

# NanoCOM-WHU

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COM Express Module

User's Manual 2<sup>nd</sup> Ed

## Copyright Notice

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## Packing List

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

Item	Quantity
● NanoCOM-WHU	1

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

## About this Document

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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](http://AAEON.com) for the latest version of this document.

## Safety Precautions

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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.**

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

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# Chapter 1

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Product Specifications

## 1.1 Specifications

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### System

Form Factor	COM Express Mini size, Type 10
CPU	8th Generation Intel® Core™/ Celeron® U Series Processor
CPU Frequency	Up to 1.60 GHz, i5-8365UE
Chipset	8th Generation Intel® Core™/ Celeron® U Series SoC
Memory Type	Onboard DDR4-2133
Max. Memory Capacity	Up to 8GB
BIOS	AMI BIOS, Legacy free
Wake on LAN	Yes
Watchdog Timer	255 Levels
Power Requirement	Standard: +12V
Power Supply Type	AT Mode
Power Consumption (Typical)	—
Dimension (L x W)	3.31" x 2.17" (84 mm x 55 mm)
Operating Temperature	32°F ~ 140°F (0°C ~ 60°C) -40°F ~ 185°F (-40°C ~ 85°C) optional
Storage Temperature	-40°F ~ 185°F (-40°C ~ 85°C)
Operating Humidity	0% ~ 90% relative humidity, non-condensing
MTBF (Hours)	717,282
Certification	CE/FCC Class A

## Display

Display Controller	Intel® UHD Graphics 620/ 610
Video Output	eDP, DDI x 1

## I/O

Ethernet	Intel® i219LM Gigabit Ethernet x 1
Audio	High Definition Audio Interface
USB port	USB3.2 Gen 2 x 2 USB2.0 x 8
Serial Port	2-wire UART (TX/RX) x 2
HDD Interface	SATA III x 2
Onboard Storage	eMMC
Expansion	PCIe [x1] x4 I2C LPC SMBus
GPIO	8-bit
Onboard Storage	eMMC up to 64GB (Optional)
TPM	fTPM

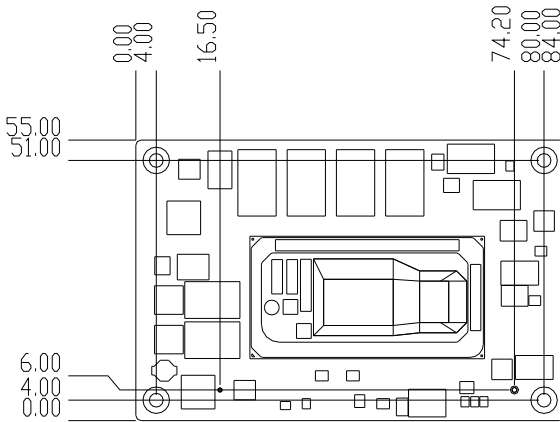
# Chapter 2

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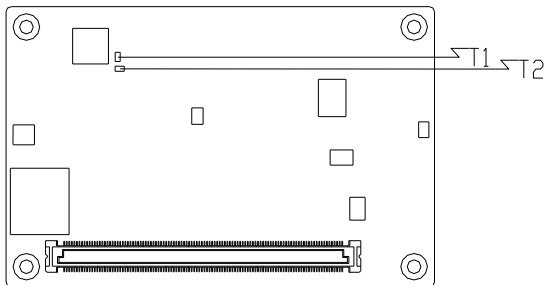
Hardware Information



## 2.1 Dimensions, Jumpers and Connectors

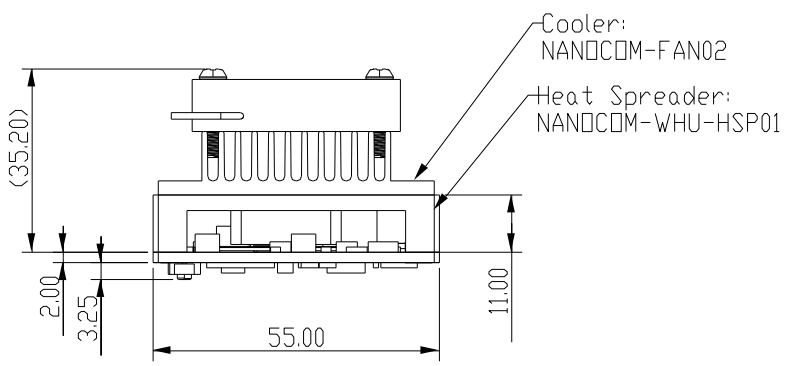


Component Side



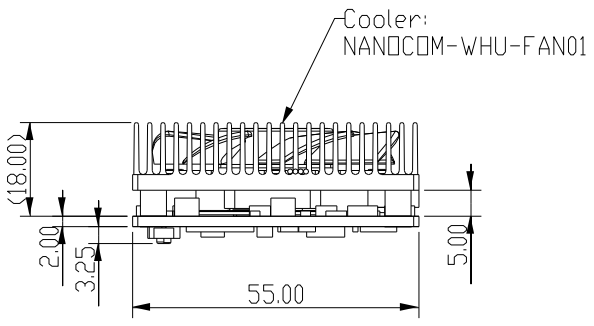
Solder Side

With Standard Thermal Solution



Unit:mm

With one-piece Thermal Solution



Unit:mm

## 2.2 Row A/B Connector Pin Definitions

Row A		Row B	
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	N.C
A9	GBE0_MDI1-	B9	N.C
A10	GBE0_MDI1+	B10	LPC_CLK
A11	GND (FIXED)	B11	GND (FIXED)
A12	GBE0_MDI0-	B12	PWRBTN#
A13	GBE0_MDI0+	B13	SMB_CK
A14	N.C	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	USB3_RXN0	B22	USB3_TXN0
A23	USB3_RXP0	B23	USB3_TXP0
A24	SUS_S5#	B24	PWR_OK

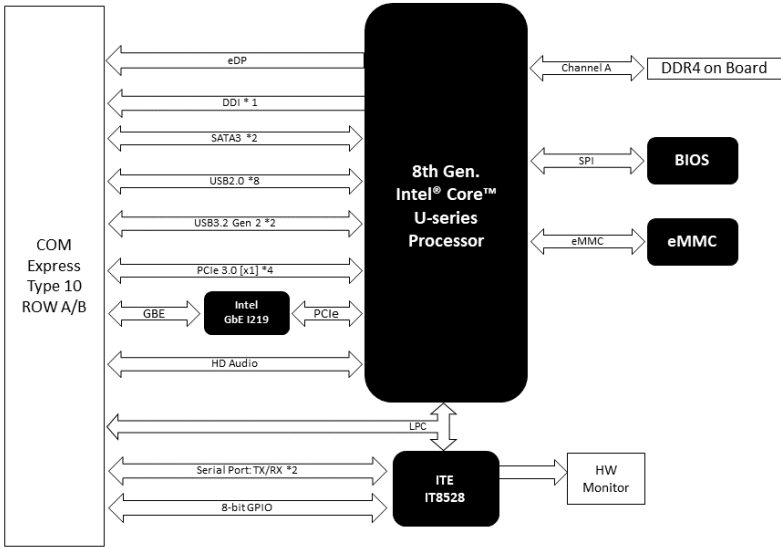
Row A		Row B	
A25	USB3_RXN1	B25	USB3_TXN1
A26	USB3_RXP1	B26	USB3_TXP1
A27	BATLOW#	B27	WDT
A28	ATA_ACT#	B28	N.C
A29	AC_SYNC	B29	AC_SDIN1
A30	AC_RST#	B30	AC_SDIN0
A31	GND (FIXED)	B31	GND (FIXED)
A32	AC_BITCLK	B32	SPKR
A33	AC_SDOUT	B33	I2C_CK
A34	BIOS_DIS0#	B34	I2C_DAT
A35	THRMTRIP#	B35	THRM#
A36	USB6-	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_CPPE#	B48	EXCD1_CPPE#
A49	EXCD0_CPPE#	B49	SYS_RESET#
A50	LPC_SERIRQ	B50	CB_RESET#

Row A		Row B	
A51	GND (FIXED)	B51	GND (FIXED)
A52	N.C.	B52	N.C.
A53	N.C.	B53	N.C.
A54	GPI0	B54	GPO1
A55	N.C.	B55	N.C.
A56	N.C.	B56	N.C.
A57	GND	B57	GPO2
A58	PCIE_TX3+	B58	PCIE_RX3+
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	EDP_TXP2	B71	DDIO_PAIR0+
A72	EDP_TXN2	B72	DDIO_PAIR0-
A73	EDP_TXP1	B73	DDIO_PAIR1+
A74	EDP_TXN1	B74	DDIO_PAIR1-
A75	EDP_TXP0	B75	DDIO_PAIR2+
A76	EDP_TXN0	B76	DDIO_PAIR2-

Row A		Row B	
A77	EDP_VDD_EN	B77	N.C.
A78	N.C.	B78	N.C.
A79	N.C.	B79	EDP_BKLT_EN
A80	GND (FIXED)	B80	GND (FIXED)
A81	EDP_TXP3	B81	DDIO_PAIR3+
A82	EDP_TXN3	B82	DDIO_PAIR3-
A83	EDP_AUXP	B83	EDP_BKLTCTL
A84	EDP_AUXN	B84	VCC_5V_SBY
A85	GPI3	B85	VCC_5V_SBY
A86	N.C.	B86	VCC_5V_SBY
A87	EDP_HDP	B87	VCC_5V_SBY
A88	PCIE0_CK_REF+	B88	BISO_DIS1#
A89	PCIE0_CK_REF-	B89	DDIO_HPDP
A90	GND (FIXED)	B90	GND (FIXED)
A91	SPI_POWER	B91	N.C.
A92	SPI_MISO	B92	N.C.
A93	GPO0	B93	N.C.
A94	SPI_CLK	B94	N.C.
A95	SPI_MOSI	B95	DDIO_DDC_AUX_SEL
A96	GND	B96	N.C.
A97	TYPE10#	B97	SPI_CS#
A98	RS1_TX	B98	DDIO_CTRL_CLK or DDIO_AUX+
A99	RS1_RX	B99	DDIO_CTRL_DATA or DDIO_AUX-
A100	GND (FIXED)	B100	GND (FIXED)

Row A		Row B	
A101	RS2_TX	B101	FAN_PWMOUT
A102	RS2_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
A109	VCC_12V	B109	VCC_12V
A110	GND (FIXED)	B110	GND (FIXED)

## 2.3 Function Block Diagram





# Chapter 3

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AMI BIOS Setup

## 3.1 System Test and Initialization

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The system 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 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. If they do not match, an error message will be output, and the BIOS setup program will need to be run to set the configuration information in memory.

There are three situations in which the CMOS settings will need to be set or changed:

- Starting the system for the first time
- The system hardware has been changed
- The CMOS memory has lost power and the configuration information is erased

The system's CMOS memory uses a backup battery for data retention. The battery must be replaced when it runs down.

## 3.2 AMI BIOS Setup

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

To enter BIOS Setup, press <Del> or <F2> immediately while your computer is powering up.

The function for each interface can be found below.

