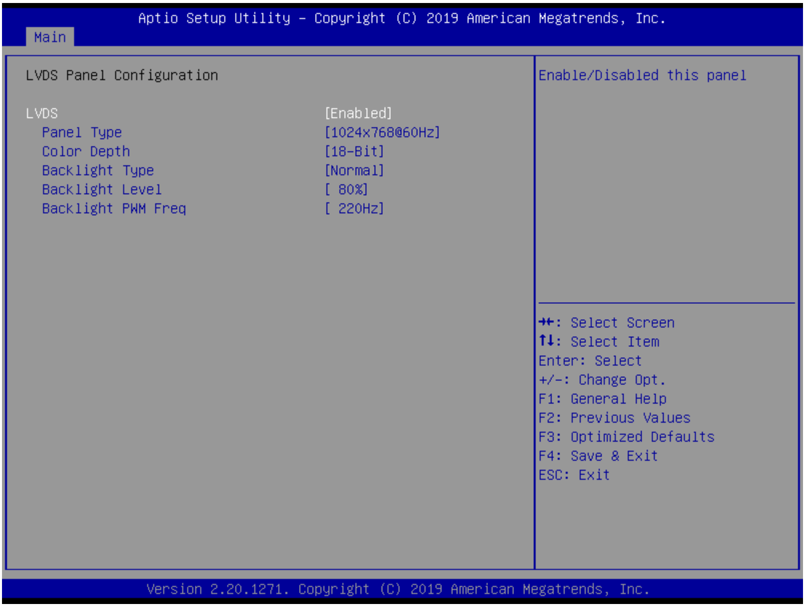
```
            Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
         Advanced
 Graphics Configuration                                       | If Enable, it will not scan
                                                              | for External Gfx Card on PEG
 Skip Scaning of External Gfx Card        [Disabled]          | and PCH PCIE Ports
 Primary Display                          [Auto]              |
 Internal Graphics                        [Auto]              |
 DVMT Pre-Allocated                       [32M]               |
 DVMT Total Gfx Mem                       [256M]              |
                                                              | →←: 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.
```

Options Summary		
Skip Scaning of External Gfx Card	Disabled	Optimal Default, Failsafe Default
	Enabled	
If Enabled, it will not scan for External Gfx Card on PEG and PCH PCIE Ports		
Primary Display	Auto	Optimal Default, Failsafe Default
	IGFX	
	PEG	
	PCI	
Select which of IGFX/ PEG/ PCI Graphics device should be Primary Display Or select SG for Switchable Gfx.		
Internal Graphics	Auto	Optimal Default, Failsafe Default
	Disabled	
	Enabled	

Table Continues on Next Page

Options Summary		
DVMT Pre-Allocated	0M	
	32M	Optimal Default, Failsafe Default
	64M	
	4M	
	8M	
	12M	
	16M	
	20M	
	24M	
	28M	
	32M/F7	
	36M	
	40M	
	44M	
	48M	
	52M	
	56M	
	60M	
Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.		
DVMT Total Gfx Mem	128M	
	256M	Optimal Default, Failsafe Default
	MAX	
Select DVMT5.0 Total Graphic Memory size used by the Internal Graphics Device.		

3.4.2 Advanced: LVDS Panel Configuration



```
          Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
  Main
 LVDS Panel Configuration                            | Enable/Disabled this panel
                                                     |
 LVDS                            [Enabled]           |
   Panel Type                    [1024x768@60Hz]     |
   Color Depth                   [18-Bit]            |
   Backlight Type                [Normal]            |
   Backlight Level               [ 80%]              |
   Backlight PWM Freq            [ 220Hz]            |
                                                     |
                                                     | →←: 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.
```

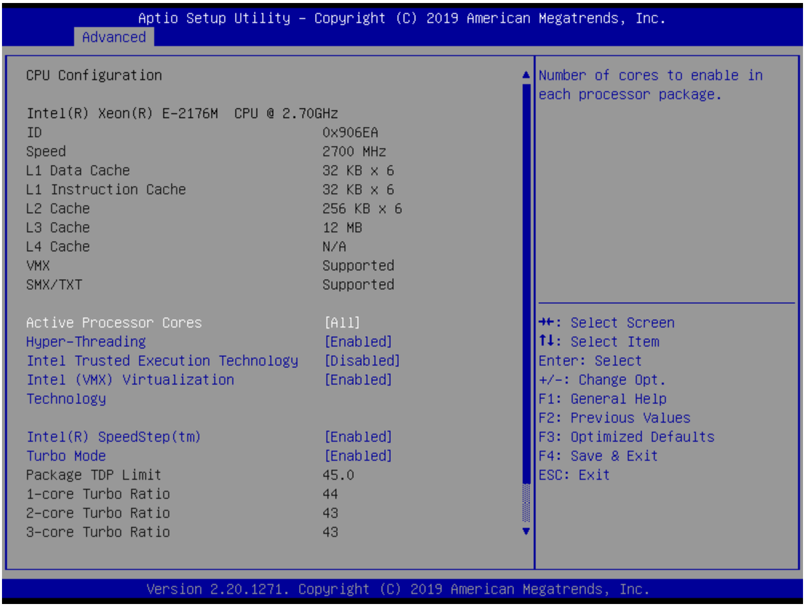
Options Summary		
LVDS	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enabled/ Disabled this panel		
Panel Type	640x480@60Hz	
	800x480@60Hz	
	800x600@60Hz	
	1024x600@60Hz	
	1024x768@60Hz	Optimal Default, Failsafe Default
	1280x768@60Hz	
	1280x800@60Hz	
	1280x1024@60Hz	
	1366x768@60Hz	
	1440x900@60Hz	
	1600x1200@60Hz	
	1920x1080@60Hz	
	1920x1200@60Hz	
Select panel type		

Options Summary		
Color Depth	18-bit	Optimal Default, Failsafe Default
	24-bit	
Select Color Depth		
Backlight Type	Normal	Optimal Default, Failsafe Default
	Inverted	
Select backlight control signal type		
Backlight Level	0%	
	10%	
	20%	
	30%	
	40%	
	50%	
	60%	
	70%	
	80%	Optimal Default, Failsafe Default
	90%	
	100%	
Select backlight control level		
Backlight PWM Freq	100Hz	
	200Hz	
	220Hz	Optimal Default, Failsafe Default
	500Hz	
	1KHz	
	2.2KHz	
	6.5KHz	
Select PWM frequency of backlight control signal		

COM Express Module

COM-CFHB6

3.4.3 Advanced: CPU Configuration



```
        Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
         Advanced
  CPU Configuration                                     Number of cores to enable in
                                                        each processor package.
  Intel(R) Xeon(R) E-2176M  CPU @ 2.70GHz
  ID                                  0x906EA
  Speed                               2700 MHz
  L1 Data Cache                       32 KB x 6
  L1 Instruction Cache                32 KB x 6
  L2 Cache                            256 KB x 6
  L3 Cache                            12 MB
  L4 Cache                            N/A
  VMX                                 Supported
  SMX/TXT                             Supported

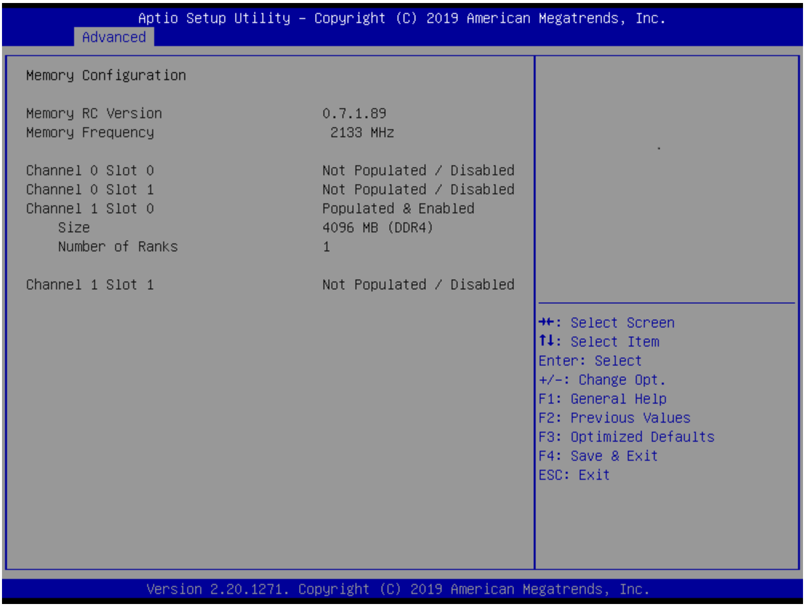
  Active Processor Cores              [All]             →←: Select Screen
  Hyper-Threading                     [Enabled]         ↑↓: Select Item
  Intel Trusted Execution Technology  [Disabled]        Enter: Select
  Intel (VMX) Virtualization          [Enabled]         +/-: Change Opt.
  Technology                                            F1: General Help
                                                        F2: Previous Values
  Intel(R) SpeedStep(tm)              [Enabled]         F3: Optimized Defaults
  Turbo Mode                          [Enabled]         F4: Save & Exit
  Package TDP Limit                   45.0              ESC: Exit
  1-core Turbo Ratio                  44
  2-core Turbo Ratio                  43
  3-core Turbo Ratio                  43

        Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.
```

Options Summary		
Active Processor Cores	ALL	Optimal Default, Failsafe Default
	1	
	2	
	3	
	4	
	5	
Number of cores to enable in each processor package.		
Hyper-Threading	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enabled for Windows XP and Linux (OS optimized for Hyper-Threading Technology) and Disabled for other OS (OS not optimized for Hyper-Threading Technology).		
Intel Trusted Execution Technology	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enable utilization of additional hardware capabilities provided by Intel Trusted Execution Technology. Changes require a full power cycle to take effect.		

Options Summary		
Intel (VMX) Virtualization Technology	Disabled	
	Enabled	Optimal Default, Failsafe Default
When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.		
Intel(R) SpeedStep(tm)	Disabled	
	Enabled	Optimal Default, Failsafe Default
Allows more than two frequency ranges to be supported.		
Turbo Mode	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enable/ Disable processor Turbo Mode (requires Intel Speed Step or Intel Speed Shift to be available and enabled).		

3.4.4 Advanced: Memory Configuration



```
Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
        Advanced

Memory Configuration

Memory RC Version                    0.7.1.89
Memory Frequency                      2133 MHz

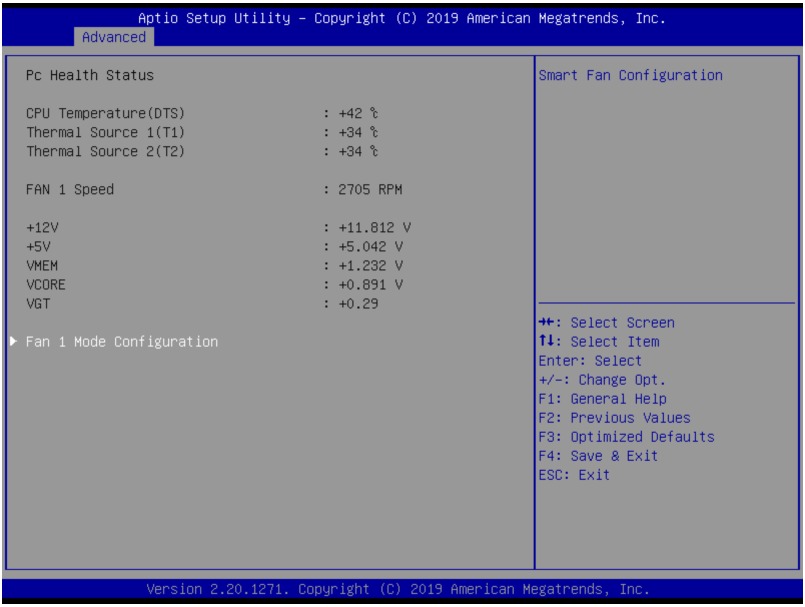
Channel 0 Slot 0                     Not Populated / Disabled
Channel 0 Slot 1                     Not Populated / Disabled
Channel 1 Slot 0                     Populated & Enabled
    Size                             4096 MB (DDR4)
    Number of Ranks                  1

Channel 1 Slot 1                     Not Populated / Disabled

                                              →←: 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.
```

3.4.5 Advanced: On-Module H/W Monitor



```
              Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
        Advanced
  Pc Health Status                                        Smart Fan Configuration

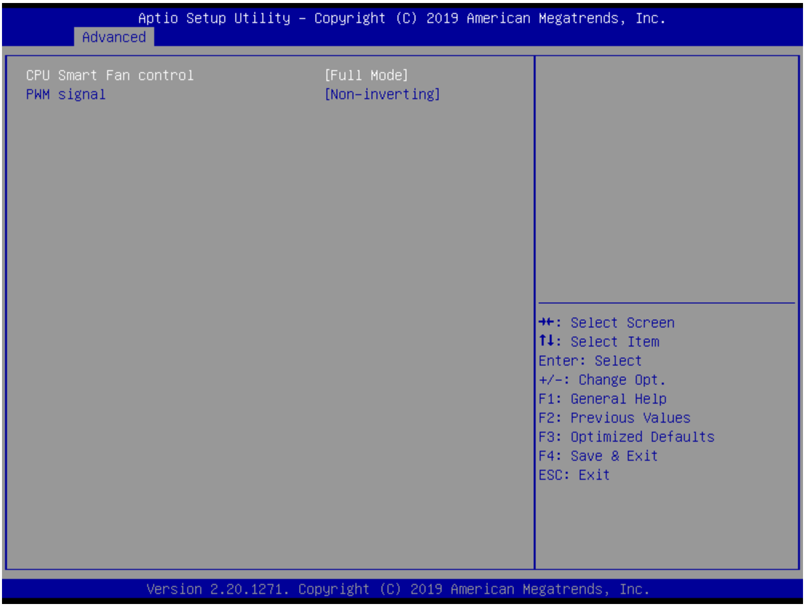
  CPU Temperature(DTS)                 : +42 ℃
  Thermal Source 1(T1)                 : +34 ℃
  Thermal Source 2(T2)                 : +34 ℃

  FAN 1 Speed                          : 2705 RPM

  +12V                                 : +11.812 V
  +5V                                  : +5.042 V
  VMEM                                 : +1.232 V
  VCORE                                : +0.891 V
  VGT                                  : +0.29
                                                          →←: Select Screen
▶ Fan 1 Mode Configuration                                ↑↓: 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.
```

3.4.5.1 Fan 1 Mode Configuration



```
             Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
     Advanced

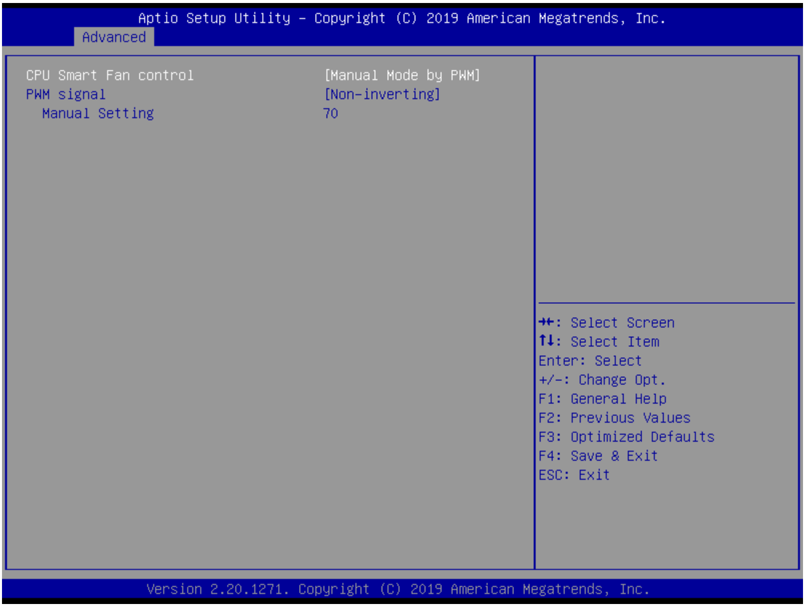
  CPU Smart Fan control                 [Full Mode]
  PWM signal                            [Non-inverting]

                                                          ++: 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.
```

Options Summary		
CPU Smart Fan control	Full Mode	Optimal Default, Failsafe Default
	Manual Mode by PWM	
	Auto Mode by PWM	
PWM signal	Non-inverting	Optimal Default, Failsafe Default
	Inverting	
Select output PWM of inverting or non-uninverting signal		

3.4.5.2 CPU Smart Fan Control: Manual Mode by PWM

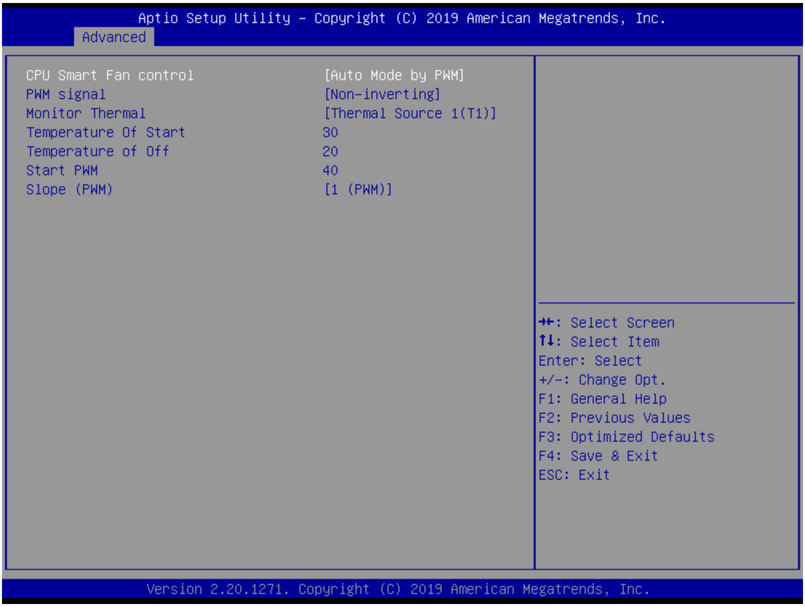


```
            Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
         Advanced
  CPU Smart Fan control                  [Manual Mode by PWM]
  PWM signal                             [Non-inverting]
    Manual Setting                       70

                                                               →←: 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.
```

Options Summary		
Manual Setting	70	Optimal Default, Failsafe Default
Set Fan at fixed Duty-Cycle Min=0 Max=100 Please input Dec number:		

3.4.5.3 CPU Smart Fan Control: Auto Mode by PWM



```
         Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
    Advanced

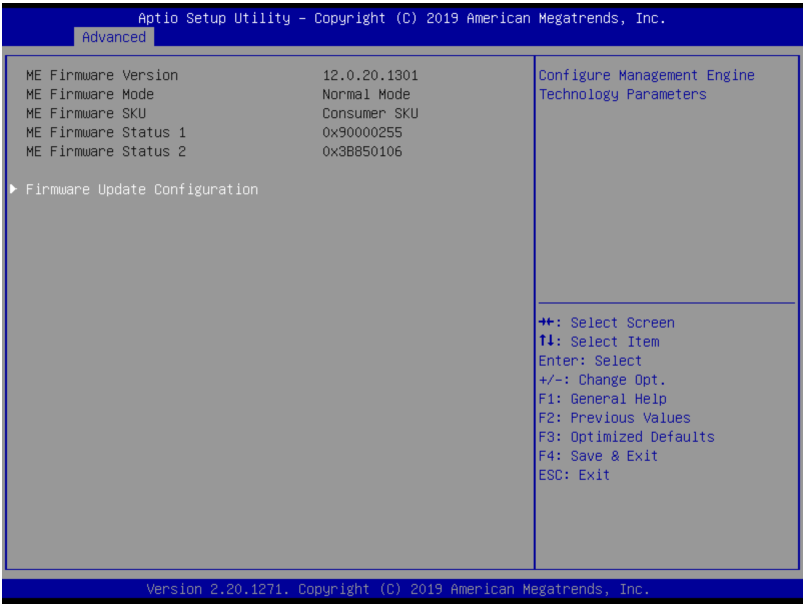
 CPU Smart Fan control                [Auto Mode by PWM]
 PWM signal                           [Non-inverting]
 Monitor Thermal                      [Thermal Source 1(T1)]
 Temperature Of Start                 30
 Temperature of Off                   20
 Start PWM                            40
 Slope (PWM)                          [1 (PWM)]

                                                         →←: 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.
```

