USER'S MANUAL

IMB550

Intel® Socket 1851 Core™ Ultra 9/7/5 Processors ATX Industrial Motherboard

User's Manual

AXIOMTEK

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CAUTION

Wrong type of batteries may cause explosion. It is recommended that users only replace with the same or equivalent type of batteries as suggested by the manufacturer once properly disposing of any used ones.

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ESD Precautions

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

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

Trademarks Acknowledgments

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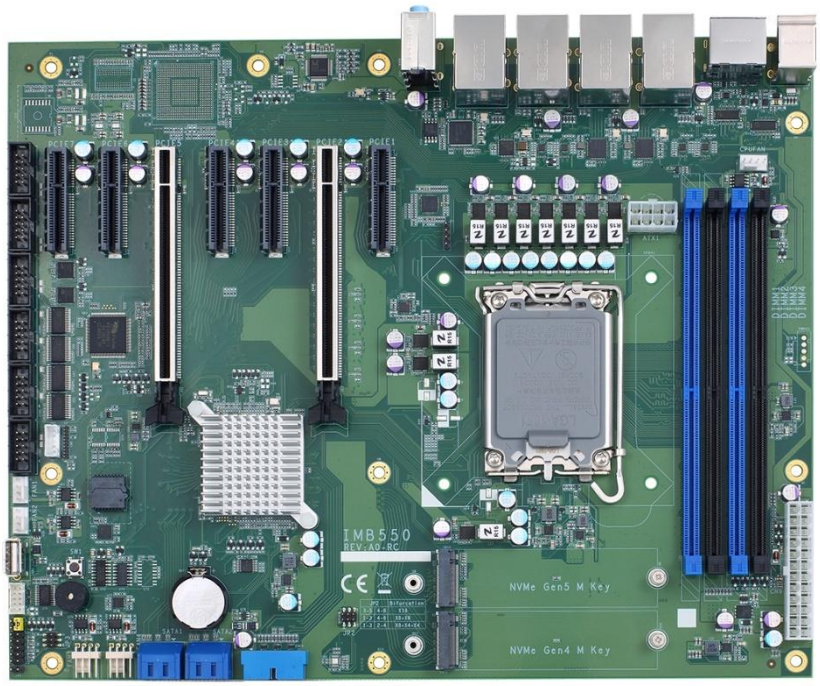
Section 1
Introduction



The IMB550 is an advanced ATX industrial motherboard based on Intel® Core™ Ultra Processors in an LGA1851 socket and comes with an Intel® W880 chipset. Specially designed for optimal computing and visual performance, the IMB550 motherboard is an ideal solution for major industry applications ranging from machine vision with AI to designing complex AI model training and LLM. With its built-in Intel Xᵉ LPG graphics, this industrial grade motherboard delivers superb 3D visual performance and supports displays through DisplayPort++, and HDMI ports to meet professional-grade CAD and media/entertainment needs.

In addition, the IMB550 supports Intel® Turbo Boost Technology 2.0 and Intel® Turbo Boost Max Technology 3.0 technology, Intel® Xᵉ LPG graphics,192GB DDR5-4400 ECC/non-ECC un-buffered Long-DIMM, and 2 PCI-Express 5.0 x16 slots. It also features Intel® AMT with Intel vPro®, SATA RAID, M.2 M key for NVMe as well as PCI Express expansion interfaces, making it specifically suited for various applications with added features.

1.1 Features

- Intel® Socket 1851 Core™ Ultra 9/7/5 Processors (Arrow Lake-S), up to 125W
- 4 x 288-pin DDR5-4400 ECC/non-ECC un-buffered Long-DIMM with maximum memory capacity up to 192GB (max. 48GB per slot)
- HDMI and Display port++ with dual-view support
- 2 x M.2 Key M 2280
- PCIe x16 slot with PCIe Gen5 signal
- IPMI 2.0 supported by OpenBMC (by project)
- Optimized CPU socket layout design for airflow of rackmount system

1.2 Specifications

- **CPU**
- Intel® Socket 1851 Core™ Ultra 9/7/5 Processors (Arrow Lake-S), up to 125W

Model	Core	Thread	TDP
Ultra 9 285K	24	24	125W
Ultra 9 285	24	24	65W
Ultra 7 265	20	20	35W
Ultra 5 245	14	14	65W
Ultra 5 225	10	10	65W
Ultra 9 285T	24	24	35W
Ultra 7 265T	20	20	35W
Ultra 5 245T	14	14	35W
Ultra 5 225T	10	10	35W

- **Chipset**
  - Intel® W880

- **BIOS**
  - AMI BIOS

- **System Memory**
  - 4 x 288-pin ECC/non-ECC un-buffered Long-DIMM sockets
  - Maximum 192GB DDR5-4400 memory (max. 48GB per slot)

- **Onboard Multi I/O**
  - 1 x PS/2 keyboard (rear I/O)
  - 1 x PS/2 mouse (rear I/O)
  - 1 x SMBus
  - Four serial ports:
    - 2 x RS-232 (internal, box headers).
    - 2 x RS-232/422/485 (internal, box headers)

- **USB Interface**
  - 4 x USB3.2 Gen 2x1 (10Gbps) ports.(rear I/O)
  - 4 x Dual USB 3.2 Gen 1x1 (5Gbps) ports. (rear I/O)
  - 2 x Dual USB 3.2 Gen1x1 (5Gbps) (internal, box header)
  - 1 x USB 2.0 (internal, 180D Type-A)

- **Ethernet**
  - 1 x 10/100/1000 Mbps with Intel® I219-LM supporting Wake-on-LAN, PXE Boot ROM, and Intel® AMT with Intel vPro®
  - 2 x 10/100/1000/2500 Mbps Ethernet with Intel® I226-V supporting Wake-on-LAN, and PXE Boot ROM
  - 1 x 10/100/1000Mbps IPMI LAN Intel® I210-AT shared with AST2600, supports Wake-on-LAN, and PXE Boot ROM (option)

- **Serial ATA**
  - 4 x SATA-600 with RAID 0/1/5/10

- **Digital I/O**
  - 8-channel programmable

- **Audio**
  - HD Codec audio as MIC-in/Line-in/Line-out

- **Display**
  - 1 x HDMI 1.4b, up to 4096 x 2160 @ 24Hz
  - 1 x Display port++ (DP 1.2), up to 4096 x 2304 @ 60Hz

- **Expansion Interface**
  - 2 x PCIe x16 slots (signal: PCIe Gen 5 x16 + PCIe x0 or PCIe Gen 5 x8 + PCIe Gen 4 x8)
  - 5 x PCIe x4 slot open ended (slot 1, 4 & 7 with PCIe x4 signal; slot 3 & 6 with PCIe x2 signal; signal by PCH)

- **TPM**
  - TPM 2.0

- **Power Input**
  - 1 x ATX power input connector
  - 1 x 12V ATX power input connector for CPU Power

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

- **Storage Temperature**
  - -20°C ~ 75°C

- **Form Factor**
  - 305 x 244mm

Note

All specifications and images are subject to change without notice.

1.3 Packing list

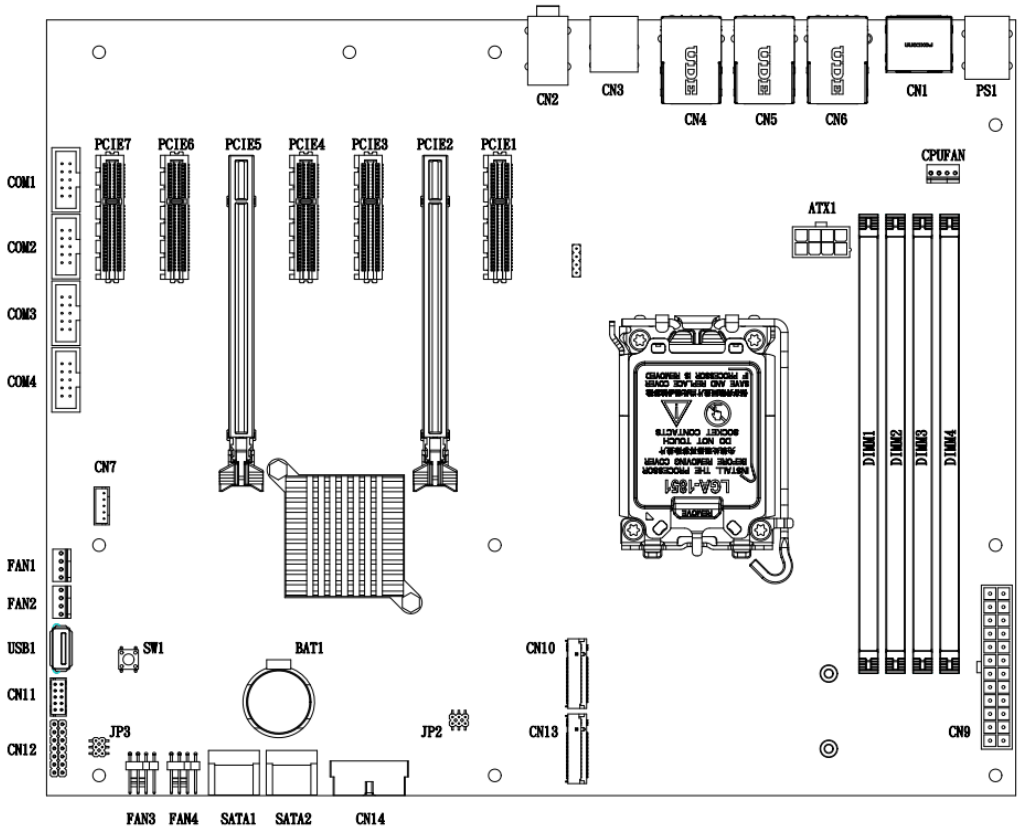
- **Bulk pack**
  - 1 x Motherboard
  - 1 x I/O bracket

- **Single pack**
  - 1 x Motherboard
  - 1 x I/O bracket

Section 2
Board and Pin Assignments

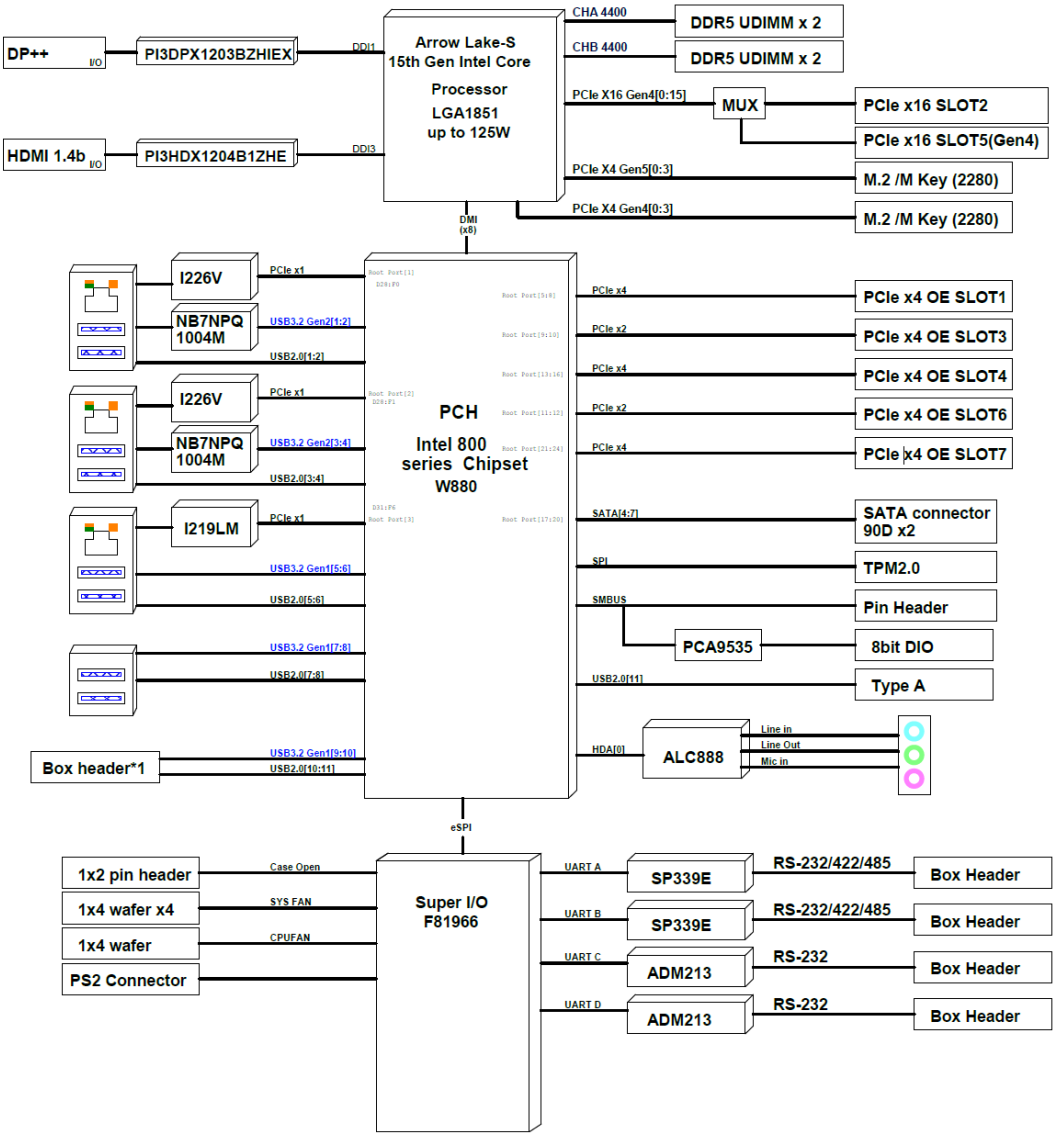
2.1 Board Layout

Top side



2.2 Block Diagram

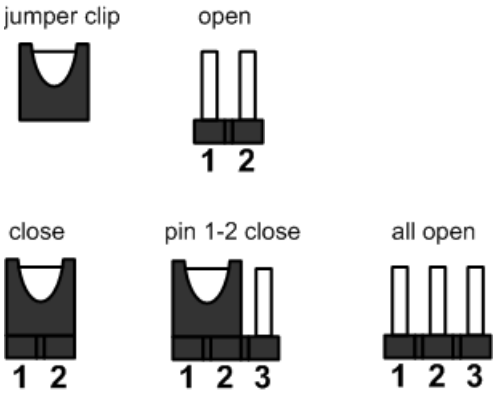
BLOCK DIAGRAM



2.3 Jumper Settings

Pin description

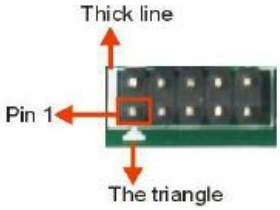
A jumper is a small component consisting of a jumper clip and jumper pins. Install a jumper clip on two jumper pins to close the jumper pins. Remove the jumper clip from two jumper pins to open the jumper pins. The following illustration shows how to set up a jumper.



Note

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

- ***There is a thick line or a triangle near the header or jumper pin 1.***



- ***A square pad, which you can find on the back of the motherboard, is usually used for pin 1.***

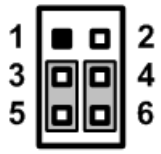
Before applying power to the IMB550 series motherboard, make sure all of the jumpers are in factory default position. Below you can find a summary table of all jumpers and onboard default settings.

Jumper	Description	Setting
JP2	PCIe x16 slot Default: x16	3-5 Close 4-5 Close
JP3	AT/ATX Power Mode Select Default: AT Mode	2-4 Close

2.3.1 PCIE2/PCIE5 x16 slot bifurcation (JP2)

Use these jumpers (3x2-pin p=2.54mm) to set signal of PCIe x16 slot.

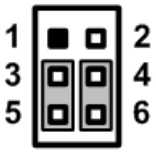
Function	JP2 Setting	Remark
PCIE2 : x16 PCIE5 : NA	Closed 3-5 (Default) Closed 4-6 (Default)	
PCIE2 : x8 PCIE5 : x8	Closed 1-3 Closed 4-6	
PCIE2 : x8 PCIE5 : x4 & x4	Closed 1-3 Closed 2-4	
PCIE2 : x8 & x8 PCIE5 : NA	Closed 1-3 Closed 4-6	For riser card
PCIE2 : x8, x4 & x4 PCIE5 : NA	Closed 1-3 Closed 2-4	For riser card



2.3.2 ATX/AT mode (JP3)

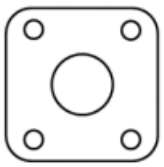
This 3x2-pin p=2.54mm jumper allows you to select AT or ATX power mode.

Function	Setting
AT mode (Default)	Closed 2-4
ATX mode	Closed 4-6



2.3.3 Clear CMOS (SW1)

Pressing the tact switch can restore BIOS optimal defaults.



