

---

# FPC-9309W-G5

Ruggedized Edge AI Computing Platform  
supporting NVIDIA® RTX-5090 GPU Card,  
Intel® Core™ Ultra Processor (Series 2)

## User Manual

Version 1.0



---

This page is intentionally left blank.

---

---

## Revision History

Version	Release Time	Description
1.0	2025.11	Initial release

<b>Revision History .....</b>	<b>i</b>
<b>Contents .....</b>	<b>ii</b>
<b>Preface.....</b>	<b>v</b>
Copyright Notice.....	v
Declaration of Conformity.....	v
CE .....	v
FCC Class A.....	v
RoHS.....	vi
SVHC / REACH.....	vi
Important Safety Instructions .....	vii
Warning.....	viii
Replacing Lithium Battery .....	viii
Technical Support.....	viii
Warranty.....	ix
<b>Chapter 1 - Introduction.....</b>	<b>1</b>
1.1. The Computer .....	2
1.2. About this Manual.....	2
1.3. Specifications .....	3
1.4. Inside the Package.....	5
1.5.1. Optional Accessories .....	5
1.5.2. Optional Configuration (CTOS* Kit) .....	6
<b>Chapter 2 - System Overview .....</b>	<b>7</b>
2.1. Dimensions .....	8
2.2. Take A Tour.....	9
2.2.1. Front View .....	9
2.2.2. Rear View.....	10
2.3. Driver Installation Notes .....	11
<b>Chapter 3 - System Configuration .....</b>	<b>13</b>
3.1. Board Layout.....	14
3.2. Jumpers and Connectors .....	20
3.2.1. Jumpers .....	20
3.2.2. Connectors .....	21
<b>Chapter 4 - Installation and Maintenance.....</b>	<b>33</b>
4.1. Install Hardware .....	34
4.1.1. Open the Computer.....	34
4.1.2. Install CPU .....	37
4.1.3. Install/Uninstall Memory Modules .....	39
4.1.4. Install Wi-Fi Module.....	42
4.1.5. Install SATA Storage Devices.....	46
4.1.6. Install graphic cards .....	48

4.2. Wire DC-in Power Source .....	51
4.2.1. Automation Mode .....	51
4.2.2. Vehicle Application Mode .....	52
<b>Chapter 5 - BIOS .....</b>	<b>53</b>
5.1. Main .....	56
5.2. Advanced .....	57
5.2.1. CPU Configuration .....	58
5.2.2. Power & Performance .....	59
5.2.3. PCH-FW Configuration .....	60
5.2.4. DMI Configuration .....	61
5.2.5. Trusted Computing .....	62
5.2.6. ACPI Settings .....	64
5.2.7. F81966 Super IO Configuration .....	65
5.2.8. Hardware Monitor .....	66
5.2.9. S5 RTC Wake Settings .....	67
5.2.10. Serial Port Console Redirection .....	68
5.2.11. AMI Graphic Output Protocol Policy .....	70
5.2.12. USB Configuration .....	71
5.2.13. Network Stack Configuration .....	73
5.2.14. NVMe Configuration .....	74
5.2.15. Intel(R) Rapid Storage Technology .....	75
5.3. Chipset .....	76
5.3.1. System Agent (SA) Configuration .....	77
5.3.2. PCH-IO Configuration .....	82
5.4. Security .....	86
5.4.1. Secure Boot .....	87
5.5. Boot .....	88
5.6. Save & Exit .....	90
5.7. MEBx .....	91
5.8. RAID Setting Steps .....	92

---

This page is intentionally left blank.

## Copyright Notice

All Rights Reserved.

The information in this document is subject to change without prior notice in order to improve the reliability, design and function. It does not represent a commitment on the part of the manufacturer.

Under no circumstances will the manufacturer be liable for any direct, indirect, special, incidental, or consequential damages arising from the use or inability to use the product or documentation, even if advised of the possibility of such damages.

This document contains proprietary information protected by copyright. All rights are reserved. No part of this document may be reproduced by any mechanical, electronic, or other means in any form without prior written permission of the manufacturer.

## Declaration of Conformity

### CE

The CE symbol on the computer indicates that it is in compliance with the directives of the European Union (EU). A Certificate of Compliance is available by contacting Technical Support.