Options Summary		
Monitor Thermal	Thermal Source 1(T1)	Optimal Default, Failsafe Default
	Thermal Source 2(T2)	
Select monitor thermal source		
Temperature of Start	30	Optimal Default, Failsafe Default
Temperature Of Start		
Temperature Of Off	20	Optimal Default, Failsafe Default
Temperature Of Off		
Start PWM	40	Optimal Default, Failsafe Default
Start PWM		
Slope (PWM)	0 (PWM)	
	1 (PWM)	Optimal Default, Failsafe Default
	2 (PWM)	
	4 (PWM)	
	8 (PWM)	
	16 (PWM)	
	32 (PWM)	
	64 (PWM)	
Slope (PWM)		

3.4.6 Advanced: PCH-FW Configuration

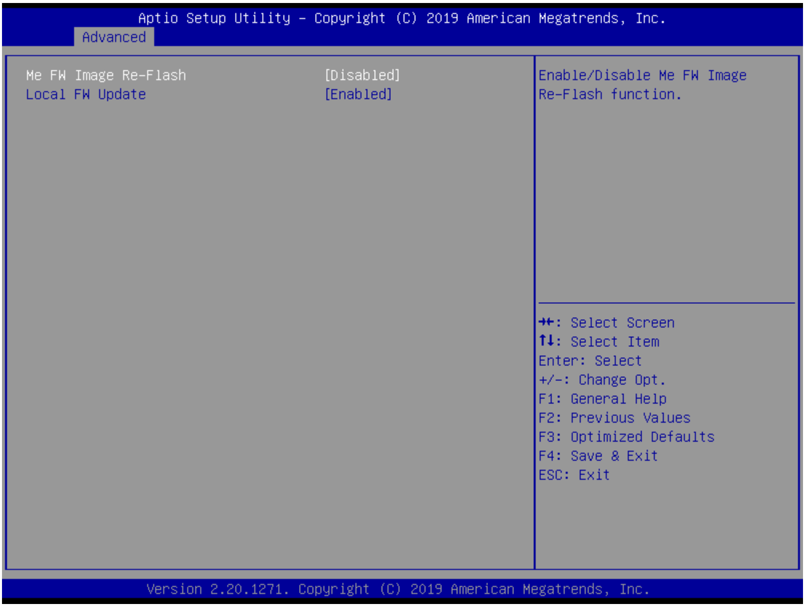


```
            Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
          Advanced

  ME Firmware Version                    12.0.20.1301    | Configure Management Engine
  ME Firmware Mode                       Normal Mode     | Technology Parameters
  ME Firmware SKU                        Consumer SKU    |
  ME Firmware Status 1                   0x90000255      |
  ME Firmware Status 2                   0x3B850106      |
                                                         |
▶ Firmware Update Configuration                          |
                                                         |
                                                         | ----------------------------
                                                         | →←: 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.
```

3.4.6.1 Firmware Update Configuration

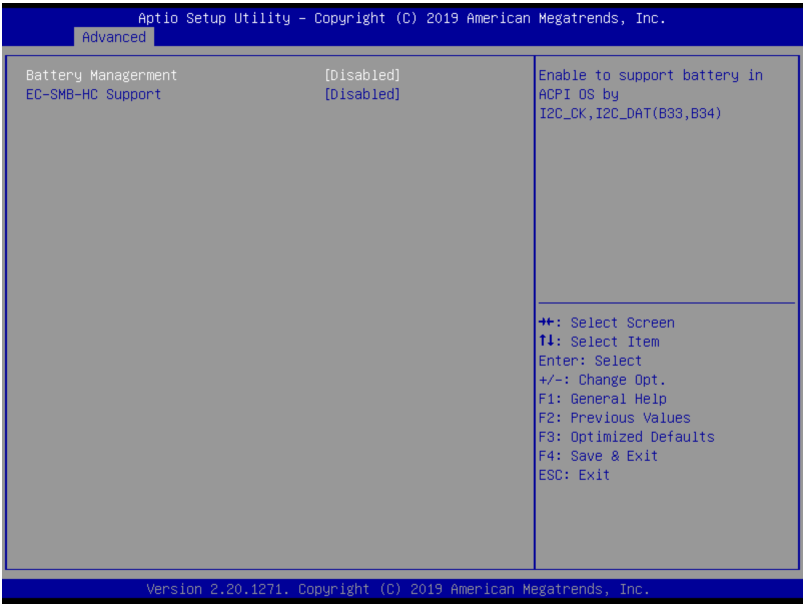


```
          Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
         Advanced
  Me FW Image Re-Flash                  [Disabled]     Enable/Disable Me FW Image
  Local FW Update                       [Enabled]      Re-Flash function.

                                                       →←: 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.
```

Options Summary		
Me FW Image Re-Flash	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enabled /Disabled Me FW Image Re-Flash function.		
Local FW Update	Disabled	
	Enabled	Optimal Default, Failsafe Default
Options for Local FW Update function.		

3.4.7 Advanced: On-Module Configuration



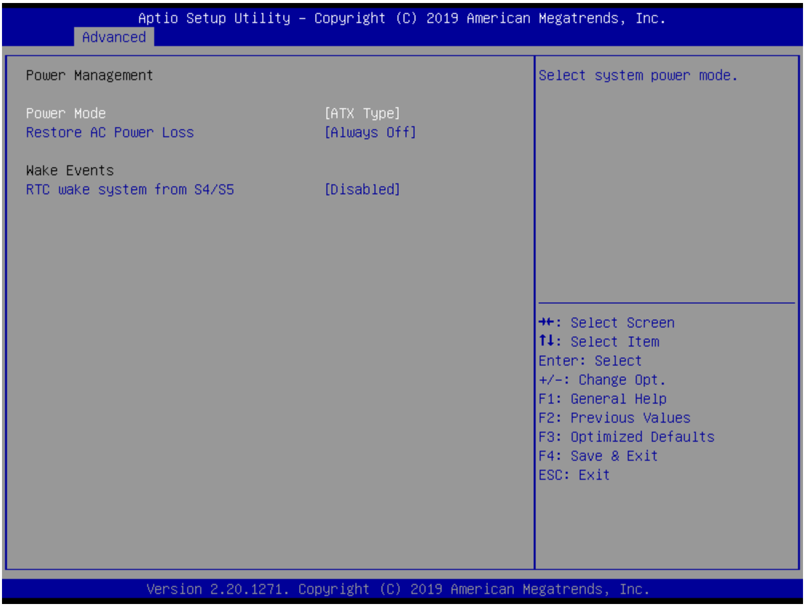
```
          Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
        Advanced
  Battery Managerment                  [Disabled]      Enable to support battery in
  EC-SMB-HC Support                    [Disabled]      ACPI OS by
                                                       I2C_CK,I2C_DAT(B33,B34)

                                                       →←: 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.
```

Options Summary		
Battery Management	Disabled	Optimal Default, Failsafe Default
	One Battery	
Enabled to support battery in ACPI OS by I2C_CK , I2C_DAT (B33,B34)		
EC-SMB-HC Support	Disabled	Optimal Default, Failsafe Default
	Enabled	
SMBus Host Controller Interface via Embedded Controller.		

3.4.8 Advanced: Power Management



```
          Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
        Advanced
 Power Management                                   Select system power mode.

 Power Mode                      [ATX Type]
 Restore AC Power Loss           [Always Off]

 Wake Events
 RTC wake system from S4/S5      [Disabled]

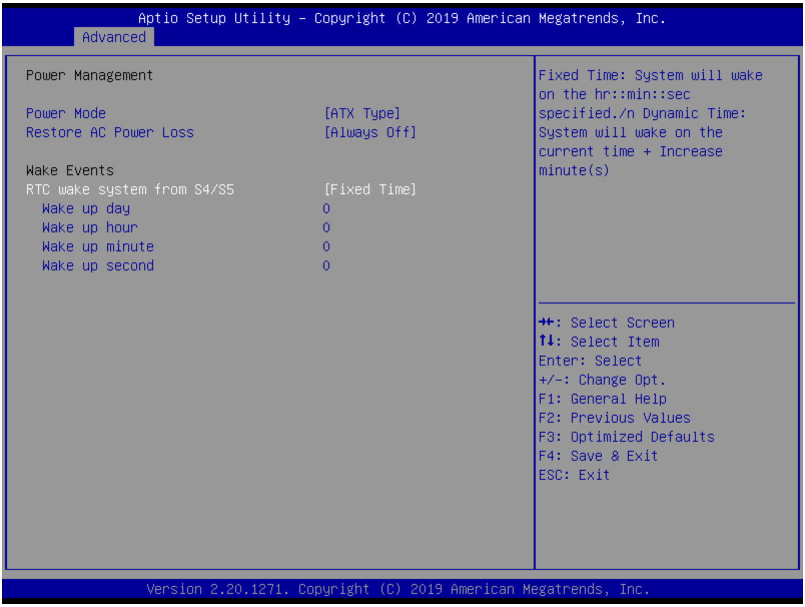


                                                    →←: Select Screen
                                                    ↑↓: Select Item
                                                    Enter: Select
                                                    +/-: Change Opt.
                                                    F1: General Help
          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

          Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.
```

Options Summary		
Power Mode	ATX Type	Optimal Default, Failsafe Default
	AT Type	
Select system power mode.		
Restore AC Power Loss	Last State	
	Always On	
	Always Off	Optimal Default, Failsafe Default
IO Restore AC Power Loss		
RTC wake system from S4/S5	Disabled	Optimal Default, Failsafe Default
	Fixed Time	
Fixed Time: System will wake on the hr::min::sec specified. Dynamic time: System will wake on the current time + Increase minute(s)		

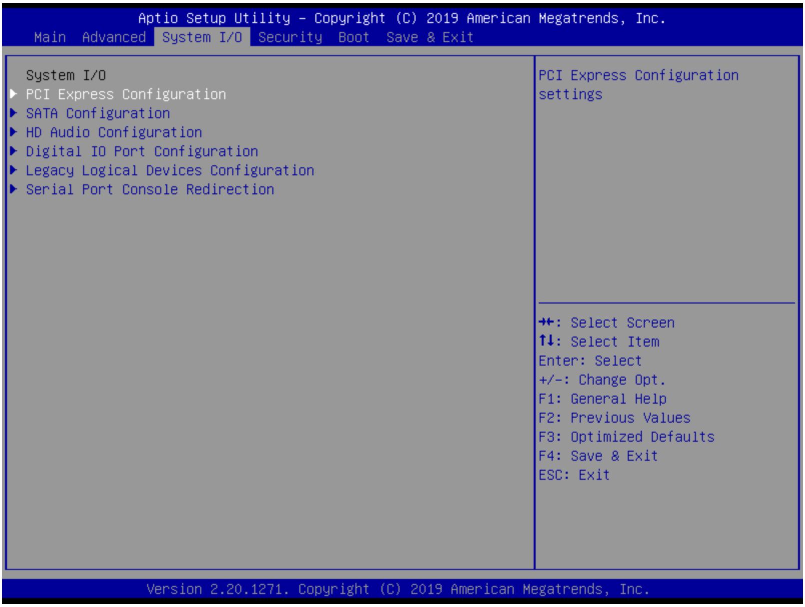
3.4.8.1 RTC Wake System from S4/S5: Fixed Time



```
                    Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
       Advanced
  Power Management                                      Fixed Time: System will wake
                                                        on the hr::min::sec
  Power Mode                          [ATX Type]        specified./n Dynamic Time:
  Restore AC Power Loss               [Always Off]      System will wake on the
                                                        current time + Increase
  Wake Events                                           minute(s)
  RTC wake system from S4/S5          [Fixed Time]
    Wake up day                       0
    Wake up hour                      0
    Wake up minute                    0
    Wake up second                    0
                                                        →←: 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.
```

Options Summary		
Wake up day	0	Optimal Default, Failsafe Default
Select 0 for daily system wake up ,1-31 for which day of the month that you would like the system to work up		
Wake up hour	0	Optimal Default, Failsafe Default
Select 0-23 For example enter 3 for 3am and 15 for 3pm		
Wake up minute	0	Optimal Default, Failsafe Default
Select minute: 0-59		
Wake up second	0	Optimal Default, Failsafe Default
Select second: 0-59		

3.5 Setup submenu: System I/O



```
            Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
    Main  Advanced  System I/O  Security  Boot  Save & Exit

  System I/O                                          PCI Express Configuration
▶ PCI Express Configuration                           settings
▶ SATA Configuration
▶ HD Audio Configuration
▶ Digital IO Port Configuration
▶ Legacy Logical Devices Configuration
▶ Serial Port Console Redirection

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

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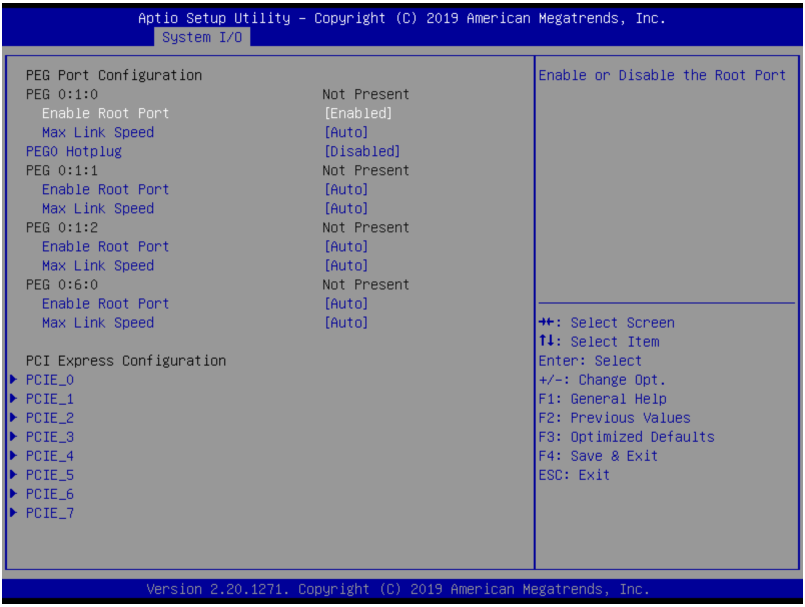
```

3.5.1 System I/O: PCI Express Configuration



```
                Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                          System I/O
  PEG Port Configuration                                      Enable or Disable the Root Port
  PEG 0:1:0                            Not Present
    Enable Root Port                   [Enabled]
    Max Link Speed                     [Auto]
  PEG0 Hotplug                         [Disabled]
  PEG 0:1:1                            Not Present
    Enable Root Port                   [Auto]
    Max Link Speed                     [Auto]
  PEG 0:1:2                            Not Present
    Enable Root Port                   [Auto]
    Max Link Speed                     [Auto]
  PEG 0:6:0                            Not Present
    Enable Root Port                   [Auto]
    Max Link Speed                     [Auto]                 →←: Select Screen
                                                              ↑↓: Select Item
  PCI Express Configuration                                   Enter: Select
▶ PCIE_0                                                      +/-: Change Opt.
▶ PCIE_1                                                      F1: General Help
▶ PCIE_2                                                      F2: Previous Values
▶ PCIE_3                                                      F3: Optimized Defaults
▶ PCIE_4                                                      F4: Save & Exit
▶ PCIE_5                                                      ESC: Exit
▶ PCIE_6
▶ PCIE_7

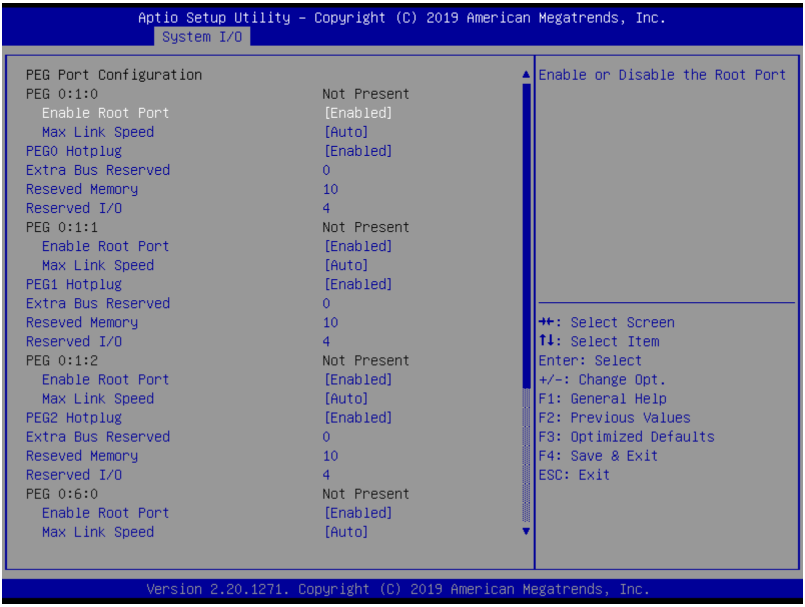
              Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.
```

Options Summary		
PEG 0:1:0 Enable Root Port	Disabled	
	Enabled	Optimal Default, Failsafe Default
	Auto	
Enabled or Disabled the Root Port		
PEG 0:1:0 Max Link Speed	Auto	Optimal Default, Failsafe Default
	Gen1	
	Gen2	
	Gen3	
Configure PEG 0:1:0 Max Speed		
PEG 0:1:0 - PEG0 Hotplug	Disabled	Optimal Default, Failsafe Default
	Enabled	
PCI Express Hot Plug Enabled/ Disabled		
PEG 0:1:1 Enable Root Port	Disabled	
	Enabled	
	Auto	Optimal Default, Failsafe Default
Enabled or Disabled the Root Port		

Options Summary		
PEG 0:1:1 Max Link Speed	Auto	Optimal Default, Failsafe Default
	Gen1	
	Gen2	
	Gen3	
Configure PEG 0:1:1 Max Speed		
PEG 0:1:2 Enable Root Port	Disabled	
	Enabled	
	Auto	Optimal Default, Failsafe Default
Enabled or Disabled the Root Port		
PEG 0:1:2 Max Link Speed	Auto	Optimal Default, Failsafe Default
	Gen1	
	Gen2	
	Gen3	
Configure PEG 0:1:2 Max Speed		
PEG 0:6:0 Enable Root Port	Disabled	
	Enabled	
	Auto	Optimal Default, Failsafe Default
Enabled or Disabled the Root Port		
PEG 0:6:0 Max Link Speed	Auto	Optimal Default, Failsafe Default
	Gen1	
	Gen2	
	Gen3	
Configure PEG 0:6:0 Max Speed		

