

PICO-EHL4

PICO-ITX Single Board Computer

User's Manual 2nd Ed

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Packing List

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

Item	Quantity
● PICO-EHL4 MB	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 on 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 WHERE THE STORAGE TEMPERATURE IS BELOW -20° C (-4°F) OR ABOVE 60°C (140°F) TO PREVENT DAMAGE.**

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	○	○	○	○	○	○
<p>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。</p> <p>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。</p> <p>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。</p>						

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	○	○	○	○	○	○
Wires & Connectors for External Connections	○	○	○	○	○	○
<p>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.</p> <p>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.</p> <p>Note: The Environment Friendly Use Period as labeled on this product is applicable under normal usage only</p>						

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Chapter 1

Product Specifications

1.1 Specifications

System

Form Factor	PICO-ITX
CPU	Intel® Atom™ x6000E series, Intel® Pentium and Celeron® N and J series processors Intel® Atom™ x6425RE (4C, 1.9GHz, TDP 12W) Intel® Atom™ x6414RE (4C, 1.5GHz, TDP 9W) Intel® Atom™ x6212RE (2C, 1.2GHz, TDP 6W) Intel® Atom™ x6425E (4C, 1.8GHz, up to 3GHz, TDP 12W) Intel® Atom™ x6413E (4C, 1.5GHz, up to 3GHz, TDP 9W) Intel® Atom™ x6211E (2C, 1.2GHz, up to 3GHz, TDP 6W) Intel® Pentium® J6426 (4C, 1.8GHz, up to 3GHz, TDP 10W) Intel® Pentium® N6415 (4C, 1.2GHz, up to 3GHz, TDP-up 6.5W) Intel® Celeron® J6412 (4C, 1.8GHz, up to 3GHz, TDP 10W) Intel® Celeron® J6210 (2C, 1.2GHz, up to 3GHz, TDP 6.5W) (Intel® Atom™ x6427FE/x6200FE by request)
CPU Frequency	Up to 3 GHz
Chipset	Intel® Elkhart Lake SoC Processor
Memory Type	LPDDR4x 3200 MHz on board memory
Max. Memory Capacity	Up to 16 GB

System

BIOS	AMI UEFI
Wake On LAN	Yes
Watchdog Timer	255 Levels
Power Requirement	+12V AT/ATX (default)
Power Supply Type	Lockable & Phoenix Terminal co-lay
Power Consumption (Typical)	Intel® Pentium® J6426, LPDDR4x onboard 8GB: 2.36A at +12V (balance), 2.81A at +12V (max) Intel® Atom™ x6425E, LPDDR4x onboard 16GB: 2.56A at +12V (balance), 2.81A at +12V (max)
System Cooling	Heat-spreader, heatsink & cooler optional
Dimensions	3.94" x 2.84" (100mm x 72mm)
Gross Weight	0.55 lbs. (0.25 kg)
Operating Temperature	32°F ~ 140°F (0°C ~ 60°C)
Storage Temperature	-40°F ~ 176°F (-40°C ~ 80°C)
Operating Humidity	0% ~ 90% relative humidity, non-condensing
MTBF (Hours)	461,744
Certification	CE/FCC Class A
OS Support	Windows 10 (64 bit) Ubuntu Linux (Version: TBC)

Display

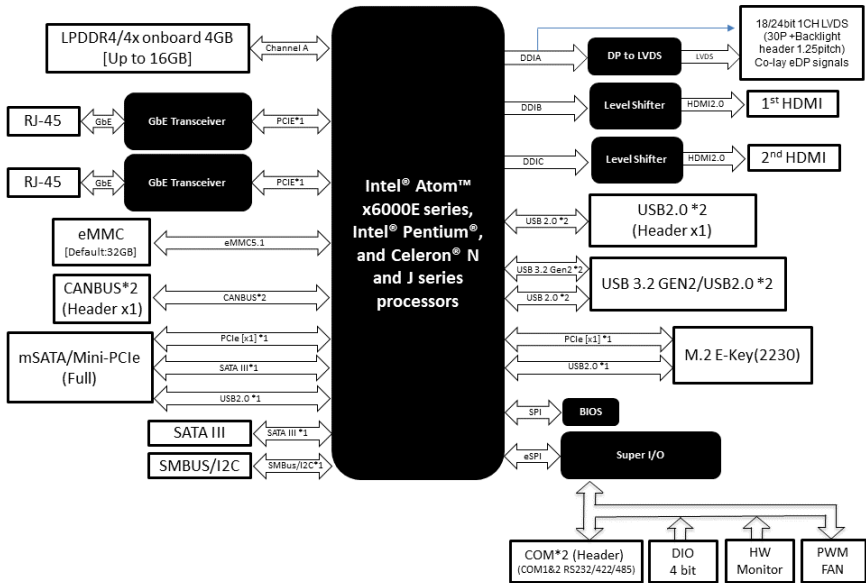
Chipset	Intel® Atom™ x6000E series, Intel® Pentium and Celeron® N and J series processors
Resolution	HDMI2.0b x 2, 4K 60Hz Single channel 12V/3.3V, 18/24-bit LVDS/eDP up to 4K
LCD Interface	18/24-bit Single LVDS

I/O

Storage/SSD	eMMC x 1 (32/64/128 GB) SATA III (6.0 Gbps) x 1 SATA Power (5V) x 1
Ethernet	RTL8111, 10/100/1000Base, RJ45 x 2 (Compatible with RJ45 x 1)
USB Port	2 x USB3.2 Gen 2 rear IO 2 x USB2.0 header
Serial Port	RS-232/422/485 x 2
Audio	—
DIO	4-bit
Expansion Slot	M.2 2230 E-key x 1 (for Wi-Fi/Bluetooth, PCIe/USB signal only) Mini PCIe (Full-Sized) x 1 (Default mSATA or USB2.0, PCIe set by BIOS) SMBUS/I2C + eSPI x 1 (SMBUS as default, I2C selected by HW BOM) CANBus x 2 (see note)
SIM	—
TPM	Intel® PTT (Integrated TPM)

Note: CANBus not supported by Celeron J6412 or Celeron N6210 processors.

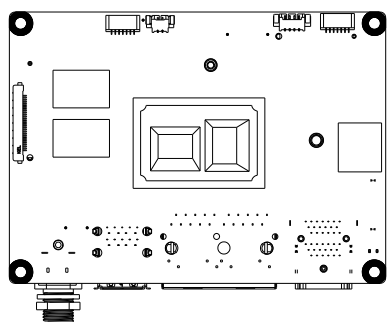
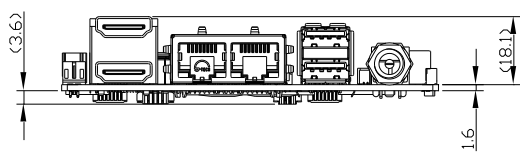
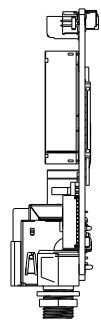
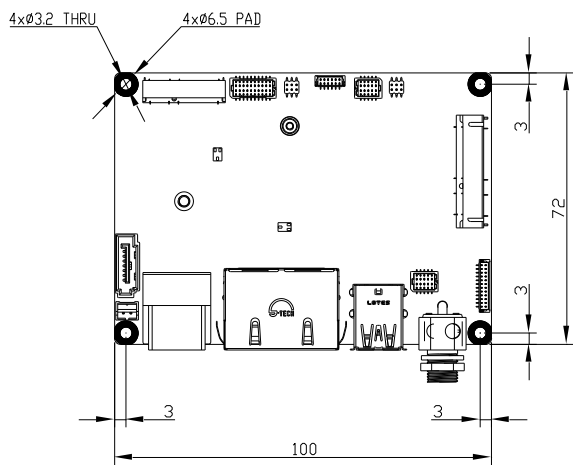
1.2 Function Block Diagram



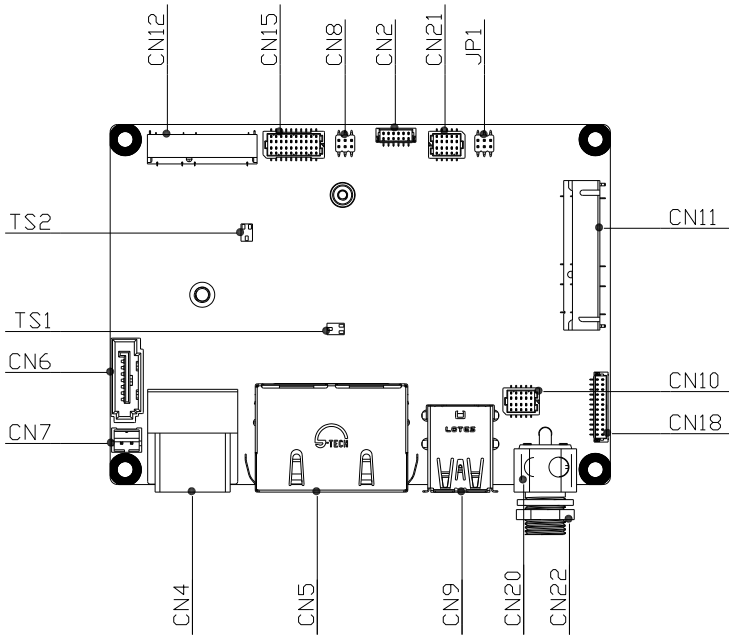
Chapter 2

Hardware Information

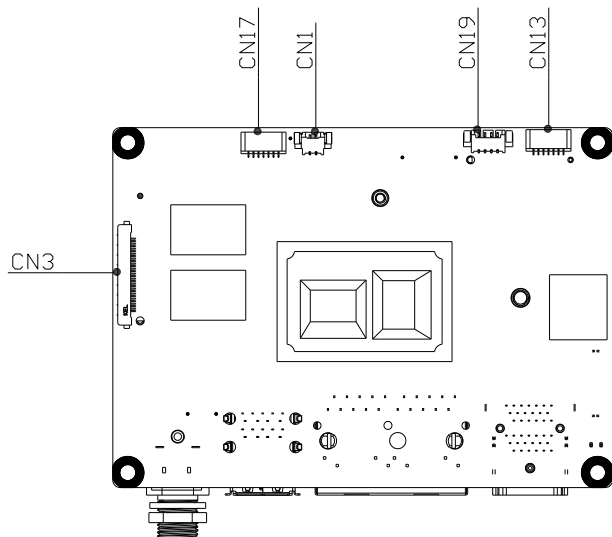
2.1 Dimensions



2.2 Jumpers and Connectors



Component Side



Solder Side

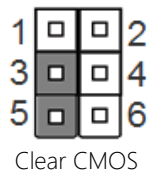
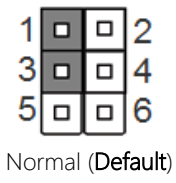
2.3 List of Jumpers

Please refer to the table below for all of the board's jumpers that you can configure for your application

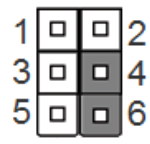
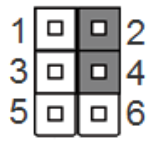
Label	Function
JP1	Clear CMOS Jumper, Auto Power Button Selection

2.3.1 Clear CMOS Jumper, Auto Power Button Selection (JP1)

Clear CMOS Jumper



Auto Power Button Enable/Disable Selection



Note: To avoid damage to the system, do not connect pins 1,3,5 with pins 2,4,6.

2.4 List of Connectors

Please refer to the table below for all of the board's connectors that you can configure for your application

Label	Function
CN1	RTC Battery Connector
CN2	LVDS Back Light Inverter
CN3	LVDS/eDP [Reserved]
CN4	Dual HDMI Connector
CN5	Dual RJ45 Connector
CN6	SATA Connector
CN7	SATA Power +5V Connector
CN8	4-bit DIO Header
CN9	USB2.0/USB3.2 Gen2 Dual Connector Port1, Port2
CN10	USB2.0 Header (Supports 2 Ports)
CN11	mSATA/ Mini Card Slot
CN12	M.2 E-Key Slot
CN13	CAN Bus Header (Supports 2 Ports)
CN15	COM Header (Supports 2 Ports)
CN17	SPI
CN18	eSPI/SMBus/I2C
CN19	4-pin Smart FAN
CN20	Power Input 12V
CN21	Front Panel Header
CN22	DC Jack Power Input [Reserved]
CN23	RJ45 Connector [Reserved]

2.4.1 RTC Battery Connector (CN1)

Pin	Pin Name	Signal Type	Signal Level
1	+3.3V	PWR	+3.3V
2	GND	GND	

2.4.2 LVDS Back Light Inverter (CN2)

Pin	Pin Name	Signal Type	Signal Level
1	BLK_PWR	PWR	+12V (Default)/ +5V
2	BLK_PWR	PWR	+12V (Default)/ +5V
3	BKL_CONTROL		
4	GND	GND	
5	GND	GND	
6	BKL_ENABLE		+3.3V

Note 1: Backlight Power can be 12V or 5V, set by BOM: SKU R466 for 12V and SKU R2679 for 5V (Default is 12V).

Note 2: CN2 max current 2A.