2.4 Connectors

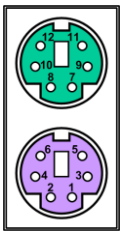
Signals go to other parts of the system through connectors. Loose or improper connection might cause problems. Make sure all connectors are properly and firmly connected. Here is a summary table showing the connectors on the motherboard.

Connector	Description
PS1	PS/2 KB / MS Connector
CN1	DP / HDMI Connector
CN6	LAN I226 + USB3.2 GEN2*2 Connector
CN5	LAN I226 + USB3.2 GEN2*2 Connector
CN4	LAN I219 + USB3.2 GEN1*2 Connector
CN3	USB3.2 GEN1*2 Connector
CN2	Audio ALC888 Connector
COM1~COM4	COM Box Header
CN7	SMBUS Box Header
FAN1~FAN4	System FAN
CPU FAN	CPU FAN
USB1	USB2.0 (180° type-A)
CN11	GPIO
CN12	FRONT PANEL
SATA1~SATA2	SATA Connector
CN14	USB3.2 GEN1*2 box header
CN10	NVME GEN4 M.2 PCIE Connector
CN13	NVME GEN5 M.2 PCIE Connector
DIMM1~DIMM4	DDR5 UDIMM Connector
CN9	ATX Power Connector
ATX1	ATX CPU 12V Power Connector
JP2	PCIE2/PCIE5 x16 bifurcation Jumper
JP3	AT/ATX mode Jumper
JP4	Case Open Jumper
SW1	Clear CMOS BTN
BAT1	CMOS Battery Connector
PCIE2、PCIE5	PCIE GEN4 x16 bifurcation Connector
PCIE1 / PCIE4 / PCIE7	PCIE GEN4 x4 Connector
PCIE3 / PCIE6	PCIE GEN4 x2 Connector

2.4.1 PS2 KM/MS (PS1)

The board has two 6-pin mini-DIN PS/2 connectors, green for mouse and purple for keyboard.

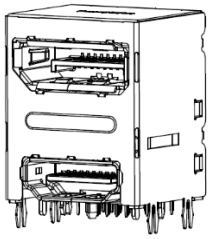
Pin	Signal	Pin	Signal
1	K/B Data	7	M/S Data
2	NC	8	NC
3	GND	9	GND
4	Standby power +5V	10	Standby power +5V
5	K/B CLK	11	M/S CLK
6	NC	12	NC



2.4.2 DP / HDMI Connector (CN1)

CN1 is a double-deck connector comprising an upper connector for DisplayPort++ (CN1A) and a lower connector for HDMI (CN1B).

Pin	Signal	Pin	Signal
1	LANE 0	21	DATA2
2	GND	22	GND
3	LANE 0#	23	DATA2#
4	LANE 1	24	DATA1
5	GND	25	GND
6	LANE 1#	26	DATA1#
7	LANE 2	27	DATA0
8	GND	28	GND
9	LANE 2#	29	DATA1#
10	LANE 3	30	Clock
11	GND	31	GND
12	LANE 3#	32	Clock#
13	Detect Pin	33	NC
14	GND	34	NC
15	AUX CH	35	SCL
16	GND	36	SDA
17	AUX CH#	37	GND
18	Hot Plug Detect	38	+5V POWER
19	GND	39	Hot Plug Detect
20	DP_PWR(3.3V)		

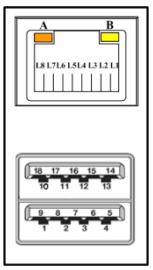


2.4.3 LAN I226 + USB3.2 GEN2*2 Connector (CN5、CN6)

The motherboard comes with three high performance plug and play Ethernet interfaces (RJ-45) which are fully compliant with the IEEE 802.3 standard. Connection can be established by plugging one end of the Ethernet cable into this RJ-45 connector and the other end to a (LAN2/CN5) 2500/1000/100/10 (LAN1/CN6) 2500/1000/100/10 Base-T hub. The Universal Serial Bus Compliant with USB 3.2 Gen2x1 (10Gbps) (CN6) or USB3.2 Gen2x1 (10Gbps) (CN5) connectors on the rear I/O are for connecting USB peripherals such as a keyboard, mouse, scanner, etc.

Pin	LAN Signal	LAN Signal
L1	BI_DA+	Bidirectional or Transmit Data+
L2	BI_DA-	Bidirectional or Transmit Data-
L3	BI_DB+	Bidirectional or Receive Data+
L4	BI_DC+	Bidirectional or Not Connected
L5	BI_DC-	Bidirectional or Not Connected
L6	BI_DB-	Bidirectional or Receive Data
L7	BI_DD+	Bidirectional or Not Connected
L8	BI_DD-	Bidirectional or Not Connected
A	Speed LED	2500 LAN LED (Green) / 1000 LAN LED (Orange)
B	Active LED	Active Link LED (Yellow)

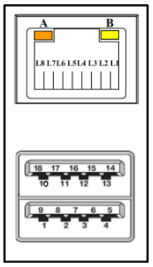
Pin	USB Signal	Pin	USB Signal
1	USB3_POWER	2	USB1 -
3	USB1 +	4	GND
5	USB3_SSRX1-	6	USB3_SSRX1+
7	GND	8	USB3_SSTX1-
9	USB3_SSTX1+	10	USB3_POWER
11	USB2 -	12	USB2 +
13	GND	14	USB3_SSRX2-
15	USB3_SSRX2+	16	GND
17	USB3_SSTX2-	18	USB3_SSTX2+



2.4.4 LAN I219 + USB3.2 GEN1*2 Connector (CN4)

Pin	LAN Signal	Pin	LAN Signal
L1	Tx+ (Data transmission positive)	L2	Tx- (Data transmission negative)
L3	Rx+ (Data reception positive)	L4	RJ-1 (For 1000 Base-T only)
L5	RJ-1 (For 1000 Base-T only)	L6	Rx- (Data reception negative)
L7	RJ-1 (For 1000 Base-T only)	L8	RJ-1 (For 1000 Base-T only)
A	100 LAN LED (Green) / 1000 LAN LED (Orange)	B	Active LED

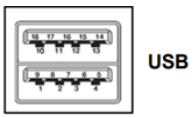
Pin	USB Signal		Pin	USB Signal
1	USB3_POWER		2	USB1 -
3	USB1 +		4	GND
5	USB3_SSRX1-		6	USB3_SSRX1+
7	GND		8	USB3_SSTX1-
9	USB3_SSTX1+		10	USB3_POWER
11	USB2 -		12	USB2 +
13	GND		14	USB3_SSRX2-
15	USB3_SSRX2+		16	GND
17	USB3_SSTX2-		18	USB3_SSTX2+



2.4.5 USB3.2 GEN1*2 Connector (CN3)

This is a Universal Serial Bus (complaint with USB 3.2 Gen1x1) connector on the rear I/O for installing USB peripherals such as keyboard, mouse, scanner, etc.

Pin	Signal	Pin	Signal
1	USB_VCC (+5V power)	10	USB_VCC (+5V power)
2	USB_Data1-	11	USB_Data2-
3	USB_Data1+	12	USB_Data2+
4	GND	13	GND
5	SSRX1-	14	SSRX2-
6	SSRX1+	15	SSRX2+
7	GND	16	GND
8	SSTX1-	17	SSTX2-
9	SSTX1+	18	SSTX2+



2.4.6 Audio ALC888 Connector (CN2)

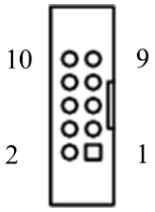
Install an audio driver, and then attach audio devices to CN2.

Pin Color	Signal
Blue	Line-in
Green	Line-out
Pink	MIC-in

2.4.7 COM Box Header (COM1~COM4)

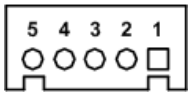
The motherboard comes with 5x2-pin headers for COM serial port interfaces for COM1 to COM4. Only COM1 and COM 2 are selectable for RS-232/422/485 mode by BIOS setting. The pin assignments are listed in the following table

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



2.4.8 SMBUS Box Header (CN7)

Pin	Signal	Pin	Signal
1	SMB_SCL	2	N/C
3	GND	4	SMB_SDA
5	+5V		



2.4.9 FAN connectors (CPUFAN, FAN1~FAN4)

This motherboard has four fan connectors. Find fan speed option(s) at BIOS Setup Utility: Advanced\HW Monitor\PC Health Status.

The CPUFAN (4x1-pin p=2.54mm) is for the CPU fan connector.

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

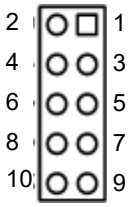
The FAN1, FAN2, FAN 3 and FAN4 (4x1-pin p=2.54mm) are for system fan connectors.

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

2.4.10 GPIO Header (CN11)

This header (5x2-pin p=2.00mm) is for digital I/O interface.

Pin	Signal	Pin	Signal
1	DIO1	2	DIO8
3	DIO2	4	DIO7
5	DIO3	6	DIO6
7	DIO4	8	DIO5
9	NC	10	GND



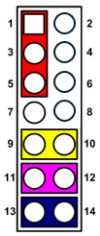
Note

The default value of DIO1 to DIO8 is set as GPI with high level.

2.4.11 Front Panel (CN12)

This is a front panel header (7x2-pin p=2.54mm).

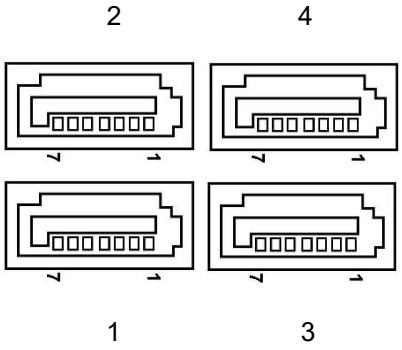
Pin	Signal	Pin	Signal
1	Power LED+	2	NA
3	GND	4	NA
5	Power LED-	6	NA
7	NA	8	NA
9	Power SW-	10	Power SW+
11	RESET-	12	RESET+
13	HDD LED-	14	HDD LED+



2.4.12 SATA Connector (SATA1 & SATA2)

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

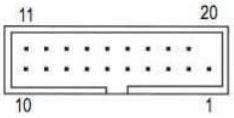
Pin	Signal
1	GND
2	SATA_TX+
3	SATA_TX-
4	GND
5	SATA_RX-
6	SATA_RX+
7	GND



2.4.13 Internal USB 3.2 Gen 1x1 (5Gbps) Connector (CN14)

The CN14 is a 19-pin internal connector for installing various USB 3.2 Gen 1x1 (5Gbps) compliant peripherals.

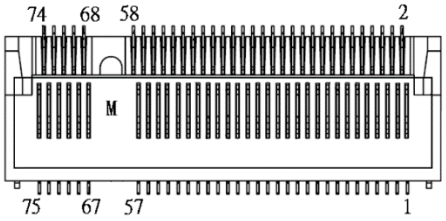
Pin	Signal	Pin	Signal
1	VBUS0		
2	SSRX5-	19	VBUS1
3	SSRX5+	18	SSRX6-
4	GND	17	SSRX6+
5	SSTX5-	16	GND
6	SSTX5+	15	SSTX6-
7	GND	14	SSTX6+
8	USB10-	13	GND
9	USB10+	12	USB11-
10	ID	11	USB11+



2.4.14 M.2 2280 Key M NVMe SSD (CN10 and CN13)

The motherboard comes with two M.2 Key M connector suitable for mounting PCIE x4 NVMe storage card.

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	GND	2	+3.3V	3	GND	4	+3.3V
5	PERn3	6	NC	7	PERp3	8	NC
9	GND	10	LED_1#	11	PETn3	12	+3.3V
13	PETp3	14	+3.3V	15	GND	16	+3.3V
17	PERn2	18	+3.3V	19	PERp2	20	NC
21	GND	22	NC	23	PETn2	24	NC
25	PETp2	26	NC	27	GND	28	NC
29	PERn1	30	NC	31	PERp1	32	NC
33	GND	34	NC	35	PETn1	36	NC
37	PETp1	38	NC	39	GND	40	NC
41	PERn0	42	NC	43	PERp0	44	NC
45	GND	46	NC	47	PETn0	48	NC
49	PETp0	50	PERST#	51	GND	52	CLKREQ#
53	REFCLKn	54	PEWAKE#	55	REFCLKp	56	NC
57	GND	58	NC	59	CONNECTOR Key M	60	CONNECTOR Key M
61	CONNECTOR Key M	62	CONNECTOR Key M	63	CONNECTOR Key M	64	CONNECTOR Key M
65	CONNECTOR Key M	66	CONNECTOR Key M	67	NC	68	NC
69	NC	70	+3.3V	71	GND	72	+3.3V
73	GND	74	+3.3V	75	GND		



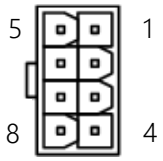
2.4.15 Power Input Connectors (ATX1 and CN9)

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

An external power supply plug fits into ATX1 and CN9 in only one orientation. Properly press down power supply plug until it completely and firmly fits into the connector. Loose connection may cause system instability.

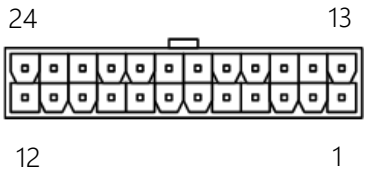
ATX1 CPU power input connector:

Pin	ATX1 Signal	Pin	ATX1 Signal
1	GND	5	+12V
2	GND	6	+12V
3	GND	7	+12V
4	GND	8	+12V



CN9 24-pin power input connector:

Pin	CN19 Signal	Pin	CN19 Signal
1	3.3V	13	3.3V
2	3.3V	14	-12V
3	GND	15	GND
4	+5V	16	PS_ON
5	GND	17	GND
6	+5V	18	GND
7	GND	19	GND
8	PWR OK	20	-5V
9	5VSB	21	+5V
10	+12V	22	+5V
11	+12V	23	+5V
12	3.3V	24	GND



Section 3
Hardware Description

3.1 Microprocessors

The IMB550 series supports Intel® Core™ Ultra Processors in an LGA1851 socket (Arrow Lake-S) and comes with an Intel® W880 chipset, which enable your system to operate under Windows® 11 and Linux environments. The system performance depends on the microprocessor. Make sure all correct settings are arranged for your installed microprocessor to prevent the CPU from damaging.

Note

Caution: Make sure you turn off the power before you install the processor into the CPU socket.

3.2 BIOS

The IMB550 series uses AMI Plug and Play BIOS.

3.3 System Memory

The IMB550 supports four 288-pin DDR5 Long-DIMM sockets for maximum memory capacity up to 192GB. The memory module comes in sizes of 2GB, 4GB, 8GB, 16GB, 32GB, and 48GB.

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Section 4
AMI BIOS Setup Utility

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

4.1 Starting

To enter the setup screens, follow the steps below:

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


Note

If your computer cannot boot after making and saving system changes with BIOS setup, you can restore BIOS optimal defaults by setting press the tact switch "SW1" for 5 seconds (see section 2.3.3).

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

4.2 Navigation Keys

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

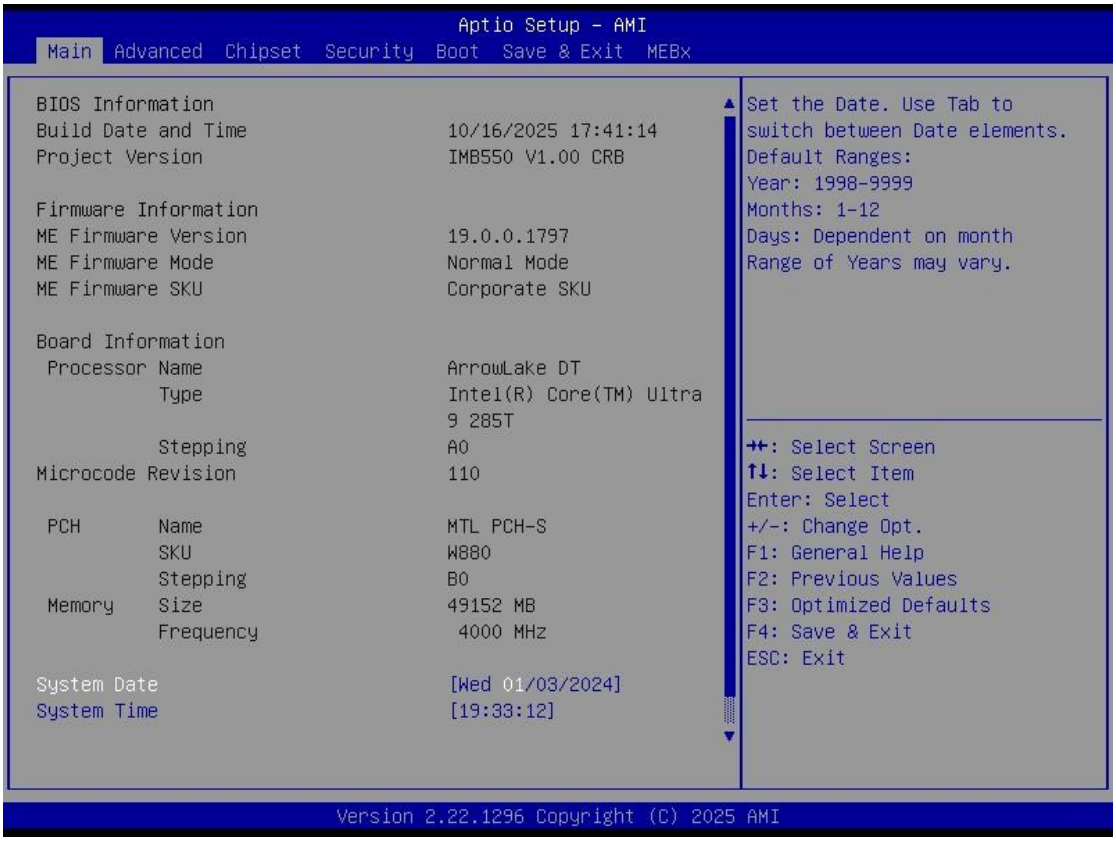

Note

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

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

4.3 Main Menu

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



BIOS Information
Display the BIOS information.