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

**Advanced** – Enable/ Disable boot option for legacy network devices

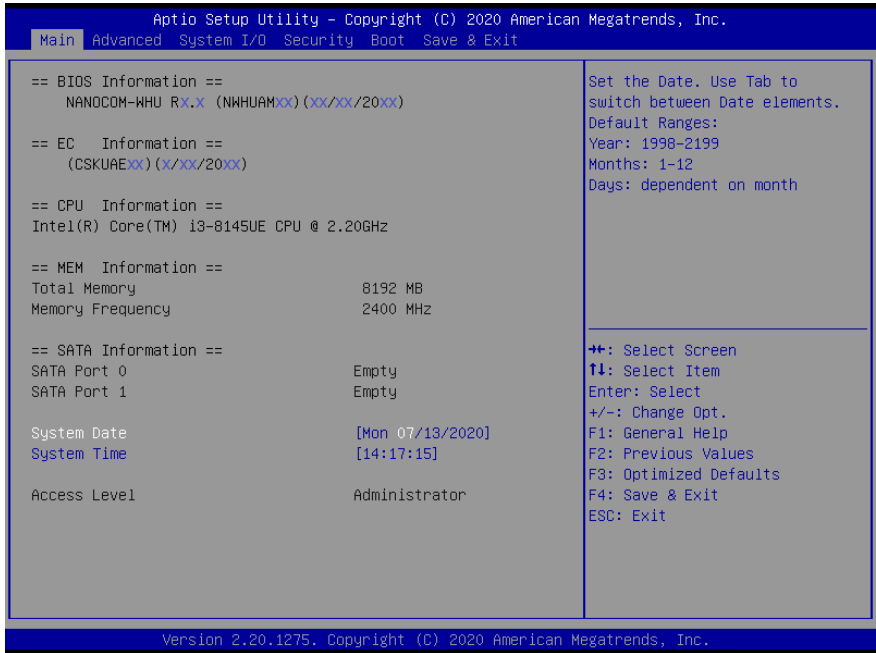
**System I/O** – For configuring PCI Express settings

**Security** – The setup administrator password can be set here

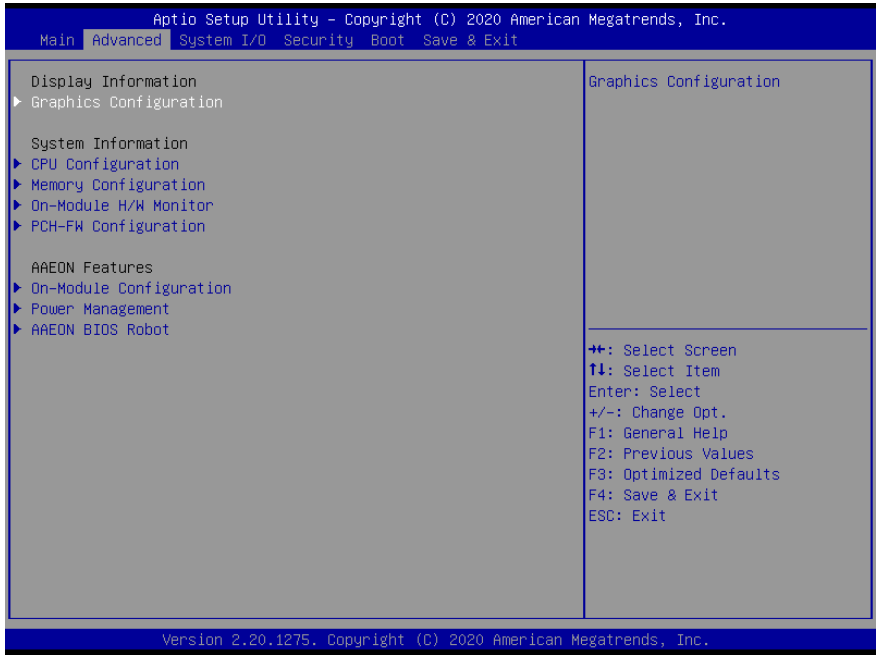
**Boot** – Enable/ Disable Quiet Boot option

**Save & Exit** – Save your changes and exit the program

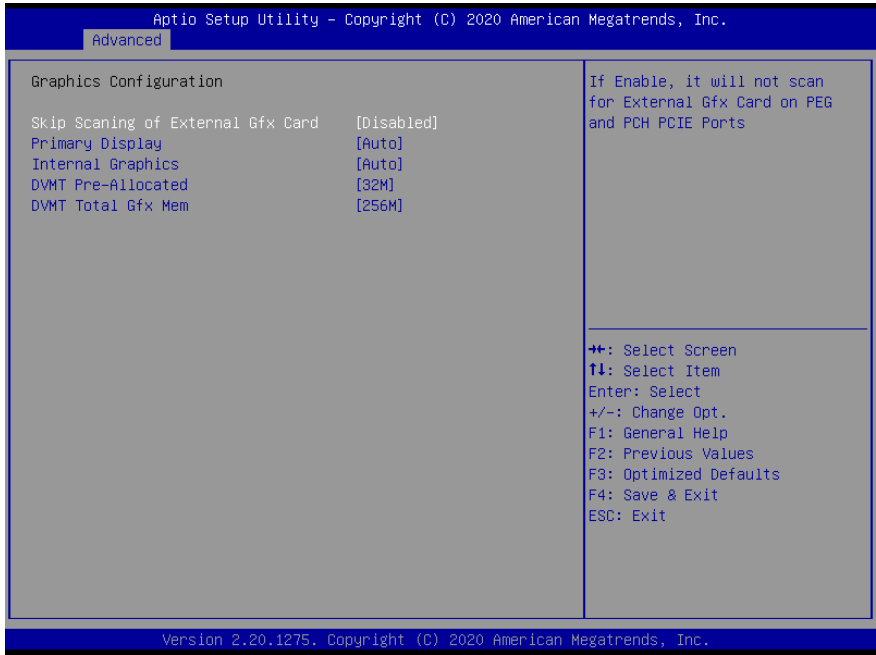
### 3.3 Setup Submenu: Main



### 3.4 Setup Submenu: Advanced



### 3.4.1 Graphics Configuration



Options Summary		
Skip Scanning of External Gfx Card	Enable	
	Disable	Optimal Default, Failsafe Default
If Enable, it will not scan for External Gfx Card on PEG and PCH PCIE Ports.		
Primary Display	Auto	Optimal Default, Failsafe Default
	IGFS	
	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	
Keep IGFS enabled based on the setup options.		

Table Continues on Next Page...

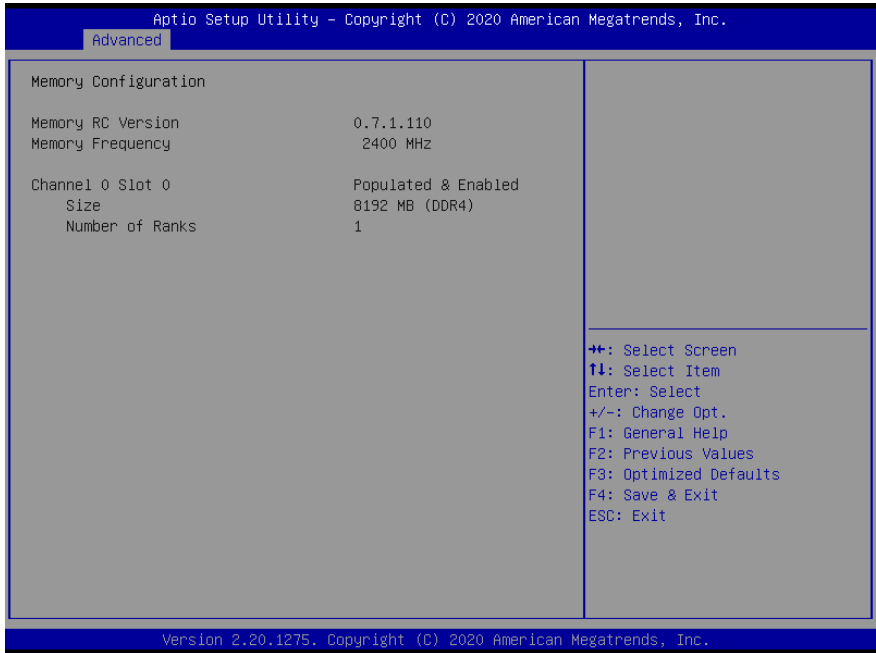
Options Summary		
DVMT Pre-Allocated	0M	
	32M	Optimal Default, Failsafe Default
	64M	
	4M	
	8M	
	12M	
	16M	
	20M	
	24M	
	28M	
	32M/F7	
	36M	
	40M	
	44M	
	48M	
	52M	
56M		
60M		
Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.		
DVMT Total Gfx Mem	128M	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





Options Summary		
Intel® SpeedStep™	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).		

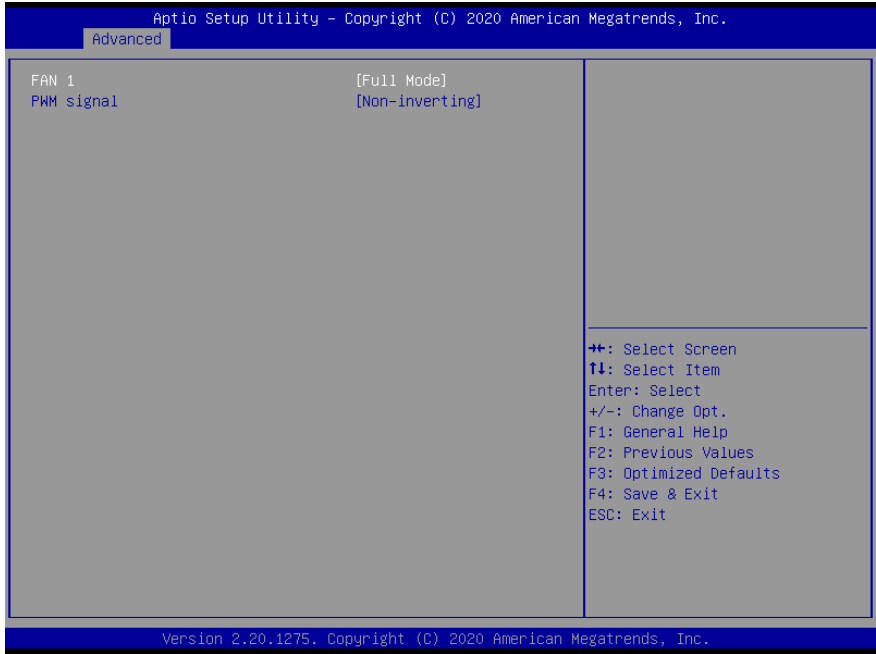
### 3.4.3 Memory Configuration



### 3.4.4 On-Module H/W Monitor

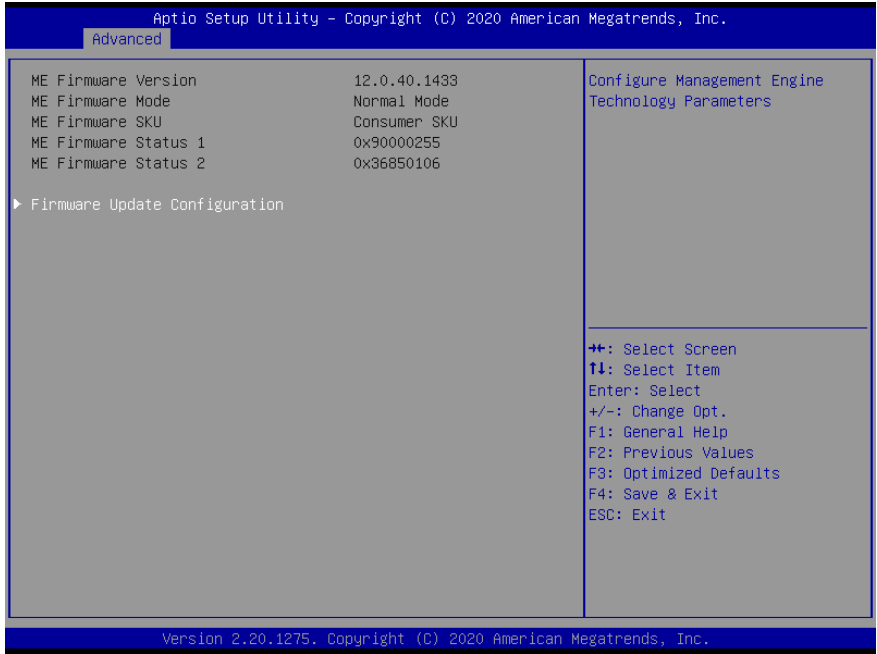
The screenshot displays the Aptio Setup Utility BIOS interface. At the top, it reads "Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc." and "Advanced". The main area is divided into two columns. The left column, titled "Pc Health Status", lists various system metrics: CPU Temperature (PECI) at +55 °C, Thermal Source 1 (T1) at +33 °C, Thermal Source 2 (T2) at +30 °C, FAN 1 Speed at 3439 RPM, +12V at +12.053 V, 5VSB at +4.961 V, VMEM at +1.196 V, and VCORE at +0.773 V. Below this is a "Fan 1 Mode Configuration" option with a right-pointing arrow. The right column, titled "Smart Fan Configuration", is currently empty. A legend at the bottom right of the screen lists navigation keys: ++ for Select Screen, T1 for Select Item, Enter for Select, +/- for Change Opt., F1 for General Help, F2 for Previous Values, F3 for Optimized Defaults, F4 for Save & Exit, and ESC for Exit. The footer of the screen reads "Version 2.20.1275. Copyright (C) 2020 American Megatrends, Inc."