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from ARBOR. Please contact your local supplier for ordering information.

### Warning

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

### FCC Class A

This device complies with Part 15 of the 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.

## Preface

---

### NOTE:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### RoHS

ARBOR Technology Corp. certifies that all components in its products are in compliance and conform to the European Union's Restriction of Use of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2002/95/EC.

The above mentioned directive was published on 2/13/2003. The main purpose of the directive is to prohibit the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) in electrical and electronic products. Member states of the EU are to enforce by 7/1/2006.

ARBOR Technology Corp. hereby states that the listed products do not contain unintentional additions of lead, mercury, hex chrome, PBB or PBDB that exceed a maximum concentration value of 0.1% by weight or for cadmium exceed 0.01% by weight, per homogenous material. Homogenous material is defined as a substance or mixture of substances with uniform composition (such as solders, resins, plating, etc.). Lead-free solder is used for all terminations (Sn(96-96.5%), Ag(3.0-3.5%) and Cu(0.5%)).

### SVHC / REACH

To minimize the environmental impact and take more responsibility to the earth we live, Arbor hereby confirms all products comply with the restriction of SVHC (Substances of Very High Concern) in (EC) 1907/2006 (REACH --Registration, Evaluation, Authorization, and Restriction of Chemicals) regulated by the European Union.

All substances listed in SVHC < 0.1 % by weight (1000 ppm)

## **Important Safety Instructions**

Read these safety instructions carefully

1. Read all cautions and warnings on the equipment.
2. Place this equipment on a reliable surface when installing. Dropping it or letting it fall may cause damage
3. Make sure the correct voltage is connected to the equipment.
4. For pluggable equipment, the socket outlet should be near the equipment and should be easily accessible.
5. Keep this equipment away from humidity.
6. The openings on the enclosure are for air convection and protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
7. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
8. Never pour any liquid into opening. This may cause fire or electrical shock.
9. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
10. If one of the following situations arises, get the equipment checked by service personnel:
  - a. The power cord or plug is damaged.
  - b. Liquid has penetrated into the equipment.
  - c. The equipment has been exposed to moisture.
  - d. The equipment does not work well, or you cannot get it to work according to the user's manual.
  - e. The equipment has been dropped or damaged.
  - f. The equipment has obvious signs of breakage.
11. Keep this User Manual for later reference.

### **Warning**

The Box PC and its components contain very delicately Integrated Circuits (IC). To protect the Box PC and its components against damage caused by static electricity, you should always follow the precautions below when handling it:

1. Disconnect your Box PC from the power source when you want to work on the inside.
2. Use a grounded wrist strap when handling computer components.
3. Place components on a grounded antistatic pad or on the bag that came with the Box PC, whenever components are separated from the system.

### **Replacing Lithium Battery**

Incorrect replacement of the lithium battery may lead to a risk of explosion.

The lithium battery must be replaced with an identical battery or a battery type recommended by the manufacturer.

Do not throw lithium batteries into the trash can. It must be disposed of in accordance with local regulations concerning special waste.

### **Technical Support**

If you have any technical difficulties, please consult the user's manual first at:  
<http://www.arbor-technology.com>

Please do not hesitate to e-mail our customer service when you still cannot find out the answer.

E-mail: [info@arbor.com.tw](mailto:info@arbor.com.tw)

## **Warranty**

This product is warranted to be in good working order for a period of one year from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster.

Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, or inability to use this product. Vendor will not be liable for any claim made by any other related party.

Vendors disclaim all other warranties, either expressed or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose, with respect to the hardware, the accompanying product's manual(s) and written materials, and any accompanying hardware. This limited warranty gives you specific legal rights.

Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.

---

This page is intentionally left blank.