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

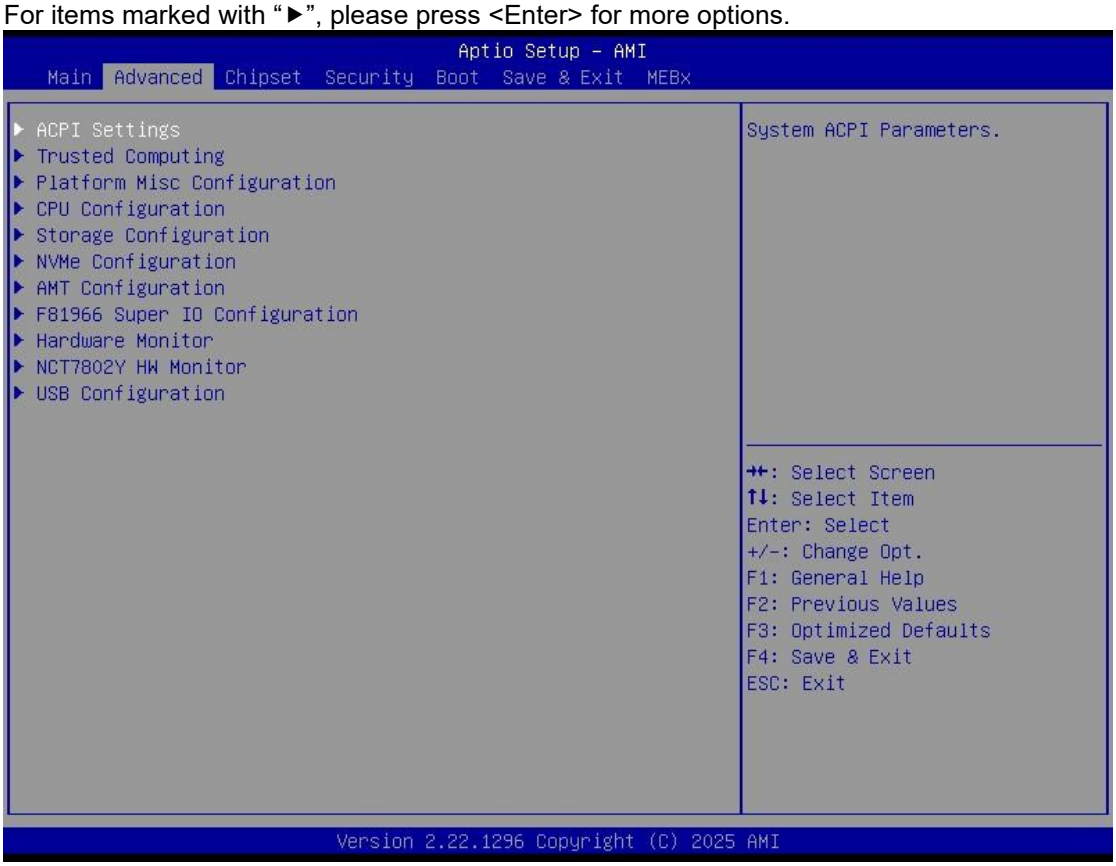
Access Level
Display the access level of current user.

4.4 Advanced Menu

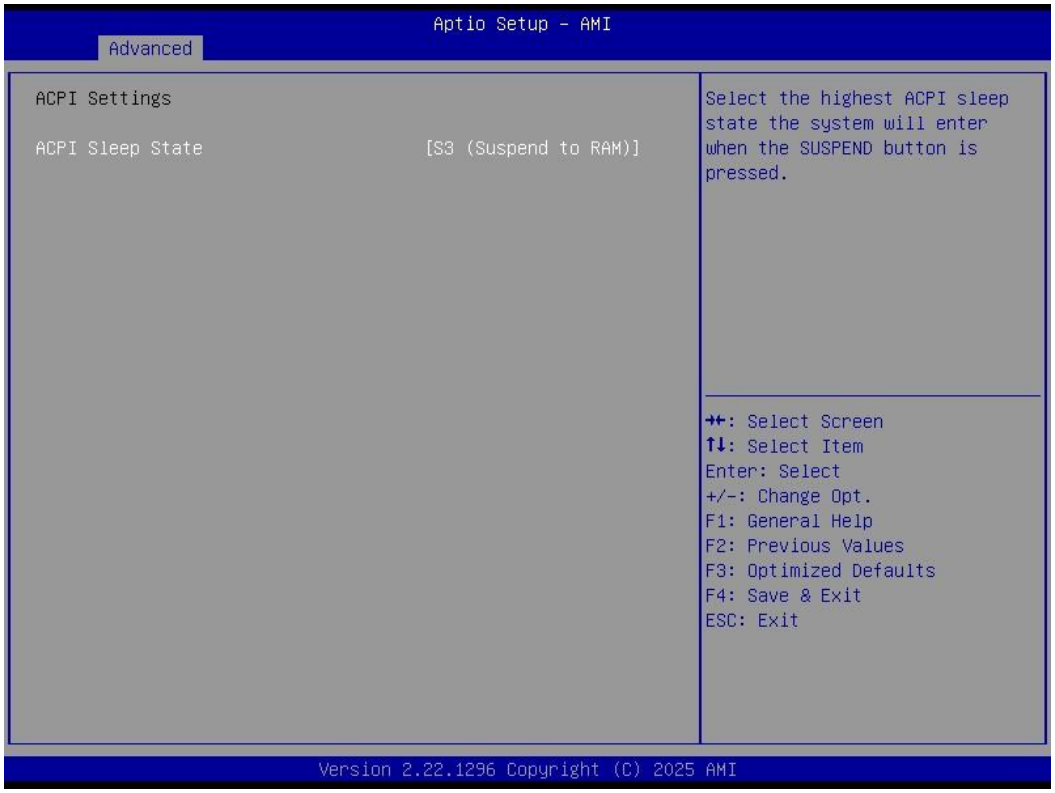
The Advanced menu also allows users to set configuration of the CPU and other system devices. You can select any of the items in the left frame of the screen to go to the sub menus:

- ► ACPI Settings
- ► Trusted Computing
- ► Platform Misc Configuration
- ► CPU Configuration
- ► Storage Configuration
- ► NVMe Configuration
- ► AMT Configuration
- ► F81966 Super IO Configuration
- ► Hardware Monitor
- ► NCT7802Y HW Monitor
- ► USB Configuration

For items marked with "►", please press <Enter> for more options.

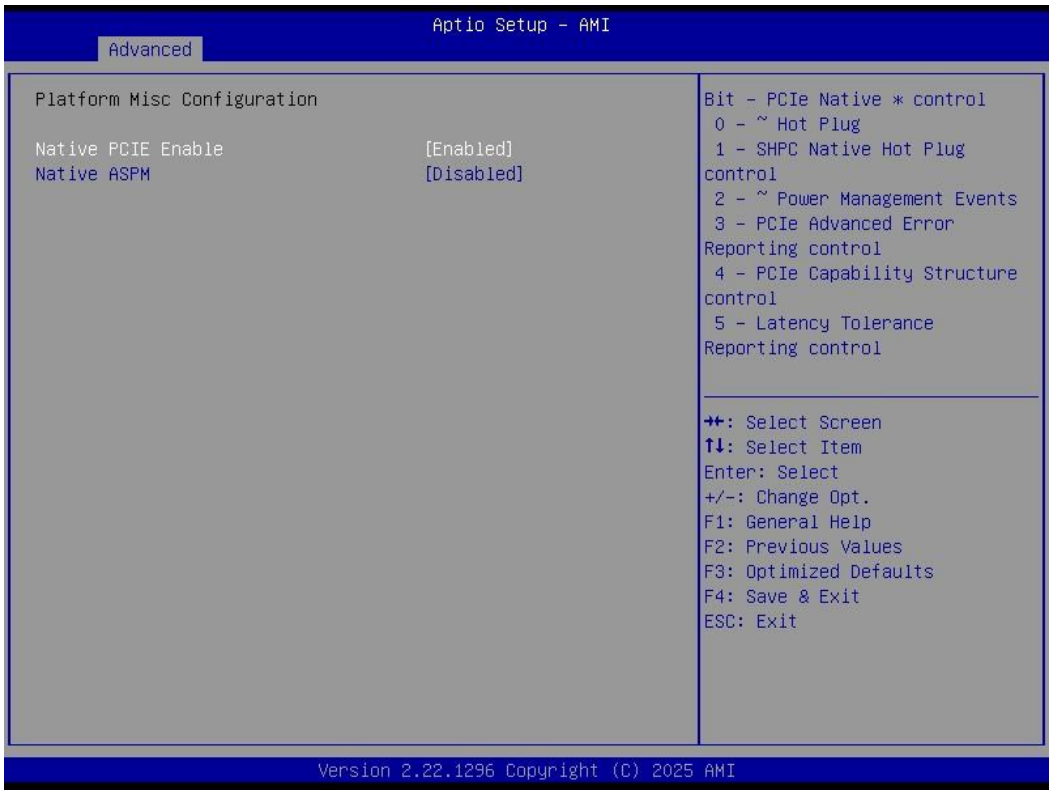


- **ACPI Setting**
  The ACPI (Advanced Configuration and Power Interface) setting allows you to configure power management features and system sleep states supported by the operating system.



- **Trusted Computing**
  Enable or disable security device support.

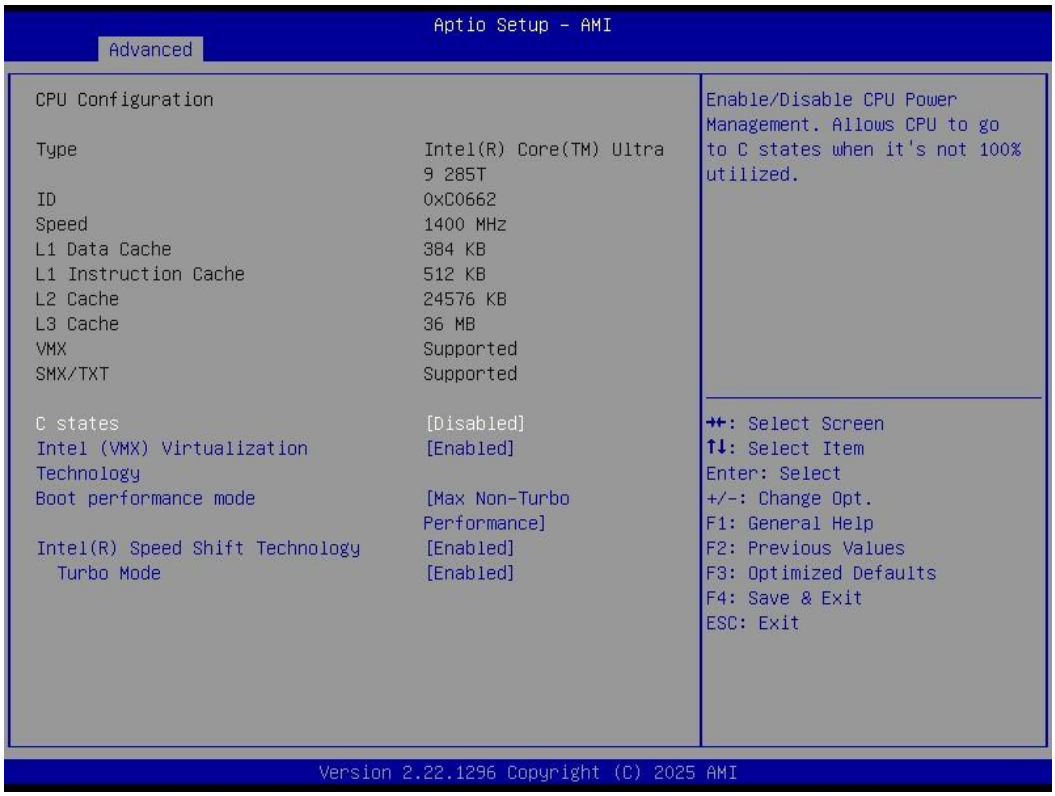
- **Platform Misc Configuration**
  This screen allows you to set Platform Misc Configuration.



Native PCIE Enable
Bit - PCIe Native * control\n 0 - ~ Hot Plug\n 1 - SHPC Native Hot Plug control\n 2 - ~ Power Management Events\n 3 - PCIe Advanced Error Reporting control\n 4 - PCIe Capability Structure control\n 5 - Latency Tolerance Reporting control.

Native ASPM
Enabled - OS Controlled ASPM, Disabled - BIOS Controlled ASPM.

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



Package C State Limit
Maximum Package C State Limit Setting. CPU Default: Sets to Factory default value. Auto: Initializes to deepest available Package C State Limit.

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

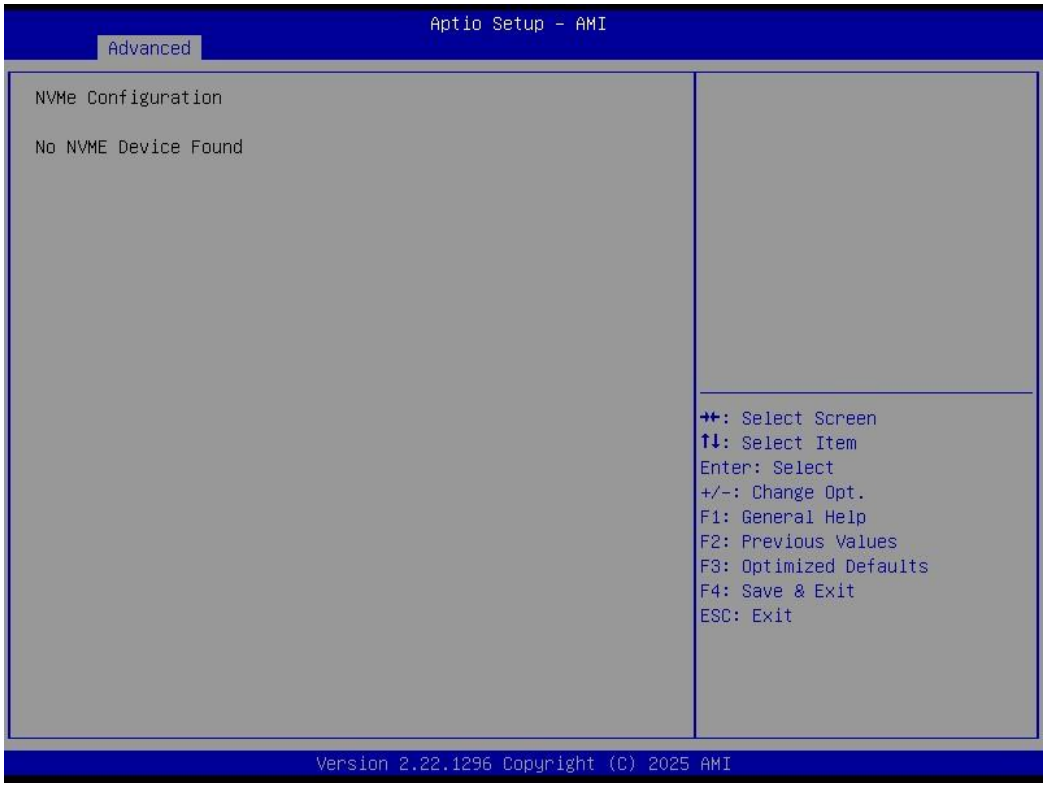
Boot performance mode
Select the performance mode that the BIOS will run after the reset.

Intel (R) SpeedStep(tm)
Allows more than two frequency ranges to be supported.