### 3.4.4.1 Fan 1 Mode Configuration

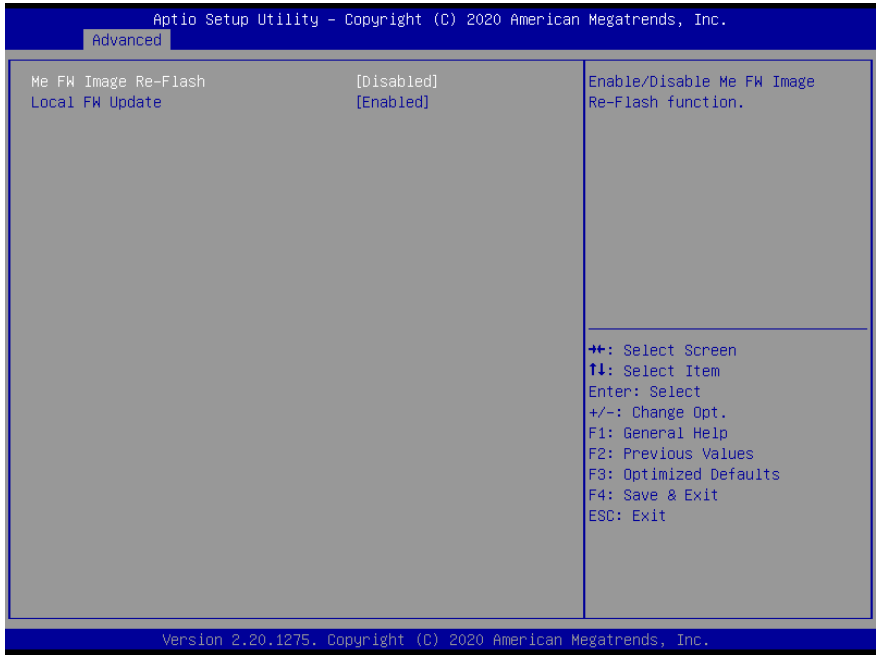


Options Summary		
FAN 1	Full Mode	Optimal Default, Failsafe Default
	Manual Mode by PWM	
	Auto Mode by PWM	
Choose the mode for FAN 1.		
PWM signal	Non-inverting	Optimal Default, Failsafe Default
	Inverting	
Select output PWM of inverting or non-inverting signal.		

### 3.4.5 PCH-FW Configuration

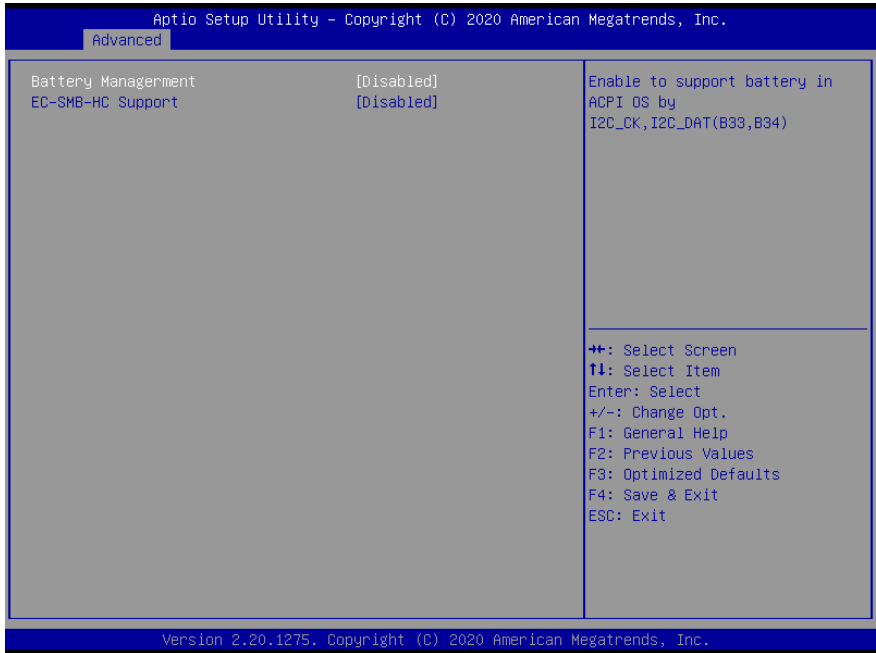


### 3.4.5.1 Firmware Update Configuration



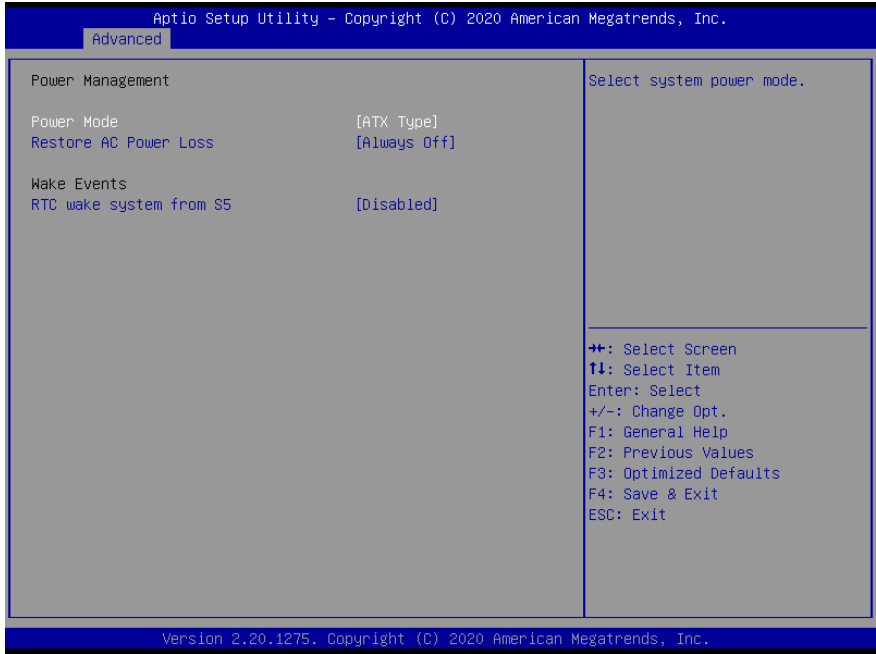
Options Summary		
Me FW Image Re-Flash	Enabled	
	Disabled	Optimal Default, Failsafe Default
Enable/Disable Me FW Image Re-Flash function.		
Local FW Update	Enabled	Optimal Default, Failsafe Default
	Disabled	
Options for Local FW Update function.		

### 3.4.6 On-Module Configuration



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

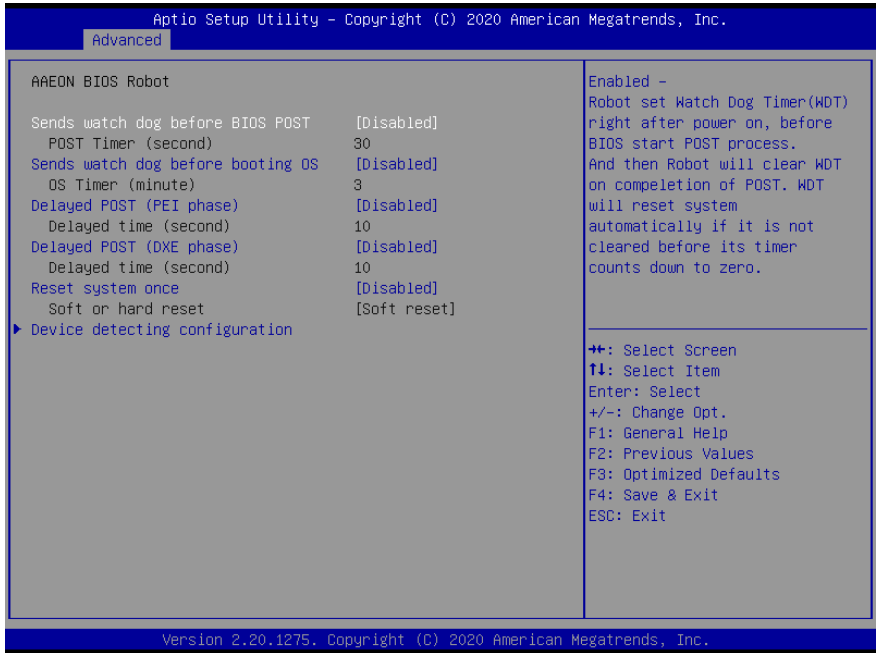
### 3.4.7 Power Management



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 S5.	Disabled	Optimal Default, Failsafe Default
	Fixed Time	
	Dynamic 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 AAEON BIOS Robot

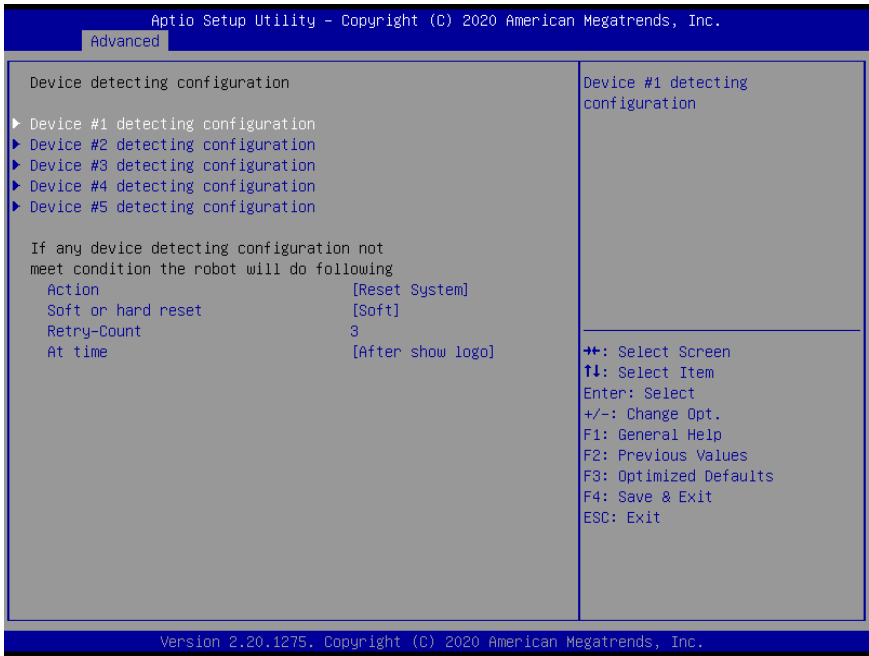


Options Summary		
Sends watch dog before BIOS POST.	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enabled - Robot set Watch Dog Timer (WDT) right after power on, before BIOS start POST process. And then Robot will clear WDT on completion of POST. WDT will reset system automatically if it is not cleared before its timer counts down to zero.		
Sends watch dog before booting OS	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enabled - Robot set Watch Dog Timer (WDT) after POST completion, before BIOS transfer control to OS.		
<b>WARNING:</b> Before enabling this function, a program in OS must be in responsible for clearing WDT. Also, this function should be disabled if OS is going to update itself.		