---

# Chapter 1

## Introduction

### 1.1. The Computer



- Intel® Core™ Ultra Processor (Series 2)
- Supports NVIDIA® RTX-50 series up to 575W GPU (up to 357.6mm length)
- Wide Range DC power input (24~48V)
- HDMI x 2 + DP x 2 (2 independent display)
- Power on/off delay control/ Configurable ignition power control
- TPM2.0 support
- 2 x outside accessible SATA SSD + 2 x NVMe SSD , supporting RAID 0,1,5
- 8 x USB3.2 supports up to 10Gbps data transfer rate
- Front-accessible I/O support
- PWM FAN control support
- 2 x M.2 (NGFF) B-Key(2242/2280/3052) socket for storage or 5G / LTE
- 1 x M.2 (NGFF) E-Key(2230) socket for Wi-Fi / BT

### 1.2. About this Manual

This manual is meant for the experienced users and integrators with hardware knowledge of personal computers. If you are not sure about the description herein, consult your vendor before further handling.

We recommend that you keep one copy of this manual for the quick reference for any necessary maintenance in the future. Thank you for choosing ARBOR products.

### 1.3. Specifications

System	
<b>CPU</b>	Intel® Core™ Ultra Processors (Series 2) in LGA1851 socket (35W / 65W CPU)
<b>Memory</b>	4 x DDR5 U-DIMM sockets, Supporting 5600MHz SDRAM up to 192GB (ECC /Non-ECC )
<b>Chipset</b>	Intel® W880E
<b>Graphics</b>	Integrated Intel® HD Graphics
<b>ATA</b>	2 x Serial ATA ports with 600MB/s HDD transfer rate
<b>LAN Chipset</b>	4 x Intel® WGI226LM 2.5GigE LAN
<b>Watchdog Timer</b>	1~255 levels reset
I/O	
<b>Serial Port</b>	2 x RS-232/422/485 configurable (default RS-232) 2 x RS-232
<b>USB Port</b>	8 x USB 3.2 Gen2 (10Gbps) / 2.0 ports 1 x USB 2.0 (Internal pin header)
<b>LAN</b>	4 x RJ-45 ports for GbE/2.5GbE
<b>Video Port</b>	2 x HDMI 2.1 up to 4K@60Hz 2 x Display Port 2.1 up to 4K@60Hz
<b>Digital I/O Port</b>	1x DB25 connector for DIO ( 8 in /8 out ) port
<b>Optional Port</b>	1x RJ-45 for Optional OOB port (Option)
<b>Audio</b>	Mic-in/Line-out
<b>Expansion Bus</b>	1 x mini-PCI Express Slot interconnected with SIM card sockets for optional Wi-Fi/BT/3G/LTE/GPS (PClex1+USB2.0, Full Size) 1 x M.2 E key ( 2230) with PClex1+USB2.0, for Wireless 2 x M.2 B key ( 2242/3052) w/ (PClex1+USB3.0+SATA ) interconnected with SIM for 5G / LTE expansion or for storage ( either one) 2 x PCIe x16 slots for 600W GPU card or Dual 300W GPU 3 x PCIe x 8 slots ( via 4 lanes)
Environmental	
<b>Operating Temp.</b>	65W TDP CPU : -20 ~ 55°C (-4 ~ 131°F) 35W TDP CPU : -20 ~ 70°C (-4 ~ 158°F) w/ NVIDIA® RTX-5090: -20 ~ 45°C (-4 ~112°F)
<b>Storage Temp.</b>	-40 ~ 85°C (-40 ~ 185°F)
<b>Operating Humidity</b>	10 ~ 95% @ 50°C (non-condensing)

## Introduction

---

<b>Vibration</b>	Comply with MIL-STD-810G, Method 514.6, Category 4 w/ SSD
<b>Shock</b>	Comply with MIL-STD-810G, Method 516.6, Table 516.6-II 20G
<b>Qualification</b>	
<b>Certification</b>	CE, FCC Class A
<b>Power Requirement</b>	
<b>Power Input</b>	DC 24~48V input (w/ 4-pin DC input terminal block ---+ )
<b>Ignition Switch</b>	2-pin terminal block: IGN / Remote SW ( default: IGN)
<b>Storage</b>	
<b>Type</b>	2 x 2.5"/3.5" drive bays (outside accessible)
	2 x M.2 M key NVMe SSD ( 2242/2280 ) with PCIe x 4
<b>Mechanical</b>	
<b>Construction</b>	Metal
<b>Mounting</b>	Wall-mount
<b>Weight</b>	7.4 kg (16.31lb)
<b>Dimensions (W x D x H)</b>	220 x 380 x 320 mm
<b>OS Support</b>	
Windows 10/11 IoT Enterprise 2021, Linux (Kernal 6.11)	
<b>Ordering Information</b>	
<b>FPC-9309W-G5</b>	Ruggedized Edge AI Computing Platform supporting NVIDIA® RTX-5090 GPU Card, Intel® Core™ Ultra Processor (Series 2)