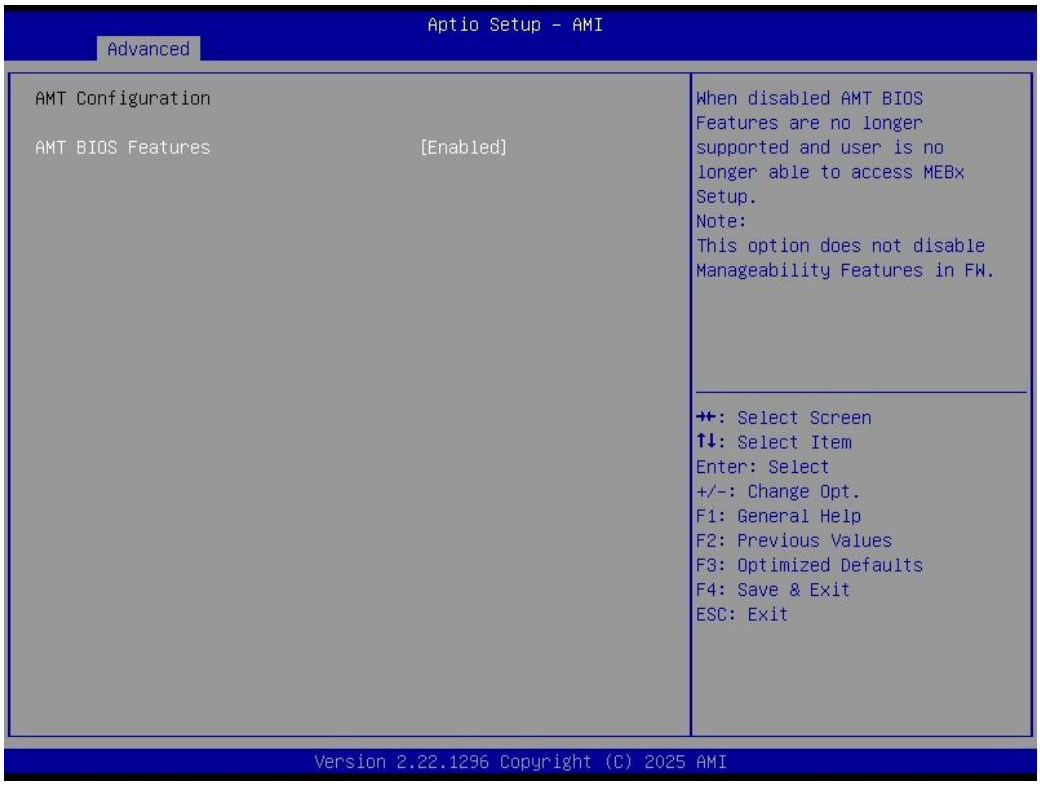
Turbo Mode
Allows to enable processor cores to raise the operating frequency.

- **Storage Configuration**
  This screen shows storage information.

- **NVMe Configuration**
  This screen shows NVMe device information.

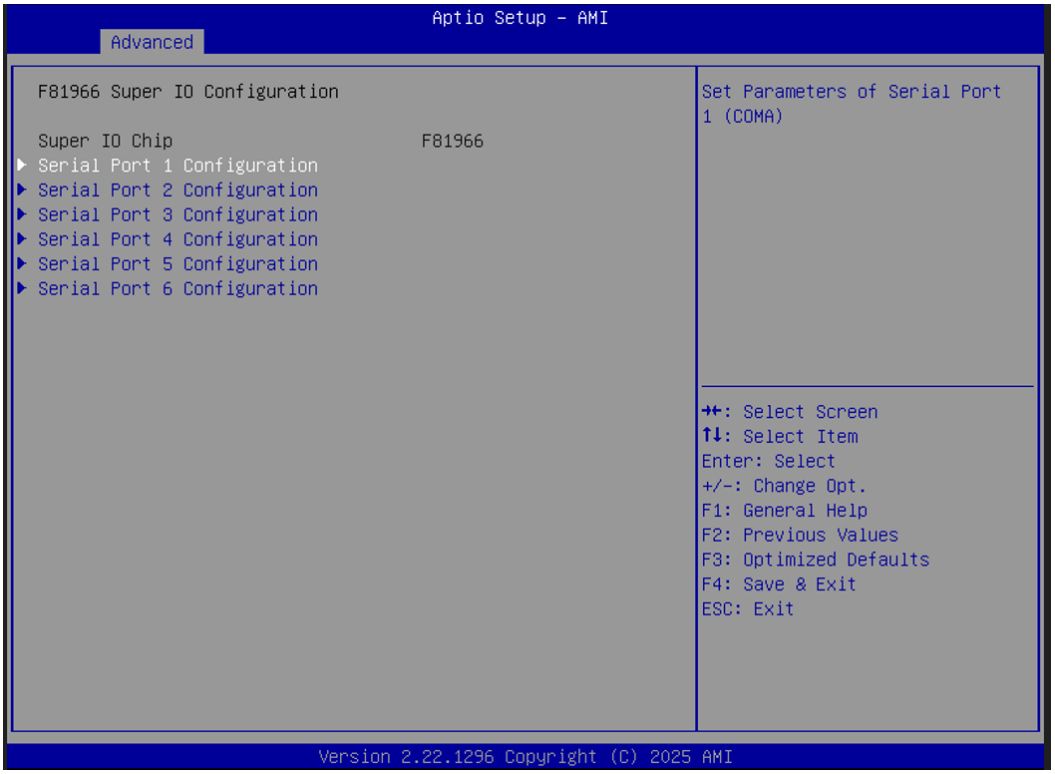


- **AMT Configuration**
  This screen displays Active Management Technology information.

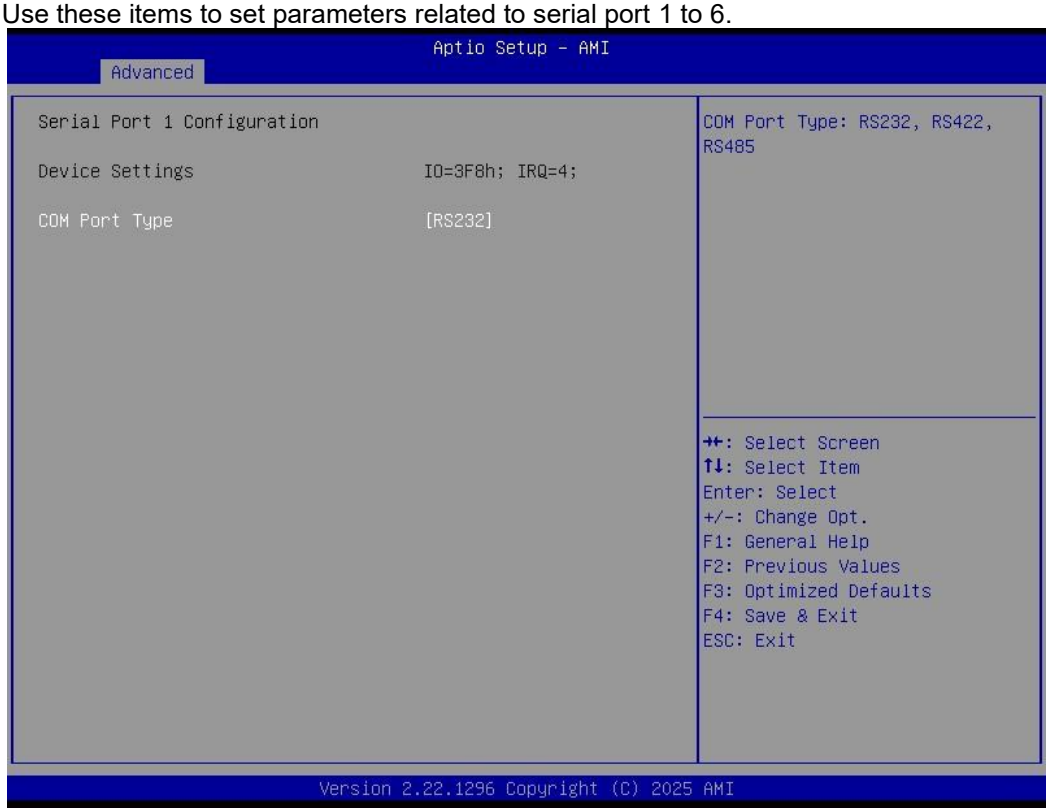


AMT BIOS Features
Enable or disable Active Management Technology BIOS features. The default is Enabled.

- **F81966 Super IO Configuration**
  You can use this screen to select options for the Super IO Configuration, and change the value of the selected option. A description of the selected item appears on the right side of the screen. For items marked with "▶", please press <Enter> for more options.



- **Serial Port 1 Configuration**
  Use these items to set parameters related to serial port 1 to 6.

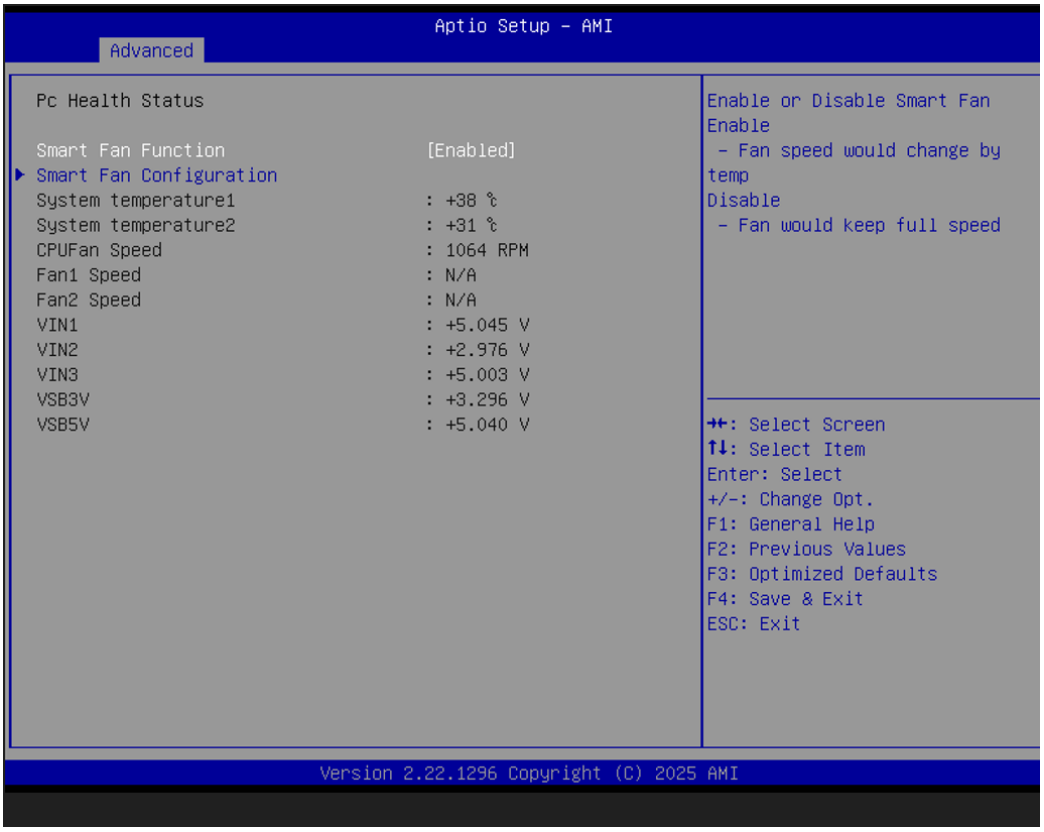


Serial Port 1
This item allows you to use it as RS232/422/485. The default is RS232.

Serial Port 2
This item allows you to use it as RS232/422/485. The default is RS232.

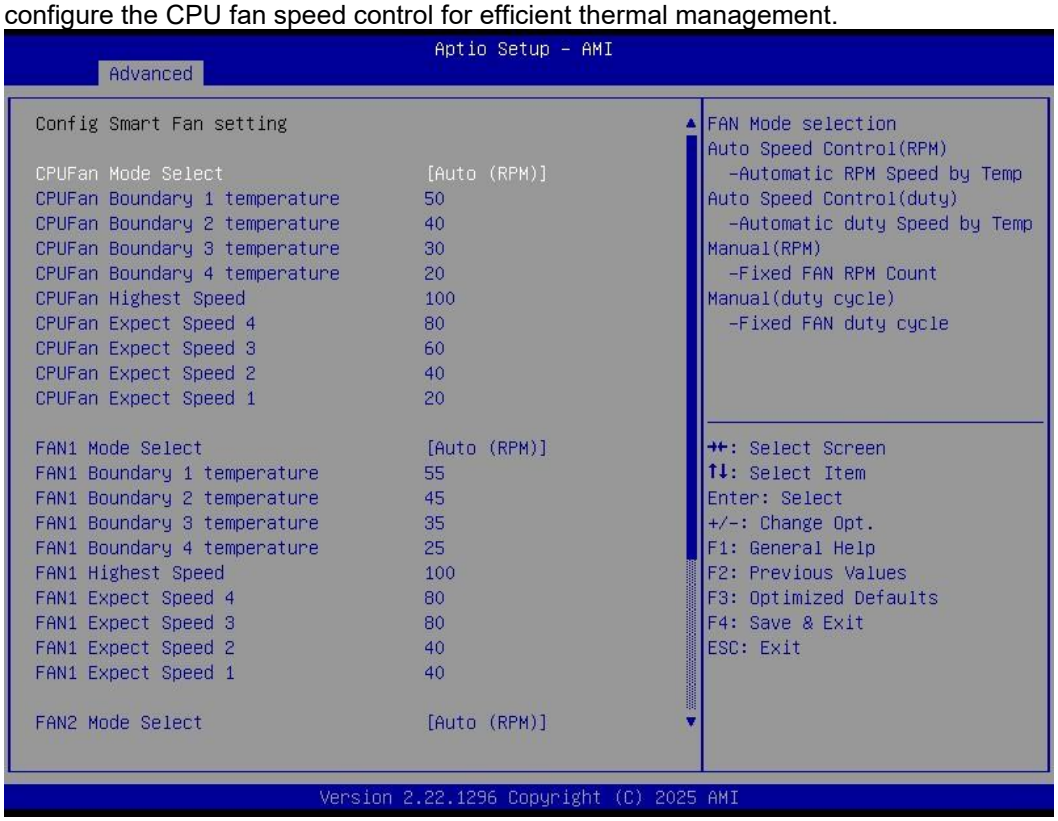
Serial Port 3~6 (Port 5 & Port 6 are optional, by project support)
These items allow you to use RS232 only .

- **Hardware Monitor**
  This screen monitors hardware health status.

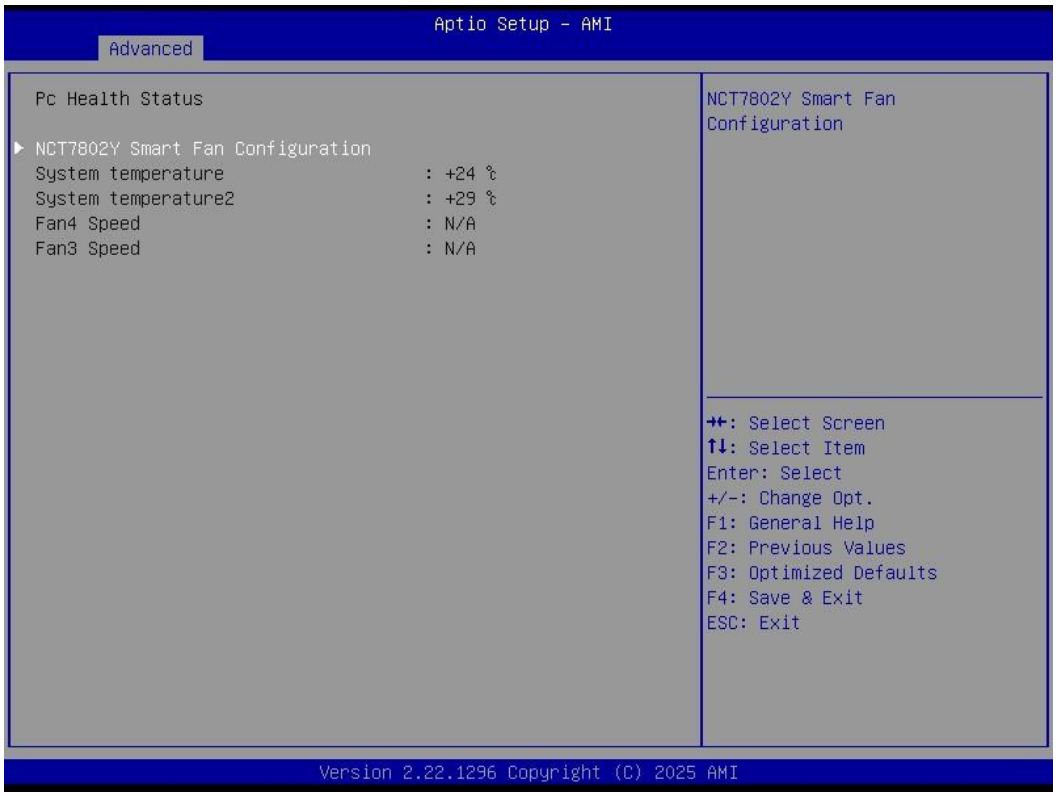


This screen displays the temperature of system and CPU, cooling fans speed in RPM and system voltages (VCC_CPU, DDR, +12V, +5V and +3.3V).