Table Continues on Next Page

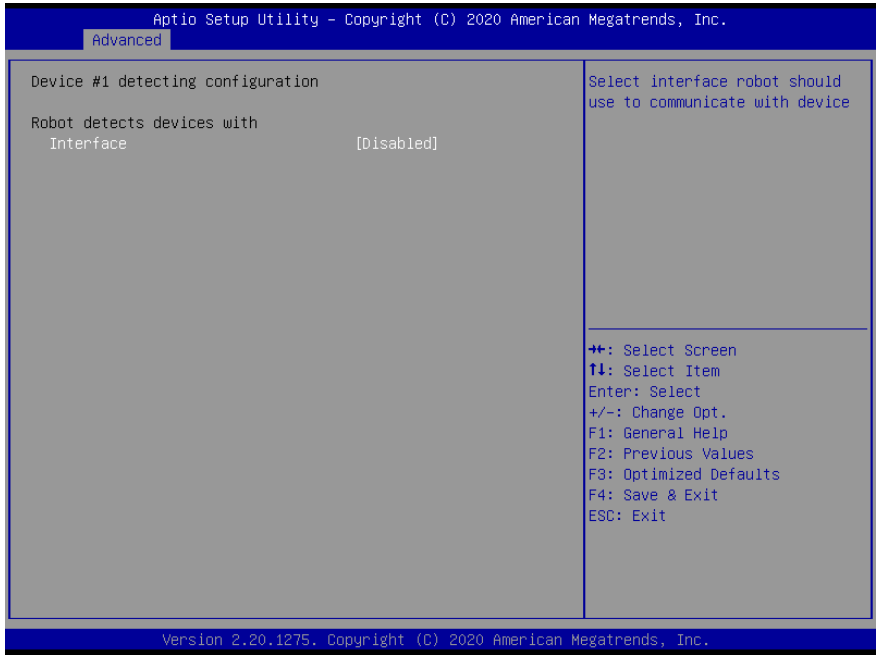
Options Summary		
<b>Delayed POST (PEI phase)</b>	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enabled – Robot holds BIOS from starting POST, right after power. This allows BIOS POST to start with stable power or start after system is physically warmed-up. Note: Robot does this before ‘Sends watch dog’.		
<b>Delayed POST (DXE phase)</b>	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enabled – Robot holds BIOS from starting POST, right after power. This allows BIOS POST to start with stable power or start after system is physically warmed-up. Note: Robot does this before ‘Sends watch dog’.		
<b>Reset System once</b>	Disabled	Optimal Default, Failsafe Default
	Enabled	
Enabled – Robot resets system for one time on each boot. This will send a soft or hard reset to onboard devices, thus puts devices to more stable state.		

### 3.4.8.1 Device Detecting Configuration



Options Summary		
Action	Reset System	Optimal Default, Failsafe Default
	Hold System	
Select action that robot should do.		
Soft or hard reset	Soft	Optimal Default, Failsafe Default
	Hard	
Select reset type robot should send on each boot.		
Retry-Count	3	Optimal Default, Failsafe Default
Fill retry counter here. Robot will reset system at most counter times, and then let the system continues its POST.		
At time	After show logo	Optimal Default, Failsafe Default
	Before show logo	
Select robot action time: After show logo: Robot will do action after logo is displayed. System devices are almost ready. Before show logo: Robot will do action earlier before logo, but some devices may not be ready.		

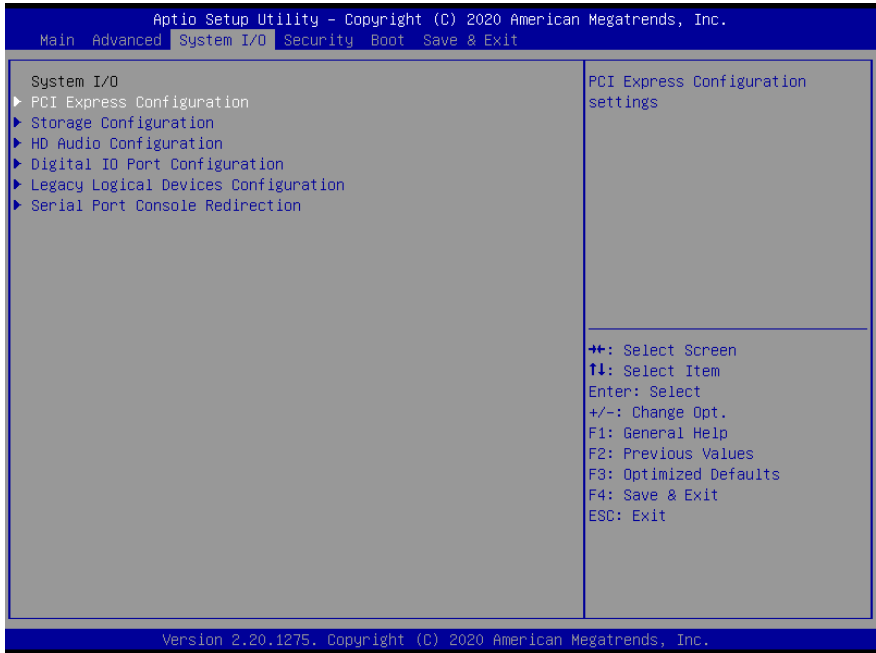
### 3.4.8.1.1 Device #1~5 Detecting Configuration



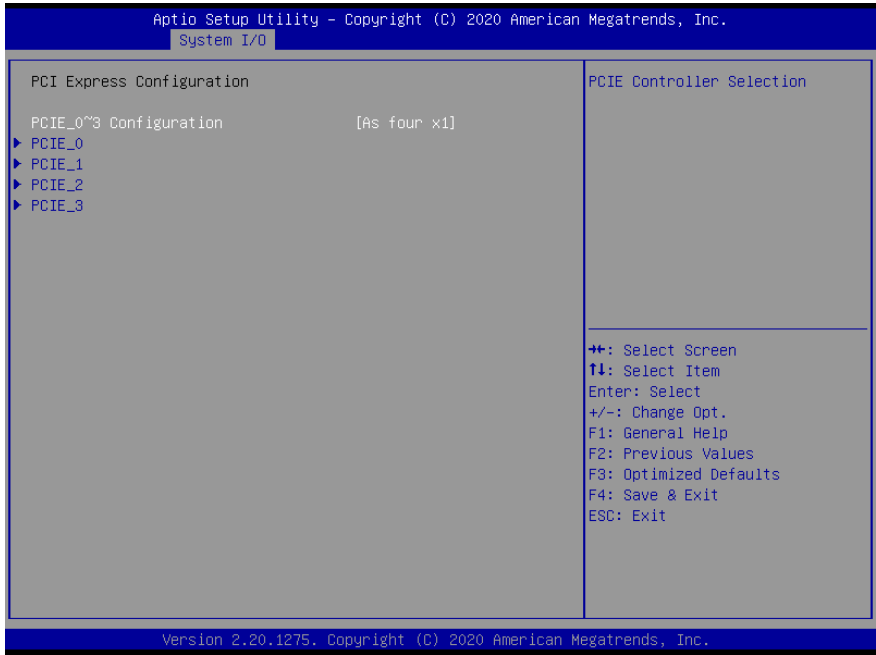
Options Summary		
Interface	Disabled	Optimal Default, Failsafe Default
	PCI	
	DIO	
	SMBUS	
	Legacy I/O	
	Super I/O	
	MMIO	
Select interface robot should use to communicate with device.		

**Note:** This menu is the same for all Devices #1 thru #5.

### 3.5 Setup Submenu: System I/O

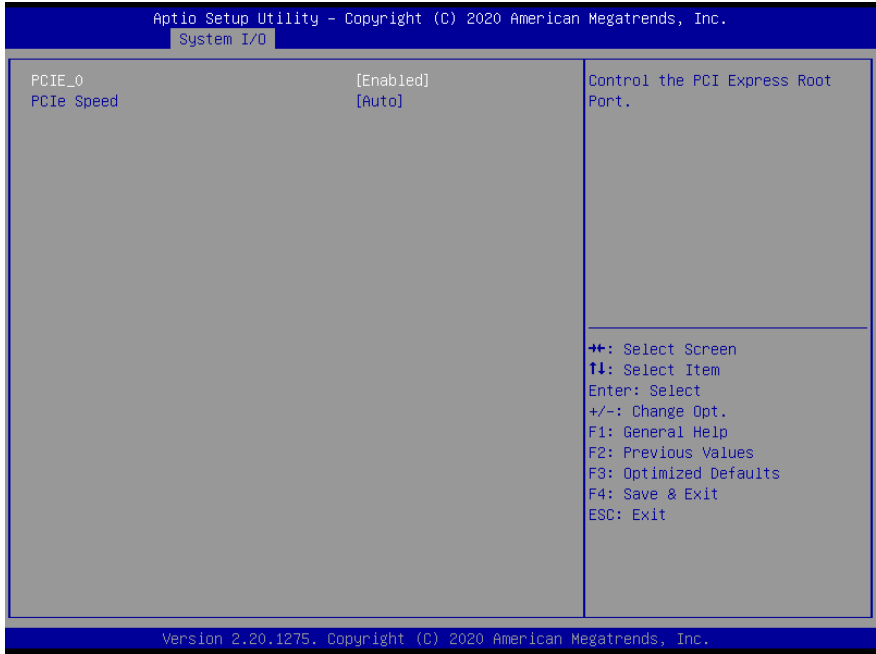


### 3.5.1 PCI Express Configuration



Options Summary		
PCI Express Configuration	As Four x1	Optimal Default, Failsafe Default
	As one x2 and two x1	
	As two x2	
	As one x4	
PCI Express Controller Selection.		

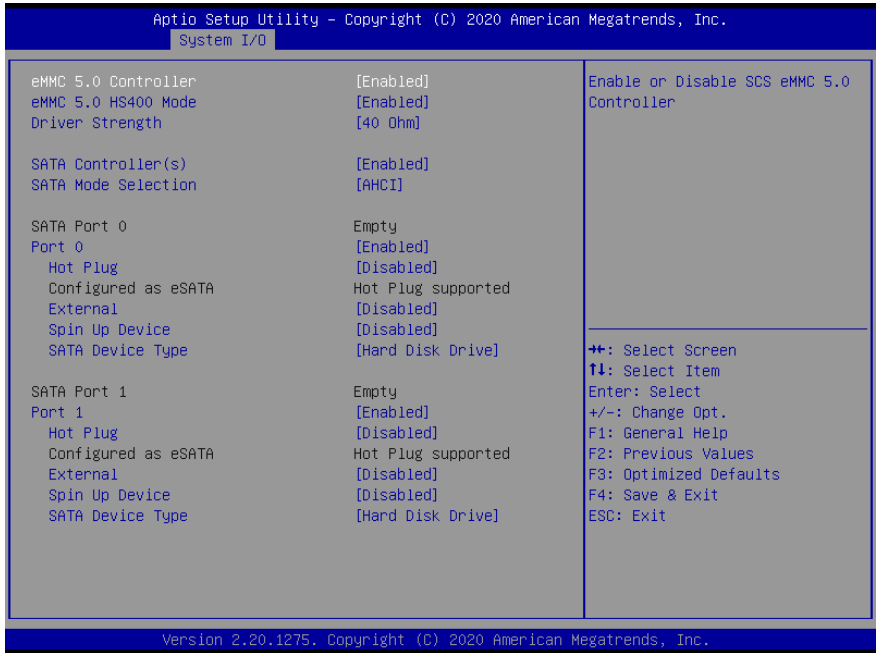
### 3.5.1.1 PCIE\_# Configuration



Options Summary		
PCIE_N	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.		

**Note:** This menu is the same for PCIE\_0, PCIE\_1, PCIE\_2, and PCIE\_3.

## 3.5.2 Storage Configuration



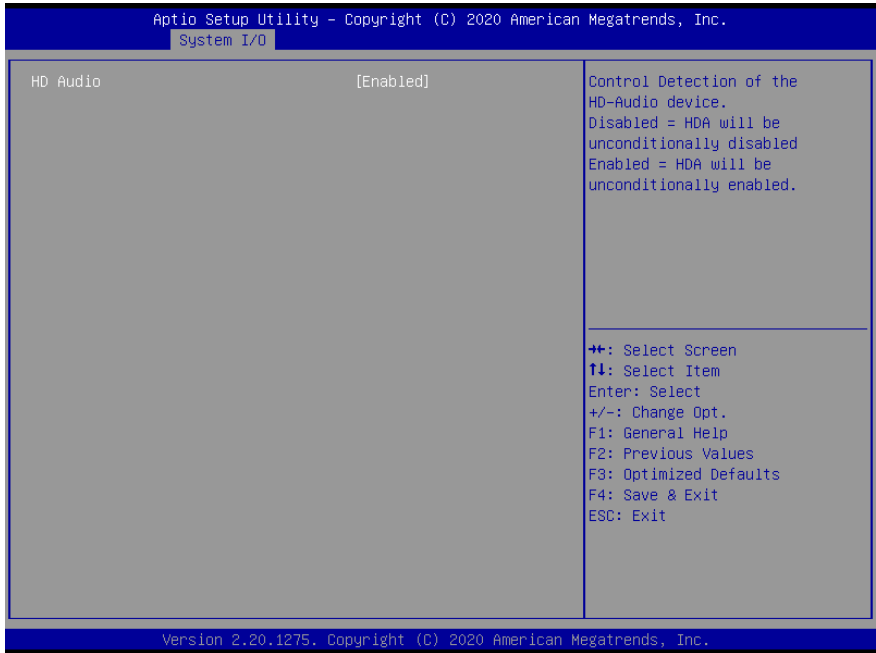
Options Summary		
eMMC 5.0 Controller	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enable or Disable SCS eMMC 5.0 Controller.		
eMMC 5.0 HS400 Mode	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enable or Disable SCS eMMC HS400 Mode.		
Driver Strength	33 Ohm	
	40 Ohm	Optimal Default, Failsafe Default
	50 Ohm	
Sets I/O driver strength.		
SATA Controller(s)	Enabled	Optimal Default, Failsafe Default
	Disabled	
Enable/Disable SATA Device.		