3.5.1.1 PCI Express Configuration: PEG* Hotplug Enabled

This is the menu and options available if both “Enable Root Port” and “PEG* Hotplug” options are both set to “Enabled”



```
         Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                 System I/O

PEG Port Configuration                              ▲ Enable or Disable the Root Port
PEG 0:1:0                      Not Present
  Enable Root Port             [Enabled]
  Max Link Speed               [Auto]
PEG0 Hotplug                   [Enabled]
Extra Bus Reserved             0
Reseved Memory                 10
Reserved I/O                   4
PEG 0:1:1                      Not Present
  Enable Root Port             [Enabled]
  Max Link Speed               [Auto]
PEG1 Hotplug                   [Enabled]
Extra Bus Reserved             0                      →←: Select Screen
Reseved Memory                 10                     ↑↓: Select Item
Reserved I/O                   4                      Enter: Select
PEG 0:1:2                      Not Present            +/-: Change Opt.
  Enable Root Port             [Enabled]              F1: General Help
  Max Link Speed               [Auto]                 F2: Previous Values
PEG2 Hotplug                   [Enabled]              F3: Optimized Defaults
Extra Bus Reserved             0                      F4: Save & Exit
Reseved Memory                 10                     ESC: Exit
Reserved I/O                   4
PEG 0:6:0                      Not Present
  Enable Root Port             [Enabled]
  Max Link Speed               [Auto]               ▼

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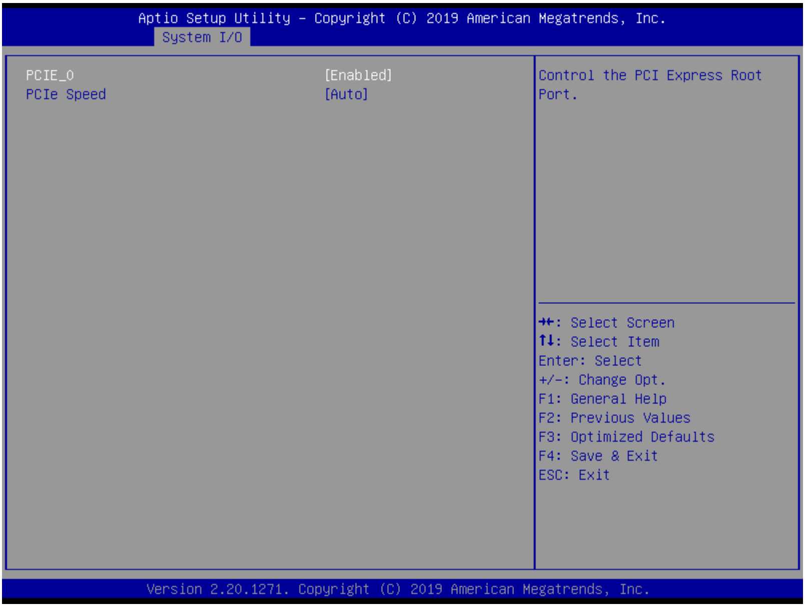
```

Options Summary		
Extra Bus Reserved	0	Optimal Default, Failsafe Default
Extra Bus Reserved (0-7) for bridges behind this Root Bridge.		
Reserved Memory	10	Optimal Default, Failsafe Default
Reserved Memory for this Root Bridge (1-4096) MB		
Reserved I/O	4	Optimal Default, Failsafe Default
Reserved I/O (4K/8K/12K/16K/20K) Range for this Root Bridge.		

3.5.1.2 PCI Express Configuration: PCIE_0 – PCIE_7 Submenus

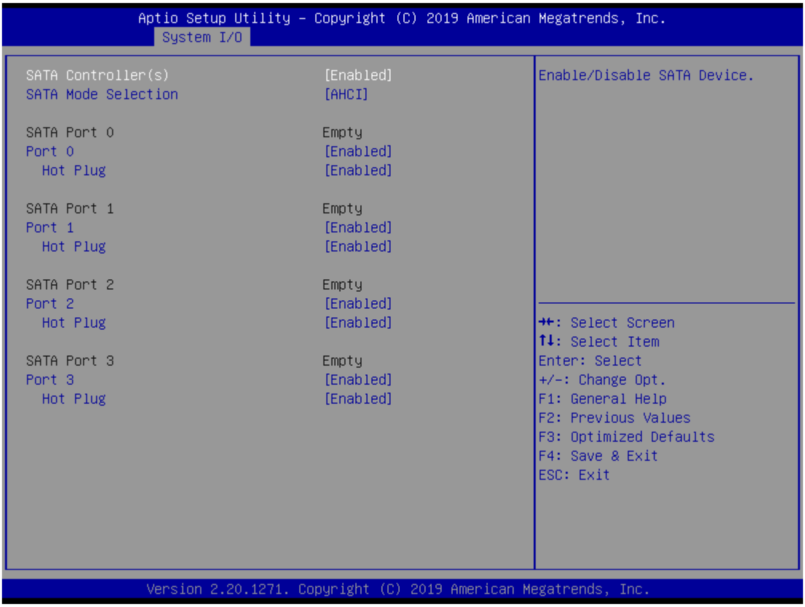


```
            Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                        System I/O
  PCIE_0                                      [Enabled]        Control the PCI Express Root
  PCIe Speed                                  [Auto]           Port.

                                                               →←: 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.
```

Options Summary		
PCIE_0~PCIE_7	Disabled	
	Enabled	Optimal Default, Failsafe Default
Control the PCI Express Root Port.		
PCIe Speed	Auto	Optimal Default, Failsafe Default
	Gen1	
	Gen2	
	Gen3	
Configure PCIe Speed		

3.5.2 System I/O: SATA Configuration

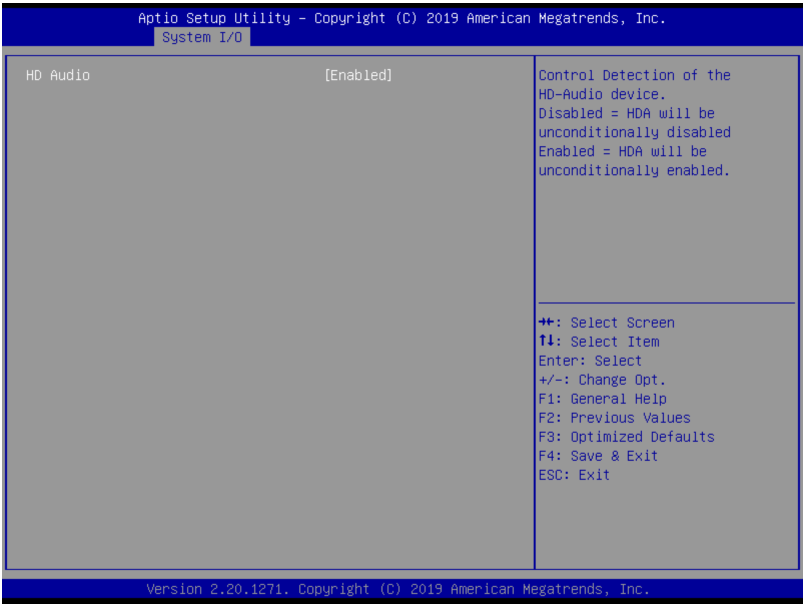


```
           Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
                 System I/O
 SATA Controller(s)                    [Enabled]   | Enable/Disable SATA Device.
 SATA Mode Selection                   [AHCI]      |
                                                   |
 SATA Port 0                           Empty       |
 Port 0                                [Enabled]   |
   Hot Plug                            [Enabled]   |
                                                   |
 SATA Port 1                           Empty       |
 Port 1                                [Enabled]   |
   Hot Plug                            [Enabled]   |
                                                   |
 SATA Port 2                           Empty       |-------------------------
 Port 2                                [Enabled]   | →←: Select Screen
   Hot Plug                            [Enabled]   | ↑↓: Select Item
                                                   | Enter: Select
 SATA Port 3                           Empty       | +/-: Change Opt.
 Port 3                                [Enabled]   | F1: General Help
   Hot Plug                            [Enabled]   | F2: Previous Values
                                                   | F3: Optimized Defaults
                                                   | F4: Save & Exit
                                                   | ESC: Exit
          Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.
```

Options Summary		
SATA Controller(s)	Enabled	Optimal Default, Failsafe Default
	Disabled	
Enable/Disable SATA Device.		
SATA Mode Selection	AHCI	Optimal Default, Failsafe Default
	Intel RST Premium with Intel Option System Acceleration	
Determines how SATA controller(s) operate.		
Port 0	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enable or Disable SATA Port.		
Hot Plug	Disabled	
	Enabled	Optimal Default, Failsafe Default
Designates this port as Hot Pluggable.		
Port 1	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enable or Disable SATA Port.		

Options Summary		
Hot Plug	Disabled	
	Enabled	Optimal Default, Failsafe Default
Designates this port as Hot Pluggable.		
Port 2	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enable or Disable SATA Port.		
Hot Plug	Disabled	
	Enabled	Optimal Default, Failsafe Default
Designates this port as Hot Pluggable.		
Port 3	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enable or Disable SATA Port.		
Hot Plug	Disabled	
	Enabled	Optimal Default, Failsafe Default
Designates this port as Hot Pluggable.		

3.5.3 System I/O: HD Audio Configuration



```
        Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                    System I/O

 HD Audio                              [Enabled]      Control Detection of the
                                                      HD-Audio device.
                                                      Disabled = HDA will be
                                                      unconditionally disabled
                                                      Enabled = HDA will be
                                                      unconditionally enabled.

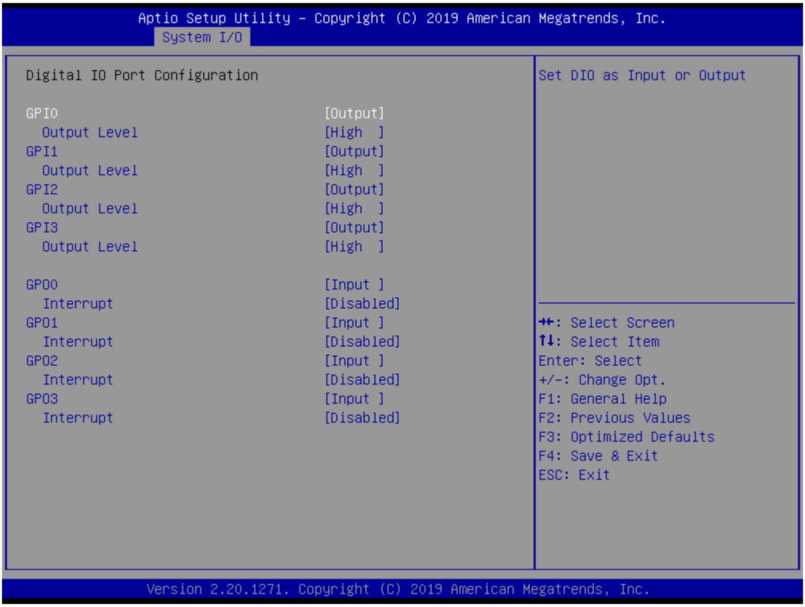
                                                      →←: Select Screen
                                                      ↑↓: Select Item
                                                      Enter: Select
                                                      +/-: Change Opt.
                                                      F1: General Help
  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

          Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.
```

Options Summary		
HD Audio	Disabled	
	Enabled	Optimal Default, Failsafe Default

Control Detection of the HD-Audio device.
Disabled = HAD will be unconditionally disable
Enabled = HAD will be unconditionally enable.

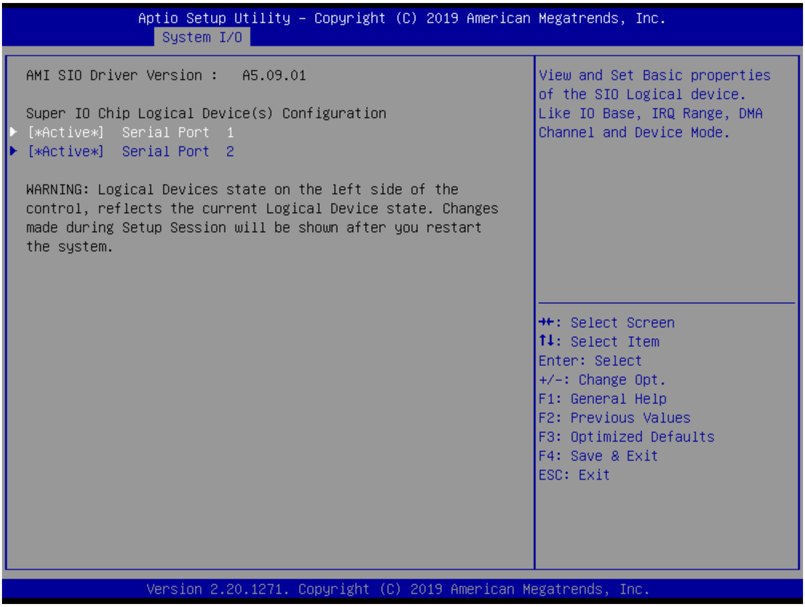
3.5.4 System I/O: Digital IO Port Configuration



```
        Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
                   System I/O
 Digital IO Port Configuration                         | Set DIO as Input or Output
                                                       |
 GPI0                                  [Output]        |
   Output Level                        [High  ]        |
 GPI1                                  [Output]        |
   Output Level                        [High  ]        |
 GPI2                                  [Output]        |
   Output Level                        [High  ]        |
 GPI3                                  [Output]        |
   Output Level                        [High  ]        |
                                                       |
 GPO0                                  [Input ]        |
   Interrupt                           [Disabled]      |-----------------------
 GPO1                                  [Input ]        | →←: Select Screen
   Interrupt                           [Disabled]      | ↑↓: Select Item
 GPO2                                  [Input ]        | Enter: Select
   Interrupt                           [Disabled]      | +/-: Change Opt.
 GPO3                                  [Input ]        | F1: General Help
   Interrupt                           [Disabled]      | F2: Previous Values
                                                       | F3: Optimized Defaults
                                                       | F4: Save & Exit
                                                       | ESC: Exit
        Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.
```

Options Summary		
GPI *	Input	
	Output	Optimal Default, Failsafe Default
Set DIO as Input or Output		
Output Level	High	Optimal Default, Failsafe Default
	Low	
Set output level when DIO pin is output		
GPO *	Input	Optimal Default, Failsafe Default
	Output	
Set DIO as Input or Output		
Interrupt	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enabled interrupt function with low pulse mode. This triggered pulse needs more than 10ms.		

3.5.5 System I/O: Legacy Logical Devices Configuration



```
Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
System I/O

AMI SIO Driver Version :   A5.09.01              View and Set Basic properties
                                                 of the SIO Logical device.
Super IO Chip Logical Device(s) Configuration    Like IO Base, IRQ Range, DMA
▶ [*Active*]  Serial Port  1                     Channel and Device Mode.
▶ [*Active*]  Serial Port  2

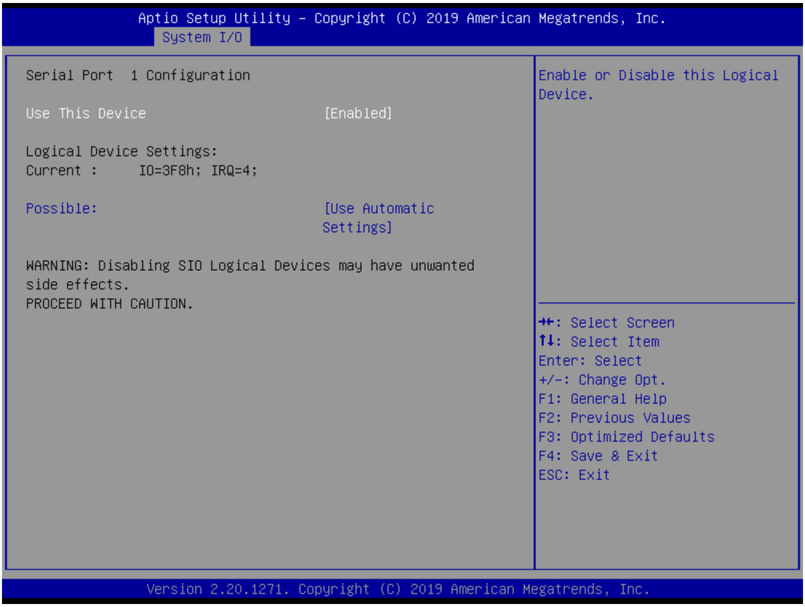
WARNING: Logical Devices state on the left side of the
control, reflects the current Logical Device state. Changes
made during Setup Session will be shown after you restart
the system.
                                                 →←: Select Screen
                                                 ↑↓: 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.
```

COM Express Module

COM-CFHB6

3.5.5.1 [*Active*] Serial Port 1



```
Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
System I/O

Serial Port  1 Configuration                           Enable or Disable this Logical
                                                       Device.
Use This Device                     [Enabled]

Logical Device Settings:
Current :     IO=3F8h; IRQ=4;

Possible:                           [Use Automatic
                                    Settings]

WARNING: Disabling SIO Logical Devices may have unwanted
side effects.
PROCEED WITH CAUTION.
                                                       →←: 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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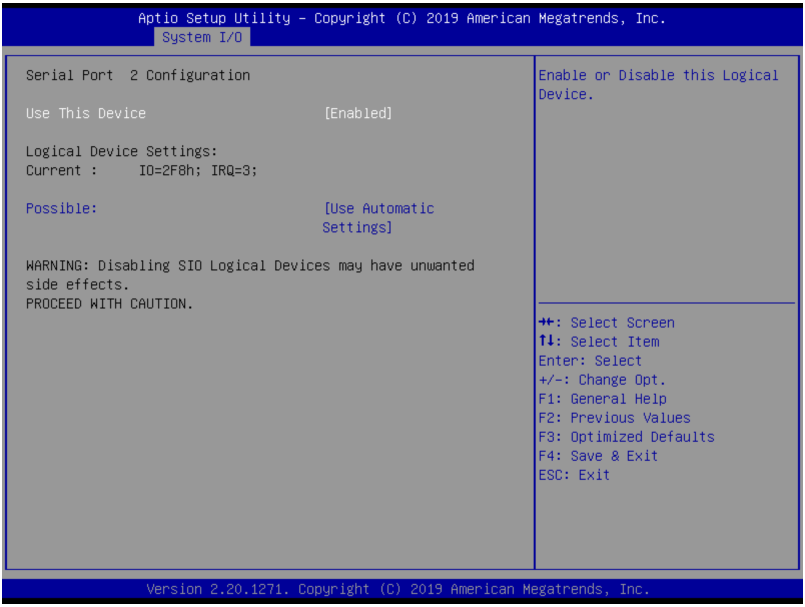
```

Options Summary		
Use This Device	Disable	
	Enable	Optimal Default, Failsafe Default
Enable or Disable this Logical Device.		
Possible	Use Automatic Setting	Optimal Default, Failsafe Default
	IO=3F8h; IRQ=4 ; DMA;	
	IO=2C8h; IRQ=11 ; DMA;	
Allows the user to change the device resource settings. New settings will be reflected on this setup page after system restarts.		