2.4.3 LVDS/eDP (Reserved) (CN3)

Pin	Pin Name	Signal Type	Signal Level
1	+VDD	PWR	+3.3V
2	+VDD	PWR	+3.3V
3	+VDD	PWR	+3.3V
4	GND	GND	

Pin	Pin Name	Signal Type	Signal Level
5	LVD1_CA_2_DN/ EDP_LANE2_DN	DIFF	
6	LVD1_CA_2_DP/ EDP_LANE2_DP	DIFF	
7	GND	GND	
8	LVD1_CA_1_DN/ EDP_LANE1_DN	DIFF	
9	LVD1_CA_1_DP/ EDP_LANE1_DP	DIFF	
10	GND	GND	
11	LVD1_CA_0_DN/ EDP_LANE0_DN	DIFF	
12	LVD1_CA_0_DP/ EDP_LANE0_DP	DIFF	
13	GND	GND	
14	LVD1_CA_3_DN/ EDP_LANE3_DN	DIFF	
15	LVD1_CA_3_DP/ EDP_LANE3_DP	DIFF	
16	GND	GND	
17	LVD1_CA_CLKN/ EDP_AUX_DN	DIFF	
18	LVD1_CA_CLKP/ EDP_AUX_DP	DIFF	
19	GND	GND	
20	LVD1_BKLCTL/ DDIO_BKLTCTL_R		
21	LVD1_DDC_DATA		
22	LVD1_BKLTEN/ DDIO_BKLTEN_R		
23	LVD1_DDC_CLK/ DDIO_HPD		
24	GND	GND	
25	GND	GND	
26	GND	GND	

Pin	Pin Name	Signal Type	Signal Level
27	+VCC_EDP_BKLT	PWR	+12V (Default) / +5V
28	+VCC_EDP_BKLT	PWR	+12V (Default) / +5V
29	+VCC_EDP_BKLT	PWR	+12V (Default) / +5V
30	+VCC_EDP_BKLT	PWR	+12V (Default) / +5V

Note 1: Backlight Power can be 12V or 5V, set by BOM: SKU R466 for 12V and SKU R2679 for 5V (Default is 12V).

Note 2: CN3 Backlight power max current 1.2A. VDD power max current 1A

2.4.4 Dual HDMI Connector (CN4)

Pin	Pin Name	Signal Type	Signal Level
1	HDMI_TX2+	DIFF	
2	GND	GND	
3	HDMI_TX2-	DIFF	
4	HDMI_TX1+	DIFF	
5	GND	GND	
6	HDMI_TX1-	DIFF	
7	HDMI_TX0+	DIFF	
8	GND	GND	
9	HDMI_TX0-	DIFF	
10	HDMI_CLK+	DIFF	
11	GND	GND	
12	HDMI_CLK-	DIFF	
13	NC		
14	NC		

Pin	Pin Name	Signal Type	Signal Level
15	DDC_CLK	I/O	+5V
16	DDC_DATA	I/O	+5V
17	GND	GND	
18	+5V	PWR	+5V
19	HDMI_HPD		
20	HDMI_TX2+	DIFF	
21	GND	GND	
22	HDMI_TX2-	DIFF	
23	HDMI_TX1+	DIFF	
24	GND	GND	
25	HDMI_TX1-	DIFF	
26	HDMI_TX0+	DIFF	
27	GND	GND	
28	HDMI_TX0-	DIFF	
29	HDMI_CLK+	DIFF	
30	GND	GND	
31	HDMI_CLK-	DIFF	
32	NC		
33	NC		
34	DDC_CLK	I/O	+5V
35	DDC_DATA	I/O	+5V
36	GND	GND	
37	+5V	PWR	+5V
38	HDMI_HPD		

2.4.5 Dual LAN Connector (CN5)

Pin	Pin Name	Signal Type	Signal Level
1P1	LAN1_MDI0+	DIFF	
1P2	LAN1_MDI0-	DIFF	
1P3	LAN1_MDI1+	DIFF	
1P4	LAN1_MDI1-	DIFF	
1P5	GND	GND	
1P6	GND	GND	
1P7	LAN1_MDI2+	DIFF	
1P8	LAN1_MDI2-	DIFF	
1P9	LAN1_MDI3+	DIFF	
1P10	LAN1_MDI3-	DIFF	
1L1	LAN1_LED_LNK#_ACT	Signal	
1L2	+V3P3A	VDD	3.3V
1L3	LAN1_LED_100#	Signal	
1L4	LAN1_LED_1000#	Signal	
2P1	LAN2_MDI0+	DIFF	
2P2	LAN2_MDI0-	DIFF	
2P3	LAN2_MDI1+	DIFF	
2P4	LAN2_MDI1-	DIFF	
2P5	GND	GND	
2P6	GND	GND	
2P7	LAN2_MDI2+	DIFF	
2P8	LAN2_MDI2-	DIFF	
2P9	LAN2_MDI3+	DIFF	
2P10	LAN2_MDI3-	DIFF	

Pin	Pin Name	Signal Type	Signal Level
2L1	LAN2_LED_LNK#_ACT	Signal	
2L2	+V3P3A	VDD	3.3V
2L3	LAN2_LED_100#	Signal	
2L4	LAN2_LED_1000#	Signal	

2.4.6 SATA Port (CN6)

Pin	Pin Name	Signal Type	Signal Level
1	GND	GND	
2	SATA_1_TXP	DIFF	
3	SATA_1_TXN	DIFF	
4	GND	GND	
5	SATA_1_RXN	DIFF	
6	SATA_1_RXP	DIFF	
7	GND	GND	

2.4.7 +5V SATA Power Connector (CN7)

Pin	Pin Name	Signal Type	Signal Level
1	+5V	PWR	+5V
2	GND	GND	

Note: CN7 SATA Power max current 1.5A.

2.4.8 DIO 4-bit Header (CN8)

Pin	Pin Name	Signal Type	Signal Level
1	+V5S	VDD	5V
2	DIO_0	Signal	
3	DIO_1	Signal	
4	DIO_2	Signal	
5	DIO_3	Signal	
6	GND	GND	GND

Note: CN8 DIO power max current: 0.5A.

2.4.9 USB2.0/ USB3.2 Dual Port (Port 1/ Port 2) (CN9)

Pin	Pin Name	Signal Type	Signal Level
1	+V5A_USB12	PWR	+5V
2	USB2_0_DN	DIFF	
3	USB2_0_DP	DIFF	
4	GND	GND	
5	USB3_0_RXN	DIFF	
6	USB3_0_RXP	DIFF	
7	GND	GND	
8	USB3_0_TXN	DIFF	
9	USB3_0_TXP	DIFF	
10	+V5A_USB12	PWR	+5V
11	USB2_1_DN	DIFF	
12	USB2_1_DP	DIFF	

Pin	Pin Name	Signal Type	Signal Level
13	GND	GND	
14	USB3_1_RXN	DIFF	
15	USB3_1_RXP	DIFF	
16	GND	GND	
17	USB3_1_TXN	DIFF	
18	USB3_1_TXP	DIFF	

Note: CN9 USB Power max current: 2.0A, 1.0A for each port.

2.4.10 USB2.0 Dual Port Header (CN10)

Pin	Pin Name	Signal Type	Signal Level
1	+V5A_USB34	PWR	+5V
2	+V5A_USB34	PWR	+5V
3	USB2_2_DN	DIFF	
4	USB2_3_DN	DIFF	
5	USB2_2_DP	DIFF	
6	USB2_3_DP	DIFF	
7	GND	GND	
8	GND	GND	
9	GND	GND	
10	GND	GND	

Note: CN10 USB Power max current: 2.0A, 1.0A for each port.

2.4.11 mSATA/ Mini Card Slot (CN11)

Pin	Pin Name	Signal Type	Signal Level
1	PCIE_WAKE#	IN	
2	+3.3V	PWR	+3.3V
3	NC		
4	GND	GND	
5	NC		
6	+1.5V	PWR	+1.5V
7	PCIE_CLK_REQ#	IN	
8	NC		
9	GND	GND	
10	NC		
11	PCIE_REF_CLK-	DIFF	
12	NC		
13	PCIE_REF_CLK+	DIFF	
14	NC		
15	GND	GND	
16	NC		
17	NC		
18	GND	GND	
19	NC		
20	W_DISABLE#	OUT	+3.3V
21	GND	GND	
22	PCIE_RST#	OUT	+3.3V
23	PCIE_RX-/SATA_RX+	DIFF	
24	+3.3V	PWR	+3.3V

Pin	Pin Name	Signal Type	Signal Level
25	PCIE_RX+/SATA_RX-	DIFF	
26	GND	GND	
27	GND	GND	
28	+1.5V	PWR	+1.5V
29	GND	GND	
30	SMB_CLK	I/O	+3.3V
31	PCIE_TX-/SATA_TX-	DIFF	
32	SMB_DATA	I/O	+3.3V
33	PCIE_TX+/SATA_TX+	DIFF	
34	GND	GND	
35	GND	GND	
36	USB_D-	DIFF	
37	GND	GND	
38	USB_D+	DIFF	
39	+3.3V	PWR	+3.3V
40	GND	GND	
41	+3.3V	PWR	+3.3V
42	NC		
43	GND	GND	
44	NC		
45	NC		
46	NC		
47	NC		
48	+1.5V	PWR	+1.5V
49	NC		
50	GND	GND	

Pin	Pin Name	Signal Type	Signal Level
51	NC		
52	+3.3V	PWR	+3.3V

2.4.12 M.2 E-Key Slot (CN12)

Pin	Pin Name	Signal Type	Signal Level
1	GND	GND	
2	+V3P3A	PWR	3.3V
3	USB2_4_DP	DIFF	
4	+V3P3A	PWR	3.3V
5	USB2_4_DN	DIFF	
6	NC		
7	GND	GND	
8	NC		
9	NC		
10	NC		
11	NC		
12	NC		
13	NC		
14	NC		
15	NC		
16	NC		
17	NC		
18	GND	GND	
19	NC		
20	NC		

Pin	Pin Name	Signal Type	Signal Level
21	NC		
22	NC		
23	NC		
32	NC		
33	GND	GND	
34	NC		
35	PCIE_2_TXP	DIFF	
36	NC		
37	PCIE_2_TXN	DIFF	
38	NC		
39	GND	GND	
40	NC		
41	PCIE_2_RXP	DIFF	
42	NC		
43	PCIE_2_RXN	GND	
44	NC		
45	GND	GND	
46	NC		
47	PCIE_0_CLK_DP	DIFF	
48	NC		
49	PCIE_0_CLK_DN	DIFF	
50	NC		
51	GND	GND	
52	BUF_PLT_RST#	Signal	
53	PCIE_CLKREQ#0	Signal	
54	SOC_BT_EN	Signal	

Pin	Pin Name	Signal Type	Signal Level
55	PCIE_WAKE#	Signal	
56	SOC_WIFI_EN	Signal	
57	GND	GND	
58	NC		
59	NC		
60	NC		
61	NC		
62	NC		
63	GND	GND	
64	NC		
65	NC		
66	NC		
67	NC		
68	NC		
69	GND	GND	
70	NC		
71	NC		
72	+V3P3A	PWR	3.3V
73	NC		
74	+V3P3A	PWR	3.3V
75	GND	GND	

2.4.13 CAN Bus Dual Port Header (CN13)

Pin	Pin Name	Signal Type	Signal Level
1	+V5A	PWR	+5V
2	+V3P3A	PWR	+3.3V
3	CAN0_TX		
4	CAN0_RX		
5	GND	GND	
6	CAN1_TX		
7	CAN1_RX		

2.4.14 COM Dual Port Header (CN15)

Pin	RS232 Signal	RS422 Signal	RS485 Signal
1	DCD_1	TX_1-	DATA_1-
2	DCD_2	TX_2-	DATA_2-
3	RX_1	TX_1+	DATA_1+
4	RX_2	TX_2+	DATA_2+
5	TX_1	RX_1+	
6	TX_2	RX_2+	
7	DTR_1	RX_1-	
8	DTR_2	RX_2-	
9	GND	GND	GND
10	GND	GND	GND
11	DSR_1		
12	DSR_2		
13	RTS_1		
14	RTS_2		

Pin	RS232 Signal	RS422 Signal	RS485 Signal
15	CTS_1		
16	CTS_2		
17	RI_1/12V/5V		
18	RI_2/12V/5V		
19	UART_TX		
20	UART_RX		

Note 1: COM RS-232/ 422/ 485 mode can be set by BIOS. Default is RS-232.

Note 2: RI1/+5V/+12V can be set by BOM (R423 RI/ R369 +12V/ R370 +5V). Default is RING.

Note 3: RI2/+5V/+12V can be set by BOM (R424 RI/ R372 +12V/ R373 +5V). Default is RING.

Note 4: Max current: 0.5A for each port.

2.4.15 SPI Port (CN17)

Pin	Pin Name	Signal Type	Signal Level
1	SPI_SO	Signal	
2	GND	GND	
3	SPI_CLK	Signal	
4	+V3P3A_SPI	PWR	+3.3V
5	SPI_SI	Signal	
6	SPI_CS	Signal	
7	NC		

2.4.16 eSPI/ SMBus/ I2C

Pin	Pin Name	Signal Type	Signal Level
1	ESPI_IO0	IN/OUT	+1.8V
2	ESPI_IO1	IN/OUT	+1.8V
3	ESPI_IO2	IN/OUT	+1.8V
4	ESPI_IO3	IN/OUT	+1.8V
5	+V3.3S	PWR	+3.3V
6	ESPI_CS	Signal	
7	ESPI_RESET#	OUT	+1.8V
8	GND	GND	
9	ESPI_CLK	OUT	1.8V
10	SMB_DATA/ I2C_SDA	IN/OUT	+3.3V
11	SMB_CLK/ I2C_CLK	OUT	+3.3V
12	SMB_ALERT/ INT_SERIRQ	IN	+3.3V

2.4.17 4-pin Smart Fan Connector (CN19)

Pin	Pin Name	Signal Type	Signal Level
1	GND	GND	GND
2	+V12S	PWR	+12V
3	FAN_TAC	Signal	
4	FAN_CTL	Signal	

Note: CN19 Smart Fan power max current: 1.0A.