Table Continues on Next Page



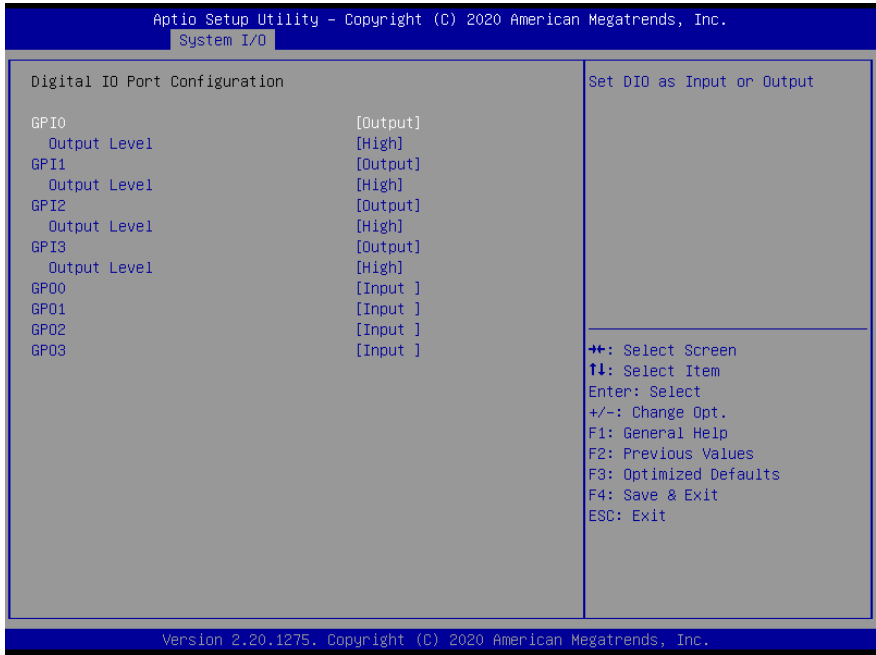
Options Summary		
<b>SATA Mode Selection</b>	AHCI	Optimal Default, Failsafe Default
	Intel RST Premium with Intel Optane System Acceleration	
Determines how SATA controller(s) operate.		
SATA Port 0/1 Configuration		
<b>Port 0/1</b>	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enable or Disable SATA Port 0/1		
<b>Hot Plug</b>	Disabled	Optimal Default, Failsafe Default
	Enabled	
Designates this port as Hot Pluggable.		
<b>External</b>	Disabled	Optimal Default, Failsafe Default
	Enabled	
Marks this port as external.		
<b>Spin Up Device</b>	Disabled	Optimal Default, Failsafe Default
	Enabled	
If enabled for any of ports Staggered Spin Up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise all drives spin up at boot.		
<b>SATA Device Type</b>	Hard Disk Drive	Optimal Default, Failsafe Default
	Solid State Drive	
Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.		

### 3.5.3 HD Audio Configuration



Options Summary		
HD Audio	Disabled	
	Enabled	Optimal Default, Failsafe Default
Control Detection of the HD-Audio device. Disabled: HD-Audio will be unconditionally disabled. Enabled: HD-Audio will be unconditionally disabled.		

### 3.5.4 Digital IO Port Configuration

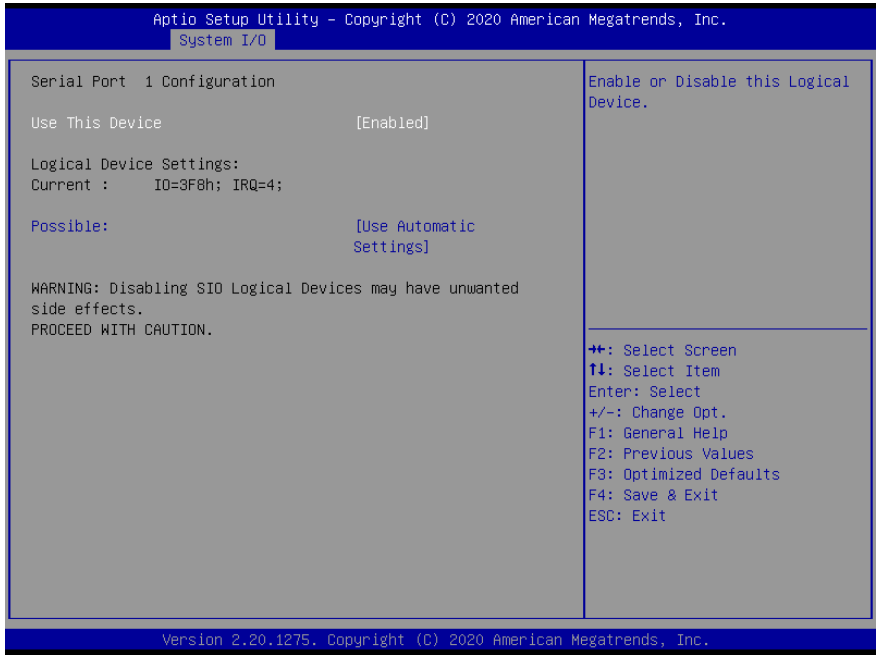


Options Summary		
IO Type	Output	Optimal Default, Failsafe Default
	Input	
Set IO as Input or Output		
IO Data	Low	
	High	Optimal Default, Failsafe Default
Set is output level when DIO pin is output		

### 3.5.5 Legacy Logical Devices Configuration

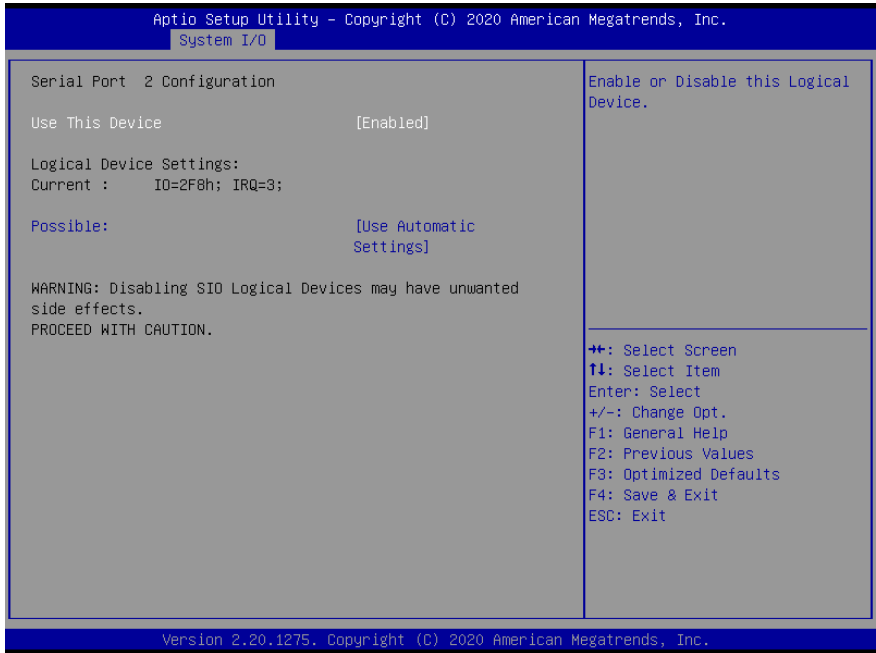


### 3.5.5.1 [\*Active\*] Serial Port 1



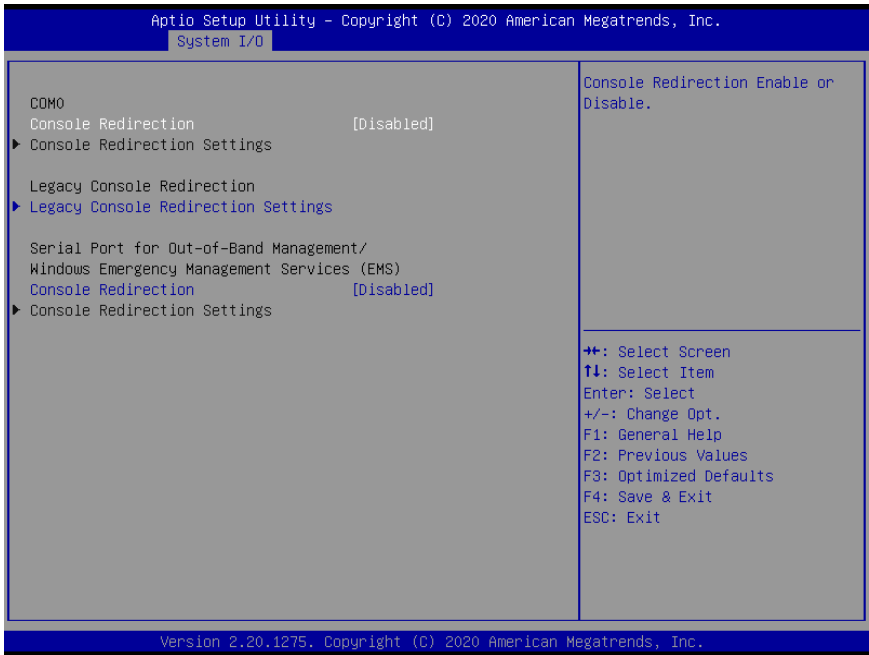
Options Summary		
Use This Device	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enable or Disable this Logical Device.		
Possible	Use Automatic Settings	Optimal Default, Failsafe Default
	IO=3F8h; IRQ=4; DMA;	
	IO=2C8h; IRQ=11; DMA	
Allows the user to change the device resource settings. New settings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

### 3.5.5.2 [\*Active\*] Serial Port 2



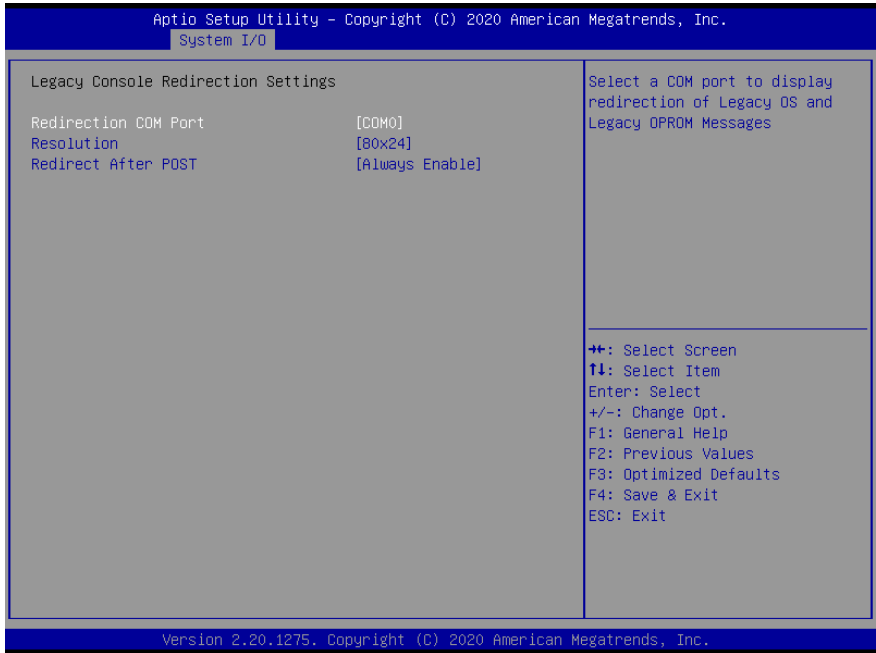
Options Summary		
Use This Device	Disabled	
	Enabled	Optimal Default, Failsafe Default
Enable or Disable this Logical Device.		
Possible	Use Automatic Settings	Optimal Default, Failsafe Default
	IO=2F8h; IRQ=3; DMA;	
	IO=2D8h; IRQ=10; DMA	
Allows the user to change the device resource settings. New settings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

### 3.5.6 Serial Port Console Redirection



Options Summary		
Console Redirection (COM0)	Disabled	Optimal Default, Failsafe Default
	Enabled	
Console Redirection	Enable or Disable.	
Console Redirection	Disabled	Optimal Default, Failsafe Default
	Enabled	
Console Redirection	Enable or Disable.	