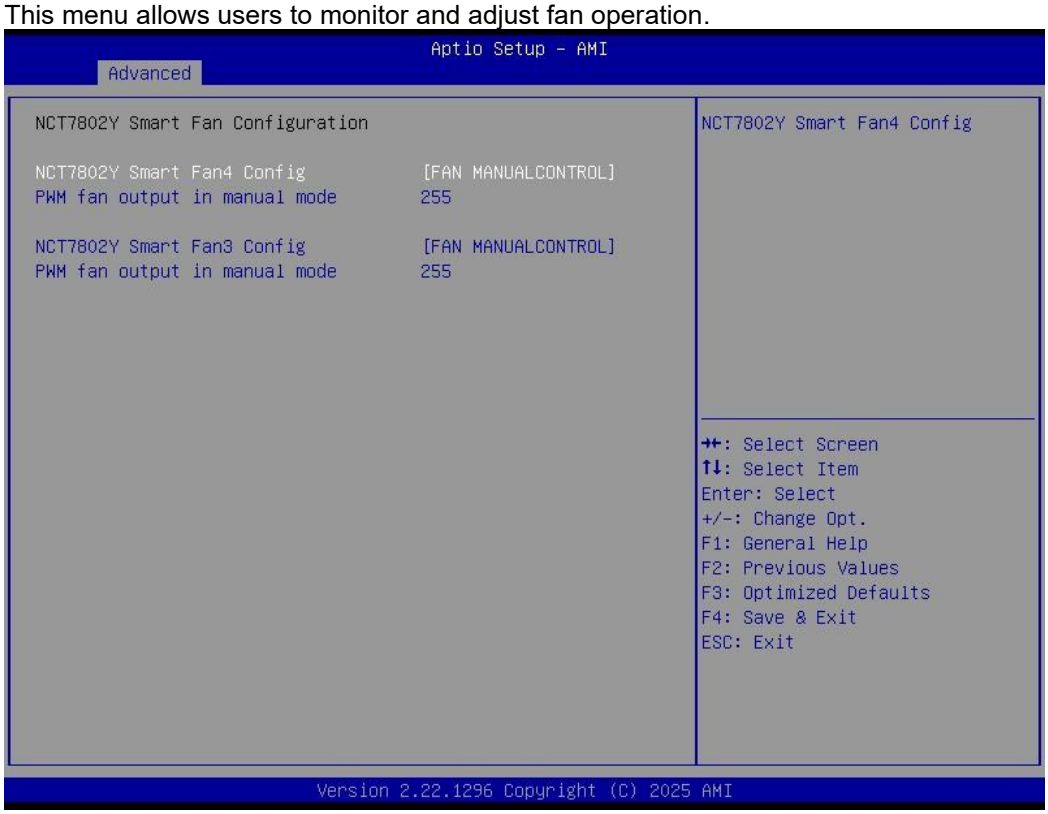
- **Smart Fan Configuration**
  The CPU Smart Fan Configuration menu allows you to monitor the CPU temperature and configure the CPU fan speed control for efficient thermal management.



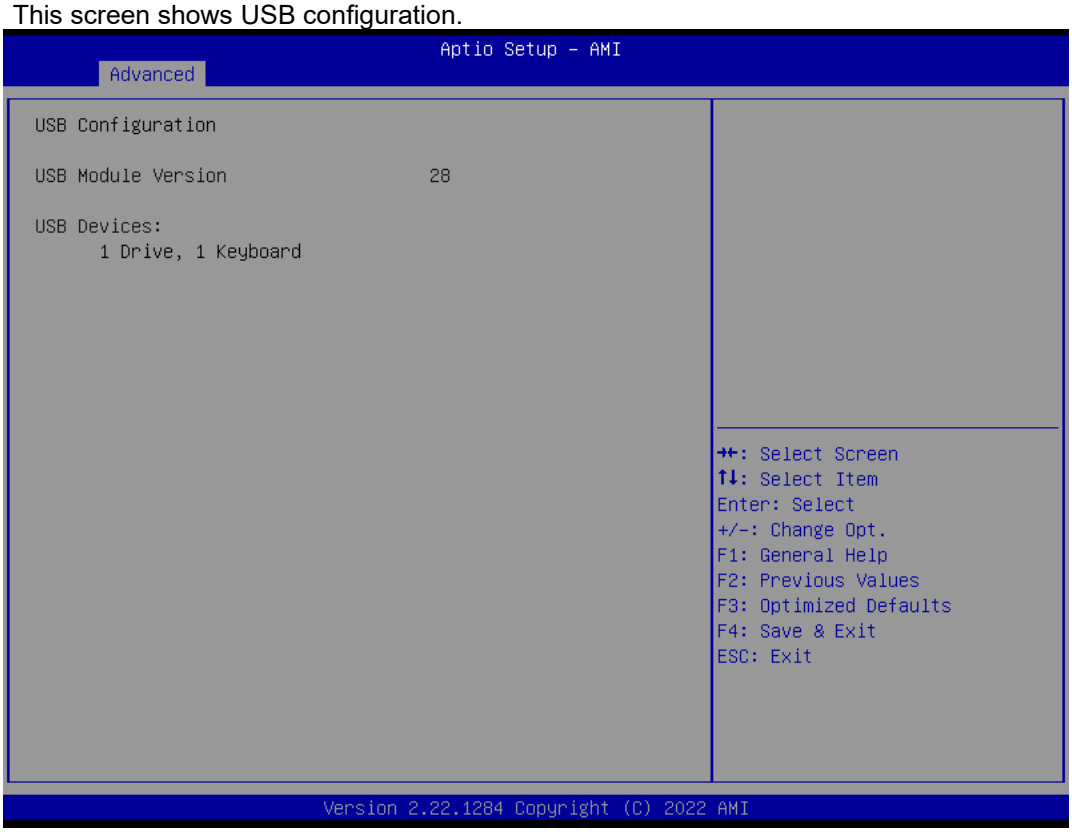
- **NCT7802Y HW Monitor**
  This provides real-time monitoring of system temperatures, and fan speeds to ensure stable operation and prevent hardware damage.



- **NCT7802Y Smart Fan Configuration**
  This menu allows users to monitor and adjust fan operation.



- **USB Configuration**
  This screen shows USB configuration.

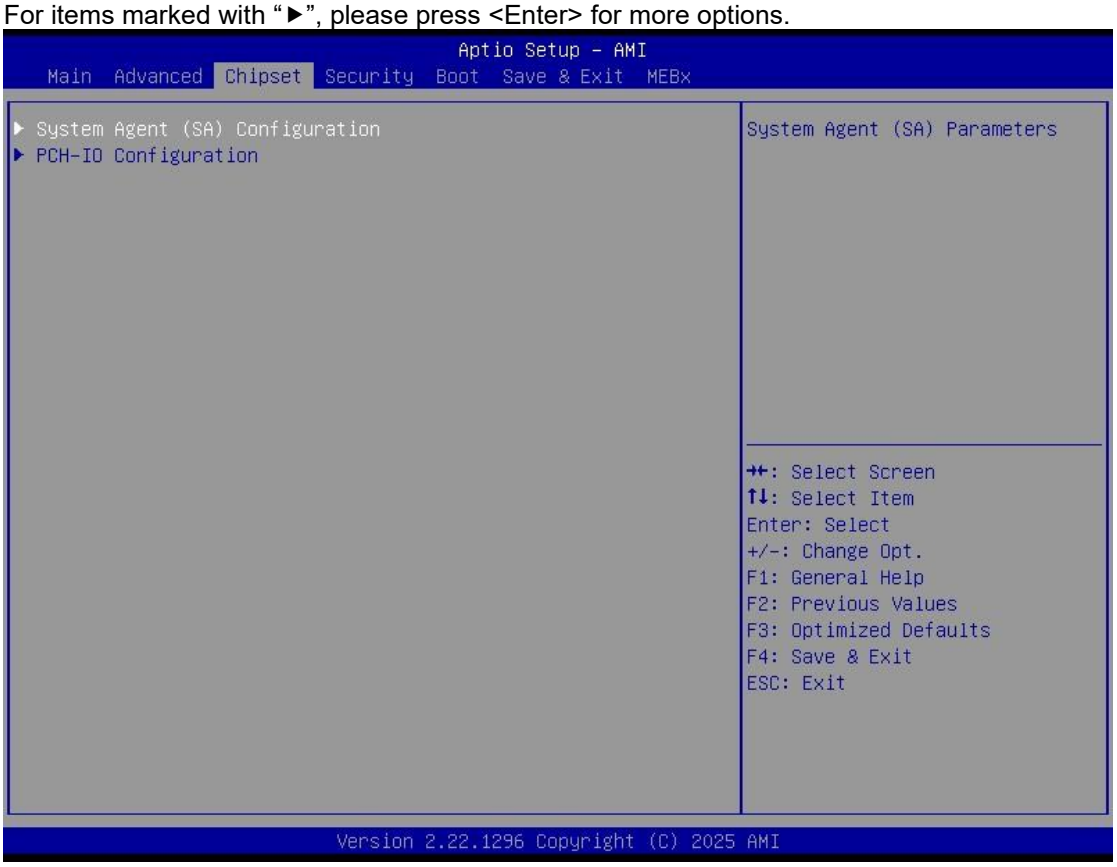


4.5 Chipset Menu

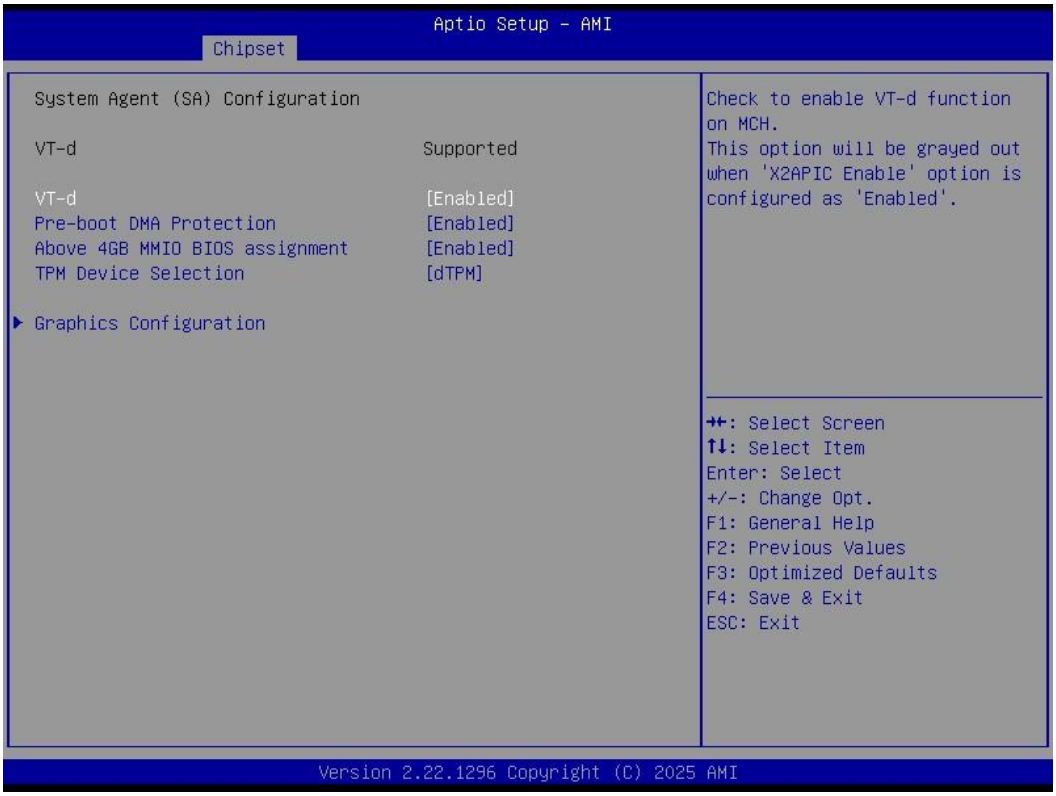
The Chipset menu allows users to change the advanced chipset settings. You can select any of the items in the left frame of the screen to go to the sub menus:

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

For items marked with "►", please press <Enter> for more options.



- **System Agent (SA) Configuration**
  This screen allows users to configure System Agent (SA) parameters. For items marked with "►", please press <Enter> for more options.



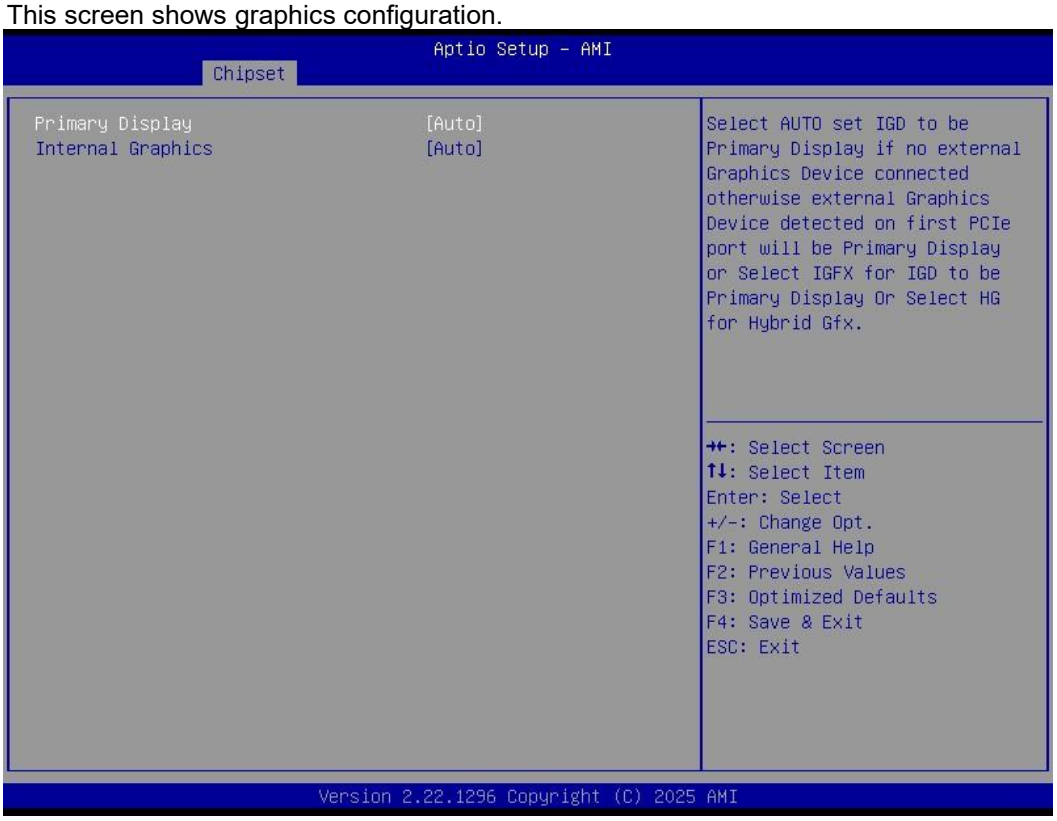
VT-d
Check to enable VT-d function on MCH.

Above 4GB MMIO BIOS assignment
Enable/Disable above 4GB Memory Mapped IO BIOS assignment \n\n. This is enabled automatically when Aperture Size is set to 2048MB.

Graphics Configuration
Open the sub menu for parameters related to graphics configuration.