3.5.5.2 [*Active*] Serial Port 2



```
          Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
                    System I/O

  Serial Port  2 Configuration                          Enable or Disable this Logical
                                                        Device.
  Use This Device                     [Enabled]

  Logical Device Settings:
  Current :     IO=2F8h; IRQ=3;

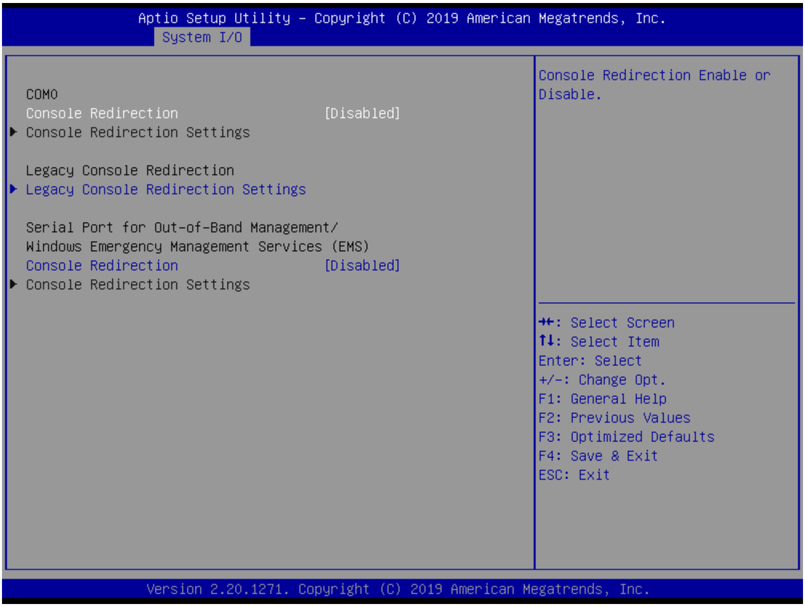
  Possible:                           [Use Automatic
                                      Settings]

  WARNING: Disabling SIO Logical Devices may have unwanted
  side effects.
  PROCEED WITH CAUTION.
                                                        →←: 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.
```

Options Summary		
Use This Device	Disable	
	Enable	Optimal Default, Failsafe Default
Enable or Disable this Logical Device.		
Possible	Use Automatic Setting	Optimal Default, Failsafe Default
	IO=2F8h; IRQ=3 ; DMA;	
	IO=2D8h; IRQ=10 ; DMA;	
Allows the user to change the device resource settings. New settings will be reflected on this setup page after system restarts.		

3.5.6 System I/O: Serial Port Console Redirection

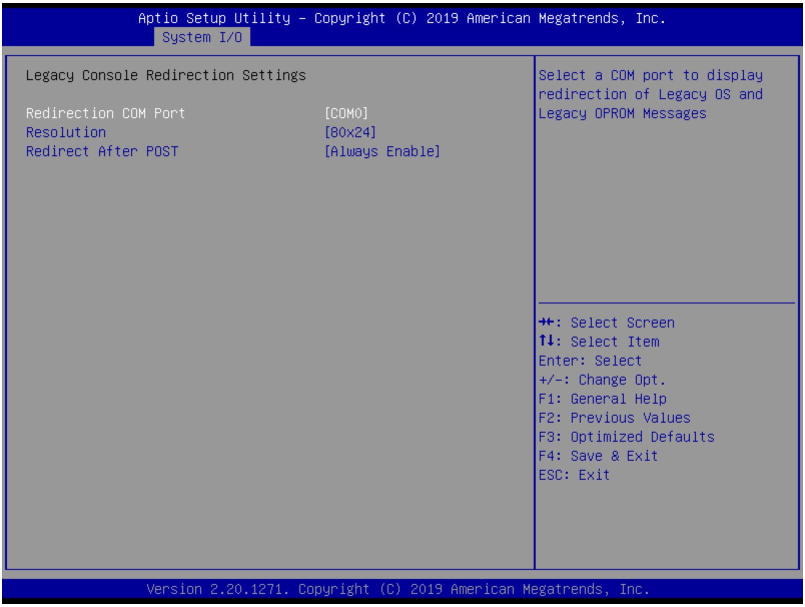


```
         Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                 System I/O
  COM0                                          | Console Redirection Enable or
  Console Redirection           [Disabled]      | Disable.
▶ Console Redirection Settings                  |
                                                |
  Legacy Console Redirection                    |
▶ Legacy Console Redirection Settings           |
                                                |
  Serial Port for Out-of-Band Management/       |
  Windows Emergency Management Services (EMS)   |
  Console Redirection           [Disabled]      |
▶ Console Redirection Settings                  |
                                                |------------------------------
                                                | →←: 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.
```

Options Summary		
COM0 : Console Redirection	Disable	Optimal Default, Failsafe Default
	Enable	
Console Redirection Enable or Disable		
Out-of-Band Management: Console Redirection	Disable	Optimal Default, Failsafe Default
	Enable	
Console Redirection Enable or Disable		

3.5.6.1 Legacy Console Redirection Settings



```
Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
System I/O

Legacy Console Redirection Settings                    Select a COM port to display
                                                       redirection of Legacy OS and
Redirection COM Port                 [COM0]            Legacy OPROM Messages
Resolution                           [80x24]
Redirect After POST                  [Always Enable]

                                                       →←: 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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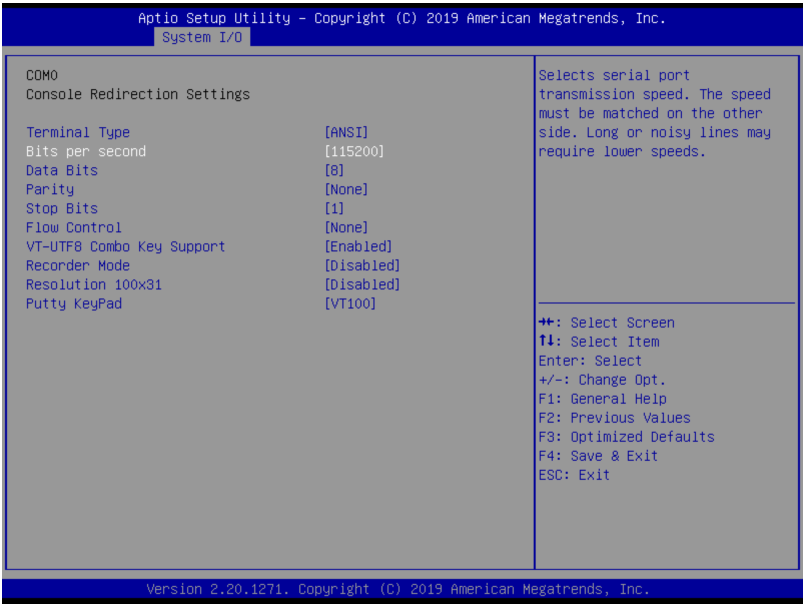
```

Options Summary		
Redirection COM Port	COM0	Optimal Default, Failsafe Default
Select a COM port to display redirection of Legacy OS and Legacy OPROM Messages		
Resolution	80x24	Optimal Default, Failsafe Default
	80x25	
On Legacy OS, the Number of Rows and Columns supported redirection		
Redirect After POST	Always Enable	Optimal Default, Failsafe Default
	BootLoader	
When Boot Loader is selected, then Legacy Console Redirection is disable before booting to legacy OS , When Always Enable is selected, then Legacy Console Redirection is enables for legacy OS. Default setting for this option is set to Always Enable.		

3.5.6.2 COM0 Console Redirection Settings



```
Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
System I/O

COM0
Console Redirection Settings

Terminal Type                          [ANSI]
Bits per second                        [115200]
Data Bits                              [8]
Parity                                 [None]
Stop Bits                              [1]
Flow Control                           [None]
VT-UTF8 Combo Key Support              [Enabled]
Recorder Mode                          [Disabled]
Resolution 100x31                      [Disabled]
Putty KeyPad                           [VT100]

Selects serial port
transmission speed. The speed
must be matched on the other
side. Long or noisy lines may
require lower speeds.

→←: 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.
```

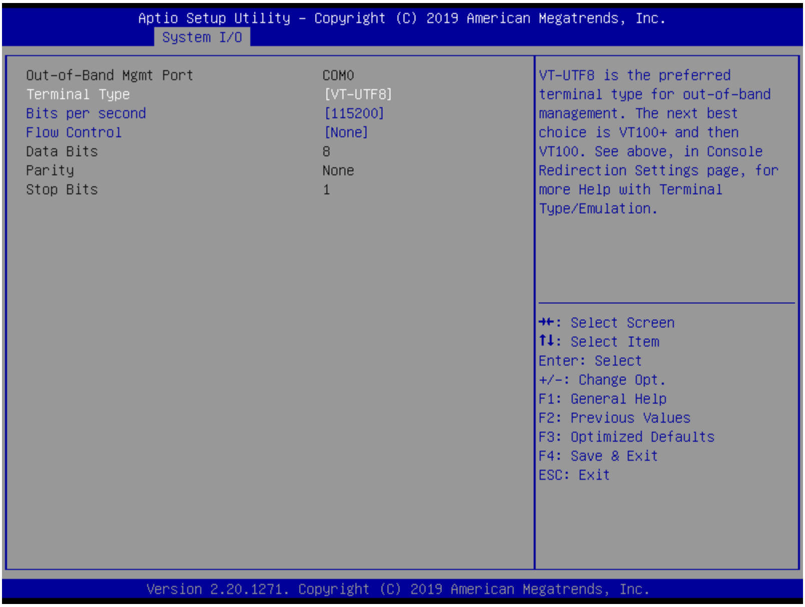
Options Summary		
Terminal Type	VT100	
	VT100+	
	VT-UTF8	
	ANSI	Optimal Default, Failsafe Default
Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100+: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.		
Bits per second	9600	
	19200	
	38400	
	57600	
	115200	Optimal Default, Failsafe Default
Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.		

Options Summary		
Data Bits	7	
	8	Optimal Default, Failsafe Default
Data Bits		
Parity	None	Optimal Default, Failsafe Default
	Even	
	Odd	
	Mark	
	Space	
A parity bit can be sent with the date bits to detect some transmission errors. Even: parity bit is 0 if the num of 1's in the data bits is Even. Odd: parity bit is 0 if num of 1's in the data bits is Odd. Mark: parity bit is always 1. Space: Parity bit is always 0. Mark and Space Parity do not allow for error detection.		
Stop Bits	1	Optimal Default, Failsafe Default
	2	
Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning). The standard setting is 1 stop bit .Communication with slow devices may require more than 1 stop bit.		
Flow Control	None	Optimal Default, Failsafe Default
	Hardware RTS/CTS	
Flow Control can prevent data loss form buffer overflow. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.		
VT-UTF8 Combo Key Support	Disable	
	Enable	Optimal Default, Failsafe Default
Enable VT-UTF8 Combo Key Support for ANSI/VT100 terminals.		
Recorder Mode	Disable	Optimal Default, Failsafe Default
	Enable	
With the mode enabled only text will be sent. This is to capture Terminal data.		
Resolution 100x31	Disable	Optimal Default, Failsafe Default
	Enable	
Enable or Disable extended terminal resolution.		

Table Continues on Next Page

Options Summary		
Putty KeyPad	VT100	Optimal Default, Failsafe Default
	LINUX	
	XTERMR6	
	SC0	
	ESCN	
	VT400	
Select FunctionKey and KeyPad on Putty.		

3.5.6.3 Out of Band Management



```
Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
System I/O

Out-of-Band Mgmt Port                COM0         VT-UTF8 is the preferred
Terminal Type                        [VT-UTF8]    terminal type for out-of-band
Bits per second                      [115200]     management. The next best
Flow Control                         [None]       choice is VT100+ and then
Data Bits                            8            VT100. See above, in Console
Parity                               None         Redirection Settings page, for
Stop Bits                            1            more Help with Terminal
                                                  Type/Emulation.

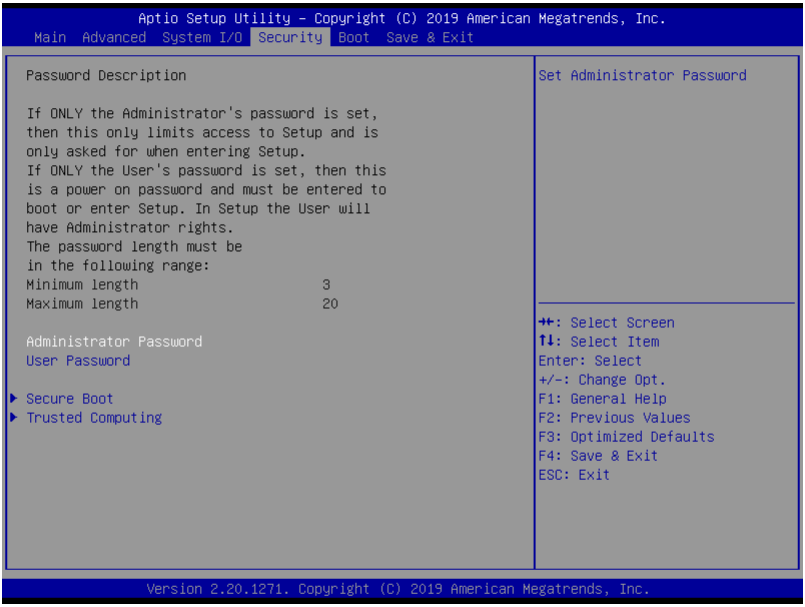
                                                  →←: Select Screen
                                                  ↑↓: Select Item
                                                  Enter: Select
                                                  +/-: Change Opt.
                                                  F1: General Help
                  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

Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.
```

Options Summary		
Terminal Type	VT100	
	VT100+	
	VT-UTF8	Optimal Default, Failsafe Default
	ANSI	
VT-UTF8 is the preferred terminal type for Out-of-Band Management. The next best choice is VT100+ and then VT100. See above, in Console Redirection Settings page, for more Help with Terminal Type/Emulation.		
Bits per second	9600	
	19200	
	38400	
	57600	
	115200	Optimal Default, Failsafe Default
Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.		

Options Summary		
Flow Control	None	Optimal Default, Failsafe Default
	Hardware RTS/CTS	
	Software Xon/Xoff	
Flow Control can prevent data loss form buffer overflow. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.		

3.6 Setup submenu: Security



```
Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
  Main  Advanced  System I/O  Security  Boot  Save & Exit

  Password Description                                 Set Administrator Password

  If ONLY the Administrator's password is set,
  then this only limits access to Setup and is
  only asked for when entering Setup.
  If ONLY the User's password is set, then this
  is a power on password and must be entered to
  boot or enter Setup. In Setup the User will
  have Administrator rights.
  The password length must be
  in the following range:
  Minimum length                      3
  Maximum length                      20               →←: Select Screen
                                                       ↑↓: Select Item
  Administrator Password                               Enter: Select
  User Password                                        +/-: Change Opt.
                                                       F1: General Help
▶ Secure Boot                                          F2: Previous Values
▶ Trusted Computing                                    F3: Optimized Defaults
                                                       F4: Save & Exit
                                                       ESC: Exit

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```

Change Administrator/User Password

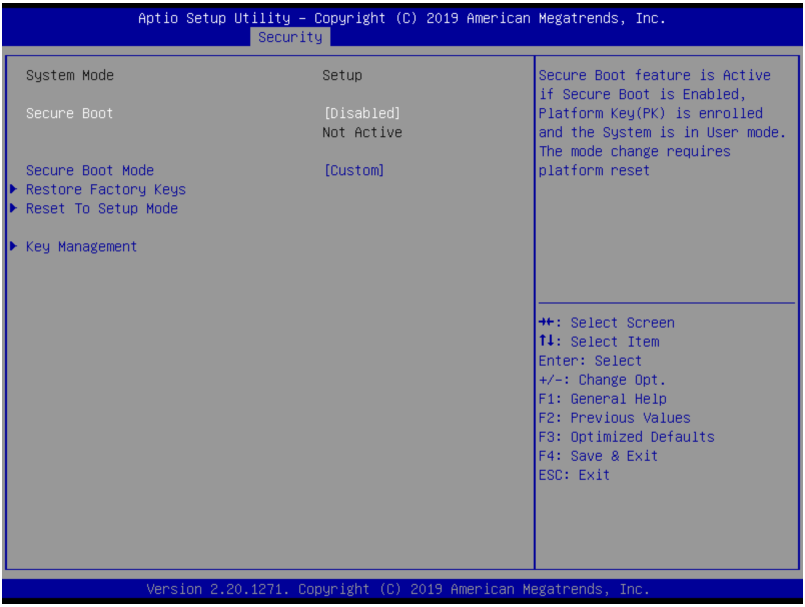
You can set an Administrator password. If you set an Administrator password, you can then set a User password. User passwords do not have access to many of the features in the Setup utility.

Select the password you want to set and press <Enter>. A dialog box will appear which lets you set the password. Passwords must be between 3 and 20 letters or numbers. Press <Enter> and re-enter the password into the next dialog box that appears. Press <Enter> after you have retyped it correctly. The password is required at boot time, or when the user enters the Setup utility.

Remove Password

Highlight this item and type in the current password. At the next dialog box press <Enter> to disable password protection.

3.6.1 Security: Secure Boot



```
              Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                                      Security

  System Mode                          Setup              Secure Boot feature is Active
                                                          if Secure Boot is Enabled,
  Secure Boot                          [Disabled]         Platform Key(PK) is enrolled
                                       Not Active         and the System is in User mode.
                                                          The mode change requires
  Secure Boot Mode                     [Custom]           platform reset
▶ Restore Factory Keys
▶ Reset To Setup Mode

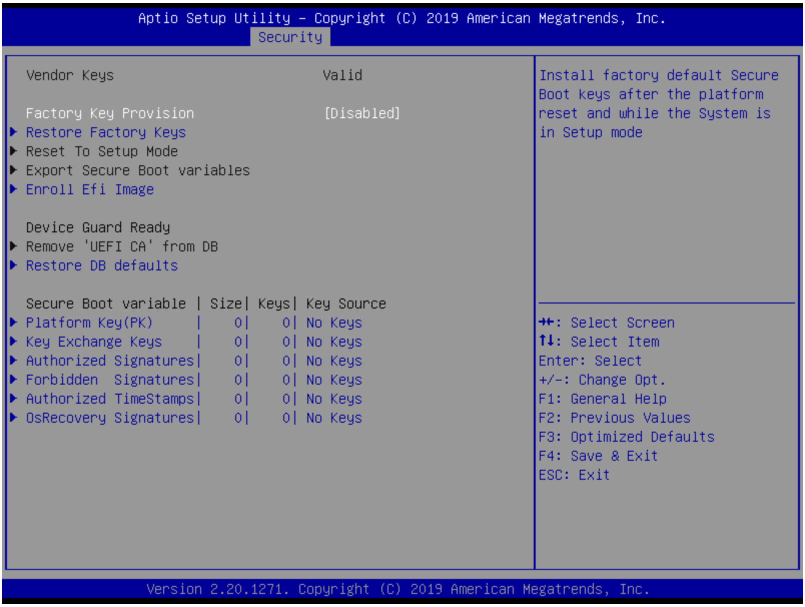
▶ Key Management

                                                          →←: 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.
```

Options Summary		
Secure Boot	Disabled	Optimal Default, Failsafe Default
	Enabled	
Secure Boot feature is Active if Secure Boot is Enabled, Platform Key(PK) is enrolled and the system is in User mode. The mode change requires platform reset		
Secure Boot Mode	Standard	
	Custom	Optimal Default, Failsafe Default
Secure Boot Mode options: Standard or Custom. In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication		
Restore Factory Keys		
Force System to User Mode. Install factory default Secure Boot key database		
Reset To Setup Mode		
Delete all Secure Boot key database form NVRAM		

3.6.1.1 Secure Boot: Key Management