## 1.4. Inside the Package

Upon opening the package, carefully inspect the contents. If any of the items is missing or appears damaged, contact your local dealer or distributor. The package should contain the following items:






1 x FPC-9309W-G5  
Robust System



1 x Information Card

### 1.5.1. Optional Accessories

The following items are normally optional, but some vendors may include them as a standard package, or some vendors may not carry all the items.




WMK-9300	Wall-mount kit for FPC-9309W-G5	
PAC-600W6C-MW	600W AC/DC 24V DIN Rail adapter kit	
PAC-1000W6C-MW	1000W AC/DC 24V DIN Rail adapter kit	

## Introduction

---

### 1.5.2. Optional Configuration (CTOS\* Kit)

Make the computer more tailored to your needs by selecting one or more components from the list below to be fabricated to the computer.

ML-5C-8G/16G/32G/48G	DDR5-5600 8GB/16GB/32GB/48GB Long DRAM	
WIFI-IN3550	Intel® AX210 M.2 Wi-Fi 6 module w/2 x 30cm internal wires	
ANT-H11	1 x 2dBi HSUPA antenna	
ANT-D11	1 x WiFi dual-band 2.4G/5G antenna	
Core™ Ultra 9 285	Intel® Core™ Ultra 9 285 processor, L2/36M, 2.5G	
Core™ Ultra 9 285T	Intel® Core™ Ultra 9 285T processor, L2/36M, 1.4G	
Core™ Ultra 7 265	Intel® Core™ Ultra 7 265 processor, L2/30M, 2.4G	
Core™ Ultra 7 265T	Intel® Core™ Ultra 7 265T processor, L2/30M, 1.5G	
Core™ Ultra 5 245	Intel® Core™ Ultra 5 245 processor, L2/24M, 3.5G	
Core™ Ultra 5 245T	Intel® Core™ Ultra 5 245T processor, L2/24M, 2.2G	

intel

\*CTOS means Configuration-to-Order Service.