2.4.18 Power Input +12V (CN20)

Pin	Pin Name	Signal Type	Signal Level
1	+V_IN	PWR	+12V
2	GND	GND	

2.4.19 Front Panel (CN21)

Pin	Pin Name	Signal Type	Signal Level
1	GND	GND	
2	EXT_PWRBTN#	Signal	
3	FP_IDELED#	Signal	
4	+V3P3S	PWR	+3.3V
5	FP_BUZZER	Signal	
6	+V5S	PWR	+5V
7	GND		
8	+V3P3S	PWR	+3.3V
9	GND		
10	HWRST#	Signal	

2.4.20 DC Jack Power Input (Reserved) (CN22)

Pin	Pin Name	Signal Type	Signal Level
1	+V_IN	PWR	+12V
2	GND	GND	
3	GND	GND	

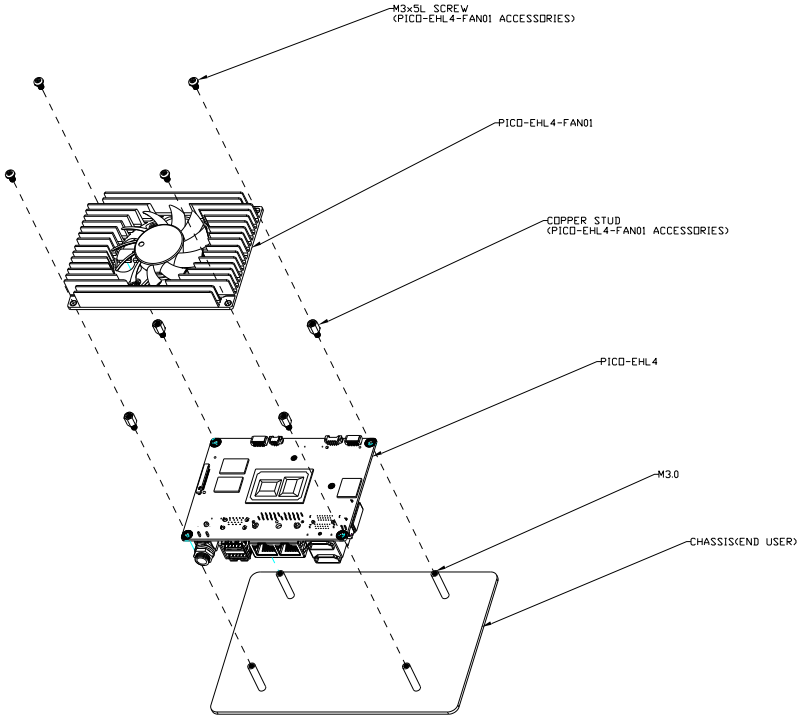
2.4.21 RJ45 Connector (Reserved)

Pin	Pin Name	Signal Type	Signal Level
1P1	LAN1_MDI0+	DIFF	
1P2	LAN1_MDI0-	DIFF	
1P3	LAN1_MDI1+	DIFF	
1P4	LAN1_MDI1-	DIFF	
1P5	GND	GND	
1P6	GND	GND	
1P7	LAN1_MDI2+	DIFF	
1P8	LAN1_MDI2-	DIFF	
1P9	LAN1_MDI3+	DIFF	
1P10	LAN1_MDI3-	DIFF	
1L1	LAN1_LED_LNK#_ACT	Signal	
1L2	+V3P3A	VDD	3.3V
1L3	LAN1_LED_100#	Signal	
1L4	LAN1_LED_1000#	Signal	

2.5 Thermal Assembly Options

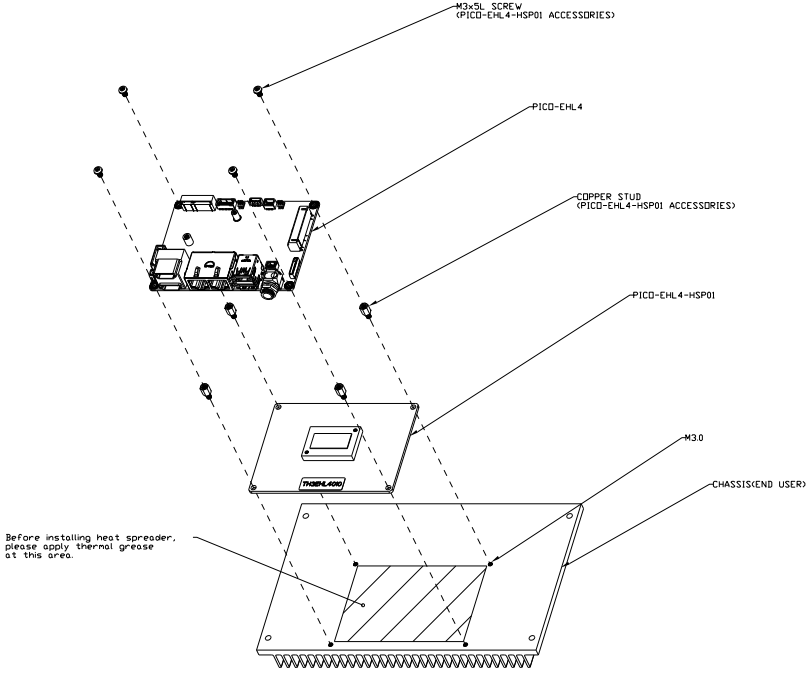
2.5.1 Active Cooling Fan FAN01

Active Cooling Fan, Part Number: PICO-EHL4-FAN01



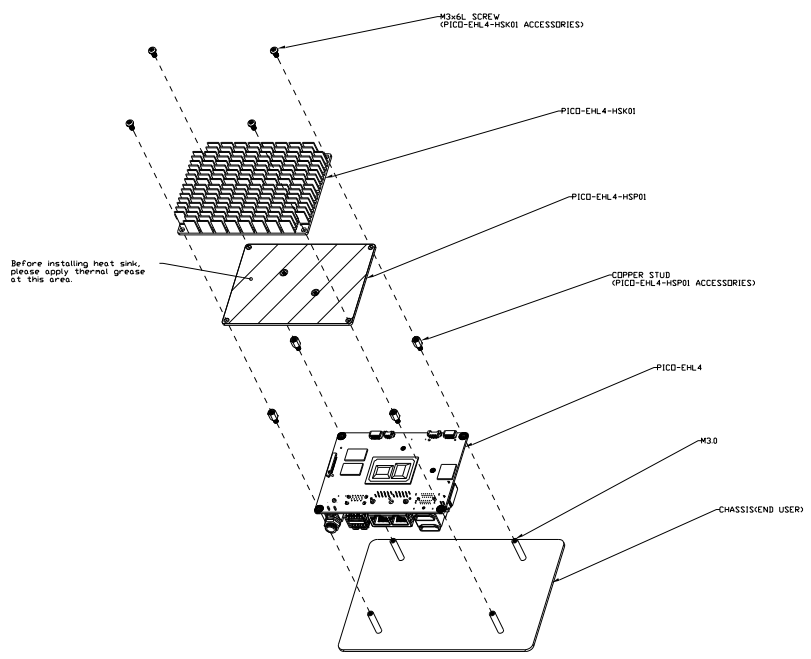
2.5.2 Fan-less Heatspreader HSP01

Heat spreader/ fan-less assembly, Part Number: PICO-EHL4-HSP01



2.5.3 Heatsink HSK01 (with Heatspreader)

Heatsink with Heatspreader, Part Number: PICO-EHL4-HSK01



Chapter 3

AMI BIOS Setup

3.1 System Test and Initialization

The PICO-EHL4 uses certain routines to perform testing and initialization during the boot up sequence. If an error, fatal or non-fatal, is encountered, the system will output a few short beeps or display an error message. The board can usually continue the boot up sequence with non-fatal errors.

The system configuration verification routines check the current system configuration against the values stored in the CMOS memory and BIOS NVRAM. If a system configuration is not found or an error is detected, the system will load the default configuration and reboot automatically.

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

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

The PICO-EHL4 CMOS memory has an integrated lithium battery backup for data retention. The battery must be replaced when it runs down.

3.2 AMI BIOS Setup

The AMI BIOS ROM has a pre-installed Setup program that allows users to modify basic system configurations. These configurations are stored in the battery-backed CMOS RAM and BIOS NVRAM so the information is retained when power is turned off.

To enter BIOS Setup, turn on the system and immediately press or <ESC>.

The following BIOS menus and their functions are listed below.

Main: Set the date and time, use tab to switch between date elements.

Advanced: Access advanced hardware options and settings.

Chipset – Chipset settings and options, including memory and graphics settings.

Security: Set setup administrator password and manage Secure Boot settings.

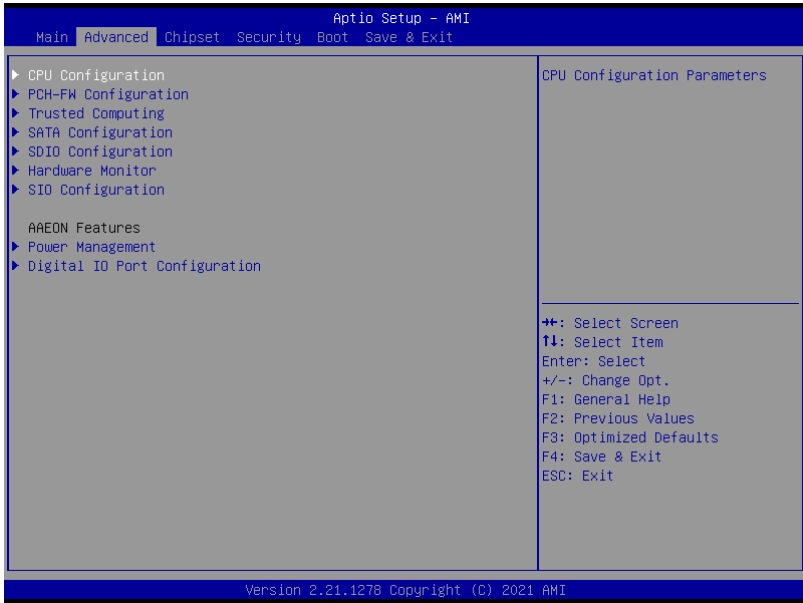
Boot: Boot Options, including Quiet Boot and BBS Priorities.

Save & Exit: Save changes to BIOS settings and exit BIOS program. Note: The system may need to restart for changes to take effect.

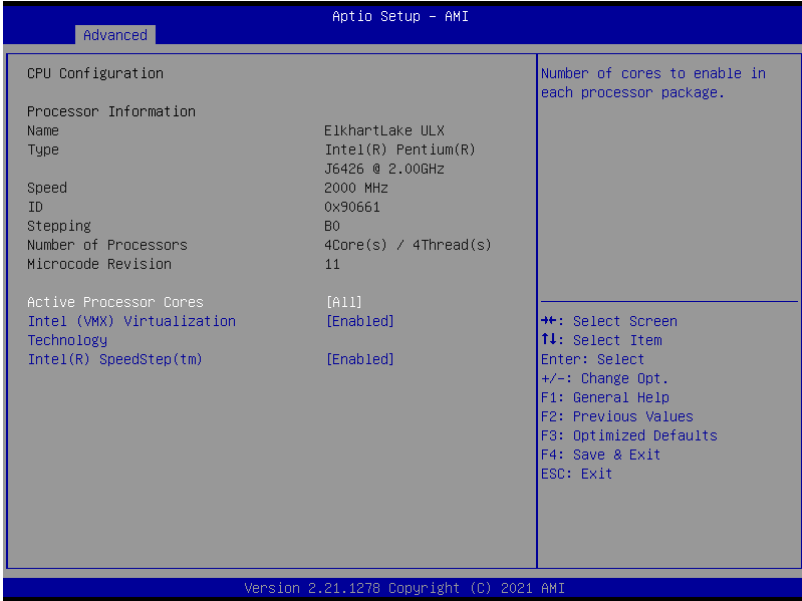
3.3 Setup Submenu: Main



3.4 Setup Submenu: Advanced

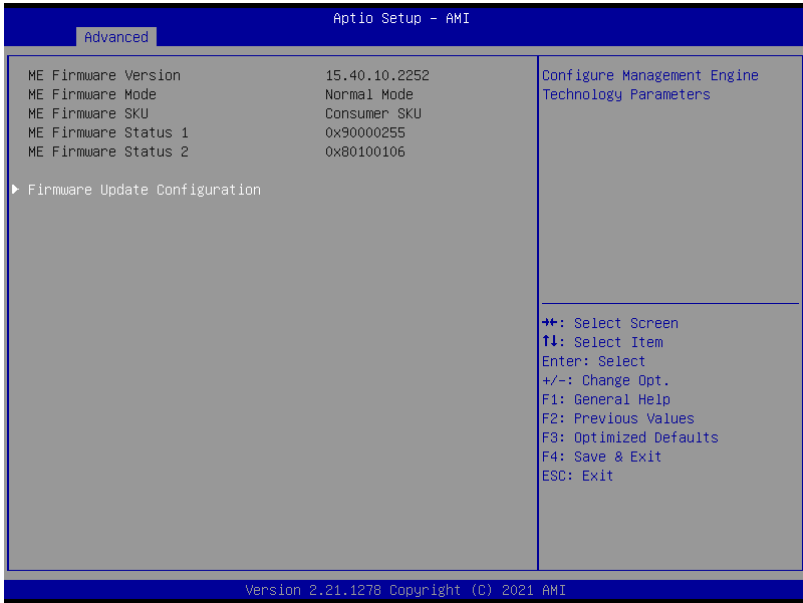


3.4.1 CPU Configuration

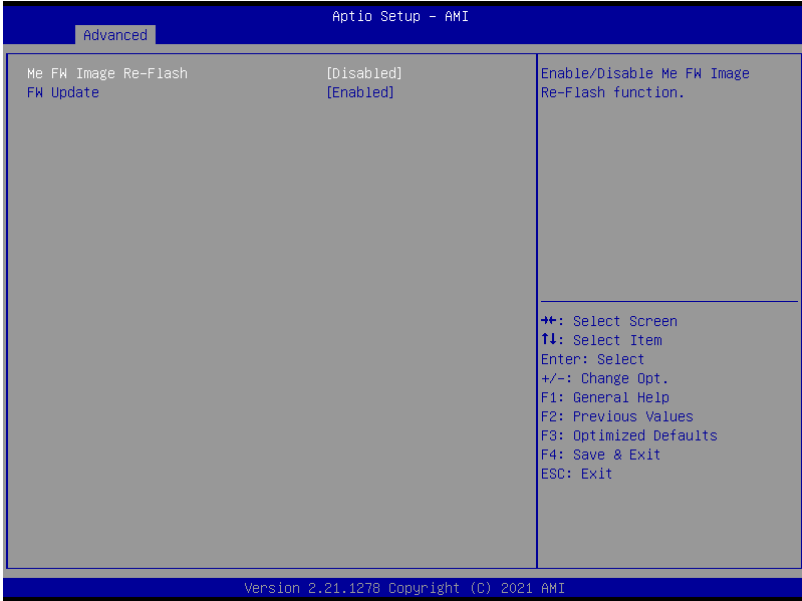


Options Summary		
Active Processor Cores	All	Optimal Default, Failsafe Default
	1~N	
Number of cores to enable in each processor package.		
Intel (VMX) Virtualization Technology	Disabled	Optimal Default, Failsafe Default
	Enabled	
When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.		