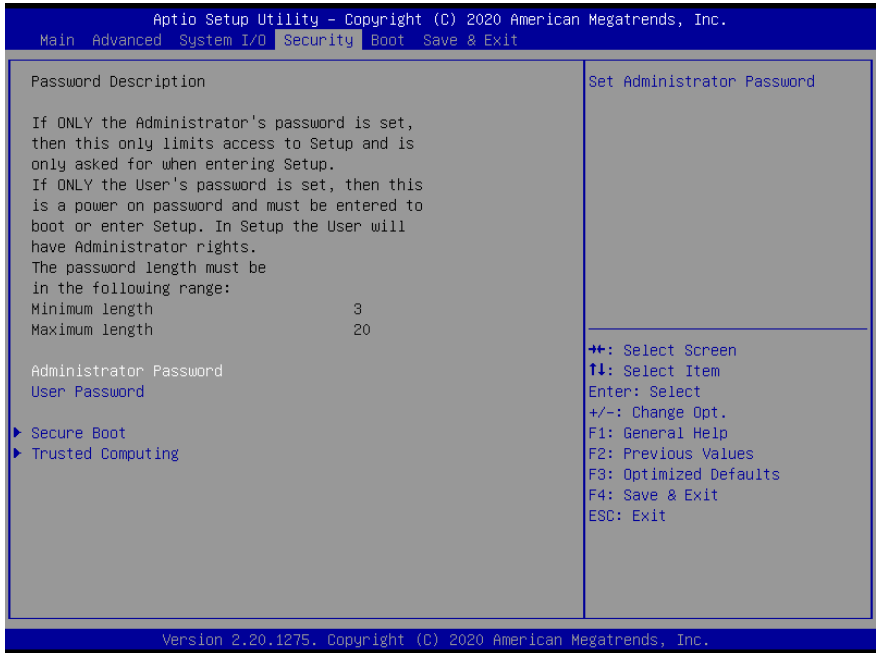
### 3.5.6.1 Legacy Console Redirection Settings



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 Bootloader is selected, then Legacy Console Redirection is disabled before booting to legacy OS. When Always Enable is selected, then Legacy Console Redirection is enabled for legacy OS. Default setting for this option is set to Always Enable.		



## 3.6 Setup Submenu: Security



### Change User/Administrator Password

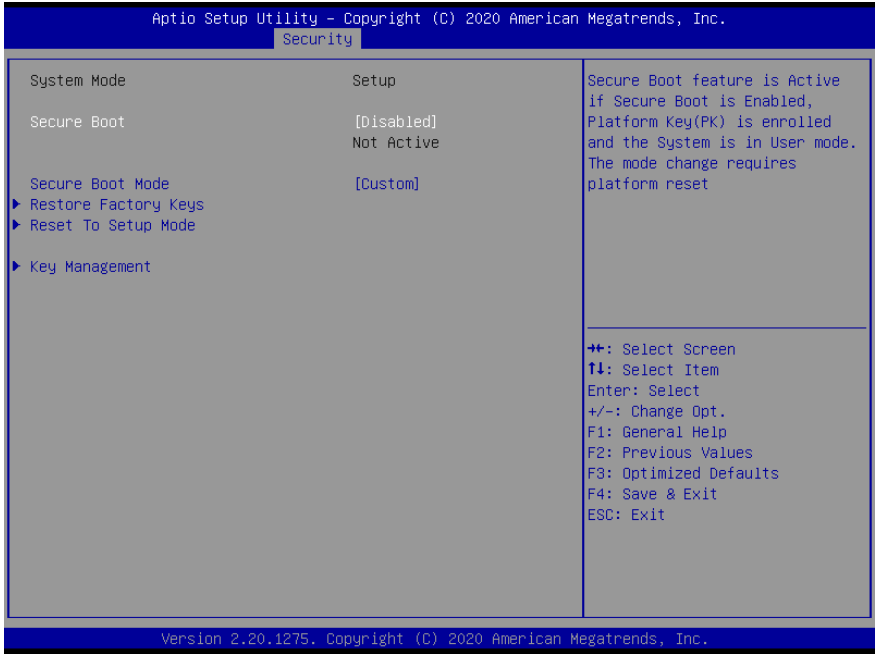
You can set an Administrator Password or User Password. An Administrator Password must be set before you can set a User Password. The password will be required during boot up, or when the user enters the Setup utility. A User Password does not provide access to many of the features in the Setup utility.

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	Disable	Optimal Default, Failsafe Default
	Enable	
Secure Boot feature is Active if Secure Boot is Enabled, Platform Key (PK) is enrolled and the System mode is in User mode. Changing the mode requires platform reset.		
Secure Boot Mode	Standard	Optimal Default, Failsafe Default
	Custom	
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	No	Press 'Yes' to restore factory keys
	Yes	
Force System to User Mode. Install factory default Secure Boot key databases		
Key Management		
Enables expert users to modify Secure Boot Policy variables without full authentication		

## 3.6.2 Key Management

COM Express Module  
NanoCOM-WHU

Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.  
Security

Vendor Keys Valid

Factory Key Provision [Disabled]

- ▶ Restore Factory Keys
- ▶ 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
▶ Key Exchange Keys	0	0	No Keys
▶ Authorized Signatures	0	0	No Keys
▶ Forbidden Signatures	0	0	No Keys
▶ Authorized TimeStamps	0	0	No Keys
▶ OsRecovery Signatures	0	0	No Keys

Install factory default Secure Boot keys after the platform reset and while the System is in Setup mode

+\*': Select Screen  
T1': Select Item  
Enter: Select  
+/-: Change Opt.  
F1: General Help  
F2: Previous Values  
F3: Optimized Defaults  
F4: Save & Exit  
ESC: Exit

Version 2.20.1275. Copyright (C) 2020 American Megatrends, Inc.

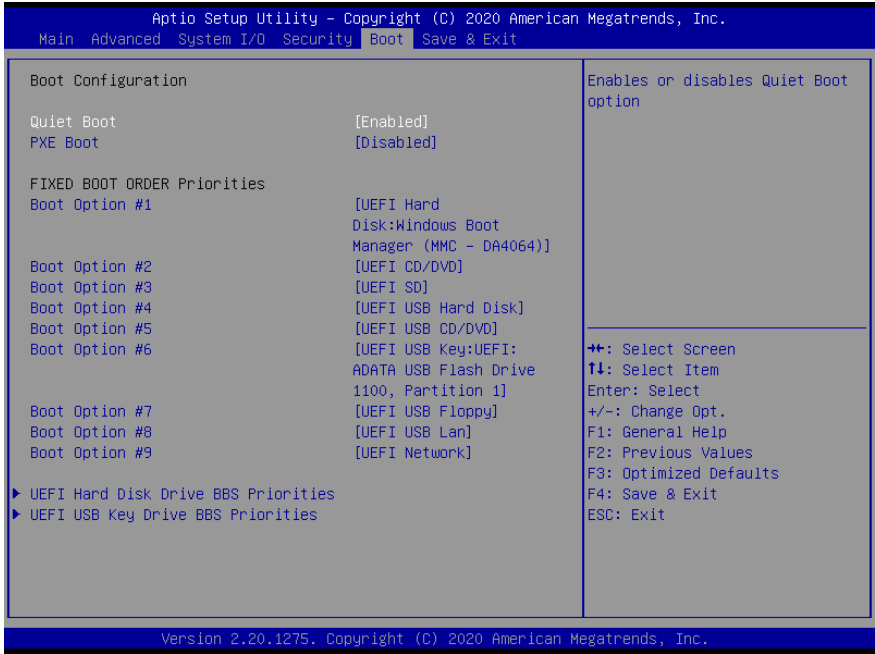
Options Summary		
Factory Key Provision	Disabled	Optimal Default, Failsafe Default
	Enabled	
Install factory default Secure Boot keys after the platform reset and while the System is in Setup mode.		
Restore Factory Keys	No	Press 'Yes' to install factory default keys
	Yes	
Force System to User Mode. Install Factory default Secure Boot key databases.		
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).		
Restore DB defaults	No	Press 'Yes' to install factory default keys
	Yes	
Restore DB Variable to factory defaults.		

Secure Boot Variable	Size	Keys#	Key Source
Platform Key (PK)   0   0   No Key			Update 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   0   0   No Key		Update	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
		Append	
Authorized Signatures  0   0   No Key		Update	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
		Append	

Table Continues on Next Page

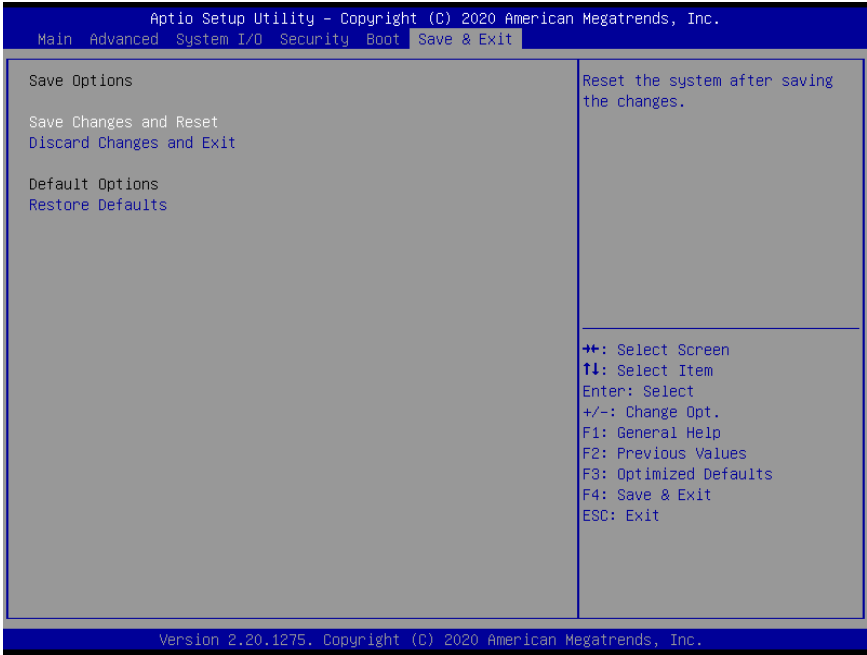
Secure Boot Variable   Size   Keys#   Key Source		
Forbidden Signatures   0   0   No Key	Update	Enroll Factory Defaults or load certificates from a file: 1.Public key Certificate: a)EFI_SIGNATURE_LIST b)EFI_CERT_X509 (DER) c)EFI_CERT_RSA2048 (bin) d)EFI_CERT_SHAXXX 2.Authenticated UEFI Variable 3.EFI PE/COFF Image(SHA256) Key Source: Factory, External, Mixed
	Append	
Authorized TimeStamps  0   0   No Key	Update	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
	Append	
OsRecovery Signatures  0   0   No Key	Update	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
	Append	

### 3.7 Setup Submenu: Boot



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 Network OpROM.		

### 3.8 Setup Submenu: Save & Exit



# Chapter 4

---

Drivers Installation



## 4.1 Driver Download and Installation

---

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

<https://www.aaeon.com/en/p/com-express-modules-nanocom-whu>

Download the driver(s) you need and extract the zip. Then, follow the steps below to install the drivers.