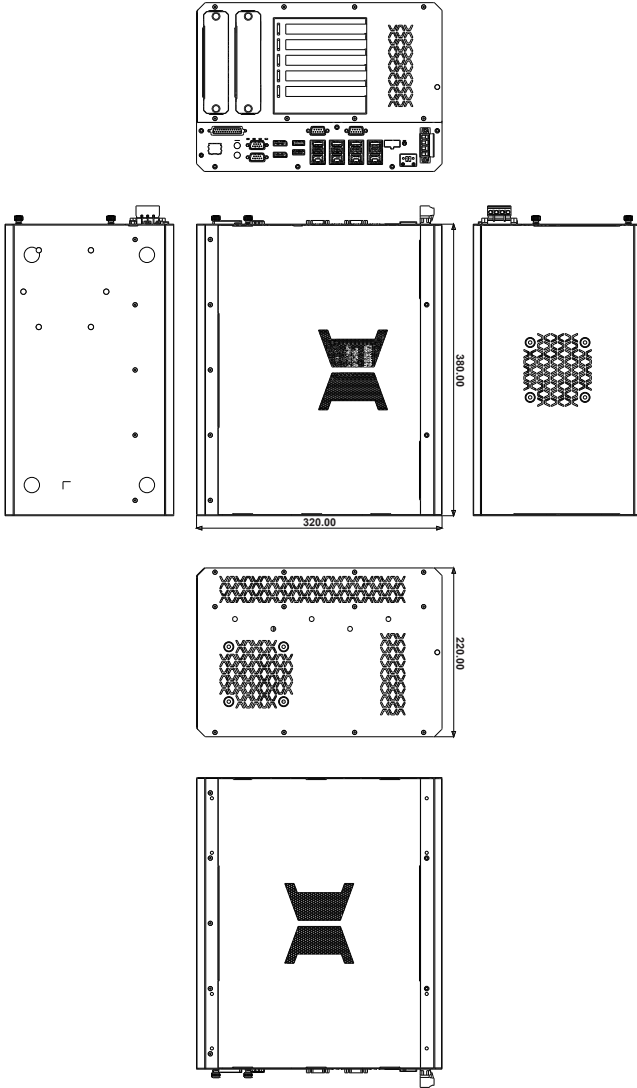
---

# Chapter 2

## System Overview

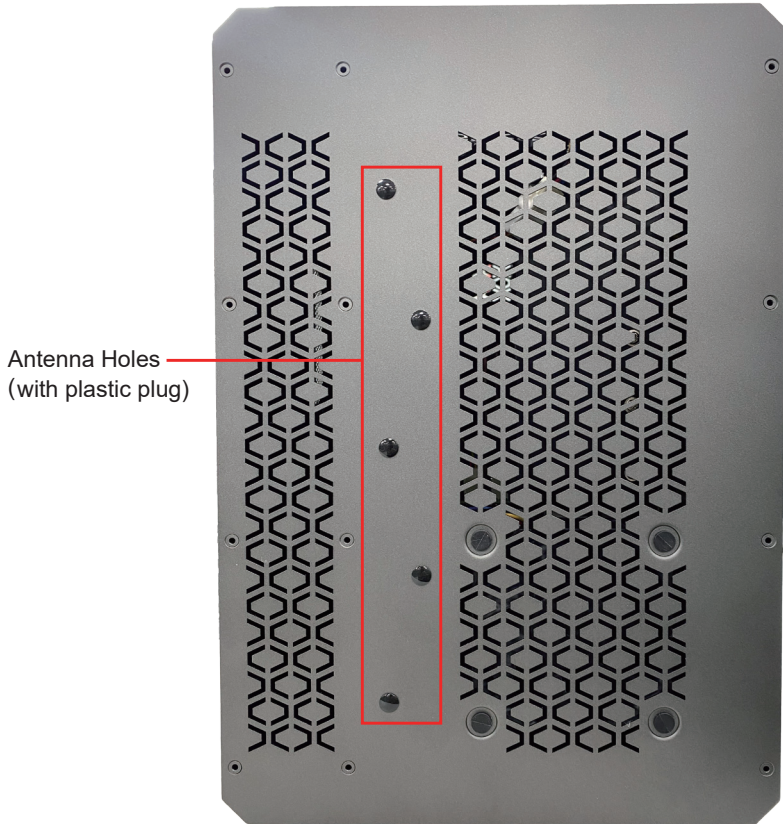
## 2.1. Dimensions

Unit: mm



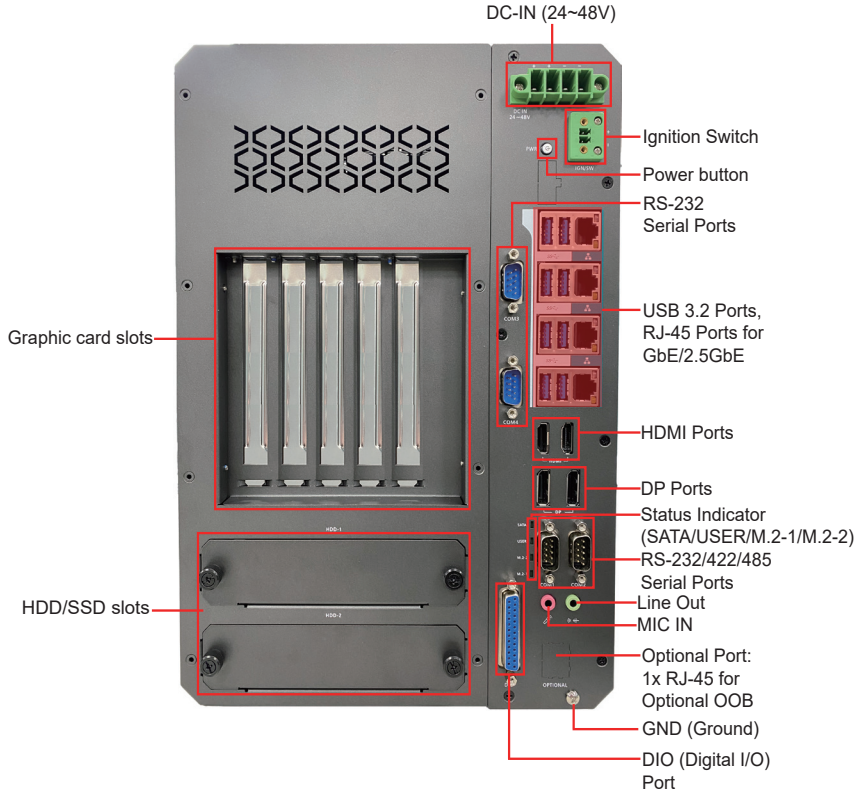
## 2.2. Take A Tour

### 2.2.1. Front View



# System Overview

## 2.2.2. Rear View



### 2.3. Driver Installation Notes

To install the drivers, please visit our website at [www.arbor-technology.com](http://www.arbor-technology.com) and download the driver pack from the **Download Center**.

---

This page is intentionally left blank.