3.4.2 PCH-FW Configuration

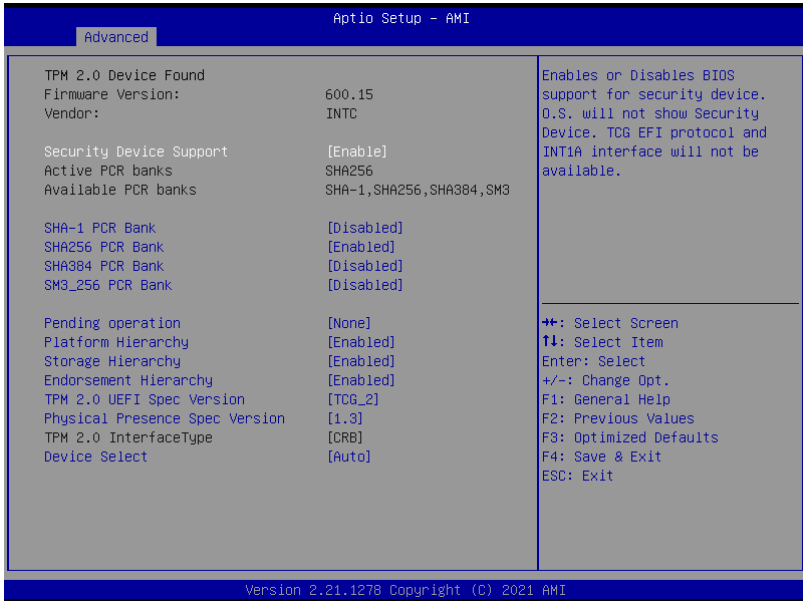


3.4.2.1 Firmware Update Configuration



Options Summary		
Me FW Image Re-Flash	Enabled	Optimal Default, Failsafe Default
	Disabled	
Enable/Disable Me FW Image Re-Flash function.		
FW Update	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enable/Disable ME FW Update function.		

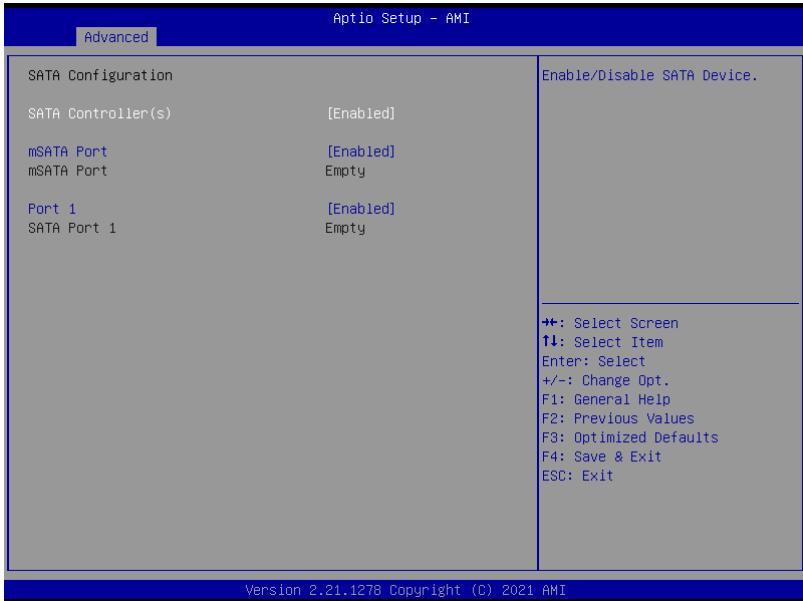
3.4.3 Trusted Computing



Options Summary		
Security Deice Support	Enable	Optimal Default, Failsafe Default
	Disable	
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.		
SHA-1 PCR Bank	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enable or Disable SHA-1 PCR Bank		
SHA256 PCR Bank	Enabled	Optimal Default, Failsafe Default
	Disabled	
Enable or Disable SHA256 PCR Bank.		
SHA384 PCR Bank	Enabled	Optimal Default, Failsafe Default
	Disabled	
Enable or Disable SHA384 PCR Bank.		
SM3_256 PCR Bank	Enabled	Optimal Default, Failsafe Default
	Disabled	
Enable or Disable SM3_256 PCR Bank		

Options Summary		
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.		
Platform Hierarchy	Enabled	Optimal Default, Failsafe Default
	Disabled	
Enable or Disable Platform Hierarchy		
Storage Hierarchy	Enabled	Optimal Default, Failsafe Default
	Disabled	
Enable or Disable Storage Hierarchy		
Endorsement Hierarchy	Enabled	Optimal Default, Failsafe Default
	Disabled	
Enable or Disable Endorsement Hierarchy		
TPM 2.0 UEFI Spec Version	TCG_2	Optimal Default, Failsafe Default
	TCG_1_2	
Select the TCH2 Spec Version Support. TCG_1_2: the Compatible mode for Win8/Win10 TCG_2: Support new TCG2 protocol and event format for Win10 or later		
Physical Presence Spec Version	1.3	Optimal Default, Failsafe Default
	1.2	
Select to Tell O.S. to support PPI Spec Version 1.2 or 1.3. Note some HCK tests might not support 1.3		
Device Select	Auto	Optimal Default, Failsafe Default
	TPM 1.2	
	TPM 2.0	
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 devices will be enumerated.		

3.4.4 SATA Configuration



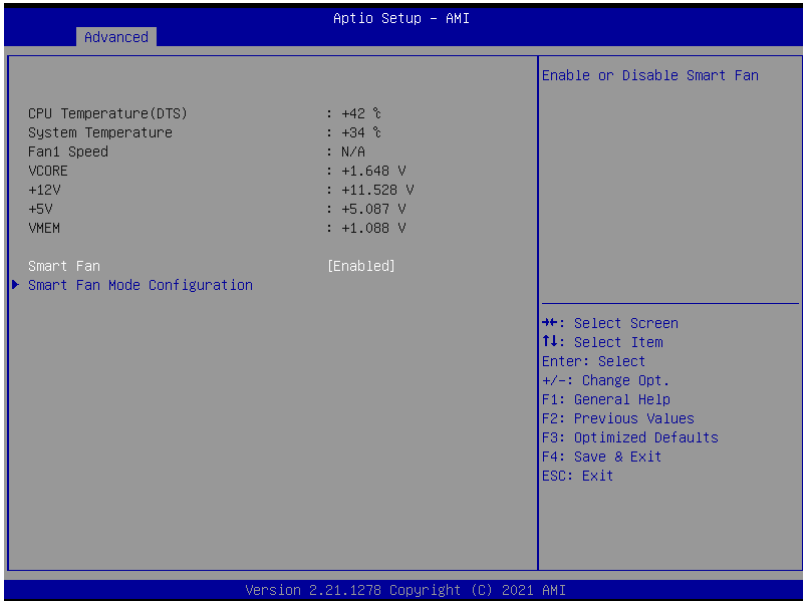
Options Summary		
SATA Controller(s)	Enabled	Optimal Default, Failsafe Default
	Disabled	
Enable/Disable SATA Device.		
Port*	Enabled	Optimal Default, Failsafe Default
	Disabled	
Enable or Disable SATA Port.		

3.4.5 SDIO Configuration

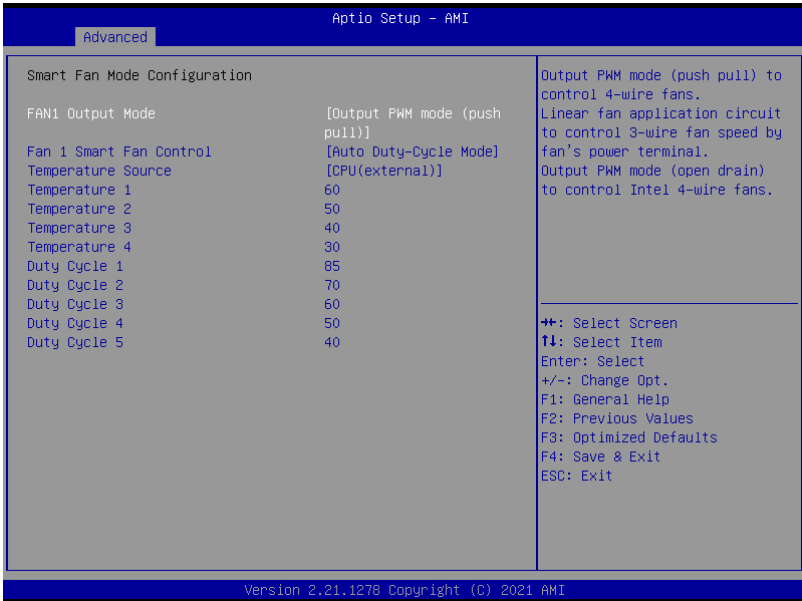


Options Summary		
eMMC 5.1 Controller	Enabled	Optimal Default, Failsafe Default
	Disabled	
Enable or Disable SCS eMMC 5.1 Controller		
SDIO Access Mode	Auto	Optimal Default, Failsafe Default
	ADMA	
	SDMA	
Auto Option: Access SD device in DMA mode if controller supports it, otherwise in PIO mode.		
DMA Option: Access SD device in DMA mode.		
PIO Option: Access SD device in PIO mode.		

3.4.6 Hardware Monitor



3.4.6.1 Smart Fan Mode Configuration



Options Summary		
Fan1 Output Mode	Output PWM mode (open drain)	Optimal Default, Failsafe Default
	Output PWM mode (push pull)	
Output PWM mode (push pull) to control 4-wire fans.\nLinear fan application circuit to control 3-wire fan speed by fan's power terminal.\nOutput PWM mode (open drain) to control Intel 4-wire fans.		
Fan1 Smart Fan control	Manual Duty Mode	Optimal Default, Failsafe Default
	Auto Duty-Cycle Mode	
Smart Fan Mode select		
Manual Duty Mode	60	Optimal Default, Failsafe Default
Manual mode fan control, user can write expected duty cycle (PWM fan type) 1-100		