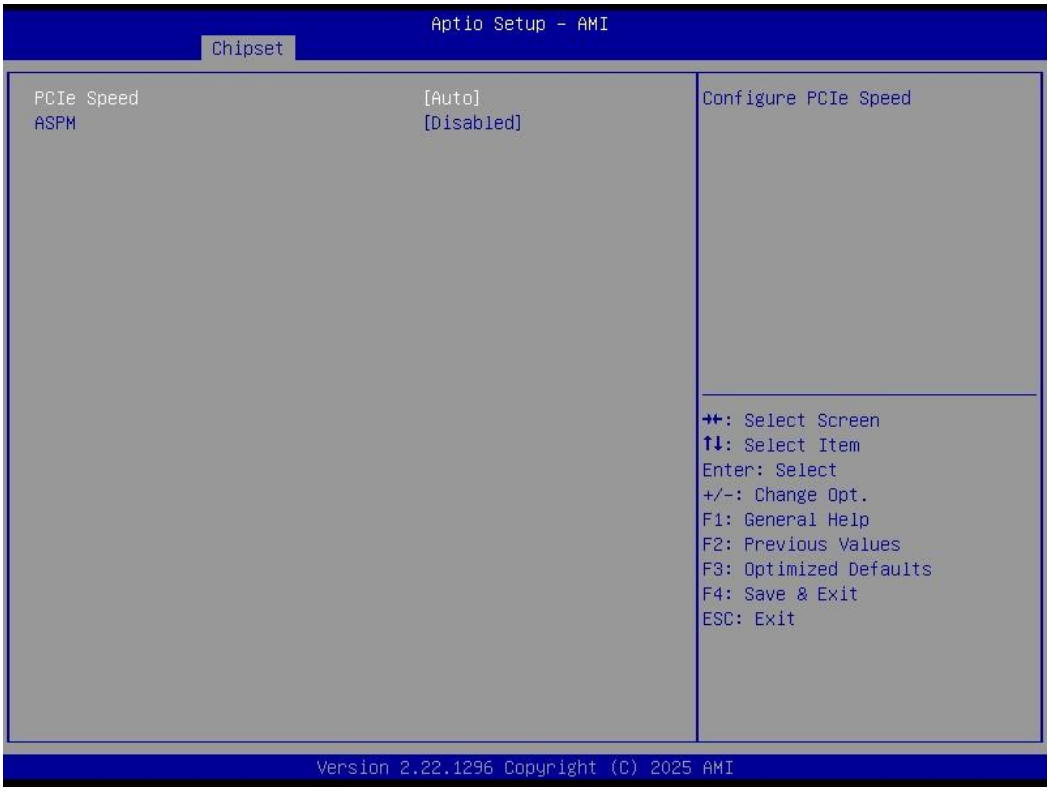
CPU PCI Express Root Port
Set the ASPM Level and PCI Express Speed.

- **Graphics Configuration**
  This screen shows graphics configuration.



Internal Graphics
Keep IGFX enabled based on the setup options.

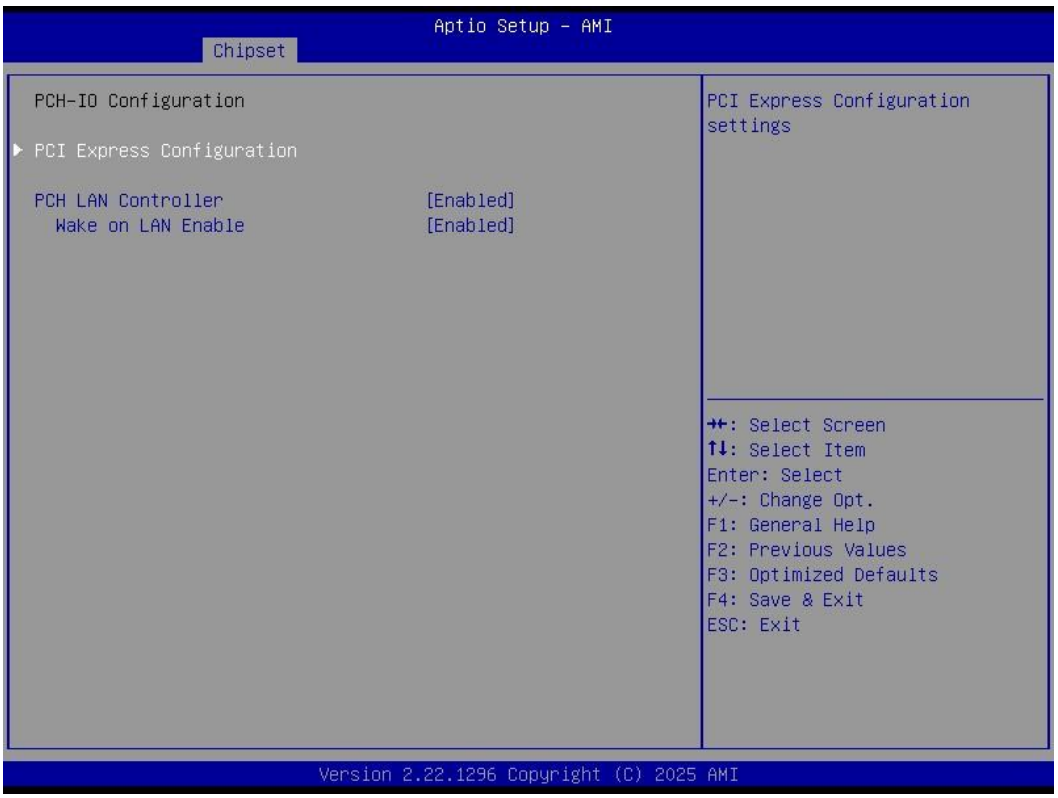
- **CPU PCI Express Root Port 4**
  This screen shows CPU PCI Express root port information.



ASPM
Set the ASPM Level:\nForce L0s - Force all links to L0s State\nForce L1 - Force all links to L1 State\nForce L0sL1 - Force all links to L0SL1 State\nDISABLE - Disables ASPM.

PCIe Speed
Configure PCIe Speed.

- **PCH-IO Configuration**
  This screen allows you to set PCH parameters.

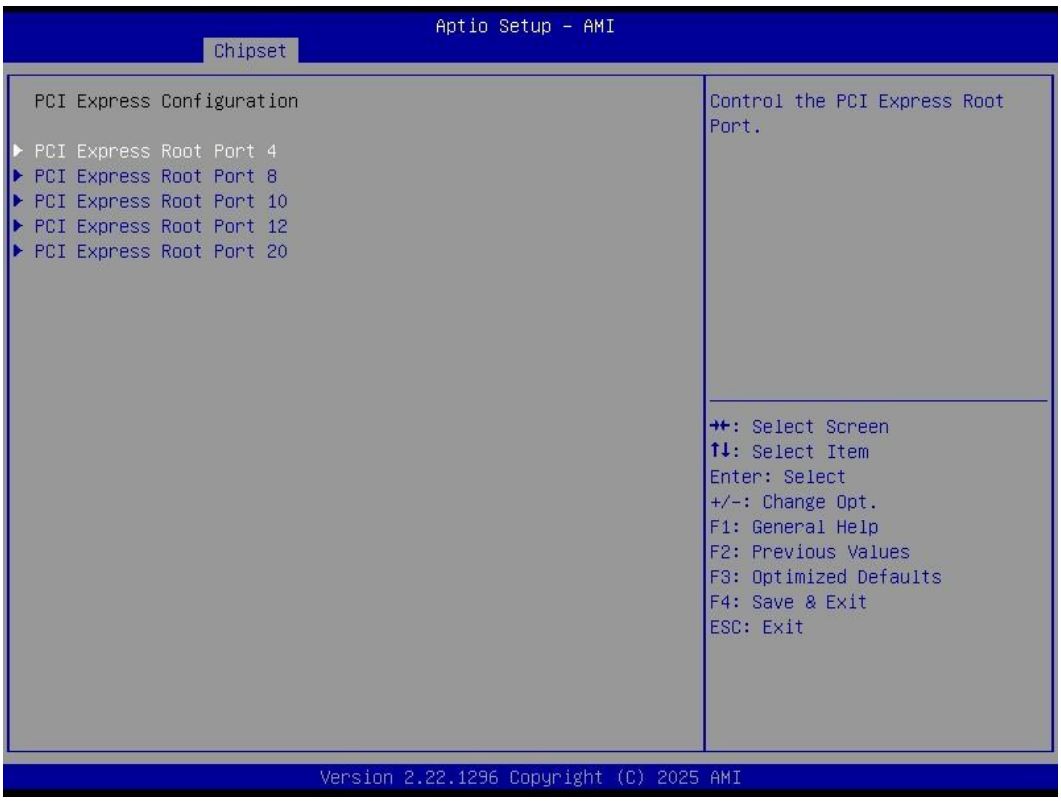


PCI Express Configuration
Configure PCIe Speed.

HD Audio Configuration
Enable or disable HD Audio.

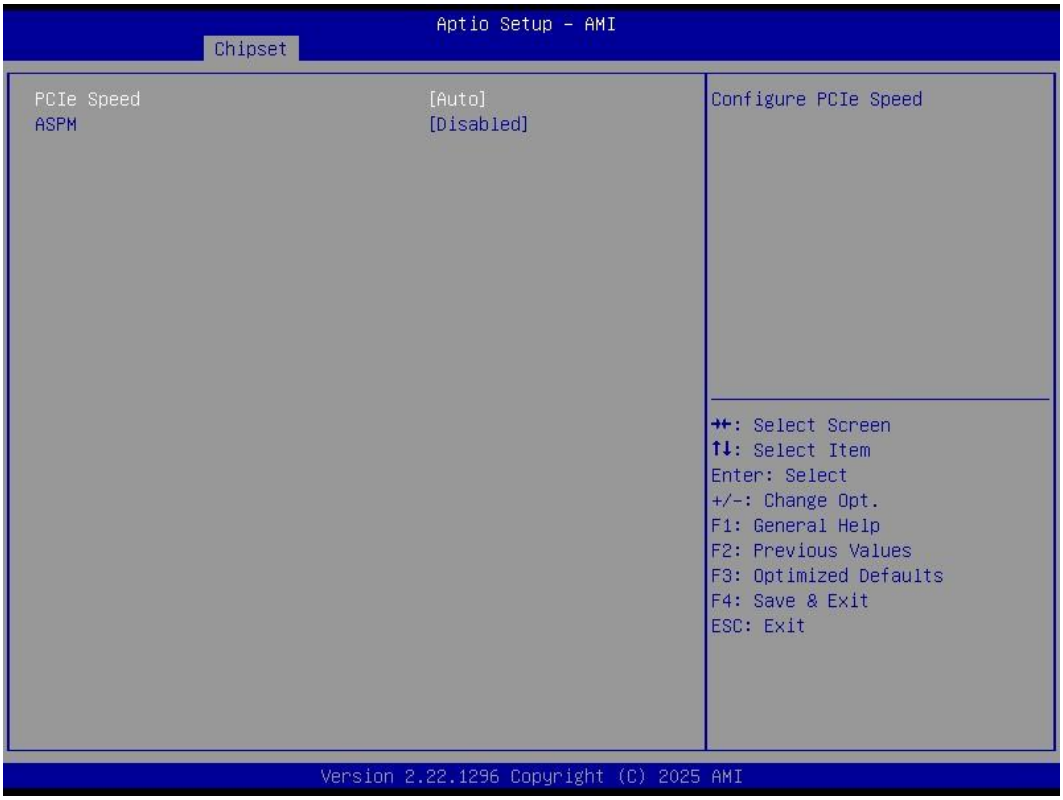
Wake on LAN Enable
Enable or disable integrated LAN to wake the system.

- **PCI Express Configuration**
  This screen shows PCI Express configuration.



Note

Port 4 -> PCIE4
Port 8 -> PCIE3
Port 10 -> PCIE6
Port 12 -> PCIE7
Port 20 -> PCIE1

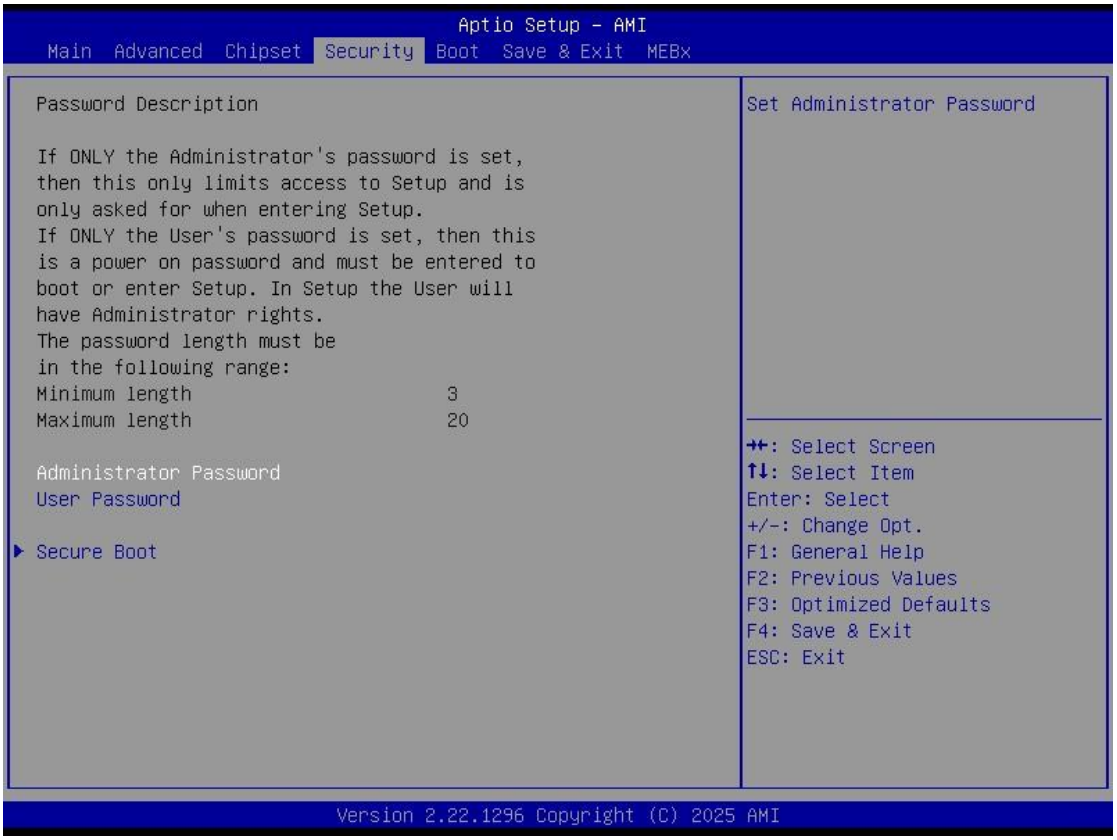


PCIe Speed
Configure PCIe Speed.

ASPM
Set the ASPM Level:\nForce L1 - Force all links to L1 State\nAUTO - BIOS auto configure\nDISABLE - Disables ASPM.

4.6 Security Menu

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

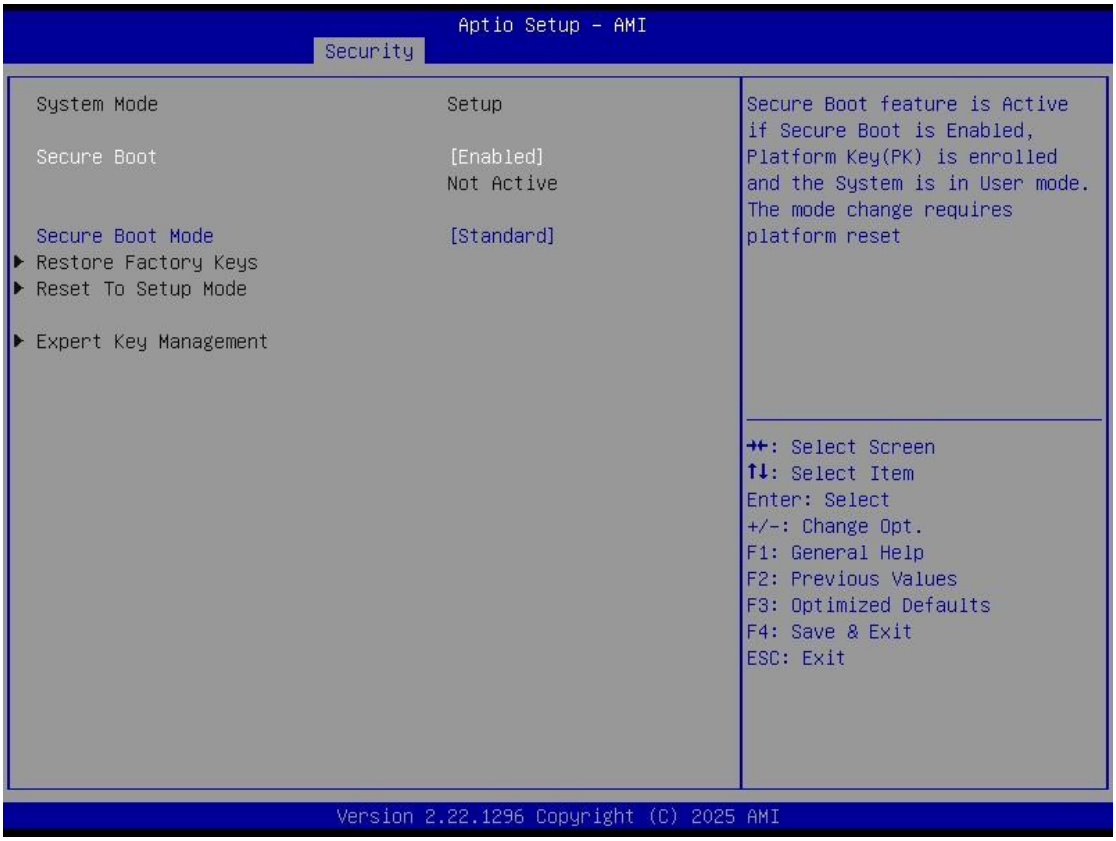


- **Administrator Password**
  This item indicates whether an administrator password has been set (installed or uninstalled).