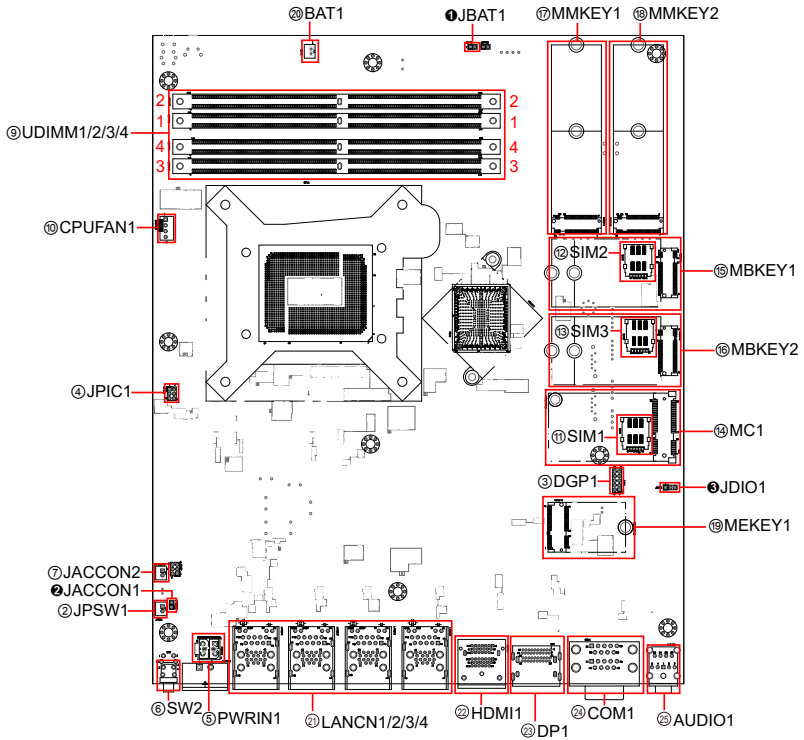
---

# Chapter 3

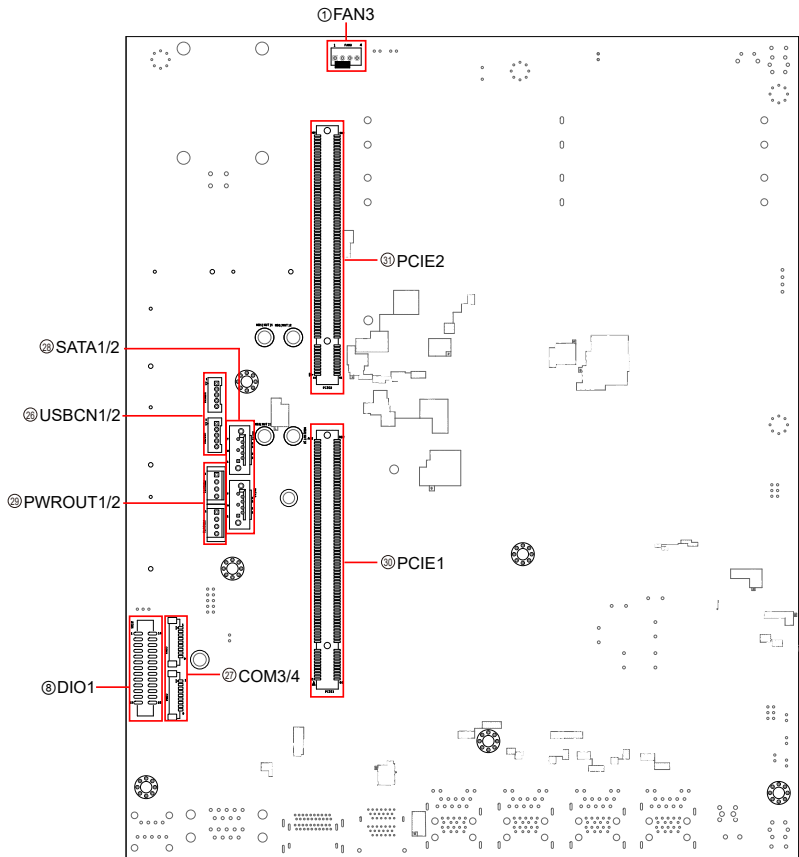
## System Configuration

### 3.1. Board Layout

#### Board Top



Board Bottom



## System Configuration

---

### Jumpers

Label	Description
①JBAT1	Clear CMOS selection
②JACCON1	ACC ON Mode selection
③JDIO1	Ignition power mode

### Connectors

Label	Description
①FAN3	Fan power connector
②JPSW1	Power button box header
③DGP1	External 80 port pin header
④JPIC1	VCORE Controller debug pin header
⑤PWRIN1	Power input connector
⑥SW2	System switch
⑦JACCON2	Ignition Power connector
⑧DIO1	Digital IO Connector
⑨UDIMM 1/2/3/4	DDR5 UDIMM slot
⑩CPUFAN1	Fan power connector
⑪SIM1	Nano SIM card socket for MC1
⑫SIM2	Nano SIM card socket for MEKEY1
⑬SIM3	Nano SIM card socket for MBKEY2
⑭MC1	PCI Express Mini-card socket
⑮MBKEY1	M.2 B-Key socket1
⑯MBKEY2	M.2 B-Key socket2
⑰MMKEY1	M.2 M-Key socket1
⑱MMKEY2	M.2 M-Key socket2
⑲MEKEY1	M.2 E-Key socket
⑳BAT1	RTC battery connector
㉑LANCN1/2/3/4	2.5GbE RJ-45 with 2 x USB3.2 connector
㉒HDMI1	2 x HDMI connector