3.4.7 SIO Configuration

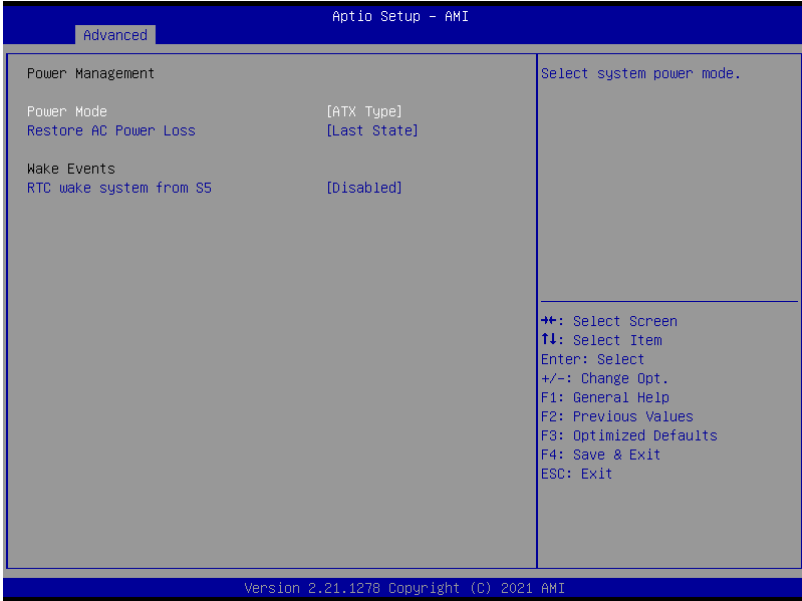


3.4.7.1 Serial Port Configuration



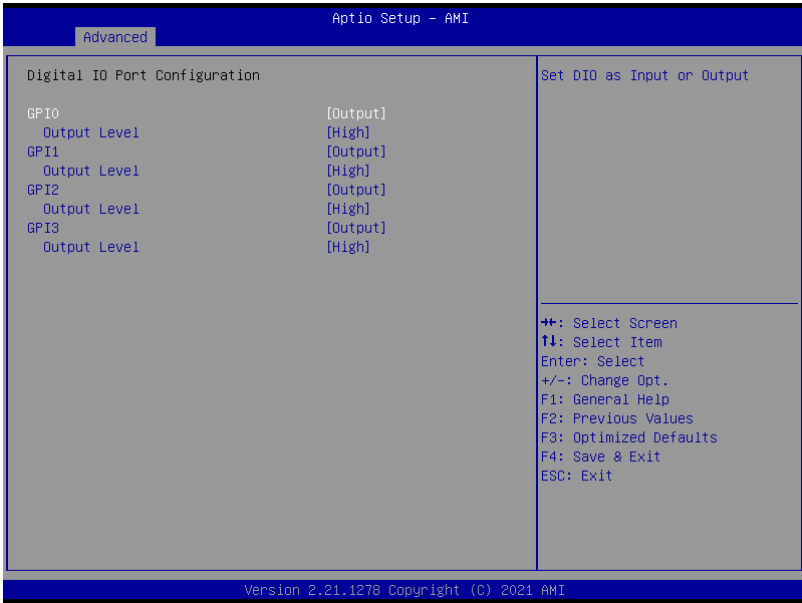
Options Summary		
Use This Device	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enable or Disable Serial Port (COM)		
Possible:	Use Automatic Settings	Optimal Default, Failsafe Default
	IO=2F8; IRQ=3;	
	IO=3F8; IRQ=4;	
Select an optimal setting for IO device		
Mode	RS232	Optimal Default, Failsafe Default
	RS422	
	RS485	
Uart RS232/422/485 selection		

3.4.8 Power Management



Options Summary		
Power Mode	ATX Type	Optimal Default, Failsafe Default
	AT Type	
Select power supply mode.		
Restore AC Power Loss	Last State	Optimal Default, Failsafe Default
	Always On	
	Always Off	
Select power state when power is re-applied after a power failure.		
RTC wake system from S5	Disabled	Optimal Default, Failsafe Default
	Fixed Time	
	Dynamic Time	
	Bypass	
Fixed Time: System will wake on the hr :: min :: sec specified		
Dynamic Time : System will wake on the current time + Increase minutes(s).		
Bypass: BIOS will not control RTC wake function during system shutdown		

3.4.9 Digital IO Port Configuration

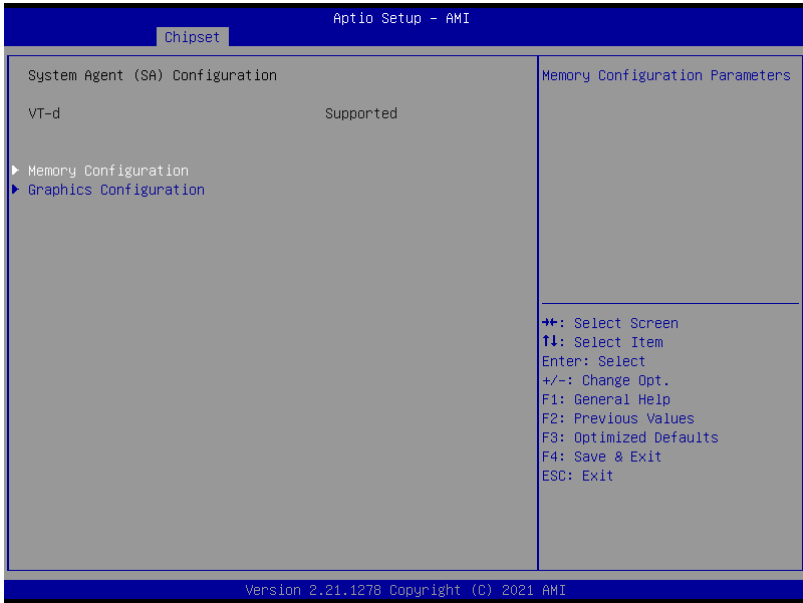


Options Summary		
DIO Port0~3	Output	Optimal Default, Failsafe Default
	Input	
Set DIO as Input or Output		
Output Level	High	Optimal Default, Failsafe Default
	Low	
Set output level when DIO pin is output		

3.5 Setup Submenu: Chipset



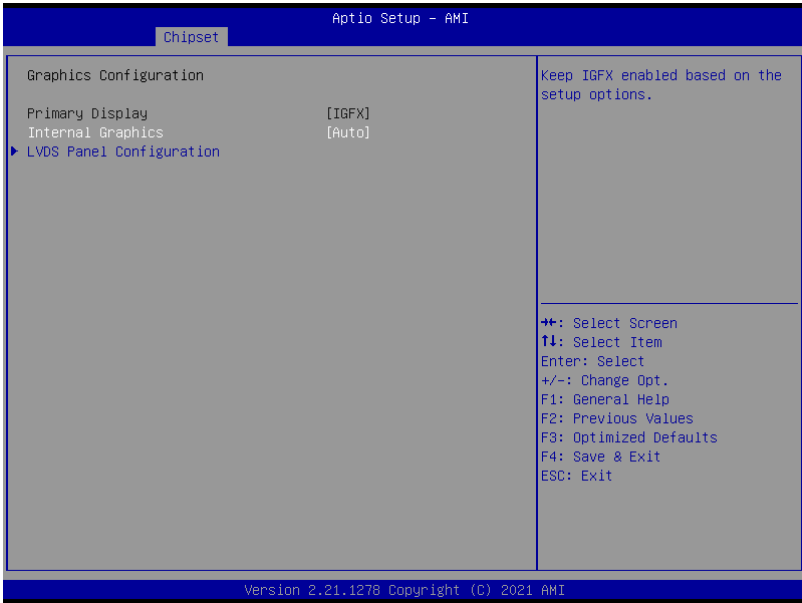
3.5.1 System Agent (SA) Configuration



3.5.11 Memory Configuration

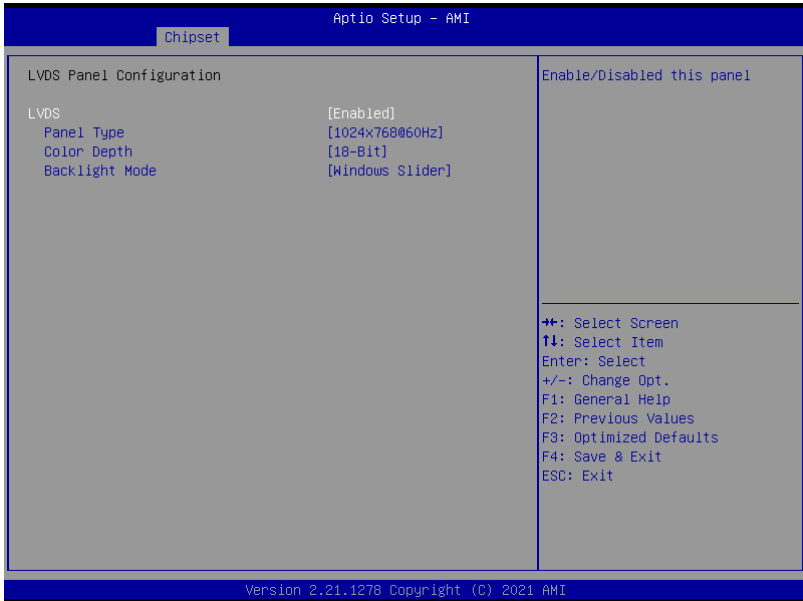


3.5.1.2 Graphics Configuration



Options Summary		
Internal Graphics	Auto	Optimal Default, Failsafe Default
	Disabled	
	Enabled	
Keep IGFX enabled based on the setup options.		

3.5.1.2.1 LVDS Panel Configuration

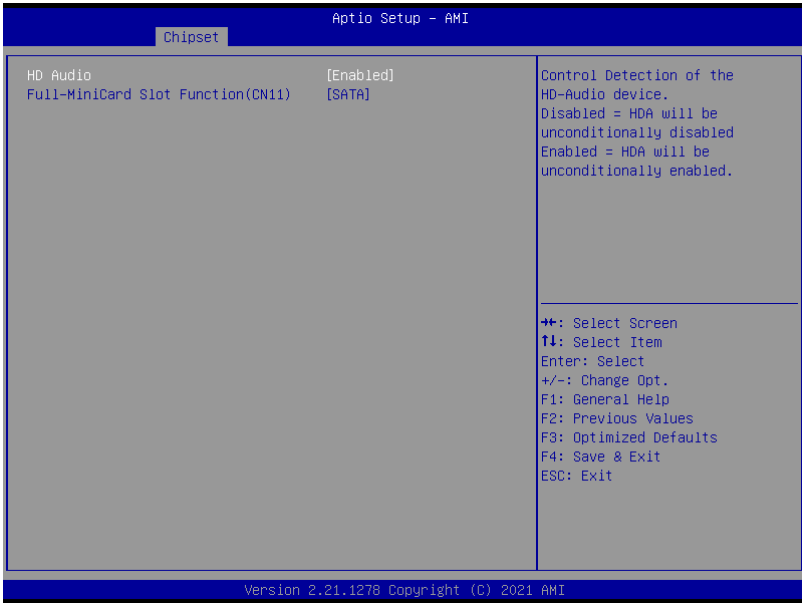


Options Summary		
LVDS	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enable/Disable this panel.		
LVDS Panel Type	640X480@60HZ	Optimal Default, Failsafe Default
	800X480@60HZ	
	800X600@60HZ	
	1024X600@60HZ	
	1024X768@60HZ	
	1280X768@60HZ	
	1280X800@60HZ	
	1280X1024@60HZ	
	1366X768@60HZ	
1440X900@60HZ		
Select panel type		

Table Continues on Next Page...

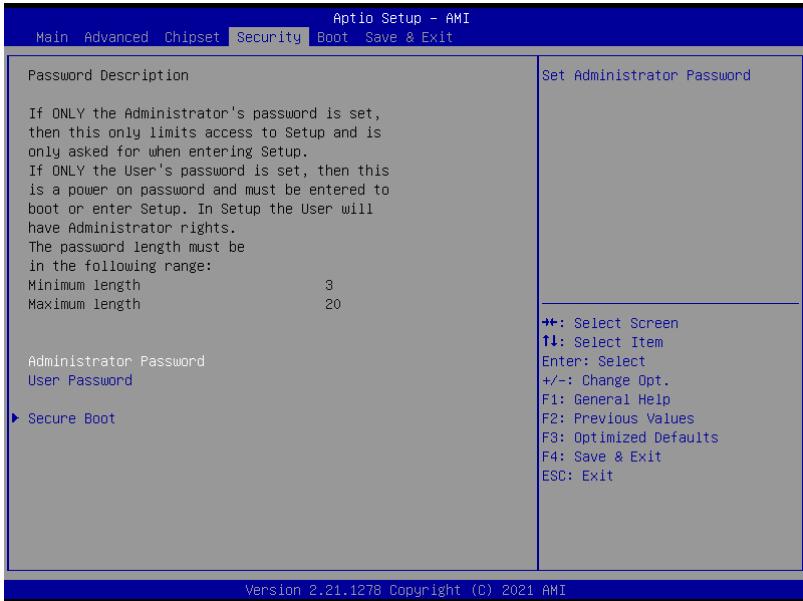
Options Summary		
Color Depth	18-bit	Optimal Default, Failsafe Default
	24-bit	
Select Color Depth		
Backlight Mode	Windows Slider	Optimal Default, Failsafe Default
	BIOS & Application	
Select backlight control signal type		
Backlight Type	Normal	Optimal Default, Failsafe Default
	Inverted	
Select backlight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

3.5.2 PCH-IO Configuration



Options Summary		
HD Audio	Enabled	Optimal Default, Failsafe Default
	Disabled	
Control Detection of the HD-Audio device. Disabled = HDA will be unconditionally disabled Enabled = HDA will be unconditionally enabled.		
Full-MiniCard Slot Function(CN11)	SATA	Optimal Default, Failsafe Default
	PCIe	
Select function enabled for Full-MiniCard(CN11) Slot		

3.6 Setup Submenu: Security



Change User/Administrator Password

You can set an Administrator Password or User Password. An Administrator Password must be set before you can set a User Password. The password will be required during boot up, or when the user enters the Setup utility. A User Password does not provide access to many of the features in the Setup utility.

Select the password you wish to set, and press Enter. In the dialog box, enter your password (must be between 3 and 20 letters or numbers). Press Enter and retype your password to confirm. Press Enter again to set the password.

Removing the Password

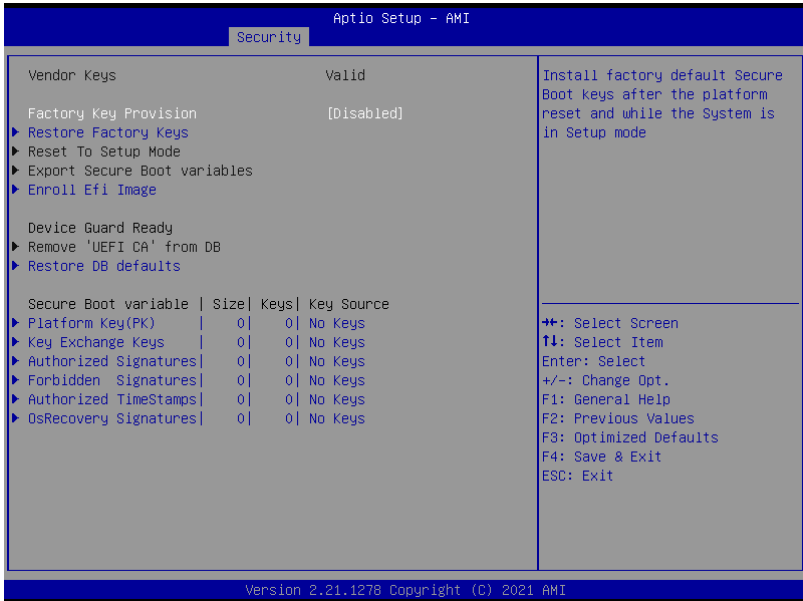
Select the password you want to remove and enter the current password. At the next dialog box press Enter to disable password protection.