```
      Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                              Security
  Vendor Keys                          Valid            | Install factory default Secure
                                                        | Boot keys after the platform
  Factory Key Provision                [Disabled]       | reset and while the System is
▶ Restore Factory Keys                                  | in Setup mode
▶ Reset To Setup Mode                                   |
▶ Export Secure Boot variables                          |
▶ Enroll Efi Image                                      |
                                                        |
  Device Guard Ready                                    |
▶ Remove 'UEFI CA' from DB                              |
▶ Restore DB defaults                                   |
                                                        |
  Secure Boot variable | Size| Keys| Key Source         |
▶ Platform Key(PK)     |    0|    0| No Keys            | →←: Select Screen
▶ Key Exchange Keys    |    0|    0| No Keys            | ↑↓: Select Item
▶ Authorized Signatures|    0|    0| No Keys            | Enter: Select
▶ Forbidden  Signatures|    0|    0| No Keys            | +/-: Change Opt.
▶ Authorized TimeStamps|    0|    0| No Keys            | F1: General Help
▶ OsRecovery Signatures|    0|    0| No Keys            | F2: Previous Values
                                                        | F3: Optimized Defaults
                                                        | F4: Save & Exit
                                                        | ESC: Exit
       Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.
```

Options Summary		
Factory Key Provision	Disabled	Optimal Default, Failsafe Default
	Enabled	
Install factory default Secure Boot key after the platform reset and while the System is in setup mode		
Restore Factory Keys		
Force System to User Mode. Install factory default Secure Boot key database		
Reset To Setup Mode		
Delete all Secure Boot key database form NVRAM		
Export Secure Boot variables		
Copy NVRAM content of Secure Boot variables to files in a root folder on a file system device		
Enroll Efi Image		
Allow the image to run in Secure Boot mode. Enroll SHA256 Hash certificate of a PE image into Authorized Signature Database (db)		

Options Summary		
Remove 'UEFI CA' from DB		
Device Guard ready system must not list 'Microsoft UEFI CA' Certificate in Authorized Signature Database (db)		
Restore DB defaults		
Restore DB variable to factory defaults		
Platform Key(PK)	Details	
	Export	
	Update	
	Delete	
Enroll Factory Defaults or load certificates from a file: 1.Public Key Certificate : a)EFI_SIGNATURE_LIST b)EFI_CERT_X509 (DER) c)EFI_CERT_RSA2048 (bin) d)EFI_CERT_SHAXXX 2.Authenticated UEFI Variable 3.EFI PE/COFF Image(SHA256) Key Source: Factory, External, Mixed		
Key Exchange Keys	Details	
	Export	
	Update	
	Append	
	Delete	
Enroll Factory Defaults or load certificates from a file: 1.Public Key Certificate : a)EFI_SIGNATURE_LIST b)EFI_CERT_X509 (DER) c)EFI_CERT_RSA2048 (bin) d)EFI_CERT_SHAXXX 2.Authenticated UEFI Variable 3.EFI PE/COFF Image(SHA256) Key Source: Factory, External, Mixed		

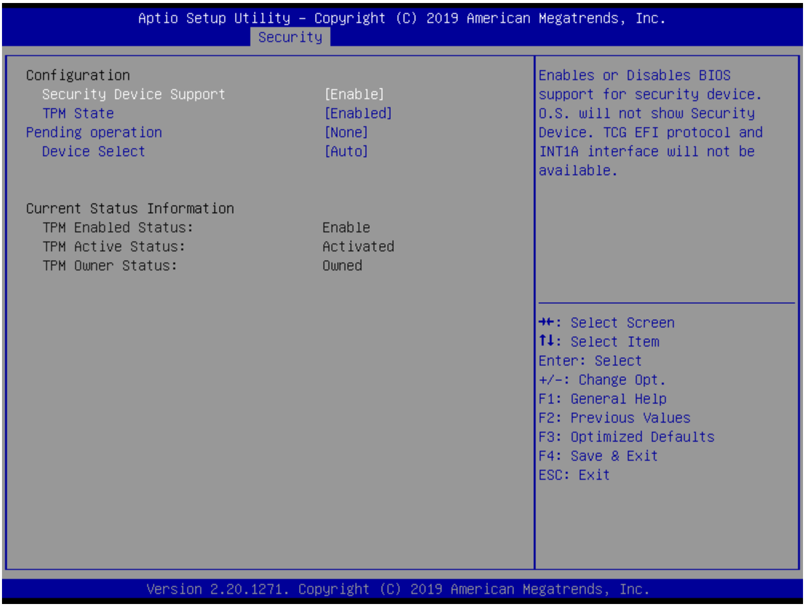
Table Continues on Next Page

Options Summary		
Authorized Signatures	Details	
	Export	
	Update	
	Append	
	Delete	
Enroll Factory Defaults or load certificates from a file: 1.Public Key Certificate : a)EFI_SIGNATURE_LIST b)EFI_CERT_X509 (DER) c)EFI_CERT_RSA2048 (bin) d)EFI_CERT_SHAXXX 2.Authenticated UEFI Variable 3.EFI PE/COFF Image(SHA256) Key Source: Factory, External, Mixed		
Forbidden Signatures	Details	
	Export	
	Update	
	Append	
	Delete	
Enroll Factory Defaults or load certificates from a file: 1.Public Key Certificate : a)EFI_SIGNATURE_LIST b)EFI_CERT_X509 (DER) c)EFI_CERT_RSA2048 (bin) d)EFI_CERT_SHAXXX 2.Authenticated UEFI Variable 3.EFI PE/COFF Image(SHA256) Key Source: Factory, External, Mixed		

Table Continues on Next Page

<table>
<tr><th colspan="3">Options Summary</th></tr>
<tr><td rowspan="2">Authorized TimeStamps</td><td>Update</td><td></td></tr>
<tr><td>Append</td><td></td></tr>
<tr><td colspan="3">Enroll Factory Defaults or load certificates from a file:
1.Public Key Certificate :
a)EFI_SIGNATURE_LIST
b)EFI_CERT_X509 (DER)
c)EFI_CERT_RSA2048 (bin)
d)EFI_CERT_SHAXXX
2.Authenticated UEFI Variable
3.EFI PE/COFF Image(SHA256)
Key Source:
Factory, External, Mixed</td></tr>
<tr><td rowspan="2">OsRecovery Signatures</td><td>Update</td><td></td></tr>
<tr><td>Append</td><td></td></tr>
<tr><td colspan="3">Enroll Factory Defaults or load certificates from a file:
1.Public Key Certificate :
a)EFI_SIGNATURE_LIST
b)EFI_CERT_X509 (DER)
c)EFI_CERT_RSA2048 (bin)
d)EFI_CERT_SHAXXX
2.Authenticated UEFI Variable
3.EFI PE/COFF Image(SHA256)
Key Source:
Factory, External, Mixed</td></tr>
</table>

3.6.2 Security: Trusted Computing



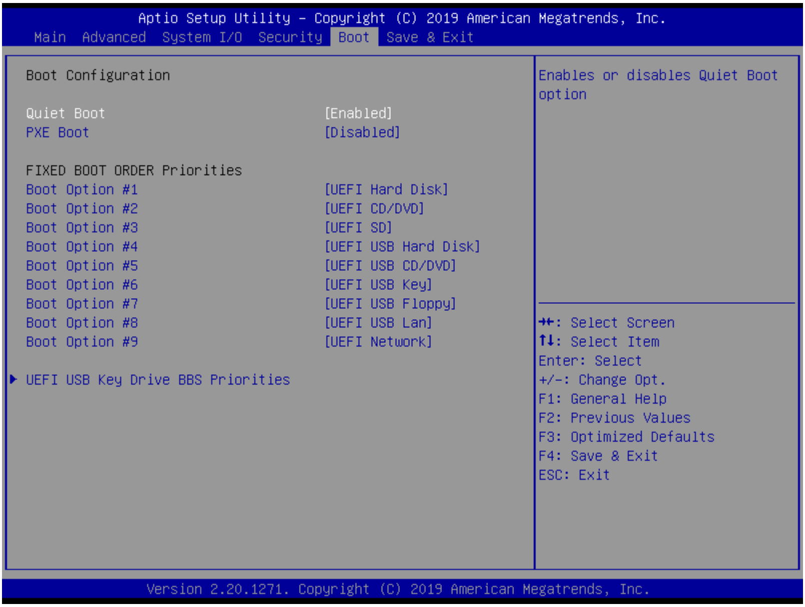
```
        Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
                              Security
 Configuration                                     │Enables or Disables BIOS
   Security Device Support        [Enable]         │support for security device.
   TPM State                      [Enabled]        │O.S. will not show Security
 Pending operation                [None]           │Device. TCG EFI protocol and
   Device Select                  [Auto]           │INT1A interface will not be
                                                   │available.
                                                   │
 Current Status Information                        │
   TPM Enabled Status:            Enable           │
   TPM Active Status:             Activated        │
   TPM Owner Status:              Owned            │
                                                   │──────────────────────────
                                                   │→←: 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.
```

Options Summary		
Security Device Support	Disable	
	Enable	Optimal Default, Failsafe Default
Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.		
TPM State	Disable	
	Enable	Optimal Default, Failsafe Default
Enables/Disables Security Device. NOTE: Your Computer will reboot during restart in order to change State of the Device.		
Pending operation	None	Optimal Default, Failsafe Default
	TPM Clear	
Schedule an Operation for the Security Device. NOTE: Your Computer will reboot during restart in order to change state of Security Device.		

Table Continues on Next Page

Options Summary		
Device Select	TPM 1.2	
	TPM 2.0	
	Auto	Optimal Default, Failsafe Default
TPM 1.2 will restrict support to TPM 1.2 devices, TPM 2.0 will restrict support to TPM 2.0 devices, Auto will support both with the default set to TPM 2.0 devices if not found, TPM 1.2 device will be enumerated.		

3.7 Setup submenu: Boot



```
Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
  Main  Advanced  System I/O  Security  Boot  Save & Exit

Boot Configuration                                   Enables or disables Quiet Boot
                                                     option
Quiet Boot                    [Enabled]
PXE Boot                      [Disabled]

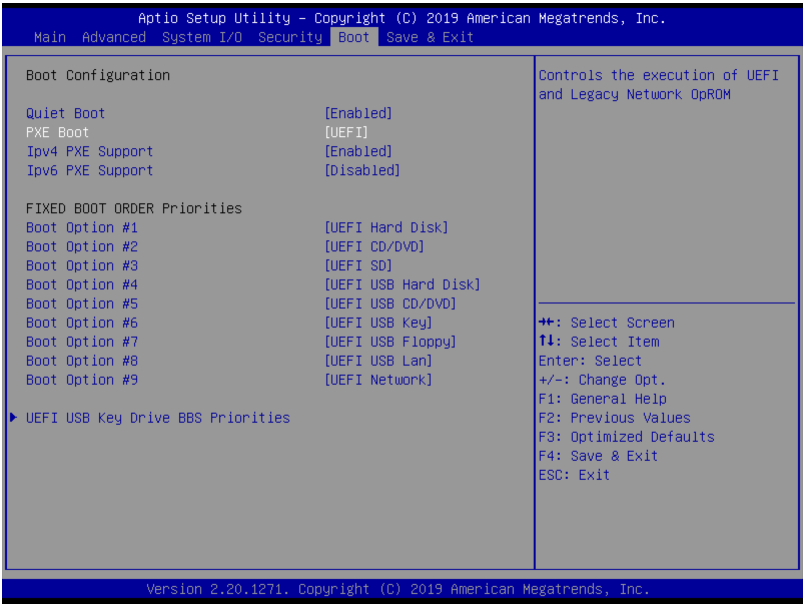
FIXED BOOT ORDER Priorities
Boot Option #1                [UEFI Hard Disk]
Boot Option #2                [UEFI CD/DVD]
Boot Option #3                [UEFI SD]
Boot Option #4                [UEFI USB Hard Disk]
Boot Option #5                [UEFI USB CD/DVD]
Boot Option #6                [UEFI USB Key]
Boot Option #7                [UEFI USB Floppy]      →←: Select Screen
Boot Option #8                [UEFI USB Lan]         ↑↓: Select Item
Boot Option #9                [UEFI Network]         Enter: Select
                                                     +/-: Change Opt.
▶ UEFI USB Key Drive BBS Priorities                  F1: General Help
                                                     F2: Previous Values
                                                     F3: Optimized Defaults
                                                     F4: Save & Exit
                                                     ESC: Exit

Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.
```

Options Summary		
Quiet Boot	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enables or Disables Quiet Boot option.		
PXE Boot	Disabled	Optimal Default, Failsafe Default
	UEFI	
Controls the execution of UEFI and Legacy PXE OpROM.		

3.7.1 Boot: PXE Boot [UEFI] Settings

This is how the Boot submenu appears when PXE Boot is set to "[UEFI]".



```
        Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
  Main  Advanced  System I/O  Security  Boot  Save & Exit

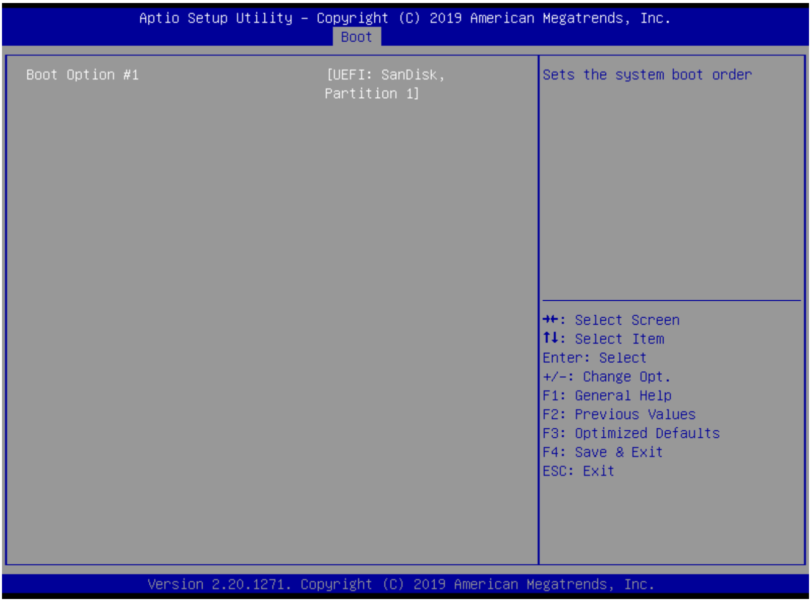
 Boot Configuration                                    Controls the execution of UEFI
                                                       and Legacy Network OpROM
 Quiet Boot                    [Enabled]
 PXE Boot                      [UEFI]
 Ipv4 PXE Support              [Enabled]
 Ipv6 PXE Support              [Disabled]

 FIXED BOOT ORDER Priorities
 Boot Option #1                [UEFI Hard Disk]
 Boot Option #2                [UEFI CD/DVD]
 Boot Option #3                [UEFI SD]
 Boot Option #4                [UEFI USB Hard Disk]
 Boot Option #5                [UEFI USB CD/DVD]
 Boot Option #6                [UEFI USB Key]          →←: Select Screen
 Boot Option #7                [UEFI USB Floppy]       ↑↓: Select Item
 Boot Option #8                [UEFI USB Lan]          Enter: Select
 Boot Option #9                [UEFI Network]          +/-: Change Opt.
                                                       F1: General Help
▶ UEFI USB Key Drive BBS Priorities                    F2: Previous Values
                                                       F3: Optimized Defaults
                                                       F4: Save & Exit
                                                       ESC: Exit

        Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.
```

Options Summary		
Ipv4 PXE Support	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enables / Disables Ipv4 PXE support. If disabled, Ipv4 PXE boot support will not be available.		
Ipv6 PXE Support	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enables / Disables Ipv6 PXE support. If disabled, Ipv6 PXE boot support will not be available.		

3.7.2 Boot: UEFI USB Key Drive BBS Priorities



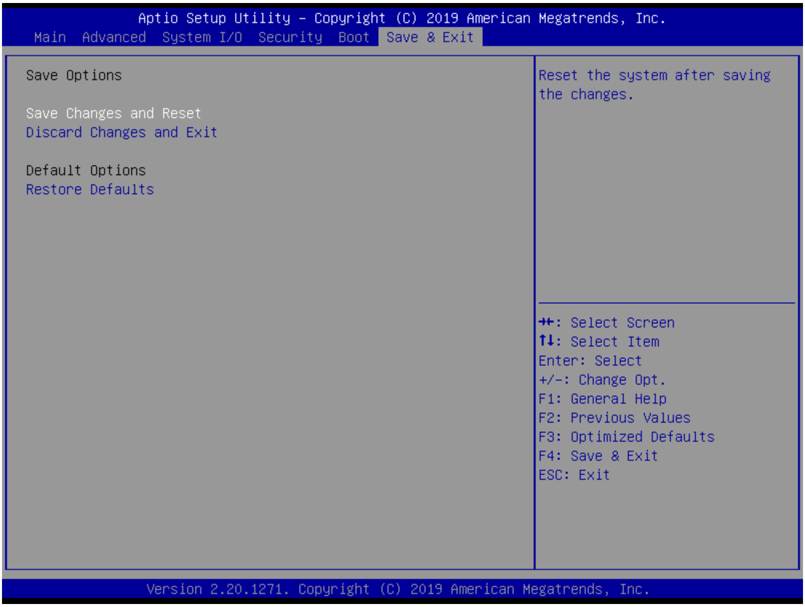
```
Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
                              Boot

Boot Option #1                      [UEFI: SanDisk,          Sets the system boot order
                                    Partition 1]

                                                             →←: 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.
```

3.8 Setup submenu: Save & Exit



```
Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
  Main  Advanced  System I/O  Security  Boot  Save & Exit

  Save Options                                   Reset the system after saving
                                                 the changes.
  Save Changes and Reset
  Discard Changes and Exit

  Default Options
  Restore Defaults

                                                 →←: 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.
```

Chapter 4

Drivers Installation

4.1 Driver Download/Installation

Drivers for the COM-CFHB6 can be downloaded from the product page on the AAEON website by following this link:

https://www.aaeon.com/en/p/com-express-modules-com-cfhb6

Download the driver(s) you need and follow the steps below to install them.

Step 1 – Install Chipset Driver

1. Click the **Step1 - Chipset** folder followed by **SetupChipset.exe**
2. Follow the instructions
3. Drivers will be installed automatically

Step 2 – Install Graphics Driver

1. Click the **Step2 - Graphic** folder
2. Click the **igxpin.exe** file in the folder
3. Follow the instructions
4. Drivers will be installed automatically

Step 3 – Install LAN Driver

1. Click the **Step3 - Network** folder.
2. Click the **ProWinx64.exe** file in the folder.
3. Follow the instructions
4. Drivers will be installed automatically

Step 4 – Install Audio Driver

1. Click the **STEP4 - Audio** folder followed by **0006-64bit_Win7_Win8_Win81_Win10_R279.exe**
2. Follow the instructions
3. Drivers will be installed automatically

Appendix A

Watchdog Timer Programming

A.1 Watchdog Timer Initial Program

Table 1 : Embedded BRAM relative register table		
	Default Value	Note
Index	0x284(Note1)	BRAM Index Register
Data	0x285(Note2)	BRAM Data Register
Logical Device Number	0xA8(Note3)	Watch dog Logical Device Number
Function and Device Number	0x00(Note4)	Watch dog Function/Device Number

Table 2 : Watchdog relative register table				
	Option Register	BitNum	Value	Note
Timer Counter	0x00(Note5)		(Note10)	Time of watchdog timer (0~255)
Counting Unit	0x01(Note6)	0(Note7)	0(Note11)	Select time unit. 0: second 1: minute
Watchdog RST pulse width	0x01(Note8)	[3:2](Note9)	0(Note12)	0: 20ms 1: 60ms 2: 100ms 3: 250ms

```
**************************************************************************************
// Embedded BRAM relative definition (Please reference to Table 1)
#define byte    EcBRAMIndex    //This parameter is represented from Note1
#define byte    EcBRAMData    //This parameter is represented from Note2
#define byte    BRAMLDNReg    //This parameter is represented from Note3
#define byte    BRAMFnDataReg    //This parameter is represented from Note4
#define    void    EcBRAMWriteByte(byte Offset, byte Value);
#define    byte    EcBRAMReadByte(byte Offset);
#define    void    IOWriteByte(byte Offset, byte Value);
#define    byte    IOReadByte(byte Offset);
// Watch Dog relative definition (Please reference to Table 2)
#define byte    TimerReg    //This parameter is represented from Note5
#define byte    TimerVal    // This parameter is represented from Note10
#define byte    UnitReg    //This parameter is represented from Note6
#define byte    UnitBit    //This parameter is represented from Note7
#define byte    UnitVal    //This parameter is represented from Note11
#define byte    RSTReg    //This parameter is represented from Note8
#define byte    RSTBit    //This parameter is represented from Note9
#define byte    RSTVal    //This parameter is represented from Note12
**************************************************************************************
```