### Step 1 – Install Chipset Drivers

1. Open the **Intel(R) Chipset Device Software 10.1.18019.8144** folder.
2. Run the **SetupChipset.exe** file in the folder
3. Follow the instructions
4. Drivers will be installed automatically

### Step 2 – Install Graphics Driver

1. Open the **Intel Graphic 27.20.100.7922 x64** folder
2. Run the **igxpın.exe** file in the folder
3. Follow the instructions
4. Drivers will be installed automatically
5. A Read Me file is included in the folder in case you have any questions during installation

### Step 3 – Install Network Drivers

1. Open the **Intel(R) Network Connections Software 24.1** folder
2. Run the **PROWinx64.exe** file in the folder
3. Follow the instructions
4. Drivers will be installed automatically

#### Step 4 – Install Audio Drivers

1. Open the **Realtek Audio R2.82** folder
2. Run the **0009-64bit\_Win7\_Win8\_Win81\_Win10\_R282.exe** file in the folder
3. Follow the instructions
4. Drivers will be installed automatically

#### Step 5 – Install Intel Management Engine Firmware

1. Open the **Intel(R) Management Engine Firmware 1910.12.0.1239** folder
2. Run the **MEISetup.exe** file in the folder
3. Follow the instructions
4. Drivers will be installed automatically

#### Step 6 – Install Intel Serial IO Drivers

1. Open the **Intel Serial IO 30.100.1841.2** folder
2. Run the **SetupSerialIO.exe** file in the folder
3. Follow the instructions
4. Drivers will be installed automatically
5. A Read Me file is included in the folder in case you have any questions during installation, as well as instructions to verify installation

# 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 BRAMLDRNReg //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 procedure 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

圖示	輸入/輸出(I/O)
	[0000000000000000 - 000000000000CF7] PCI Express Root Complex
	[0000000000000020 - 0000000000000021] 可程式化插斷控制器
	[0000000000000024 - 0000000000000025] 可程式化插斷控制器
	[0000000000000028 - 0000000000000029] 可程式化插斷控制器
	[000000000000002C - 000000000000002D] 可程式化插斷控制器
	[000000000000002E - 000000000000002F] 主機板資源
	[0000000000000030 - 0000000000000031] 可程式化插斷控制器
	[0000000000000034 - 0000000000000035] 可程式化插斷控制器
	[0000000000000038 - 0000000000000039] 可程式化插斷控制器
	[000000000000003C - 000000000000003D] 可程式化插斷控制器
	[0000000000000040 - 0000000000000043] 系統計時器
	[000000000000004E - 000000000000004F] 主機板資源
	[0000000000000050 - 0000000000000053] 系統計時器
	[0000000000000061 - 0000000000000061] 主機板資源
	[0000000000000063 - 0000000000000063] 主機板資源
	[0000000000000065 - 0000000000000065] 主機板資源
	[0000000000000067 - 0000000000000067] 主機板資源
	[0000000000000068 - 0000000000000068] Microsoft ACPI 相容內嵌控制器
	[000000000000006C - 000000000000006C] Microsoft ACPI 相容內嵌控制器
	[0000000000000070 - 0000000000000070] 主機板資源
	[0000000000000080 - 0000000000000080] 主機板資源
	[0000000000000092 - 0000000000000092] 主機板資源
	[00000000000000A0 - 00000000000000A1] 可程式化插斷控制器
	[00000000000000A4 - 00000000000000A5] 可程式化插斷控制器
	[00000000000000A8 - 00000000000000A9] 可程式化插斷控制器
	[00000000000000AC - 00000000000000AD] 可程式化插斷控制器
	[00000000000000B0 - 00000000000000B1] 可程式化插斷控制器
	[00000000000000B2 - 00000000000000B3] 主機板資源
	[00000000000000B4 - 00000000000000B5] 可程式化插斷控制器
	[00000000000000B8 - 00000000000000B9] 可程式化插斷控制器
	[00000000000000BC - 00000000000000BD] 可程式化插斷控制器
	[00000000000002F8 - 00000000000002FF] 通訊連接埠 (COM2)
	[00000000000003F8 - 00000000000003FF] 通訊連接埠 (COM1)
	[00000000000004D0 - 00000000000004D1] 可程式化插斷控制器
	[0000000000000680 - 000000000000069F] 主機板資源
	[0000000000000D00 - 000000000000FFFF] PCI Express Root Complex
	[000000000000164E - 000000000000164F] 主機板資源
	[0000000000001800 - 00000000000018FE] 主機板資源
	[0000000000001854 - 0000000000001857] 主機板資源
	[0000000000002000 - 00000000000020FE] 主機板資源
	[0000000000003000 - 000000000000303F] Intel(R) UHD Graphics 620
	[0000000000003060 - 000000000000307F] Standard SATA AHCI Controller
	[0000000000003080 - 0000000000003083] Standard SATA AHCI Controller
	[0000000000003090 - 0000000000003097] Standard SATA AHCI Controller
	[000000000000EFA0 - 000000000000EFBF] Intel(R) SMBus - 9DA3





















































## B.2 Memory Address Map





















































Address Range	Device Name
[00000000000A0000 - 00000000000BFFFF]	PCI Express Root Complex
[0000000040000000 - 00000000403FFFFF]	主機板資源
[0000000090000000 - 0000000099FFFFFF]	Intel(R) UHD Graphics 620
[0000000090000000 - 00000000DFFFFFFF]	PCI Express Root Complex
[00000000A0000000 - 00000000A0FFFFFF]	Intel(R) UHD Graphics 620
[00000000A1120000 - 00000000A112FFFF]	Intel(R) USB 3.1 可延伸主機控制器 - 1.10 (Microsoft)
[00000000A113C000 - 00000000A113DFFF]	Standard SATA AHCI Controller
[00000000A1140000 - 00000000A11400FF]	Intel(R) SMBus - 9DA3
[00000000A1141000 - 00000000A1141FFF]	Intel SD 主機控制器
[00000000A1143000 - 00000000A11437FF]	Standard SATA AHCI Controller
[00000000A1144000 - 00000000A11440FF]	Standard SATA AHCI Controller
[00000000E0000000 - 00000000EFFFFFFF]	主機板資源
[00000000FC800000 - 00000000FE7FFFFFFF]	PCI Express Root Complex
[00000000FCF00000 - 00000000FCFFFFFF]	High Definition Audio 控制器
[00000000FD000000 - 00000000FD69FFFF]	主機板資源
[00000000FD6A0000 - 00000000FD6AFFFF]	Intel(R) Serial IO GPIO Host Controller - INT34BB
[00000000FD6B0000 - 00000000FD6CFFFF]	主機板資源
[00000000FD6D0000 - 00000000FD6DFFFF]	Intel(R) Serial IO GPIO Host Controller - INT34BB
[00000000FD6E0000 - 00000000FD6EFFFF]	Intel(R) Serial IO GPIO Host Controller - INT34BB
[00000000FD6F0000 - 00000000FDFFFFFF]	主機板資源
[00000000FE000000 - 00000000FE01FFFF]	主機板資源
[00000000FE010000 - 00000000FE010FFF]	Intel(R) SPI (flash) Controller - 9DA4
[00000000FE1D9000 - 00000000FE1D9FFF]	Intel(R) Management Engine Interface
[00000000FE1DA000 - 00000000FE1DAFFF]	Intel(R) Serial IO I2C Host Controller - 9DE8
[00000000FE1DB000 - 00000000FE1DBFFF]	Intel(R) Serial IO I2C Host Controller - 9DC5
[00000000FE1DC000 - 00000000FE1DFFFF]	High Definition Audio 控制器
[00000000FE1E0000 - 00000000FE1FFFFFFF]	Intel(R) Ethernet Connection (6) I219-LM
[00000000FE200000 - 00000000FE7FFFFFFF]	主機板資源
[00000000FED00000 - 00000000FED003FF]	高精度事件計時器
[00000000FED10000 - 00000000FED17FFF]	主機板資源
[00000000FED18000 - 00000000FED18FFF]	主機板資源
[00000000FED19000 - 00000000FED19FFF]	主機板資源
[00000000FED20000 - 00000000FED3FFFF]	主機板資源
[00000000FED40000 - 00000000FED44FFF]	信賴平台模組 2.0
[00000000FED45000 - 00000000FED8FFFF]	主機板資源
[00000000FED90000 - 00000000FED93FFF]	主機板資源
[00000000FEE00000 - 00000000FEEFFFFFFF]	主機板資源
[00000000FF000000 - 00000000FFFFFFFF]	主機板資源

## B.3 IRQ Mapping Chart





















































IRQ	Device
00	系統計時器
03	通訊連接埠 (COM2)
04	通訊連接埠 (COM1)
14	Intel(R) Serial IO GPIO Host Controller - INT348B
55	Microsoft ACPI-Compliant System
56	Microsoft ACPI-Compliant System
57	Microsoft ACPI-Compliant System
58	Microsoft ACPI-Compliant System
59	Microsoft ACPI-Compliant System
60	Microsoft ACPI-Compliant System
61	Microsoft ACPI-Compliant System
62	Microsoft ACPI-Compliant System
63	Microsoft ACPI-Compliant System
64	Microsoft ACPI-Compliant System
65	Microsoft ACPI-Compliant System
66	Microsoft ACPI-Compliant System
67	Microsoft ACPI-Compliant System
68	Microsoft ACPI-Compliant System
69	Microsoft ACPI-Compliant System
70	Microsoft ACPI-Compliant System
71	Microsoft ACPI-Compliant System
72	Microsoft ACPI-Compliant System
73	Microsoft ACPI-Compliant System
74	Microsoft ACPI-Compliant System
75	Microsoft ACPI-Compliant System
76	Microsoft ACPI-Compliant System
77	Microsoft ACPI-Compliant System
78	Microsoft ACPI-Compliant System
79	Microsoft ACPI-Compliant System
80	Microsoft ACPI-Compliant System
81	Microsoft ACPI-Compliant System
82	Microsoft ACPI-Compliant System
83	Microsoft ACPI-Compliant System
84	Microsoft ACPI-Compliant System
85	Microsoft ACPI-Compliant System
86	Microsoft ACPI-Compliant System
87	Microsoft ACPI-Compliant System
88	Microsoft ACPI-Compliant System
89	Microsoft ACPI-Compliant System
90	Microsoft ACPI-Compliant System
91	Microsoft ACPI-Compliant System
92	Microsoft ACPI-Compliant System
93	Microsoft ACPI-Compliant System
94	Microsoft ACPI-Compliant System
95	Microsoft ACPI-Compliant System
96	Microsoft ACPI-Compliant System
97	Microsoft ACPI-Compliant System
98	Microsoft ACPI-Compliant System
99	Microsoft ACPI-Compliant System
100	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
 (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) 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
 (ISA) 0x00000086 (134)	Microsoft ACPI-Compliant System
 (ISA) 0x00000087 (135)	Microsoft ACPI-Compliant System
 (ISA) 0x00000088 (136)	Microsoft ACPI-Compliant System
 (ISA) 0x00000089 (137)	Microsoft ACPI-Compliant System
 (ISA) 0x0000008A (138)	Microsoft ACPI-Compliant System
 (ISA) 0x0000008B (139)	Microsoft ACPI-Compliant System
 (ISA) 0x0000008C (140)	Microsoft ACPI-Compliant System
 (ISA) 0x0000008D (141)	Microsoft ACPI-Compliant System
 (ISA) 0x0000008E (142)	Microsoft ACPI-Compliant System
 (ISA) 0x0000008F (143)	Microsoft ACPI-Compliant System
 (ISA) 0x00000090 (144)	Microsoft ACPI-Compliant System
 (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
 (ISA) 0x00000096 (150)	Microsoft ACPI-Compliant System
 (ISA) 0x00000097 (151)	Microsoft ACPI-Compliant System
















