3.6.1 Secure Boot



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	Custom	Optimal Default, Failsafe Default
	Standard	
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 databases		
Reset To Setup Mode		
Delete all Secure Boot key databases from NVRAM		

3.6.11 Key Management



Options Summary		
Factory Key Provision	Disabled	Optimal Default, Failsafe Default
	Enabled	
Install factory default Secure Boot keys 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 databases		
Reset To Setup Mode		
Delete all Secure Boot key databases from 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)		

Table Continues on Next Page...

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	

Secure Boot Variables

Enroll Factory Defaults or load certificates from a file:

1. Public Key Certificate in:

- a) EFI_SIGNATURE_LIST
- b) EFI_CERT_X509 (DER encoded)
- c) EFI_CERT_RSA2048 (bin)
- d) EFI_CERT_SHAXXX

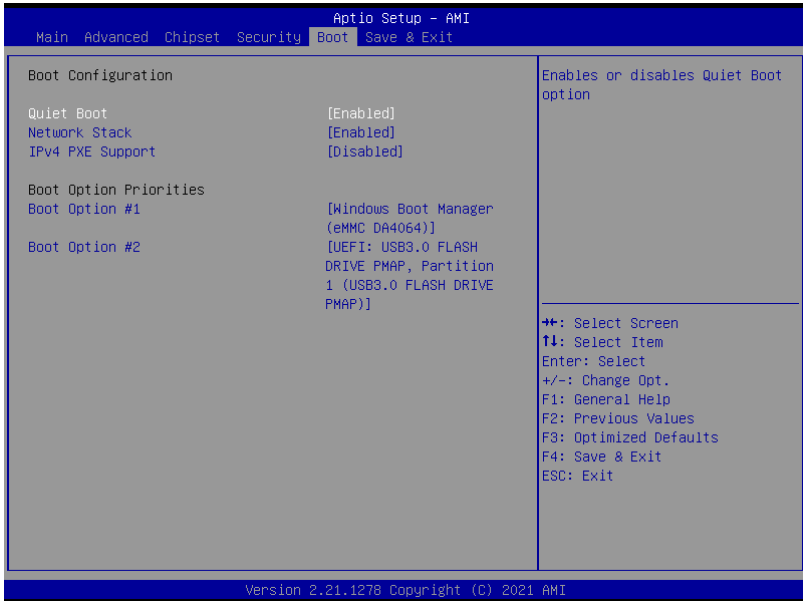
2. Authenticated UEFI Variable

3. EFI PE/COFF Image (SHA256)

Key Source:

Default, External, Mixed

3.7 Setup Submenu: Boot



Options Summary		
Quiet Boot	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enable or Disable Quiet Boot option.		
Network Stack	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enable/Disable UEFI Network Stack.		
IPv4 PXE Support	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enable/Disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.		
FIXED BOOT ORDER Priorities	Sets the system boot order	

3.8 Setup Submenu: Save & Exit



Chapter 4

Drivers Installation

4.1 Drivers Download and Installation

Drivers for the PICO-EHL4 can be downloaded from the product page on the AAEON website by following this link:

<https://www.aaeon.com/en/p/pico-itx-turnkit-pico-ehl4>

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

Step 1 – Install Chipset Driver

1. Open the **Intel Chipset** folder.
2. Run the **SetupChipset.exe** file.
3. Follow the instructions
4. Drivers will be installed automatically

Step 2 – Install Graphics Driver

1. Open the **Intel Graphics** folder.
2. Run the **igxpin.exe** file.
3. Follow the instructions
4. Driver will be installed automatically

Step 3 – Install Serial IO Driver

1. Open the **Serial IO** folder.
2. Serial IO Driver .inf files will need to be installed manually.

Step 4 – Install ME Driver

1. Open the **ME** folder.
2. Run the **SetupME.exe** file
3. Follow the instructions
4. Driver will be installed automatically

Step 5 – Install LAN Driver

1. Open the **LAN** folder.
2. Run the **Install_Win10_10050_08132021.exe** file
3. Follow the instructions
4. Driver will be installed automatically

Step 6 – Peripheral Drivers

1. Open the **Peripheral Drivers** folder.
2. Peripheral Drivers .inf files will need to be installed manually.

For Linux Peripheral Drivers, follow the instructions included in the file to download and install the relevant drivers.

Appendix A

Mating Connectors

A.1 List of Mating Connectors and Cables

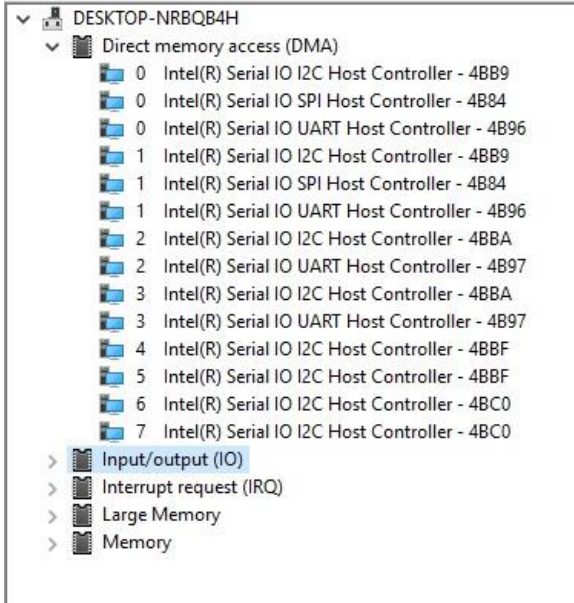
The following table lists mating connectors and available cables.

Connector Label	Function	Mating Connector		Available Cable	Cable P/N
		Vendor	Model no		
CN1	RTC Battery	Molex	51021-0200	Battery Cable	175011301C
CN2	LVDS Back Light Inverter	SHR	WL1010H-6P Terminal: KB901-10T	LVDS Inverter Cable	170X000152
CN3	LVDS	KEL	SSL20-30S	LVDS Cable	170X000314
	EDP			EDP Cable	170X000313
CN6	SATA	Molex	887505318	SATA Cable	1709070500
CN7	SATA Power	JST	PHR-2	SATA Power Cable	1702150155
CN8	4-bit DIO Header	PINREX	633-92-03GB00	N/A	N/A
CN10	USB2.0 Header	ACES	50247-010H0H0-001	USB2.0 Cable	170010010D
CN13	CAN Bus Header	JCTC	HSG: 11002H00-7P TER: 11002TOP-2E	CAN Bus Cable	170X000316
CN15	COM Header	JST	SHDR-20V-S-B	COM Port Cable	170X000231
CN18	eSPI/SMBUS/I2C	JST	SHR-12V-S-B	LPC/eSPI Cable	1703120130
CN19	4-pin Smart FAN	Molex	51021-0400	N/A	N/A
CN20	Power Input	Molex	19211-0003	Power Cable	170204010R
CN21	Front Panel	ACES	50247-010H0H0-001	Front Panel Cable	1709100108
CN22	DC Jack Power Input	HUANG JI	5525C257-3T00-R1-7.5	Power Cable	1702041004

Appendix B

I/O Information

B.1 Direct Memory Access (DMA) Map



B.2 I/O Address Map

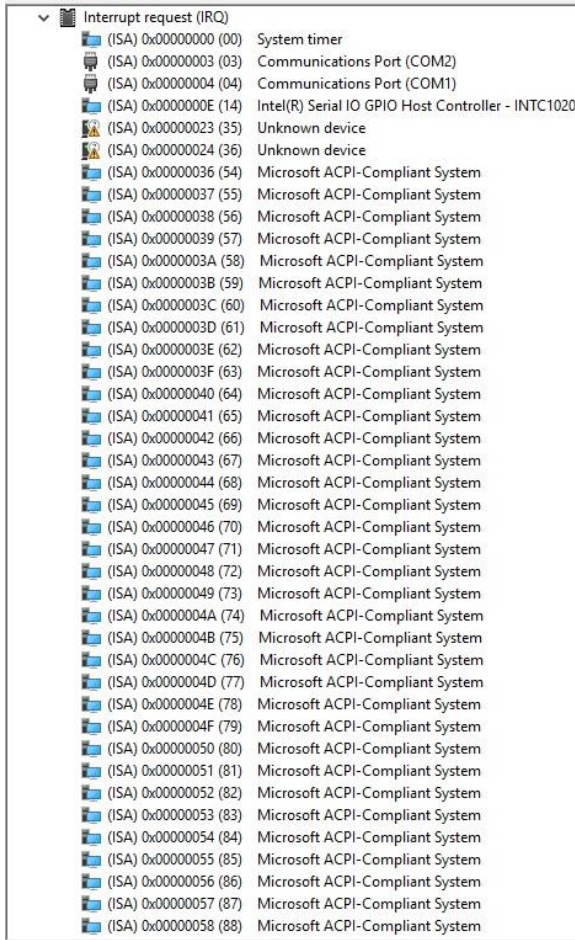
Pico-ITX Board

PICO-EHL4











































Address Range	Device Name
[0000000000000000 - 000000000000CF7]	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
[00000000000002F8 - 00000000000002FF]	Communications Port (COM2)
[00000000000003F8 - 00000000000003FF]	Communications Port (COM1)
[00000000000004D0 - 00000000000004D1]	Programmable interrupt controller
[0000000000000680 - 000000000000069F]	Motherboard resources
[0000000000000A00 - 0000000000000A0F]	Motherboard resources
[0000000000000A10 - 0000000000000A1F]	Motherboard resources
[0000000000000A20 - 0000000000000A2F]	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 - 00000000000030FF]	Realtek PCIe GbE Family Controller
[0000000000003000 - 0000000000003FFF]	Intel(R) PCI Express Root Port #3 - 4B3B
[0000000000004000 - 00000000000040FF]	Realtek PCIe GbE Family Controller #2
[0000000000004000 - 0000000000004FFF]	Intel(R) PCI Express Root Port #0 - 4B38
[0000000000005000 - 000000000000503F]	Intel(R) UHD Graphics
[0000000000005060 - 000000000000507F]	Standard SATA AHCI Controller
[0000000000005080 - 0000000000005083]	Standard SATA AHCI Controller
[0000000000005090 - 0000000000005097]	Standard SATA AHCI Controller
[000000000000EFA0 - 000000000000EFBF]	Intel(R) SMBus Controller - 4B23











































B.3 IRQ Mapping Chart























































































Device Name	IRQ
System timer	(ISA) 0x00000000 (00)
Communications Port (COM2)	(ISA) 0x00000003 (03)
Communications Port (COM1)	(ISA) 0x00000004 (04)
Intel(R) Serial IO GPIO Host Controller - INTCT1020	(ISA) 0x0000000E (14)
Unknown device	(ISA) 0x00000023 (35)
Unknown device	(ISA) 0x00000024 (36)
Microsoft ACPI-Compliant System	(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)











































 (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) 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
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 (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
 (ISA) 0x0000007E (126)	Microsoft ACPI-Compliant System
 (ISA) 0x0000007F (127)	Microsoft ACPI-Compliant System
 (ISA) 0x00000080 (128)	Microsoft ACPI-Compliant System
 (ISA) 0x00000081 (129)	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) 0x00000087 (135)	Microsoft ACPI-Compliant System
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 (ISA) 0x0000008F (143)	Microsoft ACPI-Compliant System
 (ISA) 0x00000090 (144)	Microsoft ACPI-Compliant System
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 (ISA) 0x000000A3 (163)	Microsoft ACPI-Compliant System
 (ISA) 0x000000A4 (164)	Microsoft ACPI-Compliant System
 (ISA) 0x000000A5 (165)	Microsoft ACPI-Compliant System
 (ISA) 0x000000A6 (166)	Microsoft ACPI-Compliant System
 (ISA) 0x000000A7 (167)	Microsoft ACPI-Compliant System
 (ISA) 0x000000A8 (168)	Microsoft ACPI-Compliant System
 (ISA) 0x000000A9 (169)	Microsoft ACPI-Compliant System











































 (ISA) 0x000000A8 (168)	Microsoft ACPI-Compliant System
 (ISA) 0x000000A9 (169)	Microsoft ACPI-Compliant System
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 (ISA) 0x0000010B (267)	Microsoft ACPI-Compliant System
 (ISA) 0x0000010C (268)	Microsoft ACPI-Compliant System
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 (ISA) 0x0000011C (284)	Microsoft ACPI-Compliant System
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 (ISA) 0x0000011F (287)	Microsoft ACPI-Compliant System
 (ISA) 0x00000120 (288)	Microsoft ACPI-Compliant System
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 (ISA) 0x00000128 (296)	Microsoft ACPI-Compliant System
 (ISA) 0x00000129 (297)	Microsoft ACPI-Compliant System
 (ISA) 0x0000012A (298)	Microsoft ACPI-Compliant System
 (ISA) 0x0000012B (299)	Microsoft ACPI-Compliant System
 (ISA) 0x0000012C (300)	Microsoft ACPI-Compliant System











