```
****************************************************************************************
VOID    Main(){
        // Procedure : AaeonWDTConfig
        // (byte)Timer : Time of WDT timer.(0x00~0xFF)
        // (boolean)Unit : Select time unit(0: second, 1: minute).
        AaeonWDTConfig();

        // Procedure : AaeonWDTEnable
         // This procudure will enable the WDT counting.
        AaeonWDTEnable();
}
****************************************************************************************
```

```
*********************************************************************************
// Procedure : AaeonWDTEnable
VOID    AaeonWDTEnable (){
         WDTEnableDisable(1);
}

// Procedure : AaeonWDTConfig
VOID    AaeonWDTConfig (){
         // Disable WDT counting
         WDTEnableDisable(0);
         // WDT relative parameter setting
         WDTParameterSetting();
}

VOID    WDTEnableDisable(byte Value){
        ECBRAMWriteByte(TimerReg , Value);
}

VOID    WDTParameterSetting(){
        Byte TempByte;

         // Watchdog Timer counter setting
         ECBRAMWriteByte(TimerReg , TimerVal);
        // WDT counting unit setting
         TempByte = ECBRAMReadByte(UnitReg);
         TempByte |= (UnitVal << UnitBit);
         ECBRAMWriteByte(UnitReg , TempByte);
         // WDT RST pulse width setting
         TempByte = ECBRAMReadByte(RSTReg);
         TempByte |= (RSTVal << RSTBit);
         ECBRAMWriteByte(RSTReg , TempByte);
}
*********************************************************************************
```

```
**************************************************************************************
VOID    ECBRAMWriteByte(byte OPReg, byte OPBit, byte Value){
        IOWriteByte(EcBRAMIndex, 0x10);
         IOWriteByte(EcBRAMData, BRAMLDNReg);
         IOWriteByte(EcBRAMIndex, 0x11);
         IOWriteByte(EcBRAMData, BRAMFnDataReg);

         IOWriteByte(EcBRAMIndex, 0x13 + OPReg);
         IOWriteByte(EcBRAMData, Value);

         IOWriteByte(EcBRAMIndex, 0x12);
         IOWriteByte(EcBRAMData, 0x30);            //Write start
}

Byte    ECBRAMReadByte(byte OPReg){
        IOWriteByte(EcBRAMIndex, 0x10);
         IOWriteByte(EcBRAMData, BRAMLDNReg);
         IOWriteByte(EcBRAMIndex, 0x11);
         IOWriteByte(EcBRAMData, BRAMFnDataReg);

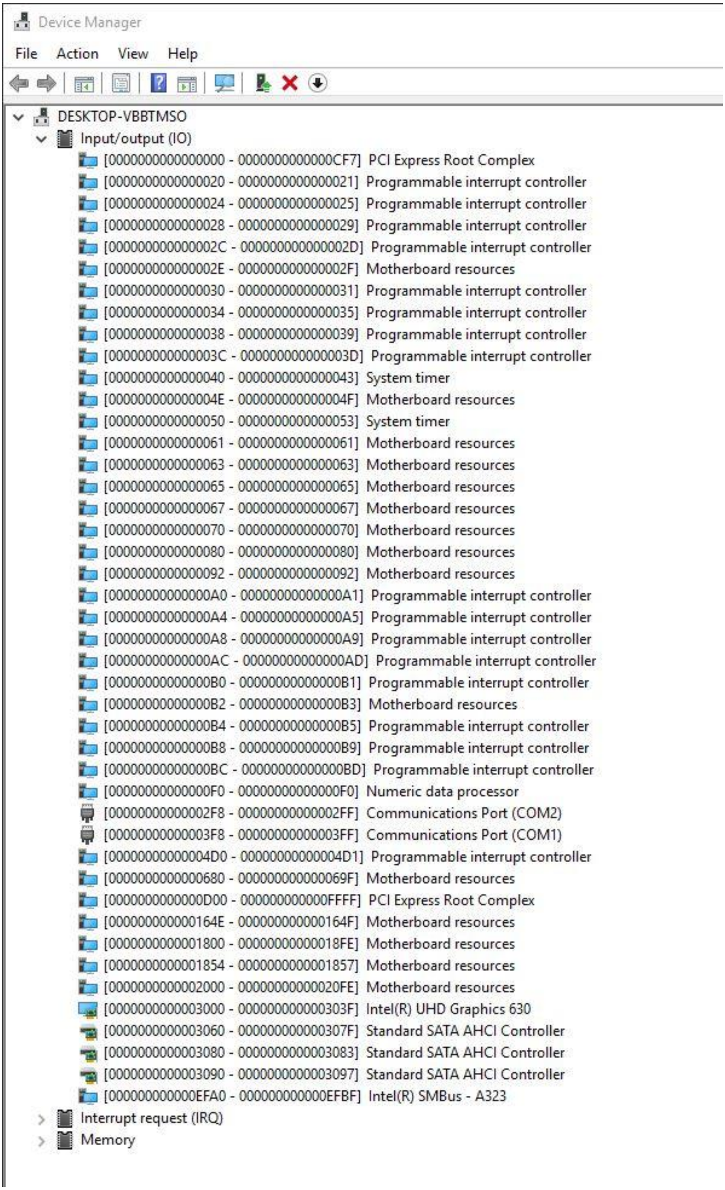
         IOWriteByte(EcBRAMIndex, 0x12);
         IOWriteByte(EcBRAMData, 0x10);            //Read start

         IOWriteByte(EcBRAMIndex, 0x13 + OPReg);
         Return       IOReadByte(EcBRAMData, Value);
}
**************************************************************************************
```

Appendix B

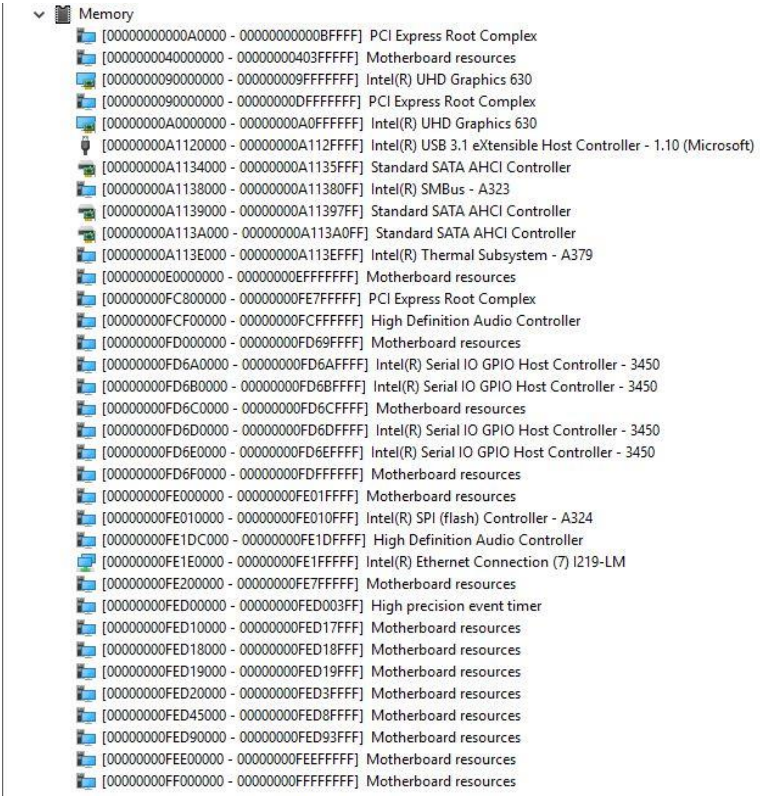
I/O Information

B.1 I/O Address Map



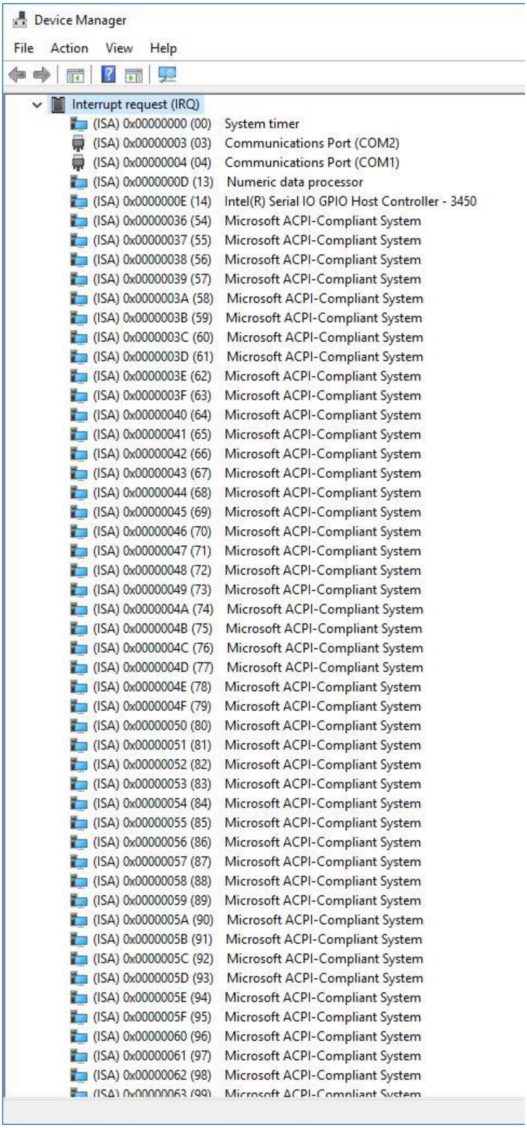
```
DESKTOP-VBBTMSO
  Input/output (IO)
    [0000000000000000 - 0000000000000CF7]  PCI Express Root Complex
    [0000000000000020 - 0000000000000021]  Programmable interrupt controller
    [0000000000000024 - 0000000000000025]  Programmable interrupt controller
    [0000000000000028 - 0000000000000029]  Programmable interrupt controller
    [000000000000002C - 000000000000002D]  Programmable interrupt controller
    [000000000000002E - 000000000000002F]  Motherboard resources
    [0000000000000030 - 0000000000000031]  Programmable interrupt controller
    [0000000000000034 - 0000000000000035]  Programmable interrupt controller
    [0000000000000038 - 0000000000000039]  Programmable interrupt controller
    [000000000000003C - 000000000000003D]  Programmable interrupt controller
    [0000000000000040 - 0000000000000043]  System timer
    [000000000000004E - 000000000000004F]  Motherboard resources
    [0000000000000050 - 0000000000000053]  System timer
    [0000000000000061 - 0000000000000061]  Motherboard resources
    [0000000000000063 - 0000000000000063]  Motherboard resources
    [0000000000000065 - 0000000000000065]  Motherboard resources
    [0000000000000067 - 0000000000000067]  Motherboard resources
    [0000000000000070 - 0000000000000070]  Motherboard resources
    [0000000000000080 - 0000000000000080]  Motherboard resources
    [0000000000000092 - 0000000000000092]  Motherboard resources
    [00000000000000A0 - 00000000000000A1]  Programmable interrupt controller
    [00000000000000A4 - 00000000000000A5]  Programmable interrupt controller
    [00000000000000A8 - 00000000000000A9]  Programmable interrupt controller
    [00000000000000AC - 00000000000000AD]  Programmable interrupt controller
    [00000000000000B0 - 00000000000000B1]  Programmable interrupt controller
    [00000000000000B2 - 00000000000000B3]  Motherboard resources
    [00000000000000B4 - 00000000000000B5]  Programmable interrupt controller
    [00000000000000B8 - 00000000000000B9]  Programmable interrupt controller
    [00000000000000BC - 00000000000000BD]  Programmable interrupt controller
    [00000000000000F0 - 00000000000000F0]  Numeric data processor
    [00000000000002F8 - 00000000000002FF]  Communications Port (COM2)
    [00000000000003F8 - 00000000000003FF]  Communications Port (COM1)
    [00000000000004D0 - 00000000000004D1]  Programmable interrupt controller
    [0000000000000680 - 000000000000069F]  Motherboard resources
    [0000000000000D00 - 000000000000FFFF]  PCI Express Root Complex
    [000000000000164E - 000000000000164F]  Motherboard resources
    [0000000000001800 - 00000000000018FE]  Motherboard resources
    [0000000000001854 - 0000000000001857]  Motherboard resources
    [0000000000002000 - 00000000000020FE]  Motherboard resources
    [0000000000003000 - 000000000000303F]  Intel(R) UHD Graphics 630
    [0000000000003060 - 000000000000307F]  Standard SATA AHCI Controller
    [0000000000003080 - 0000000000003083]  Standard SATA AHCI Controller
    [0000000000003090 - 0000000000003097]  Standard SATA AHCI Controller
    [000000000000EFA0 - 000000000000EFBF]  Intel(R) SMBus - A323
  Interrupt request (IRQ)
  Memory
```

B.2 Memory Address Map

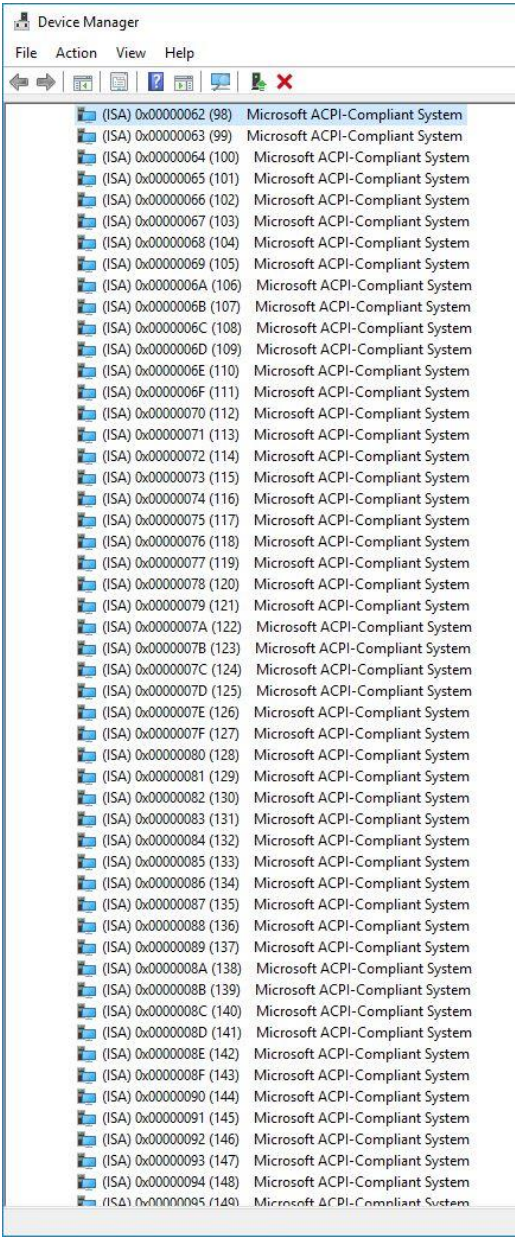


```
Memory
    [00000000000A0000 - 00000000000BFFFF]  PCI Express Root Complex
    [0000000040000000 - 00000000403FFFFF]  Motherboard resources
    [0000000090000000 - 000000009FFFFFFF]  Intel(R) UHD Graphics 630
    [0000000090000000 - 00000000DFFFFFFF]  PCI Express Root Complex
    [00000000A0000000 - 00000000A0FFFFFF]  Intel(R) UHD Graphics 630
    [00000000A1120000 - 00000000A112FFFF]  Intel(R) USB 3.1 eXtensible Host Controller - 1.10 (Microsoft)
    [00000000A1134000 - 00000000A1135FFF]  Standard SATA AHCI Controller
    [00000000A1138000 - 00000000A11380FF]  Intel(R) SMBus - A323
    [00000000A1139000 - 00000000A11397FF]  Standard SATA AHCI Controller
    [00000000A113A000 - 00000000A113A0FF]  Standard SATA AHCI Controller
    [00000000A113E000 - 00000000A113EFFF]  Intel(R) Thermal Subsystem - A379
    [00000000E0000000 - 00000000EFFFFFFF]  Motherboard resources
    [00000000FC800000 - 00000000FE7FFFFF]  PCI Express Root Complex
    [00000000FCF00000 - 00000000FCFFFFFF]  High Definition Audio Controller
    [00000000FD000000 - 00000000FD69FFFF]  Motherboard resources
    [00000000FD6A0000 - 00000000FD6AFFFF]  Intel(R) Serial IO GPIO Host Controller - 3450
    [00000000FD6B0000 - 00000000FD6BFFFF]  Intel(R) Serial IO GPIO Host Controller - 3450
    [00000000FD6C0000 - 00000000FD6CFFFF]  Motherboard resources
    [00000000FD6D0000 - 00000000FD6DFFFF]  Intel(R) Serial IO GPIO Host Controller - 3450
    [00000000FD6E0000 - 00000000FD6EFFFF]  Intel(R) Serial IO GPIO Host Controller - 3450
    [00000000FD6F0000 - 00000000FDFFFFFF]  Motherboard resources
    [00000000FE000000 - 00000000FE01FFFF]  Motherboard resources
    [00000000FE010000 - 00000000FE010FFF]  Intel(R) SPI (flash) Controller - A324
    [00000000FE1DC000 - 00000000FE1DFFFF]  High Definition Audio Controller
    [00000000FE1E0000 - 00000000FE1FFFFF]  Intel(R) Ethernet Connection (7) I219-LM
    [00000000FE200000 - 00000000FE7FFFFF]  Motherboard resources
    [00000000FED00000 - 00000000FED003FF]  High precision event timer
    [00000000FED10000 - 00000000FED17FFF]  Motherboard resources
    [00000000FED18000 - 00000000FED18FFF]  Motherboard resources
    [00000000FED19000 - 00000000FED19FFF]  Motherboard resources
    [00000000FED20000 - 00000000FED3FFFF]  Motherboard resources
    [00000000FED45000 - 00000000FED8FFFF]  Motherboard resources
    [00000000FED90000 - 00000000FED93FFF]  Motherboard resources
    [00000000FEE00000 - 00000000FEEFFFFF]  Motherboard resources
    [00000000FF000000 - 00000000FFFFFFFF]  Motherboard resources
```

B.3 Interrupt Request (IRQ) Mapping Chart