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

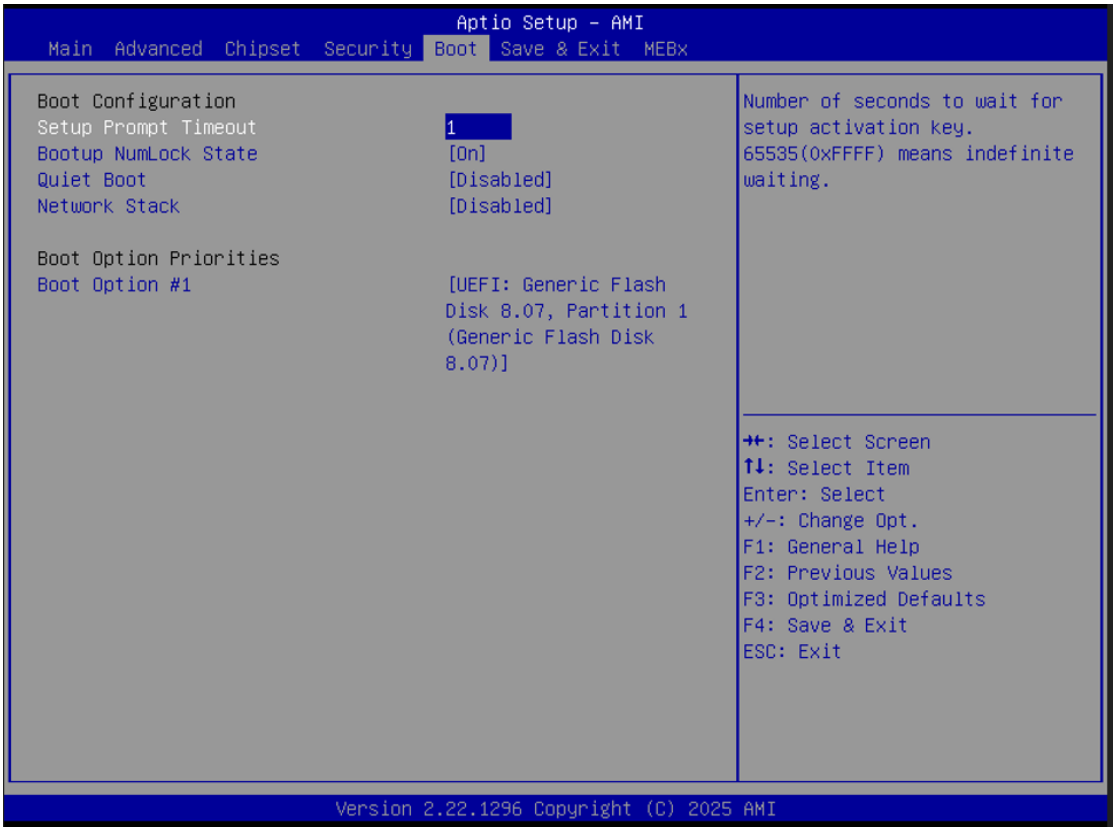
- **Secure Boot**
  This item is available on the UEFI firmware to provide a secure environment.

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



4.7 Boot Menu

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



- **Setup Prompt Timeout**
  Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.

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

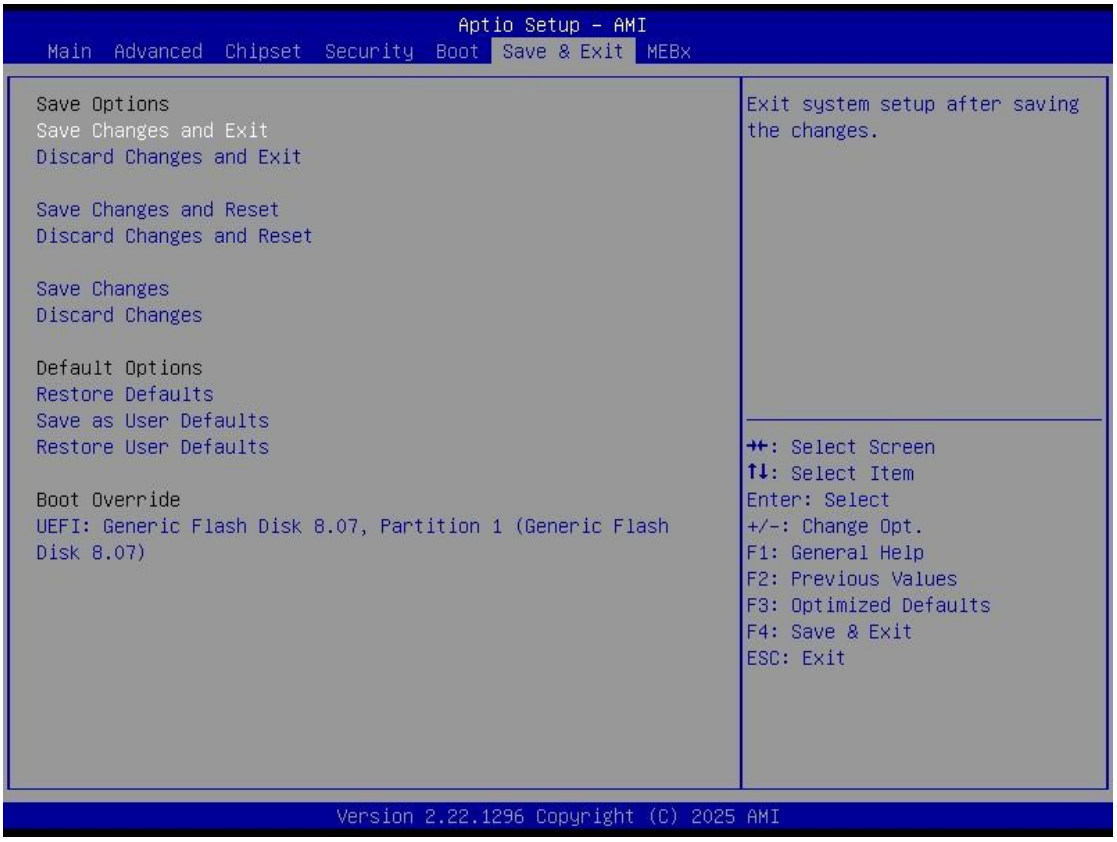
- **Quiet Boot**
  Select to display either POST output messages or a splash screen during boot-up.

- **Network Stack**
  Use this item to run the BIOS of your device through the internet instead of Hard Drives

- **Boot Option Priorities**
  These are settings for boot priority. Specify the boot device priority sequence from the available devices.

4.8 Save & Exit Menu

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



- **Save Changes and Exit**
  When you have completed the system configuration changes, select this option to leave Setup and return to Main Menu. Select Save Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to save changes and exit.

- **Discard Changes and Exit**
  Select this option to quit Setup without making any permanent changes to the system configuration and return to Main Menu. Select Discard Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to discard changes and exit.

- **Save Changes and Reset**
  When you have completed the system configuration changes, select this option to leave Setup and reboot the computer so the new system configuration parameters can take effect. Select Save Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to save changes and reset.

- **Discard Changes and Reset**
  Select this option to quit Setup without making any permanent changes to the system configuration and reboot the computer. Select Discard Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to discard changes and reset.

- **Save Changes**
  When you have completed the system configuration changes, select this option to save changes. Select Save Changes from the Save & Exit menu and press <Enter>. Select Yes to save changes.

- **Discard Changes**
  Select this option to quit Setup without making any permanent changes to the system configuration. Select Discard Changes from the Save & Exit menu and press <Enter>. Select Yes to discard changes.

- **Restore Defaults**
  It automatically sets all Setup options to a complete set of default settings when you select this option. Select Restore Defaults from the Save & Exit menu and press <Enter>.

- **Save as User Defaults**
  Select this option to save system configuration changes done so far as User Defaults. Select Save as User Defaults from the Save & Exit menu and press <Enter>.

- **Restore User Defaults**
  It automatically sets all Setup options to a complete set of User Defaults when you select this option. Select Restore User Defaults from the Save & Exit menu and press <Enter>.

- **Boot Override**
  Select a drive to immediately boot that device regardless of the current boot order.

Appendix A
Watchdog Timer

A.1 About Watchdog Timer

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

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

A.2 Sample Program Sample Code

```
//////////////////////////////////////////////////////////////////////
#include "stdafx.h"
#include <windows.h>
#include <stdio.h>
#include <tchar.h>
#include <stdlib.h>
#ifdef _DEBUG
#define new DEBUG_NEW
#endif
#pragma comment (lib, "User32.lib" )
#define IDT_TIMER WM_USER + 200
#define _CRT_SECURE_NO_WARNINGS 1
#define setbit(value,x) (value |=(1<<x))
#define clrbit(value,x) (value &=~(1<<x))
HINSTANCE hinstLibDLL = NULL;
LONG WDTDATA = 0;

typedef ULONG(*LPFNDLLGETIOSPACE)(ULONG);
LPFNDLLGETIOSPACE lpFnDll_Get_IO;
typedef void(*LPFNDLLSETIOSPACE)(ULONG, ULONG);
LPFNDLLSETIOSPACE lpFnDll_Set_IO;
int _tmain(int argc, _TCHAR* argv[])
{
int unit = 0;
int WDTtimer = 0;
if (hinstLibDLL == NULL)
{
hinstLibDLL = LoadLibrary(TEXT("diodll.dll"));
if (hinstLibDLL == NULL)
{
//MessageBox("Load diodll dll error", "", MB_OK);
}
}
if (hinstLibDLL)
{
lpFnDll_Get_IO                                                    =
(LPFNDLLGETIOSPACE)GetProcAddress(GetModuleHandle("diodll.dll"),
"GetIoSpaceByte");
```

```
lpFnDll_Set_IO                                                    =
(LPFNDLLSETIOSPACE)GetProcAddress(GetModuleHandle("diodll.dll"),
"SetIoSpaceByte");
}
printf("Input Watch Dog Timer type, 1:Second ; 2:Minute :");
scanf("%d",&unit);
printf("\nInput Timer to countdown:");
scanf("%d", &WDTtimer);
printf("Start to countdown...");
//==Enter MB Pnp Mode==
lpFnDll_Set_IO(0x2e, 0x87);
lpFnDll_Set_IO(0x2e, 0x87);
lpFnDll_Set_IO(0x2e, 0x07);
lpFnDll_Set_IO(0x2f, 0x07); //SET LDN 07
//set LDN07 FA 10 to 11
lpFnDll_Set_IO(0x2e, 0xFA);
WDTDATA = lpFnDll_Get_IO(0x2f);
WDTDATA = setbit(WDTDATA, 0);
lpFnDll_Set_IO(0x2f, WDTDATA);
if (unit == 1)
{
lpFnDll_Set_IO(0x2e, 0xF6);
lpFnDll_Set_IO(0x2f, WDTtimer);
//start watchdog counting
lpFnDll_Set_IO(0x2e, 0xF5);
WDTDATA = lpFnDll_Get_IO(0x2f);
WDTDATA = setbit(WDTDATA, 5);
lpFnDll_Set_IO(0x2f, WDTDATA);
}
else if (unit == 2)
{
//set WDT Timer
lpFnDll_Set_IO(0x2e, 0xF6);
lpFnDll_Set_IO(0x2f, WDTtimer);
//set watchdog time unit to min
lpFnDll_Set_IO(0x2e, 0xF5);
WDTDATA = lpFnDll_Get_IO(0x2f);
WDTDATA = setbit(WDTDATA, 3);
lpFnDll_Set_IO(0x2f, WDTDATA);
//start watchdog counting
lpFnDll_Set_IO(0x2e, 0xF5);
WDTDATA = lpFnDll_Get_IO(0x2f);
WDTDATA = setbit(WDTDATA, 5);
lpFnDll_Set_IO(0x2f, WDTDATA);
}
system("pause");
return 0;
}
```

- Timeout Value Range
  - 1 to 255
  - Minute / Second

Note:

```
If N=00h, the time base is set to second.
M = time value
00h: Time-out Disable
01h: Time-out occurs after 1 second
02h: Time-out occurs after 2 seconds
03h: Time-out occurs after 3 seconds
.
.
FFh: Time-out occurs after 255 seconds

If N=08h, the time base is set to minute.
M = time value
00h: Time-out Disable
01h: Time-out occurs after 1 minute
02h: Time-out occurs after 2 minutes
03h: Time-out occurs after 3 minutes
.
.
FFh: Time-out occurs after 255 minutes

//////////////////////////////////////////////////////////////////////
```

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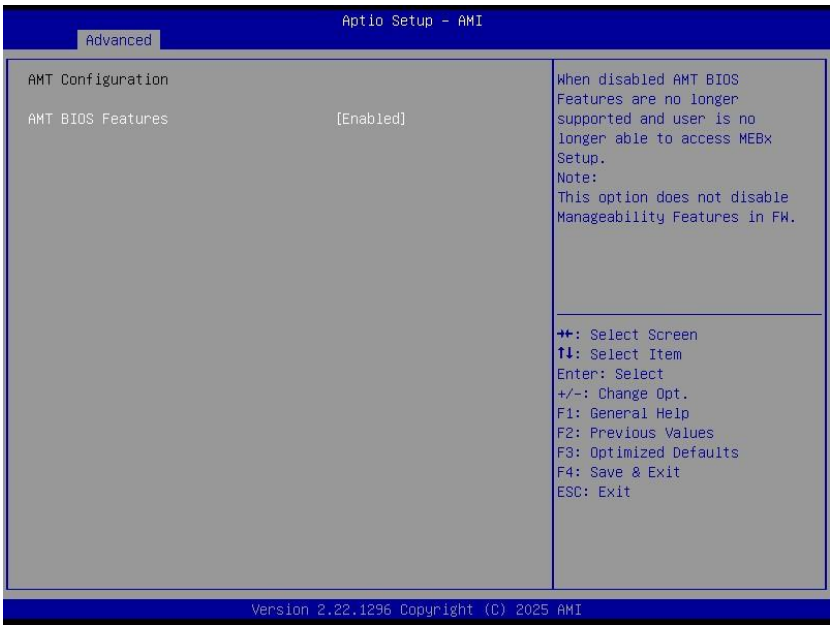
Appendix B
iAMT Settings

The Intel® Active Management Technology (Intel® AMT) utilizes built-in platform capabilities and popular third-party management and security applications to allow IT administrators to remotely discover, repair and better protect their networked computing assets, thus significantly improving IT management efficiency.

In order to use Intel® AMT you must enter the ME BIOS (<Ctrl + Alt + F1> during system startup), change the ME BIOS password, and then select "Intel® iAMT" as the manageability feature.