 (ISA) 0x0000012C (300)	Microsoft ACPI-Compliant System
 (ISA) 0x0000012D (301)	Microsoft ACPI-Compliant System
 (ISA) 0x0000012E (302)	Microsoft ACPI-Compliant System
 (ISA) 0x0000012F (303)	Microsoft ACPI-Compliant System
 (ISA) 0x00000130 (304)	Microsoft ACPI-Compliant System
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 (ISA) 0x00000139 (313)	Microsoft ACPI-Compliant System
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 (ISA) 0x0000013B (315)	Microsoft ACPI-Compliant System
 (ISA) 0x0000013C (316)	Microsoft ACPI-Compliant System
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 (ISA) 0x0000013F (319)	Microsoft ACPI-Compliant System
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 (ISA) 0x0000014E (334)	Microsoft ACPI-Compliant System
 (ISA) 0x0000014F (335)	Microsoft ACPI-Compliant System
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 (ISA) 0x00000152 (338)	Microsoft ACPI-Compliant System
 (ISA) 0x00000153 (339)	Microsoft ACPI-Compliant System
 (ISA) 0x00000154 (340)	Microsoft ACPI-Compliant System
 (ISA) 0x00000155 (341)	Microsoft ACPI-Compliant System

 (ISA) 0x00000154 (340)	Microsoft ACPI-Compliant System
 (ISA) 0x00000155 (341)	Microsoft ACPI-Compliant System
 (ISA) 0x00000156 (342)	Microsoft ACPI-Compliant System
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 (ISA) 0x00000158 (344)	Microsoft ACPI-Compliant System
 (ISA) 0x00000159 (345)	Microsoft ACPI-Compliant System
 (ISA) 0x0000015A (346)	Microsoft ACPI-Compliant System
 (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
 (ISA) 0x00000162 (354)	Microsoft ACPI-Compliant System
 (ISA) 0x00000163 (355)	Microsoft ACPI-Compliant System
 (ISA) 0x00000164 (356)	Microsoft ACPI-Compliant System
 (ISA) 0x00000165 (357)	Microsoft ACPI-Compliant System
 (ISA) 0x00000166 (358)	Microsoft ACPI-Compliant System
 (ISA) 0x00000167 (359)	Microsoft ACPI-Compliant System
 (ISA) 0x00000168 (360)	Microsoft ACPI-Compliant System
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 (ISA) 0x0000016A (362)	Microsoft ACPI-Compliant System
 (ISA) 0x0000016B (363)	Microsoft ACPI-Compliant System
 (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
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 (ISA) 0x00000173 (371)	Microsoft ACPI-Compliant System
 (ISA) 0x00000174 (372)	Microsoft ACPI-Compliant System
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 (ISA) 0x00000177 (375)	Microsoft ACPI-Compliant System
 (ISA) 0x00000178 (376)	Microsoft ACPI-Compliant System
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 (ISA) 0x0000017C (380)	Microsoft ACPI-Compliant System
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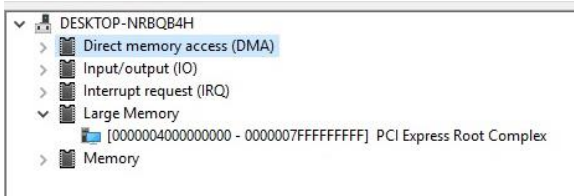
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 (ISA) 0x0000019C (412)	Microsoft ACPI-Compliant System
 (ISA) 0x0000019D (413)	Microsoft ACPI-Compliant System
 (ISA) 0x0000019E (414)	Microsoft ACPI-Compliant System
 (ISA) 0x0000019F (415)	Microsoft ACPI-Compliant System
 (ISA) 0x000001A0 (416)	Microsoft ACPI-Compliant System
 (ISA) 0x000001A1 (417)	Microsoft ACPI-Compliant System
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 (ISA) 0x000001AA (426)	Microsoft ACPI-Compliant System
 (ISA) 0x000001AB (427)	Microsoft ACPI-Compliant System
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 (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
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 (ISA) 0x000001C6 (454)	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
 (ISA) 0x000001CD (461)	Microsoft ACPI-Compliant System

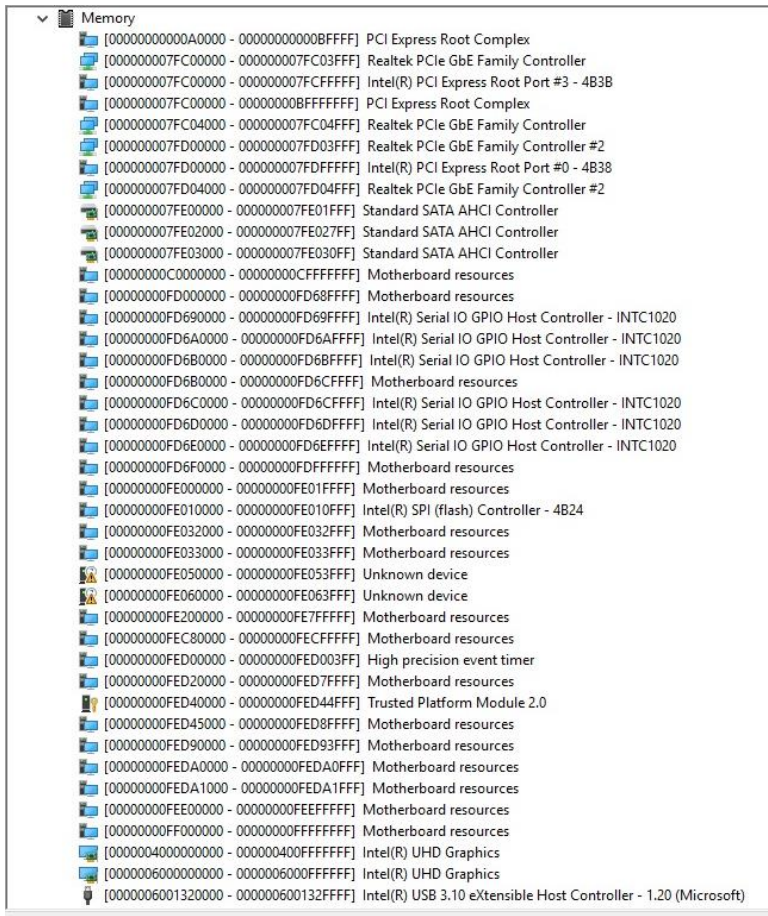
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 (ISA) 0x000001CE (462)	Microsoft ACPI-Compliant System
 (ISA) 0x000001CF (463)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D0 (464)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D1 (465)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D2 (466)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D3 (467)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D4 (468)	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
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 (ISA) 0x000001EA (490)	Microsoft ACPI-Compliant System
 (ISA) 0x000001EB (491)	Microsoft ACPI-Compliant System
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 (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) 0x00001EF (495)	Microsoft ACPI-Compliant System
 (ISA) 0x00001F0 (496)	Microsoft ACPI-Compliant System
 (ISA) 0x00001F1 (497)	Microsoft ACPI-Compliant System
 (ISA) 0x00001F2 (498)	Microsoft ACPI-Compliant System
 (ISA) 0x00001F3 (499)	Microsoft ACPI-Compliant System
 (ISA) 0x00001F4 (500)	Microsoft ACPI-Compliant System
 (ISA) 0x00001F5 (501)	Microsoft ACPI-Compliant System
 (ISA) 0x00001F6 (502)	Microsoft ACPI-Compliant System
 (ISA) 0x00001F7 (503)	Microsoft ACPI-Compliant System
 (ISA) 0x00001F8 (504)	Microsoft ACPI-Compliant System
 (ISA) 0x00001F9 (505)	Microsoft ACPI-Compliant System
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 (PCI) 0x00000010 (16)	Intel SD Host Controller
 (PCI) 0x00000010 (16)	Intel(R) Serial IO I2C Host Controller - 4B44
 (PCI) 0x00000011 (17)	Intel(R) Serial IO I2C Host Controller - 4B45
 (PCI) 0xFFFFFEC (-20)	Intel(R) Serial IO I2C Host Controller - 4B8A
 (PCI) 0xFFFFFED (-19)	Intel(R) Serial IO I2C Host Controller - 4BB9
 (PCI) 0xFFFFFEE (-18)	Intel(R) Serial IO I2C Host Controller - 4BC0
 (PCI) 0xFFFFFEF (-17)	Intel(R) Management Engine Interface #1
 (PCI) 0xFFFFFFF0 (-16)	Intel(R) Serial IO I2C Host Controller - 4BBF
 (PCI) 0xFFFFFFF1 (-15)	Intel(R) Serial IO SPI Host Controller - 4B84
 (PCI) 0xFFFFFFF2 (-14)	Intel(R) Serial IO UART Host Controller - 4B97
 (PCI) 0xFFFFFFF3 (-13)	Intel(R) Serial IO UART Host Controller - 4B96
 (PCI) 0xFFFFFFF4 (-12)	Intel(R) Integrated Sensor Solution
 (PCI) 0xFFFFFFF5 (-11)	Intel(R) USB 3.10 eXtensible Host Controller - 1.20 (Microsoft)
 (PCI) 0xFFFFFFF6 (-10)	Intel(R) UHD Graphics
 (PCI) 0xFFFFFFF7 (-9)	Realtek PCIe GbE Family Controller #2
 (PCI) 0xFFFFFFF8 (-8)	Realtek PCIe GbE Family Controller
 (PCI) 0xFFFFFFF9 (-7)	Standard SATA AHCI Controller
 (PCI) 0xFFFFFFFA (-6)	Intel(R) PCI Express Root Port #6 - 4B3E
 (PCI) 0xFFFFFFFB (-5)	Intel(R) PCI Express Root Port #2 - 4B3A
 (PCI) 0xFFFFFFFC (-4)	Intel(R) PCI Express Root Port #1 - 4B39
 (PCI) 0xFFFFFFF3 (-3)	Intel(R) PCI Express Root Port #3 - 4B3B
 (PCI) 0xFFFFFFF2 (-2)	Intel(R) PCI Express Root Port #0 - 4B38
 Large Memory	
 Memory	











































B.4 Large Memory Map



B.5 Memory Address Map



Address Range	Device Name
[0000000000A00000 - 0000000000BFFFFF]	PCI Express Root Complex
[000000007FC00000 - 000000007FC03FFF]	Realtek PCIe GbE Family Controller
[000000007FC00000 - 000000007FCFFFFF]	Intel(R) PCI Express Root Port #3 - 4B3B
[000000007FC00000 - 00000000BFFFFFFF]	PCI Express Root Complex
[000000007FC04000 - 000000007FC04FFF]	Realtek PCIe GbE Family Controller
[000000007FD00000 - 000000007FD03FFF]	Realtek PCIe GbE Family Controller #2
[000000007FD00000 - 000000007FD0FFFF]	Intel(R) PCI Express Root Port #0 - 4B38
[000000007FD04000 - 000000007FD04FFF]	Realtek PCIe GbE Family Controller #2
[000000007FE00000 - 000000007FE01FFF]	Standard SATA AHCI Controller
[000000007FE02000 - 000000007FE027FF]	Standard SATA AHCI Controller
[000000007FE03000 - 000000007FE030FF]	Standard SATA AHCI Controller
[00000000C0000000 - 00000000CFFFFFFF]	Motherboard resources
[00000000FD000000 - 00000000FD68FFFF]	Motherboard resources
[00000000FD690000 - 00000000FD69FFFF]	Intel(R) Serial IO GPIO Host Controller - INTC1020
[00000000FD6A0000 - 00000000FD6AFFFF]	Intel(R) Serial IO GPIO Host Controller - INTC1020
[00000000FD6B0000 - 00000000FD6BFFFF]	Intel(R) Serial IO GPIO Host Controller - INTC1020
[00000000FD6B0000 - 00000000FD6CFFFF]	Motherboard resources
[00000000FD6C0000 - 00000000FD6CFFFF]	Intel(R) Serial IO GPIO Host Controller - INTC1020
[00000000FD6D0000 - 00000000FD6DFFFF]	Intel(R) Serial IO GPIO Host Controller - INTC1020
[00000000FD6E0000 - 00000000FD6EFFFF]	Intel(R) Serial IO GPIO Host Controller - INTC1020
[00000000FD6F0000 - 00000000FDFFFFFF]	Motherboard resources
[00000000FE000000 - 00000000FE01FFFF]	Motherboard resources
[00000000FE010000 - 00000000FE010FFF]	Intel(R) SPI (flash) Controller - 4B24
[00000000FE032000 - 00000000FE032FFF]	Motherboard resources
[00000000FE033000 - 00000000FE033FFF]	Motherboard resources
[00000000FE050000 - 00000000FE053FFF]	Unknown device
[00000000FE060000 - 00000000FE063FFF]	Unknown device
[00000000FE200000 - 00000000FE7FFFFF]	Motherboard resources
[00000000FEC80000 - 00000000FECFFFFF]	Motherboard resources
[00000000FED00000 - 00000000FED003FF]	High precision event timer
[00000000FED20000 - 00000000FED7FFFF]	Motherboard resources
[00000000FED40000 - 00000000FED44FFF]	Trusted Platform Module 2.0
[00000000FED45000 - 00000000FED8FFFF]	Motherboard resources
[00000000FED90000 - 00000000FED93FFF]	Motherboard resources
[00000000FEDA0000 - 00000000FEDA0FFF]	Motherboard resources
[00000000FEDA1000 - 00000000FEDA1FFF]	Motherboard resources
[00000000FEE00000 - 00000000FEEFFFFFFF]	Motherboard resources
[00000000FF000000 - 00000000FFFFFFF]	Motherboard resources
[0000000400000000 - 0000000400FFFFFFF]	Intel(R) UHD Graphics
[0000000600000000 - 0000000600FFFFFFF]	Intel(R) UHD Graphics
[00000006001320000 - 0000000600132FFFFF]	Intel(R) USB 3.10 eXtensible Host Controller - 1.20 (Microsoft)