```
Interrupt request (IRQ)
    (ISA) 0x00000000 (00)  System timer
    (ISA) 0x00000003 (03)  Communications Port (COM2)
    (ISA) 0x00000004 (04)  Communications Port (COM1)
    (ISA) 0x0000000D (13)  Numeric data processor
    (ISA) 0x0000000E (14)  Intel(R) Serial IO GPIO Host Controller - 3450
    (ISA) 0x00000036 (54)  Microsoft ACPI-Compliant System
    (ISA) 0x00000037 (55)  Microsoft ACPI-Compliant System
    (ISA) 0x00000038 (56)  Microsoft ACPI-Compliant System
    (ISA) 0x00000039 (57)  Microsoft ACPI-Compliant System
    (ISA) 0x0000003A (58)  Microsoft ACPI-Compliant System
    (ISA) 0x0000003B (59)  Microsoft ACPI-Compliant System
    (ISA) 0x0000003C (60)  Microsoft ACPI-Compliant System
    (ISA) 0x0000003D (61)  Microsoft ACPI-Compliant System
    (ISA) 0x0000003E (62)  Microsoft ACPI-Compliant System
    (ISA) 0x0000003F (63)  Microsoft ACPI-Compliant System
    (ISA) 0x00000040 (64)  Microsoft ACPI-Compliant System
    (ISA) 0x00000041 (65)  Microsoft ACPI-Compliant System
    (ISA) 0x00000042 (66)  Microsoft ACPI-Compliant System
    (ISA) 0x00000043 (67)  Microsoft ACPI-Compliant System
    (ISA) 0x00000044 (68)  Microsoft ACPI-Compliant System
    (ISA) 0x00000045 (69)  Microsoft ACPI-Compliant System
    (ISA) 0x00000046 (70)  Microsoft ACPI-Compliant System
    (ISA) 0x00000047 (71)  Microsoft ACPI-Compliant System
    (ISA) 0x00000048 (72)  Microsoft ACPI-Compliant System
    (ISA) 0x00000049 (73)  Microsoft ACPI-Compliant System
    (ISA) 0x0000004A (74)  Microsoft ACPI-Compliant System
    (ISA) 0x0000004B (75)  Microsoft ACPI-Compliant System
    (ISA) 0x0000004C (76)  Microsoft ACPI-Compliant System
    (ISA) 0x0000004D (77)  Microsoft ACPI-Compliant System
    (ISA) 0x0000004E (78)  Microsoft ACPI-Compliant System
    (ISA) 0x0000004F (79)  Microsoft ACPI-Compliant System
    (ISA) 0x00000050 (80)  Microsoft ACPI-Compliant System
    (ISA) 0x00000051 (81)  Microsoft ACPI-Compliant System
    (ISA) 0x00000052 (82)  Microsoft ACPI-Compliant System
    (ISA) 0x00000053 (83)  Microsoft ACPI-Compliant System
    (ISA) 0x00000054 (84)  Microsoft ACPI-Compliant System
    (ISA) 0x00000055 (85)  Microsoft ACPI-Compliant System
    (ISA) 0x00000056 (86)  Microsoft ACPI-Compliant System
    (ISA) 0x00000057 (87)  Microsoft ACPI-Compliant System
    (ISA) 0x00000058 (88)  Microsoft ACPI-Compliant System
    (ISA) 0x00000059 (89)  Microsoft ACPI-Compliant System
    (ISA) 0x0000005A (90)  Microsoft ACPI-Compliant System
    (ISA) 0x0000005B (91)  Microsoft ACPI-Compliant System
    (ISA) 0x0000005C (92)  Microsoft ACPI-Compliant System
    (ISA) 0x0000005D (93)  Microsoft ACPI-Compliant System
    (ISA) 0x0000005E (94)  Microsoft ACPI-Compliant System
    (ISA) 0x0000005F (95)  Microsoft ACPI-Compliant System
    (ISA) 0x00000060 (96)  Microsoft ACPI-Compliant System
    (ISA) 0x00000061 (97)  Microsoft ACPI-Compliant System
    (ISA) 0x00000062 (98)  Microsoft ACPI-Compliant System
    (ISA) 0x00000063 (99)  Microsoft ACPI-Compliant System
```



```
(ISA) 0x00000062 (98)   Microsoft ACPI-Compliant System
(ISA) 0x00000063 (99)   Microsoft ACPI-Compliant System
(ISA) 0x00000064 (100)  Microsoft ACPI-Compliant System
(ISA) 0x00000065 (101)  Microsoft ACPI-Compliant System
(ISA) 0x00000066 (102)  Microsoft ACPI-Compliant System
(ISA) 0x00000067 (103)  Microsoft ACPI-Compliant System
(ISA) 0x00000068 (104)  Microsoft ACPI-Compliant System
(ISA) 0x00000069 (105)  Microsoft ACPI-Compliant System
(ISA) 0x0000006A (106)  Microsoft ACPI-Compliant System
(ISA) 0x0000006B (107)  Microsoft ACPI-Compliant System
(ISA) 0x0000006C (108)  Microsoft ACPI-Compliant System
(ISA) 0x0000006D (109)  Microsoft ACPI-Compliant System
(ISA) 0x0000006E (110)  Microsoft ACPI-Compliant System
(ISA) 0x0000006F (111)  Microsoft ACPI-Compliant System
(ISA) 0x00000070 (112)  Microsoft ACPI-Compliant System
(ISA) 0x00000071 (113)  Microsoft ACPI-Compliant System
(ISA) 0x00000072 (114)  Microsoft ACPI-Compliant System
(ISA) 0x00000073 (115)  Microsoft ACPI-Compliant System
(ISA) 0x00000074 (116)  Microsoft ACPI-Compliant System
(ISA) 0x00000075 (117)  Microsoft ACPI-Compliant System
(ISA) 0x00000076 (118)  Microsoft ACPI-Compliant System
(ISA) 0x00000077 (119)  Microsoft ACPI-Compliant System
(ISA) 0x00000078 (120)  Microsoft ACPI-Compliant System
(ISA) 0x00000079 (121)  Microsoft ACPI-Compliant System
(ISA) 0x0000007A (122)  Microsoft ACPI-Compliant System
(ISA) 0x0000007B (123)  Microsoft ACPI-Compliant System
(ISA) 0x0000007C (124)  Microsoft ACPI-Compliant System
(ISA) 0x0000007D (125)  Microsoft ACPI-Compliant System
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(ISA) 0x0000007F (127)  Microsoft ACPI-Compliant System
(ISA) 0x00000080 (128)  Microsoft ACPI-Compliant System
(ISA) 0x00000081 (129)  Microsoft ACPI-Compliant System
(ISA) 0x00000082 (130)  Microsoft ACPI-Compliant System
(ISA) 0x00000083 (131)  Microsoft ACPI-Compliant System
(ISA) 0x00000084 (132)  Microsoft ACPI-Compliant System
(ISA) 0x00000085 (133)  Microsoft ACPI-Compliant System
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(ISA) 0x0000008D (141)  Microsoft ACPI-Compliant System
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(ISA) 0x0000008F (143)  Microsoft ACPI-Compliant System
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(ISA) 0x00000091 (145)  Microsoft ACPI-Compliant System
(ISA) 0x00000092 (146)  Microsoft ACPI-Compliant System
(ISA) 0x00000093 (147)  Microsoft ACPI-Compliant System
(ISA) 0x00000094 (148)  Microsoft ACPI-Compliant System
(ISA) 0x00000095 (149)  Microsoft ACPI-Compliant System
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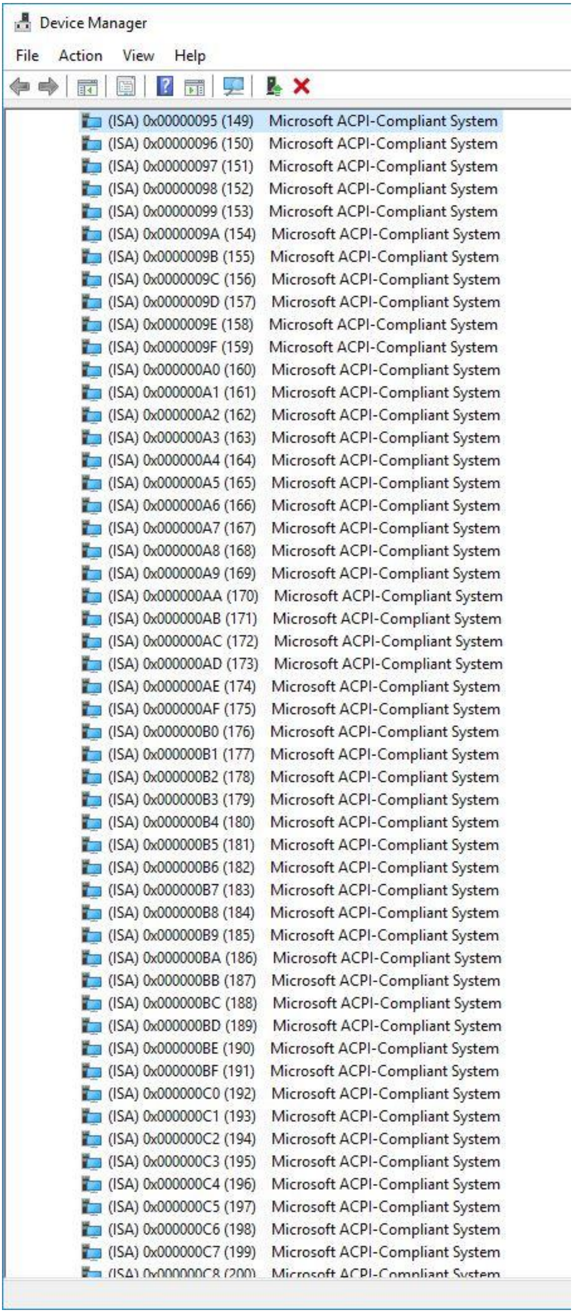

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(ISA) 0x0000009F (159)  Microsoft ACPI-Compliant System
(ISA) 0x000000A0 (160)  Microsoft ACPI-Compliant System
(ISA) 0x000000A1 (161)  Microsoft ACPI-Compliant System
(ISA) 0x000000A2 (162)  Microsoft ACPI-Compliant System
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(ISA) 0x000000C1 (193)  Microsoft ACPI-Compliant System
(ISA) 0x000000C2 (194)  Microsoft ACPI-Compliant System
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(ISA) 0x000000C7 (199)  Microsoft ACPI-Compliant System
(ISA) 0x000000C8 (200)  Microsoft ACPI-Compliant System
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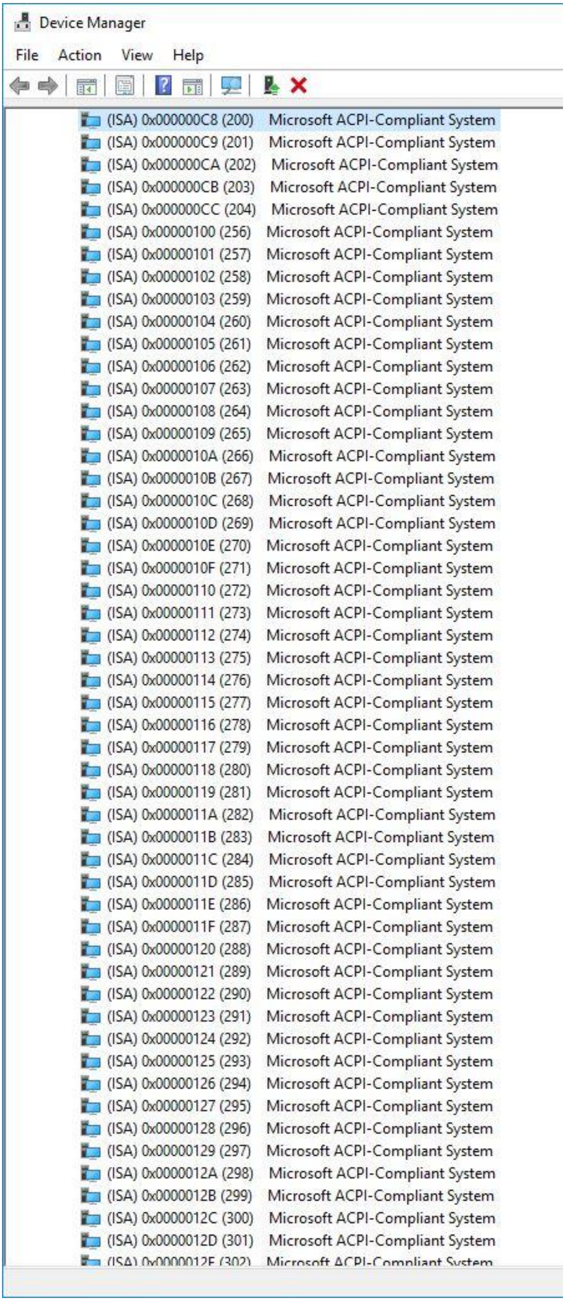

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(ISA) 0x000000CB (203)   Microsoft ACPI-Compliant System
(ISA) 0x000000CC (204)   Microsoft ACPI-Compliant System
(ISA) 0x00000100 (256)   Microsoft ACPI-Compliant System
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(ISA) 0x00000107 (263)   Microsoft ACPI-Compliant System
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(ISA) 0x00000109 (265)   Microsoft ACPI-Compliant System
(ISA) 0x0000010A (266)   Microsoft ACPI-Compliant System
(ISA) 0x0000010B (267)   Microsoft ACPI-Compliant System
(ISA) 0x0000010C (268)   Microsoft ACPI-Compliant System
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(ISA) 0x0000012B (299)   Microsoft ACPI-Compliant System
(ISA) 0x0000012C (300)   Microsoft ACPI-Compliant System
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(ISA) 0x0000012E (302)   Microsoft ACPI-Compliant System
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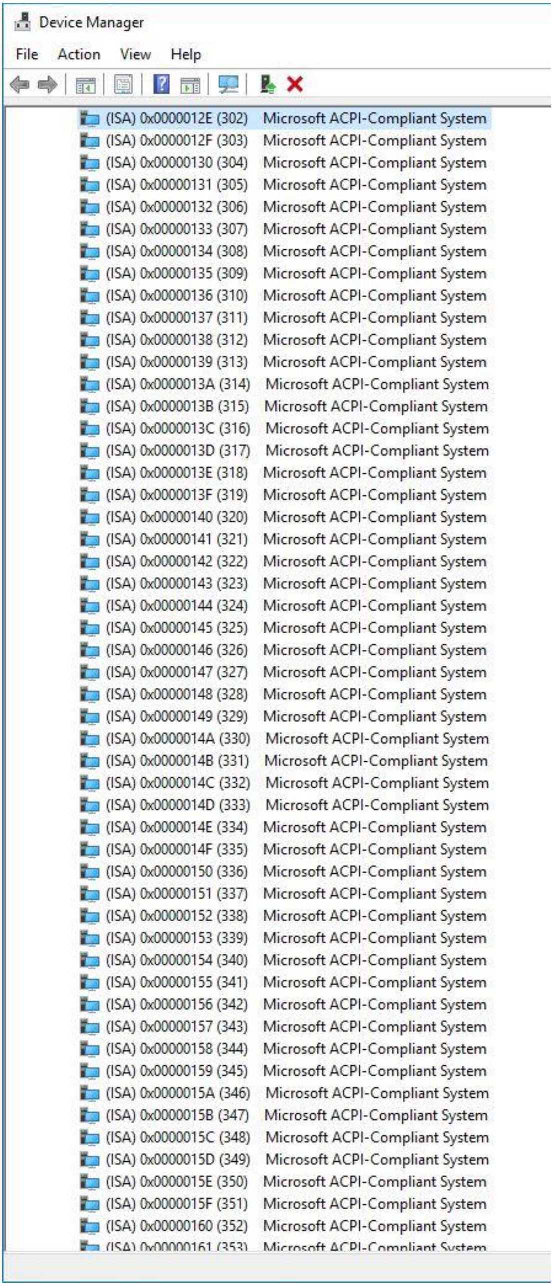

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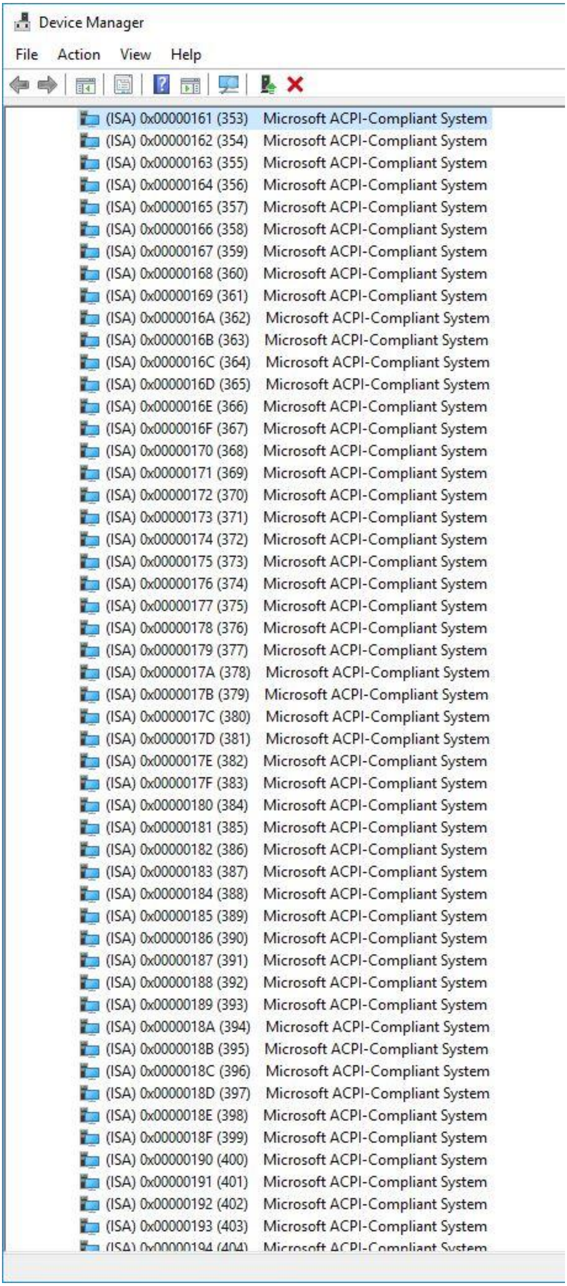
(ISA) 0x0000015B (347)   Microsoft ACPI-Compliant System
(ISA) 0x0000015C (348)   Microsoft ACPI-Compliant System
(ISA) 0x0000015D (349)   Microsoft ACPI-Compliant System
(ISA) 0x0000015E (350)   Microsoft ACPI-Compliant System
(ISA) 0x0000015F (351)   Microsoft ACPI-Compliant System
(ISA) 0x00000160 (352)   Microsoft ACPI-Compliant System
(ISA) 0x00000161 (353)   Microsoft ACPI-Compliant System
```