Entering Management Engine BIOS Extension (MEBx)

1. Go to BIOS to enable the iAMT function.



2. After restarting BIOS, exit and enter MEBx Setting.

Set and Change Password

1. You will be asked to set a password at first login. The default password is "admin".

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

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

   - One upper case letter
   - One lower case letter

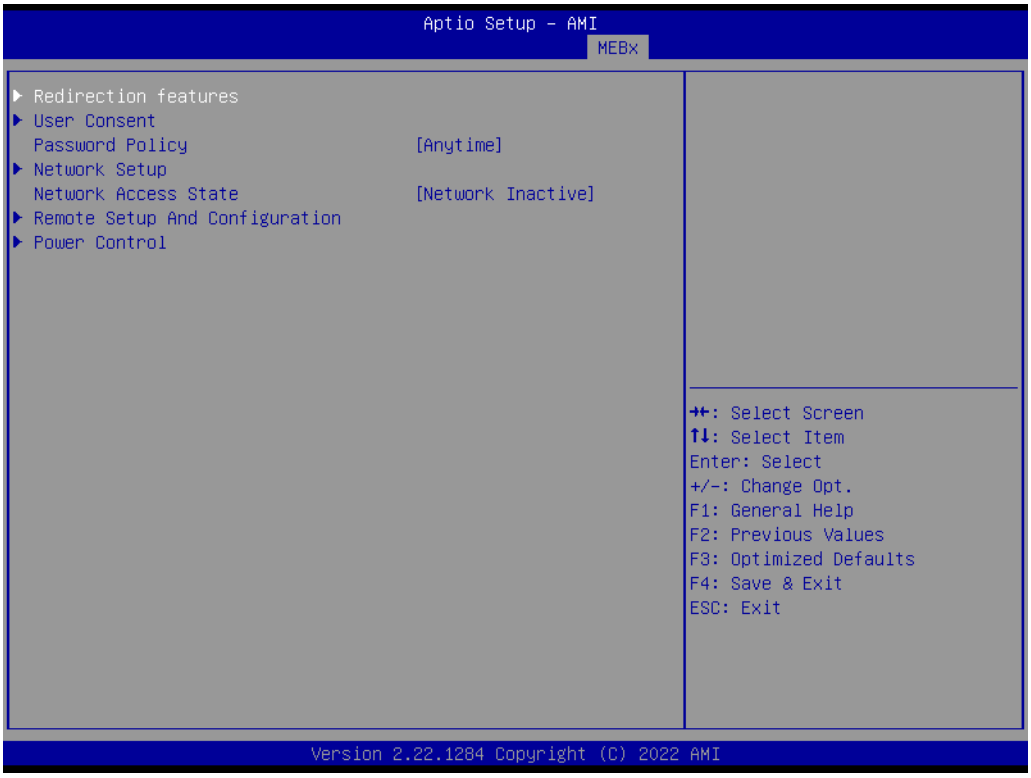
- One number
- One special symbol, such as '!', '$', ';' (except: ':', ',', '"")

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

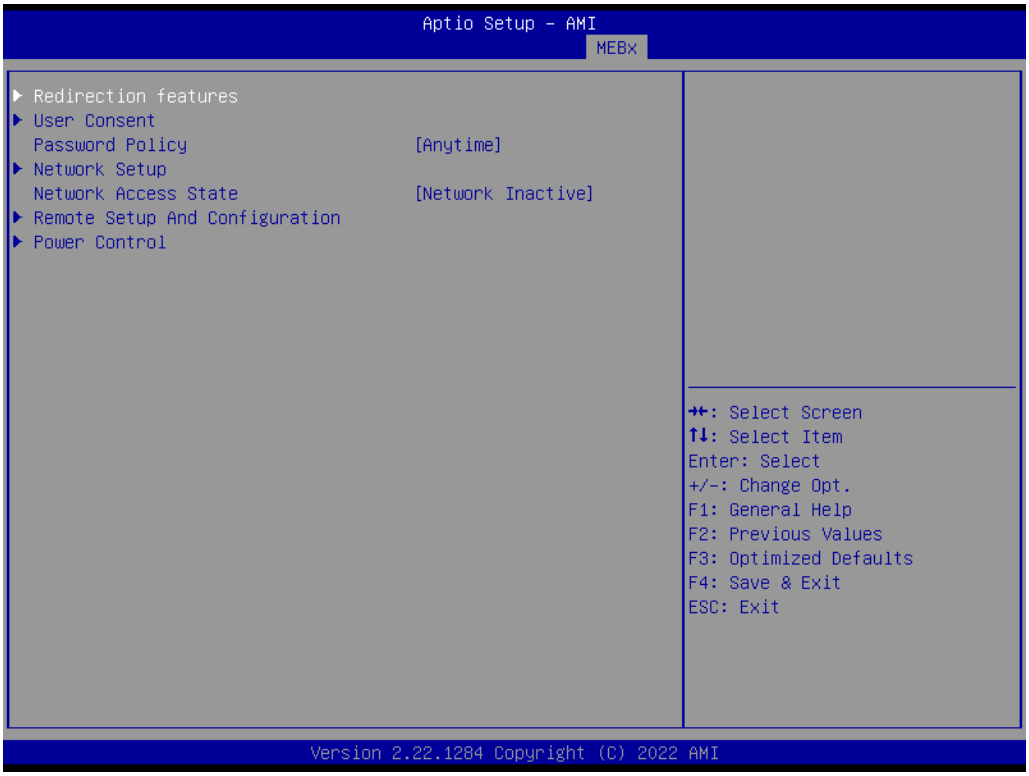
Underline and space are valid characters for the password.

iAMT Settings

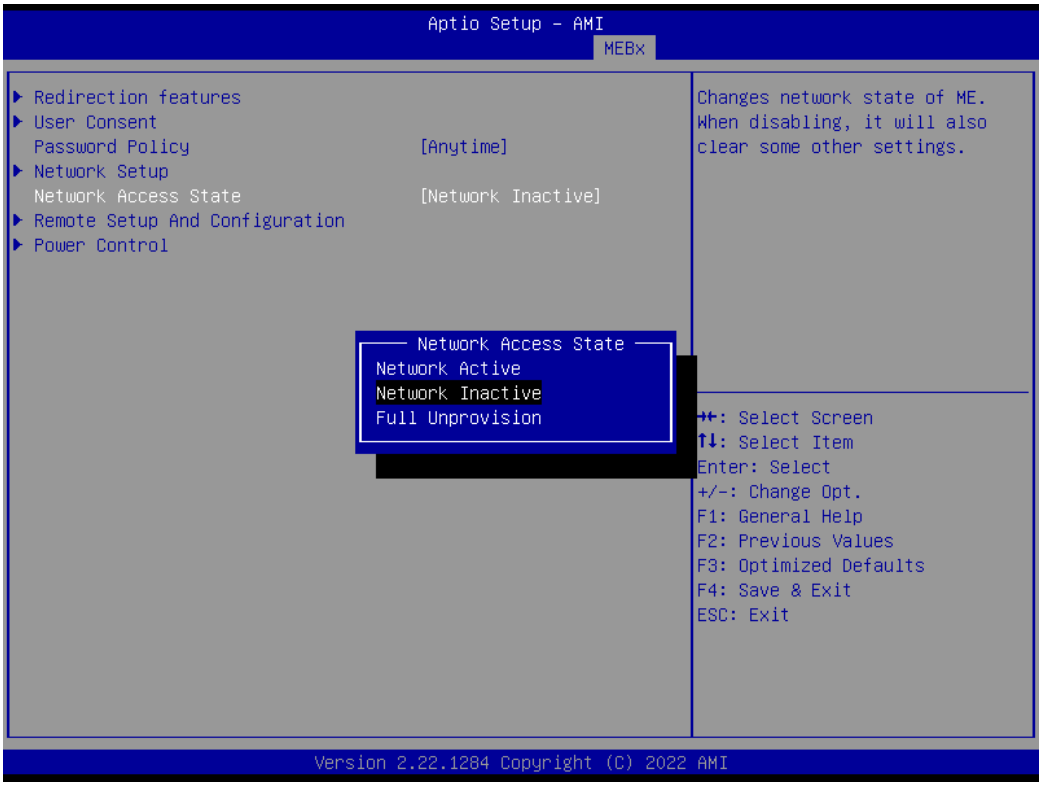
1. Select Intel® AMT configuration and press <Enter>.



2. Select Network Setup to configure iAMT.


Aptio Setup – AMI
MEBx
Redirection features
User Consent
Password Policy [Anytime]
Network Setup
Network Access State [Network Inactive]
Remote Setup And Configuration
Power Control
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.22.1284 Copyright (C) 2022 AMI

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

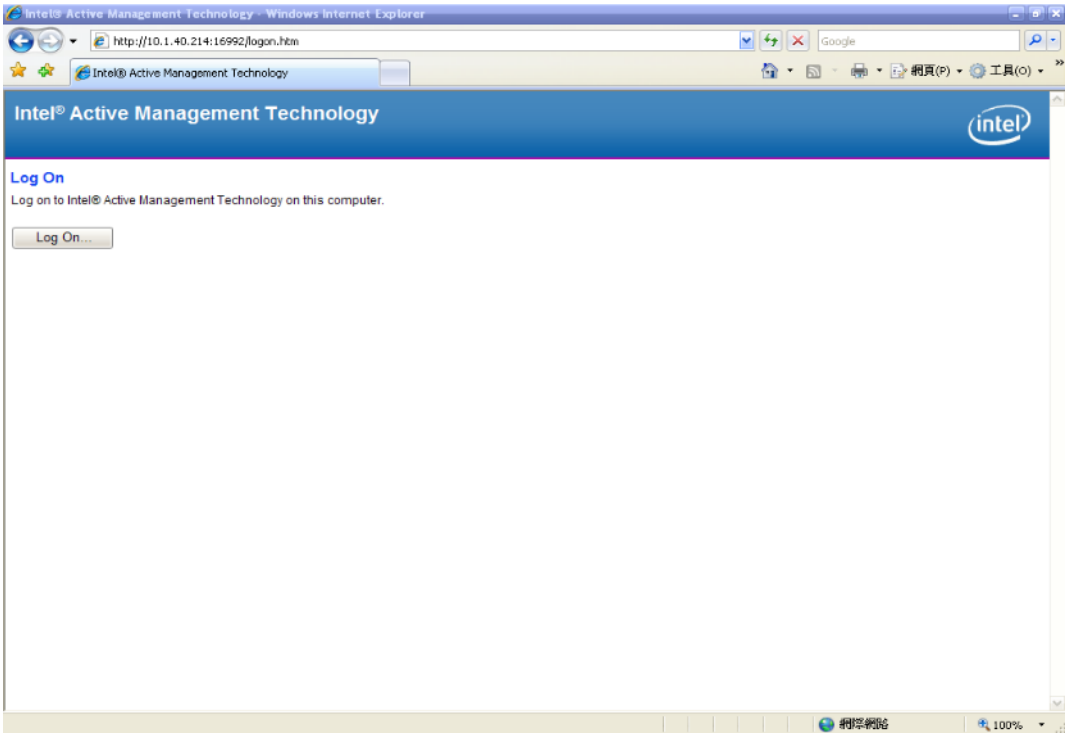


4. Exit from MEBx after completing the iAMT settings.

iAMT Web Console

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

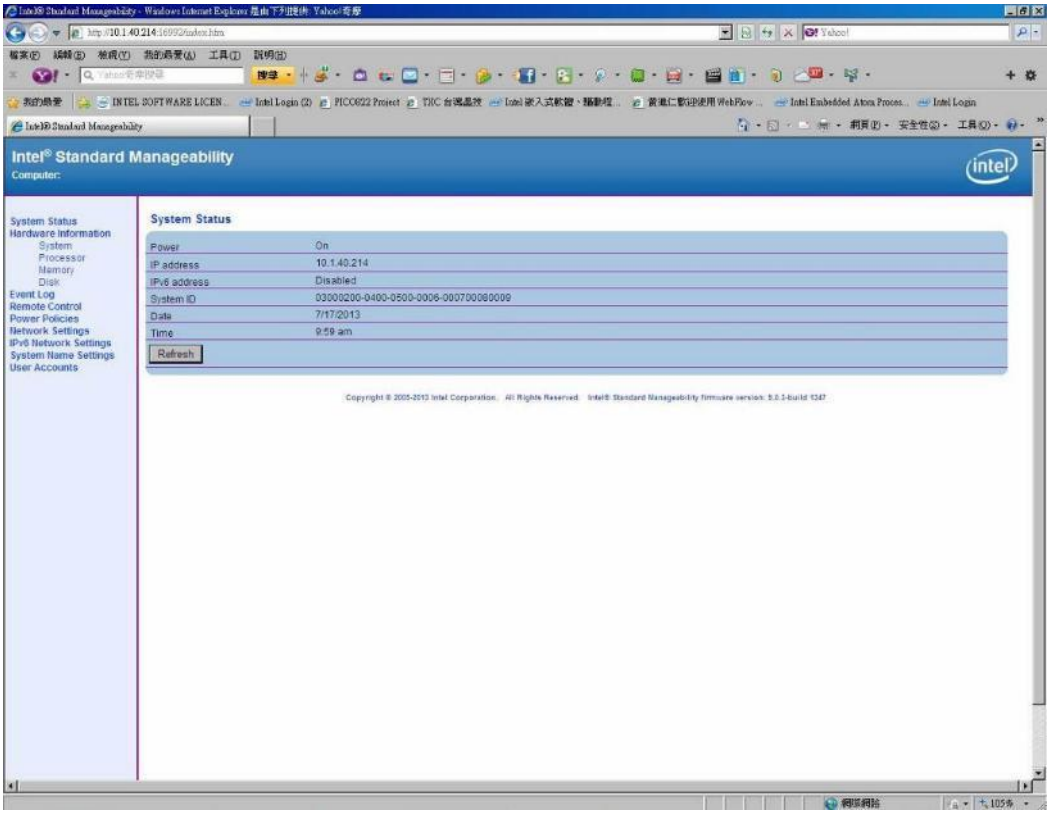
   Example: http://10.1.40.214:16992



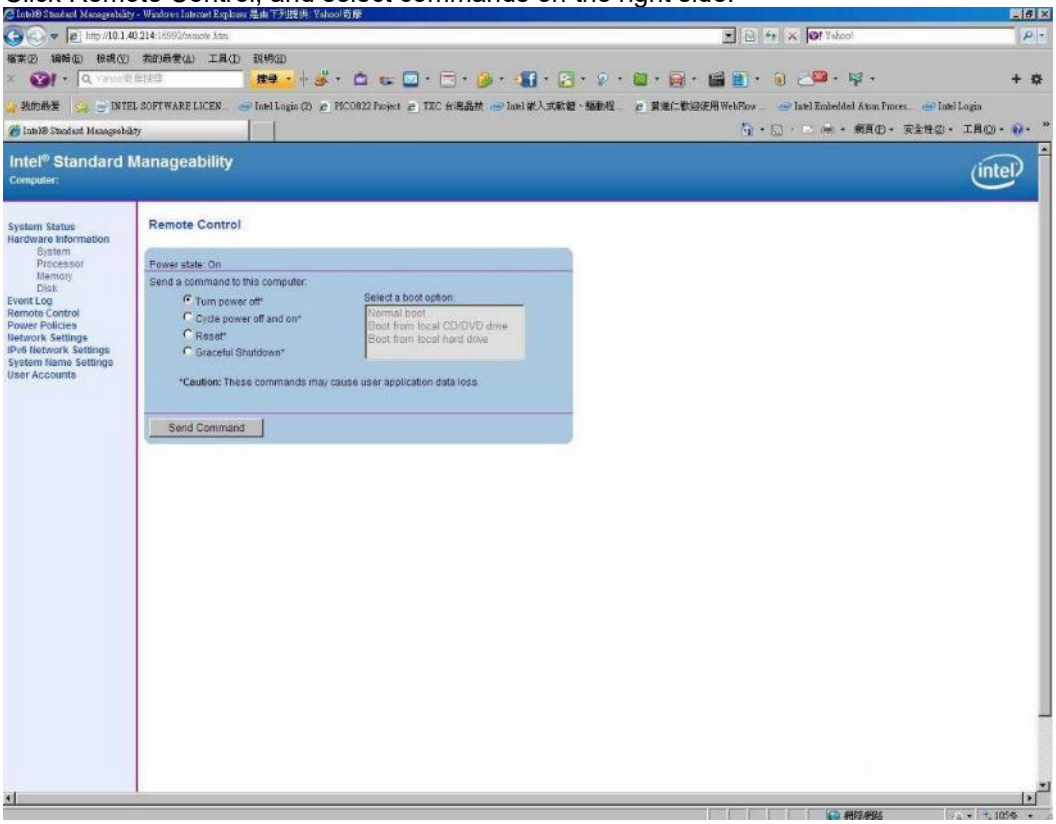
2. To log on, you will be required to type in your username and password for access to the Web.

   USER: admin (default)
   PASS: (MEBx password)

3. Enter the iAMT Web.



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



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

Appendix C
Digital I/O

Digital I/O Software Programming

- I2C to GPIO PCA9535PW.
- I2C address: 0b0100010x.
- Registers:

Command byte

Command	Register
0	Input port 0
2	Output port 0
4	Polarity Inversion port 0
6	Configuration port 0

The command byte is the first byte to follow the address byte during a write transmission. It is used as a pointer to determine which of the following registers will be written or read.

Register 0 : Input port register.
It reflects the incoming logic levels of the pins, regardless of whether the pin is defined as an input or an output. Writes to this register have no effect. The default value 'X' is determined by the externally applied logic level.

Bit	Symbol	Value
7	I0.7	X
6	I0.6	X
5	I0.5	X
4	I0.4	X
3	I0.3	X
2	I0.2	X
1	I0.1	X
0	I0.0	X

Register 2 : Output port register.
It reflects the outgoing logic levels of the pins defined as outputs. Bit values in this register have no effect on pins defined as inputs.

Bit	Symbol	Value
7	O0.7	1
6	O0.6	1
5	O0.5	1
4	O0.4	1
3	O0.3	1
2	O0.2	1
1	O0.1	1
0	O0.0	1

Register 4 : Polarity Inversion registers.
This register allows the user to invert the polarity of the Input port register data. If a bit in this register is written with '1', the Input port data polarity is inverted. If a bit in this register is written with '0', the Input port data polarity is retained.

Bit	Symbol	Value
7	N0.7	0
6	N0.6	0
5	N0.5	0
4	N0.4	0
3	N0.3	0
2	N0.2	0
1	N0.1	0
0	N0.0	0

Register 6 : Configuration registers.
This register configures the directions of the I/O pins. If a bit in this register is written with '1', the corresponding pin is enabled as an input. If a bit in this register is written with '0', the corresponding pin is enabled as an output. At reset, the device's ports are inputs.

Bit	Symbol	Value
7	C0.7	1
6	C0.6	1
5	C0.5	1
4	C0.4	1
3	C0.3	1
2	C0.2	1
1	C0.1	1
0	C0.0	1