	[00000000FD6A0000 - 00000000FD6AFFFF]	Intel(R) Serial IO GPIO Host Controller - INTC1020
	[00000000FD6B0000 - 00000000FD6BFFFF]	Intel(R) Serial IO GPIO Host Controller - INTC1020
	[00000000FD6B0000 - 00000000FD6CFFFF]	Motherboard resources
	[00000000FD6C0000 - 00000000FD6CFFFF]	Intel(R) Serial IO GPIO Host Controller - INTC1020
	[00000000FD6D0000 - 00000000FD6DFFFF]	Intel(R) Serial IO GPIO Host Controller - INTC1020
	[00000000FD6E0000 - 00000000FD6EFFFF]	Intel(R) Serial IO GPIO Host Controller - INTC1020
	[00000000FD6F0000 - 00000000FD6FFFFF]	Motherboard resources
	[00000000FE000000 - 00000000FE01FFFF]	Motherboard resources
	[00000000FE010000 - 00000000FE010FFF]	Intel(R) SPI (flash) Controller - 4B24
	[00000000FE032000 - 00000000FE032FFF]	Motherboard resources
	[00000000FE033000 - 00000000FE033FFF]	Motherboard resources
	[00000000FE050000 - 00000000FE053FFF]	Unknown device
	[00000000FE060000 - 00000000FE063FFF]	Unknown device
	[00000000FE200000 - 00000000FE7FFFFF]	Motherboard resources
	[00000000FEC80000 - 00000000FECFFFFF]	Motherboard resources
	[00000000FED00000 - 00000000FED003FF]	High precision event timer
	[00000000FED20000 - 00000000FED7FFFF]	Motherboard resources
	[00000000FED40000 - 00000000FED44FFF]	Trusted Platform Module 2.0
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	[00000000FED90000 - 00000000FED93FFF]	Motherboard resources
	[00000000FEDA0000 - 00000000FEDA0FFF]	Motherboard resources
	[00000000FEDA1000 - 00000000FEDA1FFF]	Motherboard resources
	[00000000FEE00000 - 00000000FEEFFFFF]	Motherboard resources
	[00000000FF000000 - 00000000FFFFFFFF]	Motherboard resources
	[0000004000000000 - 000000400FFFFFFF]	Intel(R) UHD Graphics
	[0000006000000000 - 0000006000FFFFFF]	Intel(R) UHD Graphics
	[0000006001320000 - 000000600132FFFF]	Intel(R) USB 3.10 eXtensible Host Controller - 1.20 (Microsoft)
	[0000006001346000 - 00000060013460FF]	Intel(R) SMBus Controller - 4B23
	[0000006001349000 - 0000006001349FFF]	Intel SD Host Controller
	[0000007FFFCEB000 - 0000007FFFCEBFFF]	Intel(R) Management Engine Interface #1
	[0000007FFFCEC000 - 0000007FFFCECFFF]	Intel(R) Serial IO I2C Host Controller - 4B45
	[0000007FFFCEd000 - 0000007FFFCEdFFF]	Intel(R) Serial IO I2C Host Controller - 4B44
	[0000007FFFCEE000 - 0000007FFFCEFFFF]	Intel(R) Serial IO I2C Host Controller - 4BBA
	[0000007FFFCEf000 - 0000007FFFCEf1FFF]	Intel(R) Serial IO I2C Host Controller - 4BB9
	[0000007FFFCEf2000 - 0000007FFFCEf3FFF]	Intel(R) Serial IO I2C Host Controller - 4BC0
	[0000007FFFCEf4000 - 0000007FFFCEf5FFF]	Intel(R) Serial IO I2C Host Controller - 4BBF
	[0000007FFFCEf6000 - 0000007FFFCEf7FFF]	Intel(R) Serial IO SPI Host Controller - 4B84
	[0000007FFFCEf8000 - 0000007FFFCEf9FFF]	Intel(R) Serial IO UART Host Controller - 4B97
	[0000007FFFCEfA000 - 0000007FFFCEfBFFF]	Intel(R) Serial IO UART Host Controller - 4B96
	[0000007FFFCEfC000 - 0000007FFFCEfFFFF]	High Definition Audio Controller
	[0000007FFFCEfD0000 - 0000007FFFCEfDFFFF]	High Definition Audio Controller
	[0000007FFFCEfE0000 - 0000007FFFCEfEFFFF]	Intel(R) Integrated Sensor Solution

Appendix C

Watchdog Timer Programming

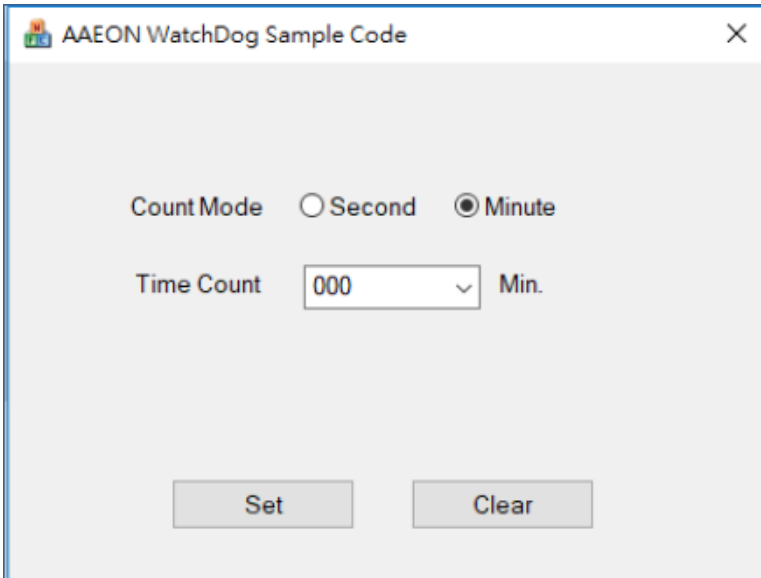
C.1 Introduction to Watchdog Timer

This section details how to set up and program the Watchdog Timer for your AAEON system or board. The watchdog timer is used to automatically detect malfunctions and recover the system. During normal operation, the system will regularly send a signal to reset the watchdog timer. If the system does not reset the watchdog timer, it will timeout and force the system into recovery and/or reboot.

The following sections refer to additional software used for programming your board, such as the AAEON Framework, AAEON SDK and AAEON Windows EAPI. If you need assistance with utilizing these tools, programming your Watchdog Timer, or would like additional documentation on these resources, contact your AAEON representative or visit our support page at <https://www.aaeon.com/en/support/>

C.2 Programing the Watchdog Timer with AAEON SDK

If you have installed the AAEON Framework, you can program the Watchdog Timer using the AAEON SDK. Simply locate where the SDK is installed, and double click the icon. The following dialog box will appear:



Count Mode: Set Watchdog Timer to count in minutes or seconds.

Time Count: The length of time (in minutes or seconds) before the Watchdog Timer will initiate a system recovery/ reboot.

Set: After selecting Count Mode and Time Count, this will save your changes and enable the Watchdog Timer function.

Clear: This will reset settings and disable the Watchdog Timer function.

C.3 Programing Watchdog Timer with AAEON Windows EAPI

AAEON Framework (KMDF Driver) must be installed before calling these functions.

EapiLibInitialize() should be the first to call before calling other EAPI functions.

EapiLibUninitialize() should be called to release resources before program exit.

When building C/C++ apps, Lib (Library, aaeonEAPI.lib) is needed.

aaeonEAPI.lib is needed for C/C++ based app, make sure the lib files and executable files are in the same folder.

The following shows how to build and run codes:

There are two scenarios to invoke Watchdog Timer functions:

1. Use **EApiWDogStart**

After EAPIWDogStart

```
|<- Delay ->|<- Event Timeout ->|<- Reset Timeout ->|
      A-----B-----C-----D
```

2. Use **EApiWDogTrigger**

After EApiWDogTrigger

```
|<- Event Timeout ->|<- Reset Timeout ->|
      E-----F-----G
```

Stage A: Watchdog is started.

Stage B: Initial Delay Period.

Stage C/F: Event is triggered, NMI, IRQ, or PIN is Triggered. This allows for possible Software Recovery.

Stage D/G: System is reset.

Stage E: Watchdog is Triggered.

EApiWDogStop must be called before Stage C/F to prevent event from being generated.

EApiWDogStop must be called before Stage D/G to prevent system from being reset.

C.3.1 Watchdog Timer Functions

C.3.1.1 EapiWDogGetCap()

Command Line:

```
EApiWDogGetCap(...)
    __OUTOPT uint32_t *pMaxDelay,
    __OUTOPT uint32_t *pMaxEventTimeout,
    __OUTOPT uint32_t *pMaxResetTimeout
)
```

Use this command to get maximum Supported Delay / Supported Event Timeout / Supported Reset Timeout of the watchdog timer.

Parameters	Function Parameters
*pMaxDelay	Maximum Supported Delay in milliseconds
*pMaxEvenTimeout	Maximum Supported Event Timeout in milliseconds; 0 = Unsupported
*pMaxResetTimeout	Maximum Supported Reset Timeout in milliseconds
Condition	Return Values
Library Uninitialized	EAPI_STATUS_NOT_INITIALIZED
pMaxDelay == NULL && pMaxResetTimeout == NULL && pMaxEventTimeout == NULL	EAPI_STATUS_INVALID_PARAMETER
Common Error	Common Error Code
Others	EAPI_STATUS_SUCCESS

C.3.1.2 EapiWDogStart()

Command Line:

```
EApiWDogStart(  
    __IN uint32_t Delay,  
    __IN uint32_t Minute,  
    __IN uint32_t EventTimeout,  
    __IN uint32_t ResetTimeout  
)
```

Use this command to start the Watchdog Timer and set the timeout values.

To stop the Watchdog Timer, issue the command **EApiWDogStop**. After issuing EApiWDogStop, the command EApiWDogStart must be called again with new values to restart.

If the hardware implementation of the watchdog timer does not allow the user to select the exact time they want, the EAPI will select the next longer time setting available.

Parameters	Function Parameters
Delay	Delay in milliseconds
Minute	Control minutes or seconds
EventTimeout	Event Timeout in milliseconds
ResetTimeout	Reset Timeout in milliseconds
Condition	Return Values
Library Uninitialized	EAPI_STATUS_NOT_INITIALIZED
(Delay > gMaxDelay) (EventTimeout > gMaxEventTimeout) (ResetTimeout > gMaxResetTimeout)	EAPI_STATUS_INVALID_PARAMETER
Common Error	Common Error Code
Others	EAPI_STATUS_SUCCESS

C.3.1.3 EapiWDogTrigger()

Command Line:

```
EapiWDogTrigger()
```

Use this command to trigger the Watchdog Timer.

Parameters	Function Parameters
None	
Condition	Return Values
Library Uninitialized	EAPI_STATUS_NOT_INITIALIZED
Watchdog Not Started	EAPI_STATUS_ERROR
Common Error	Common Error Code
Others	EAPI_STATUS_SUCCESS

C.3.1.4 EapiWDogStop()

Command Line:

```
EapiWDogStop()
```

Use this command to close the Watchdog Instance. This will disable the Watchdog Timer and clear previous settings.

Parameters	Function Parameters
None	
Condition	Return Values
Library Uninitialized	EAPI_STATUS_NOT_INITIALIZED
Common Error	Common Error Code
Others	EAPI_STATUS_SUCCESS

C.3.1.5 EapiWDogReloadTimer()

Command Line:

```
EapiWDogReloadTimer()
```

Use this command to reload the Timeout count

Parameters	Function Parameters
None	
Condition	Return Values
Library Uninitialized	EAPI_STATUS_NOT_INITIALIZED
Common Error	Common Error Code
Others	EAPI_STATUS_SUCCESS

C.3.1.6 EapiWDogGetStatus()

Command Line:

```
EapiWDogGetStatus(
    __OUTOPT uint32_t *pwdtMinute,
    __OUTOPT uint32_t *pwdtCountTime,
    __OUTOPT uint32_t *pwdtReloadTime
)
```

Use this command to get the Watchdog Timer mode, time count value and reload timer.

Parameters	Function Parameters
*pwdtMinute	Get the mode of minute or second
*pwdtCountTime	Get WDT time count
*pwdtReloadTime	Get WDT ReloadTime
Condition	Return Values
Library Uninitialized	EAPI_STATUS_NOT_INITIALIZED
Common Error	Common Error Code
Others	EAPI_STATUS_SUCCESS

C.3.1.7 EapiWDogSetStatus()

Command Line:

```
EapiWDogSetStatus(  
    __IN uint32_t wdtMinute,  
    __IN uint32_t wdtCountTime,  
    __IN uint32_t wdtReloadTime  
)
```

Use this command to set Watchdog Timer mode, time count value and reload timer.

Parameters	Function Parameters
wdtMinute	Set the mode of minute or second
wdtCountTime	Set WDT time count
wdtReloadTime	Set WDT ReloadTime
Condition	Return Values
Library Uninitialized	EAPI_STATUS_NOT_INITIALIZED
Common Error	Common Error Code
Others	EAPI_STATUS_SUCCESS