```
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(ISA) 0x00000162 (354)   Microsoft ACPI-Compliant System
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(ISA) 0x0000016C (364)   Microsoft ACPI-Compliant System
(ISA) 0x0000016D (365)   Microsoft ACPI-Compliant System
(ISA) 0x0000016E (366)   Microsoft ACPI-Compliant System
(ISA) 0x0000016F (367)   Microsoft ACPI-Compliant System
(ISA) 0x00000170 (368)   Microsoft ACPI-Compliant System
(ISA) 0x00000171 (369)   Microsoft ACPI-Compliant System
(ISA) 0x00000172 (370)   Microsoft ACPI-Compliant System
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(ISA) 0x0000017F (383)   Microsoft ACPI-Compliant System
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(ISA) 0x00000189 (393)   Microsoft ACPI-Compliant System
(ISA) 0x0000018A (394)   Microsoft ACPI-Compliant System
(ISA) 0x0000018B (395)   Microsoft ACPI-Compliant System
(ISA) 0x0000018C (396)   Microsoft ACPI-Compliant System
(ISA) 0x0000018D (397)   Microsoft ACPI-Compliant System
(ISA) 0x0000018E (398)   Microsoft ACPI-Compliant System
(ISA) 0x0000018F (399)   Microsoft ACPI-Compliant System
(ISA) 0x00000190 (400)   Microsoft ACPI-Compliant System
(ISA) 0x00000191 (401)   Microsoft ACPI-Compliant System
(ISA) 0x00000192 (402)   Microsoft ACPI-Compliant System
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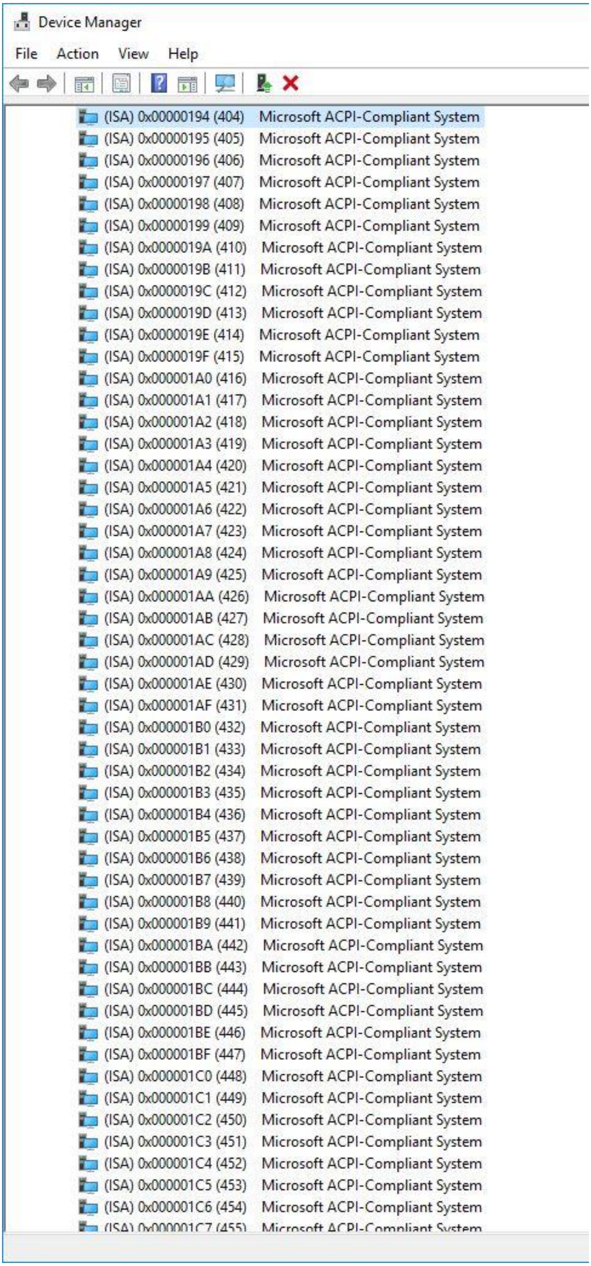
(ISA) 0x00000194 (404)   Microsoft ACPI-Compliant System
```



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(ISA) 0x00000198 (408)   Microsoft ACPI-Compliant System
(ISA) 0x00000199 (409)   Microsoft ACPI-Compliant System
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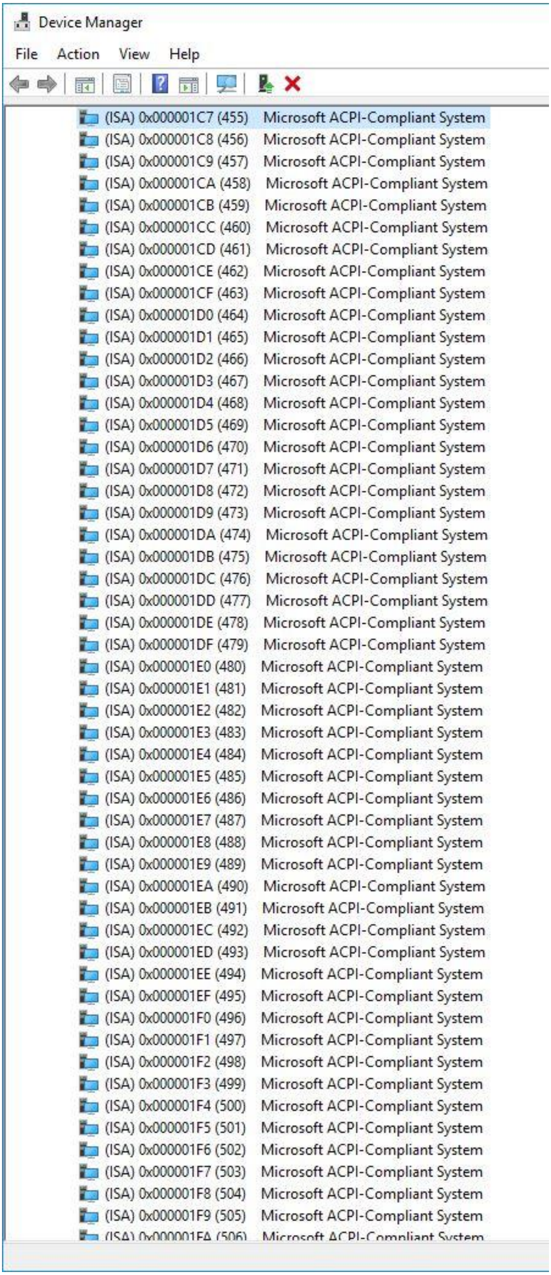
(ISA) 0x0000019C (412)   Microsoft ACPI-Compliant System
(ISA) 0x0000019D (413)   Microsoft ACPI-Compliant System
(ISA) 0x0000019E (414)   Microsoft ACPI-Compliant System
(ISA) 0x0000019F (415)   Microsoft ACPI-Compliant System
(ISA) 0x000001A0 (416)   Microsoft ACPI-Compliant System
(ISA) 0x000001A1 (417)   Microsoft ACPI-Compliant System
(ISA) 0x000001A2 (418)   Microsoft ACPI-Compliant System
(ISA) 0x000001A3 (419)   Microsoft ACPI-Compliant System
(ISA) 0x000001A4 (420)   Microsoft ACPI-Compliant System
(ISA) 0x000001A5 (421)   Microsoft ACPI-Compliant System
(ISA) 0x000001A6 (422)   Microsoft ACPI-Compliant System
(ISA) 0x000001A7 (423)   Microsoft ACPI-Compliant System
(ISA) 0x000001A8 (424)   Microsoft ACPI-Compliant System
(ISA) 0x000001A9 (425)   Microsoft ACPI-Compliant System
(ISA) 0x000001AA (426)   Microsoft ACPI-Compliant System
(ISA) 0x000001AB (427)   Microsoft ACPI-Compliant System
(ISA) 0x000001AC (428)   Microsoft ACPI-Compliant System
(ISA) 0x000001AD (429)   Microsoft ACPI-Compliant System
(ISA) 0x000001AE (430)   Microsoft ACPI-Compliant System
(ISA) 0x000001AF (431)   Microsoft ACPI-Compliant System
(ISA) 0x000001B0 (432)   Microsoft ACPI-Compliant System
(ISA) 0x000001B1 (433)   Microsoft ACPI-Compliant System
(ISA) 0x000001B2 (434)   Microsoft ACPI-Compliant System
(ISA) 0x000001B3 (435)   Microsoft ACPI-Compliant System
(ISA) 0x000001B4 (436)   Microsoft ACPI-Compliant System
(ISA) 0x000001B5 (437)   Microsoft ACPI-Compliant System
(ISA) 0x000001B6 (438)   Microsoft ACPI-Compliant System
(ISA) 0x000001B7 (439)   Microsoft ACPI-Compliant System
(ISA) 0x000001B8 (440)   Microsoft ACPI-Compliant System
(ISA) 0x000001B9 (441)   Microsoft ACPI-Compliant System
(ISA) 0x000001BA (442)   Microsoft ACPI-Compliant System
(ISA) 0x000001BB (443)   Microsoft ACPI-Compliant System
(ISA) 0x000001BC (444)   Microsoft ACPI-Compliant System
(ISA) 0x000001BD (445)   Microsoft ACPI-Compliant System
(ISA) 0x000001BE (446)   Microsoft ACPI-Compliant System
(ISA) 0x000001BF (447)   Microsoft ACPI-Compliant System
(ISA) 0x000001C0 (448)   Microsoft ACPI-Compliant System
(ISA) 0x000001C1 (449)   Microsoft ACPI-Compliant System
(ISA) 0x000001C2 (450)   Microsoft ACPI-Compliant System
(ISA) 0x000001C3 (451)   Microsoft ACPI-Compliant System
(ISA) 0x000001C4 (452)   Microsoft ACPI-Compliant System
(ISA) 0x000001C5 (453)   Microsoft ACPI-Compliant System
(ISA) 0x000001C6 (454)   Microsoft ACPI-Compliant System
(ISA) 0x000001C7 (455)   Microsoft ACPI-Compliant System
```



```
(ISA) 0x000001C7 (455)   Microsoft ACPI-Compliant System
(ISA) 0x000001C8 (456)   Microsoft ACPI-Compliant System
(ISA) 0x000001C9 (457)   Microsoft ACPI-Compliant System
(ISA) 0x000001CA (458)   Microsoft ACPI-Compliant System
(ISA) 0x000001CB (459)   Microsoft ACPI-Compliant System
(ISA) 0x000001CC (460)   Microsoft ACPI-Compliant System
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(ISA) 0x000001D2 (466)   Microsoft ACPI-Compliant System
(ISA) 0x000001D3 (467)   Microsoft ACPI-Compliant System
(ISA) 0x000001D4 (468)   Microsoft ACPI-Compliant System
(ISA) 0x000001D5 (469)   Microsoft ACPI-Compliant System
(ISA) 0x000001D6 (470)   Microsoft ACPI-Compliant System
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(ISA) 0x000001D8 (472)   Microsoft ACPI-Compliant System
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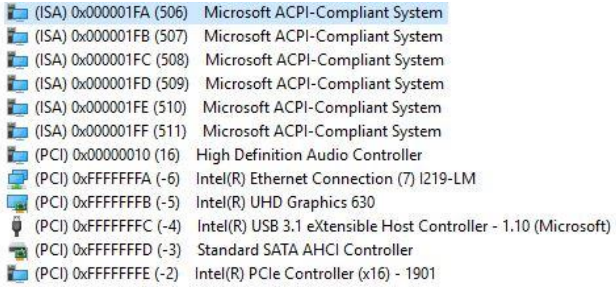
(ISA) 0x000001DA (474)   Microsoft ACPI-Compliant System
(ISA) 0x000001DB (475)   Microsoft ACPI-Compliant System
(ISA) 0x000001DC (476)   Microsoft ACPI-Compliant System
(ISA) 0x000001DD (477)   Microsoft ACPI-Compliant System
(ISA) 0x000001DE (478)   Microsoft ACPI-Compliant System
(ISA) 0x000001DF (479)   Microsoft ACPI-Compliant System
(ISA) 0x000001E0 (480)   Microsoft ACPI-Compliant System
(ISA) 0x000001E1 (481)   Microsoft ACPI-Compliant System
(ISA) 0x000001E2 (482)   Microsoft ACPI-Compliant System
(ISA) 0x000001E3 (483)   Microsoft ACPI-Compliant System
(ISA) 0x000001E4 (484)   Microsoft ACPI-Compliant System
(ISA) 0x000001E5 (485)   Microsoft ACPI-Compliant System
(ISA) 0x000001E6 (486)   Microsoft ACPI-Compliant System
(ISA) 0x000001E7 (487)   Microsoft ACPI-Compliant System
(ISA) 0x000001E8 (488)   Microsoft ACPI-Compliant System
(ISA) 0x000001E9 (489)   Microsoft ACPI-Compliant System
(ISA) 0x000001EA (490)   Microsoft ACPI-Compliant System
(ISA) 0x000001EB (491)   Microsoft ACPI-Compliant System
(ISA) 0x000001EC (492)   Microsoft ACPI-Compliant System
(ISA) 0x000001ED (493)   Microsoft ACPI-Compliant System
(ISA) 0x000001EE (494)   Microsoft ACPI-Compliant System
(ISA) 0x000001EF (495)   Microsoft ACPI-Compliant System
(ISA) 0x000001F0 (496)   Microsoft ACPI-Compliant System
(ISA) 0x000001F1 (497)   Microsoft ACPI-Compliant System
(ISA) 0x000001F2 (498)   Microsoft ACPI-Compliant System
(ISA) 0x000001F3 (499)   Microsoft ACPI-Compliant System
(ISA) 0x000001F4 (500)   Microsoft ACPI-Compliant System
(ISA) 0x000001F5 (501)   Microsoft ACPI-Compliant System
(ISA) 0x000001F6 (502)   Microsoft ACPI-Compliant System
(ISA) 0x000001F7 (503)   Microsoft ACPI-Compliant System
(ISA) 0x000001F8 (504)   Microsoft ACPI-Compliant System
(ISA) 0x000001F9 (505)   Microsoft ACPI-Compliant System
(ISA) 0x000001FA (506)   Microsoft ACPI-Compliant System
```



```
(ISA) 0x000001FA (506)   Microsoft ACPI-Compliant System
(ISA) 0x000001FB (507)   Microsoft ACPI-Compliant System
(ISA) 0x000001FC (508)   Microsoft ACPI-Compliant System
(ISA) 0x000001FD (509)   Microsoft ACPI-Compliant System
(ISA) 0x000001FE (510)   Microsoft ACPI-Compliant System
(ISA) 0x000001FF (511)   Microsoft ACPI-Compliant System
(PCI) 0x00000010 (16)    High Definition Audio Controller
(PCI) 0xFFFFFFFA (-6)    Intel(R) Ethernet Connection (7) I219-LM
(PCI) 0xFFFFFFFB (-5)    Intel(R) UHD Graphics 630
(PCI) 0xFFFFFFFC (-4)    Intel(R) USB 3.1 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFFD (-3)    Standard SATA AHCI Controller
(PCI) 0xFFFFFFFE (-2)    Intel(R) PCIe Controller (x16) - 1901
```

Appendix C

Programming Digital I/O

C.1 Digital I/O Programming

The COM-CFHB6 utilizes an AAEON chipset as its Digital I/O controller. Below are the procedures to complete its configuration, which you can use to develop a customized program to fit your application.

C.2 Digital I/O Register

Table 1 : Embedded BRAM relative register table		
	Default Value	Note
Index	0x284(Note1)	BRAM Index Register
Data	0x285(Note2)	BRAM Data Register
Logical Device Number	0xA2(Note3)	Watchdog Logical Device Number
IO Direction Function and Device Number	0x00(Note4)	DIO Input/Output Function/Device Number
IO Vaule/Status Function and Device Number	0x01(Note5)	DIO Output Data Function/Device Number

Table 2 : Digital I/O relative register table				
	Register			
	Option Register	BitNum	Value	Note
GPI0 Pin Status	0x00(Note6)	0(Note7)	(Note15)	GPA2
GPI1 Pin Status	0x00(Note6)	1(Note8)	(Note16)	GPA3
GPI2 Pin Status	0x00(Note6)	2(Note9)	(Note17)	GPA4
GPI3 Pin Status	0x00(Note6)	3(Note10)	(Note18)	GPA5
GPO0 Pin Status	0x00(Note6)	4(Note11)	(Note19)	GPJ0
GPO1 Pin Status	0x00(Note6)	5(Note12)	(Note20)	GPJ1
GPO2 Pin Status	0x00(Note6)	6(Note13)	(Note21)	GPJ2
GPO3 Pin Status	0x00(Note6)	7(Note14)	(Note22)	GPJ3

C.2 Digital I/O Sample Program

```
*************************************************************************************
// Embedded BRAM relative definition (Please reference to Table 1)
#define byte    EcBRAMIndex    //This parameter is represented from Note1
#define byte    EcBRAMData    //This parameter is represented from Note2
#define byte    BRAMLDNReg    //This parameter is represented from Note3
#define byte    BRAMFnData0Reg    //This parameter is represented from Note4
#define byte    BRAMFnData1Reg    //This parameter is represented from Note5
#define    void    EcBRAMWriteByte(byte Offset, byte Value);
#define    byte    EcBRAMReadByte(byte Offset);
#define    void    IOWriteByte(byte Offset, byte Value);
#define    byte    IOReadByte(byte Offset);
// Digital Input Status relative definition (Please reference to Table 2)
#define byte    DIO0ToDIO7Reg    // This parameter is represented from Note6
#define byte    DIO0Bit    // This parameter is represented from Note7
#define byte    DIO1Bit    // This parameter is represented from Note8
#define byte    DIO2Bit    // This parameter is represented from Note9
#define byte    DIO3Bit    // This parameter is represented from Note10
#define byte    DIO4Bit    // This parameter is represented from Note11
#define byte    DIO5Bit    // This parameter is represented from Note12
#define byte    DIO6Bit    // This parameter is represented from Note13
#define byte    DIO7Bit    // This parameter is represented from Note14
#define byte    DIO0Val    // This parameter is represented from Note15
#define byte    DIO1Val    // This parameter is represented from Note16
#define byte    DIO2Val    // This parameter is represented from Note17
#define byte    DIO3Val    // This parameter is represented from Note18
#define byte    DIO4Val    // This parameter is represented from Note19
#define byte    DIO5Val    // This parameter is represented from Note20
#define byte    DIO6Val    // This parameter is represented from Note21
#define byte    DIO7Val    // This parameter is represented from Note22
*************************************************************************************
```

```
***************************************************************************************
VOID    Main(){
        Boolean PinStatus ;

        // Procedure : AaeonReadPinStatus
        // Input :
        //        Example, Read Digital I/O Pin 3 status
         // Output :
         //       InputStatus :
         //               0: Digital I/O Pin level is low
         //               1: Digital I/O Pin level is High
        PinStatus = AaeonReadPinStatus(DIO0ToDIO7Reg, DIO3Bit);

        // Procedure : AaeonSetOutputLevel
        // Input :
        //        Example, Set Digital I/O Pin 6 level
        AaeonSetOutputLevel(DIO0ToDIO7Reg, DIO6Bit, DIO6Val);
}
***************************************************************************************
```

```
********************************************************************************************************
Boolean    AaeonReadPinStatus(byte OptionReg, byte BitNum){
        Byte TempByte;

        TempByte = ECBRAMReadByte(BRAMFnData1Reg, OptionReg);
        If (TempByte & BitNum == 0)
                Return 0;
        Return 1;
}
VOID    AaeonSetOutputLevel(byte OptionReg, byte BitNum, byte Value){
        Byte TempByte;

        TempByte = ECBRAMReadByte(BRAMFnData1Reg, OptionReg);
        TempByte |= (Value << BitNum);
         ECBRAMWriteByte(OptionReg, BitNum, Value);
}

********************************************************************************************************
```

```
************************************************************************************
VOID    ECBRAMWriteByte(byte OPReg, byte OPBit, byte Value){
        IOWriteByte(EcBRAMIndex, 0x10);
         IOWriteByte(EcBRAMData, BRAMLDNReg);
         IOWriteByte(EcBRAMIndex, 0x11);
         IOWriteByte(EcBRAMData, BRAMFnDataReg);

         IOWriteByte(EcBRAMIndex, 0x13 + OPReg);
         IOWriteByte(EcBRAMData, Value);

         IOWriteByte(EcBRAMIndex, 0x12);
         IOWriteByte(EcBRAMData, 0x30);          //Write start
}

Byte    ECBRAMReadByte(byte FnDataReg, byte OPReg){
        IOWriteByte(EcBRAMIndex, 0x10);
         IOWriteByte(EcBRAMData, BRAMLDNReg);
         IOWriteByte(EcBRAMIndex, 0x11);
         IOWriteByte(EcBRAMData, FnDataReg);

         IOWriteByte(EcBRAMIndex, 0x12);
         IOWriteByte(EcBRAMData, 0x10);          //Read start

         IOWriteByte(EcBRAMIndex, 0x13 + OPReg);
         Return      IOReadByte(EcBRAMData, Value);
}
************************************************************************************
```