	(ISA) 0x00000097 (151)	Microsoft ACPI-Compliant System
	(ISA) 0x00000098 (152)	Microsoft ACPI-Compliant System
	(ISA) 0x00000099 (153)	Microsoft ACPI-Compliant System
	(ISA) 0x0000009A (154)	Microsoft ACPI-Compliant System
	(ISA) 0x0000009B (155)	Microsoft ACPI-Compliant System
	(ISA) 0x0000009C (156)	Microsoft ACPI-Compliant System
	(ISA) 0x0000009D (157)	Microsoft ACPI-Compliant System
	(ISA) 0x0000009E (158)	Microsoft ACPI-Compliant System
	(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
	(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) 0x000000AA (170)	Microsoft ACPI-Compliant System
	(ISA) 0x000000AB (171)	Microsoft ACPI-Compliant System
	(ISA) 0x000000AC (172)	Microsoft ACPI-Compliant System
	(ISA) 0x000000AD (173)	Microsoft ACPI-Compliant System
	(ISA) 0x000000AE (174)	Microsoft ACPI-Compliant System
	(ISA) 0x000000AF (175)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B0 (176)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B1 (177)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B2 (178)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B3 (179)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B4 (180)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B5 (181)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B6 (182)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B7 (183)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B8 (184)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B9 (185)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BA (186)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BB (187)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BC (188)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BD (189)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BE (190)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BF (191)	Microsoft ACPI-Compliant System
	(ISA) 0x000000C0 (192)	Microsoft ACPI-Compliant System
	(ISA) 0x000000C1 (193)	Microsoft ACPI-Compliant System
	(ISA) 0x000000C2 (194)	Microsoft ACPI-Compliant System
	(ISA) 0x000000C3 (195)	Microsoft ACPI-Compliant System
	(ISA) 0x000000C4 (196)	Microsoft ACPI-Compliant System
	(ISA) 0x000000C5 (197)	Microsoft ACPI-Compliant System
	(ISA) 0x000000C6 (198)	Microsoft ACPI-Compliant System
	(ISA) 0x000000C7 (199)	Microsoft ACPI-Compliant System
	(ISA) 0x000000C8 (200)	Microsoft ACPI-Compliant System
	(ISA) 0x000000C9 (201)	Microsoft ACPI-Compliant System
	(ISA) 0x000000CA (202)	Microsoft ACPI-Compliant System

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 (ISA) 0x000000CA (202)	Microsoft ACPI-Compliant System
 (ISA) 0x000000CB (203)	Microsoft ACPI-Compliant System
 (ISA) 0x000000CC (204)	Microsoft ACPI-Compliant System
 (ISA) 0x00000100 (256)	Microsoft ACPI-Compliant System
 (ISA) 0x00000101 (257)	Microsoft ACPI-Compliant System
 (ISA) 0x00000102 (258)	Microsoft ACPI-Compliant System
 (ISA) 0x00000103 (259)	Microsoft ACPI-Compliant System
 (ISA) 0x00000104 (260)	Microsoft ACPI-Compliant System
 (ISA) 0x00000105 (261)	Microsoft ACPI-Compliant System
 (ISA) 0x00000106 (262)	Microsoft ACPI-Compliant System
 (ISA) 0x00000107 (263)	Microsoft ACPI-Compliant System
 (ISA) 0x00000108 (264)	Microsoft ACPI-Compliant System
 (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
 (ISA) 0x0000010D (269)	Microsoft ACPI-Compliant System
 (ISA) 0x0000010E (270)	Microsoft ACPI-Compliant System
 (ISA) 0x0000010F (271)	Microsoft ACPI-Compliant System
 (ISA) 0x00000110 (272)	Microsoft ACPI-Compliant System
 (ISA) 0x00000111 (273)	Microsoft ACPI-Compliant System
 (ISA) 0x00000112 (274)	Microsoft ACPI-Compliant System
 (ISA) 0x00000113 (275)	Microsoft ACPI-Compliant System
 (ISA) 0x00000114 (276)	Microsoft ACPI-Compliant System
 (ISA) 0x00000115 (277)	Microsoft ACPI-Compliant System
 (ISA) 0x00000116 (278)	Microsoft ACPI-Compliant System
 (ISA) 0x00000117 (279)	Microsoft ACPI-Compliant System
 (ISA) 0x00000118 (280)	Microsoft ACPI-Compliant System
 (ISA) 0x00000119 (281)	Microsoft ACPI-Compliant System
 (ISA) 0x0000011A (282)	Microsoft ACPI-Compliant System
 (ISA) 0x0000011B (283)	Microsoft ACPI-Compliant System
 (ISA) 0x0000011C (284)	Microsoft ACPI-Compliant System
 (ISA) 0x0000011D (285)	Microsoft ACPI-Compliant System
 (ISA) 0x0000011E (286)	Microsoft ACPI-Compliant System
 (ISA) 0x0000011F (287)	Microsoft ACPI-Compliant System
 (ISA) 0x00000120 (288)	Microsoft ACPI-Compliant System
 (ISA) 0x00000121 (289)	Microsoft ACPI-Compliant System
 (ISA) 0x00000122 (290)	Microsoft ACPI-Compliant System
 (ISA) 0x00000123 (291)	Microsoft ACPI-Compliant System
 (ISA) 0x00000124 (292)	Microsoft ACPI-Compliant System
 (ISA) 0x00000125 (293)	Microsoft ACPI-Compliant System
 (ISA) 0x00000126 (294)	Microsoft ACPI-Compliant System
 (ISA) 0x00000127 (295)	Microsoft ACPI-Compliant System
 (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) 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) 0x00000130 (304)	Microsoft ACPI-Compliant System
 (ISA) 0x00000131 (305)	Microsoft ACPI-Compliant System
 (ISA) 0x00000132 (306)	Microsoft ACPI-Compliant System
 (ISA) 0x00000133 (307)	Microsoft ACPI-Compliant System
 (ISA) 0x00000134 (308)	Microsoft ACPI-Compliant System
 (ISA) 0x00000135 (309)	Microsoft ACPI-Compliant System
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 (ISA) 0x00000137 (311)	Microsoft ACPI-Compliant System
 (ISA) 0x00000138 (312)	Microsoft ACPI-Compliant System
 (ISA) 0x00000139 (313)	Microsoft ACPI-Compliant System
 (ISA) 0x0000013A (314)	Microsoft ACPI-Compliant System
 (ISA) 0x0000013B (315)	Microsoft ACPI-Compliant System
 (ISA) 0x0000013C (316)	Microsoft ACPI-Compliant System
 (ISA) 0x0000013D (317)	Microsoft ACPI-Compliant System
 (ISA) 0x0000013E (318)	Microsoft ACPI-Compliant System
 (ISA) 0x0000013F (319)	Microsoft ACPI-Compliant System
 (ISA) 0x00000140 (320)	Microsoft ACPI-Compliant System
 (ISA) 0x00000141 (321)	Microsoft ACPI-Compliant System
 (ISA) 0x00000142 (322)	Microsoft ACPI-Compliant System
 (ISA) 0x00000143 (323)	Microsoft ACPI-Compliant System
 (ISA) 0x00000144 (324)	Microsoft ACPI-Compliant System
 (ISA) 0x00000145 (325)	Microsoft ACPI-Compliant System
 (ISA) 0x00000146 (326)	Microsoft ACPI-Compliant System
 (ISA) 0x00000147 (327)	Microsoft ACPI-Compliant System
 (ISA) 0x00000148 (328)	Microsoft ACPI-Compliant System
 (ISA) 0x00000149 (329)	Microsoft ACPI-Compliant System
 (ISA) 0x0000014A (330)	Microsoft ACPI-Compliant System
 (ISA) 0x0000014B (331)	Microsoft ACPI-Compliant System
 (ISA) 0x0000014C (332)	Microsoft ACPI-Compliant System
 (ISA) 0x0000014D (333)	Microsoft ACPI-Compliant System
 (ISA) 0x0000014E (334)	Microsoft ACPI-Compliant System
 (ISA) 0x0000014F (335)	Microsoft ACPI-Compliant System
 (ISA) 0x00000150 (336)	Microsoft ACPI-Compliant System
 (ISA) 0x00000151 (337)	Microsoft ACPI-Compliant System
 (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) 0x00000156 (342)	Microsoft ACPI-Compliant System
 (ISA) 0x00000157 (343)	Microsoft ACPI-Compliant System
 (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) 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
 (ISA) 0x00000169 (361)	Microsoft ACPI-Compliant System
 (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
 (ISA) 0x00000171 (369)	Microsoft ACPI-Compliant System
 (ISA) 0x00000172 (370)	Microsoft ACPI-Compliant System
 (ISA) 0x00000173 (371)	Microsoft ACPI-Compliant System
 (ISA) 0x00000174 (372)	Microsoft ACPI-Compliant System
 (ISA) 0x00000175 (373)	Microsoft ACPI-Compliant System
 (ISA) 0x00000176 (374)	Microsoft ACPI-Compliant System
 (ISA) 0x00000177 (375)	Microsoft ACPI-Compliant System
 (ISA) 0x00000178 (376)	Microsoft ACPI-Compliant System
 (ISA) 0x00000179 (377)	Microsoft ACPI-Compliant System
 (ISA) 0x0000017A (378)	Microsoft ACPI-Compliant System
 (ISA) 0x0000017B (379)	Microsoft ACPI-Compliant System
 (ISA) 0x0000017C (380)	Microsoft ACPI-Compliant System
 (ISA) 0x0000017D (381)	Microsoft ACPI-Compliant System
 (ISA) 0x0000017E (382)	Microsoft ACPI-Compliant System
 (ISA) 0x0000017F (383)	Microsoft ACPI-Compliant System
 (ISA) 0x00000180 (384)	Microsoft ACPI-Compliant System
 (ISA) 0x00000181 (385)	Microsoft ACPI-Compliant System
 (ISA) 0x00000182 (386)	Microsoft ACPI-Compliant System
 (ISA) 0x00000183 (387)	Microsoft ACPI-Compliant System
 (ISA) 0x00000184 (388)	Microsoft ACPI-Compliant System
 (ISA) 0x00000185 (389)	Microsoft ACPI-Compliant System
 (ISA) 0x00000186 (390)	Microsoft ACPI-Compliant System
 (ISA) 0x00000187 (391)	Microsoft ACPI-Compliant System
 (ISA) 0x00000188 (392)	Microsoft ACPI-Compliant System
 (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
 (ISA) 0x00000193 (403)	Microsoft ACPI-Compliant System
(ISA) 0x00000194 (404)	Microsoft ACPI-Compliant System
(ISA) 0x00000195 (405)	Microsoft ACPI-Compliant System
(ISA) 0x00000196 (406)	Microsoft ACPI-Compliant System

 (ISA) 0x00000196 (406)	Microsoft ACPI-Compliant System
 (ISA) 0x00000197 (407)	Microsoft ACPI-Compliant System
 (ISA) 0x00000198 (408)	Microsoft ACPI-Compliant System
 (ISA) 0x00000199 (409)	Microsoft ACPI-Compliant System
 (ISA) 0x0000019A (410)	Microsoft ACPI-Compliant System
 (ISA) 0x0000019B (411)	Microsoft ACPI-Compliant System
 (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) 0x000001C8 (456)	Microsoft ACPI-Compliant System
(ISA) 0x000001C9 (457)	Microsoft ACPI-Compliant System

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 (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
 (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
 (ISA) 0x000001D5 (469)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D6 (470)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D7 (471)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D8 (472)	Microsoft ACPI-Compliant System
 (ISA) 0x000001D9 (473)	Microsoft ACPI-Compliant System
 (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) 0x000001FB (507)	Microsoft ACPI-Compliant System
(ISA) 0x000001FC (508)	Microsoft ACPI-Compliant System

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	(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 控制器
	(PCI) 0x00000010 (16)	Intel SD 主機控制器
	(PCI) 0x00000010 (16)	Intel(R) Serial IO I2C Host Controller - 9DE8
	(PCI) 0x00000020 (32)	Intel(R) Serial IO I2C Host Controller - 9DC5
	(PCI) 0xFFFFF0FA (-6)	Intel(R) Management Engine Interface
	(PCI) 0xFFFFF0FB (-5)	Intel(R) Ethernet Connection (6) I219-LM
	(PCI) 0xFFFFF0FC (-4)	Intel(R) UHD Graphics 620
	(PCI) 0xFFFFF0FD (-3)	Intel(R) USB 3.1 可延伸主機控制器 - 1.10 (Microsoft)
	(PCI) 0xFFFFF0FE (-2)	Standard SATA AHCI Controller

# Appendix C

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Programming Digital I/O

## C.1 DIO Programming

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NanoCOM-WHU 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)	Watch dog Logical Device Number
IO Direction Function and Device Number	0x00(Note4)	DIO Input/Output Function/Device Number
IO Value/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.3 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);
}
*****

```