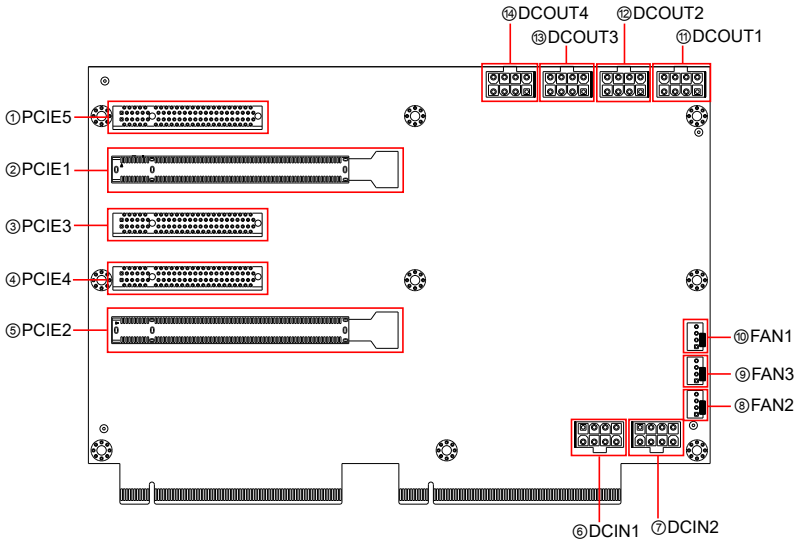
---

---

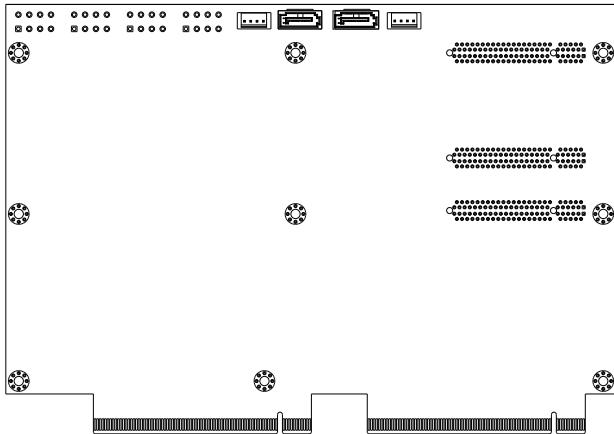
②③ DP1	2 x DP connector
②④ COM1	2 x RS232/RS422/RS485 connector
②⑤ AUDIO1	Audio / MIC connector
②⑥ USBCN1/2	USB Wafer connector
②⑦ COM3/4	RS232 connector
②⑧ SATA1/2	Serial SATA connector
②⑨ PWROUT1/2	SATA HDD power connector
③⑩ PCIE1	PCI Expansion Slot
③⑪ PCIE2	PCI Expansion Slot

---

Riser Board Top (SCDB-7494)



Riser Board Bottom (SCDB-7494)



Riser Board Connectors



<b>Label</b>	<b>Description</b>
① PCIE5	PCIe x8 slot / via 4 lanes
② PCIE1	PCIe x16 slot
③ PCIE3	PCIe x8 slot / via 4 lanes
④ PCIE4	PCIe x8 slot / via 4 lanes
⑤ PCIE2	PCIe x16 slot System power input connector
⑥ DCIN1	System power input connector
⑦ DCIN2	System power input connector
⑧ FAN2	Fan power connector
⑨ FAN3	Fan power connector
⑩ FAN1	Fan power connector
⑪ DCOUT1	VGA 12V power output connector
⑫ DCOUT2	VGA 12V power output connector
⑬ DCOUT3	VGA 12V power output connector
⑭ DCOUT4	VGA 12V power output connector

### 3.2. Jumpers and Connectors

#### 3.2.1. Jumpers



##### ① JBAT1

**Function:** Clear CMOS Selection  
**Jumper Type:** 2.00mm pitch, 1x2-pin header  
**Setting:**

Pin	Description	
<b>Short</b> 1-2	Clear CMOS	
<b>Open</b> 1-2	Keep CMOS (default)	



##### ② JACCON1

**Function:** ACC ON Mode selection  
**Jumper Type:** 2.00mm pitch, 1x2-pin header  
**Setting:**

Pin	Description	
<b>Short</b> 1-2	ACC ON Mode	
<b>Open</b> 1-2	Car mode	

##### ③ JDIO1

**Function:** Digital I/O VCC out put voltage  
**Jumper Type:** Onboard 2.00mm-pitch 1x3-pin header  
**Setting:**

Pin	Description	
<b>Short 1-2</b> 1-2	12V	
<b>Short 2-3</b> 2-3	5V (default)	

### 3.2.2. Connectors

#### 3.2.2.1 Main board

##### ①⑩ FAN Connector (FAN3/CPUFAN1)

**Function:** Fan Power Connector

**Connector Type:** Onboard 2.54mm pitch 1x4-pin one-wall wafer connector

**Pin Assignment:** **Pin Description**

1	GND
2	+12V
3	RPM
4	Control



##### ② JPSW1:

**Function:** Power Button

**Connector Type:** 2-pin wafer

**Pin Assignment:** **Pin Description**

1	PWR_IN_SW#
2	GND



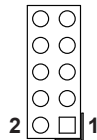
##### ③ DGP1

**Function:** Debug Port

**Connector Type:** Onboard 10-pin header

**Pin Assignment:** **Pin Description**

Pin	Description	Pin	Description
1	ESPI_CLK	2	GND
3	ESPI_CS0#	4	ESPI_IO0
5	ESPI_RST#	6	V3.3A
7	ESPI_IO3	8	ESPI_IO2
9	V3.3S	10	ESPI_IO1



## System Configuration

---

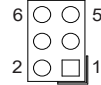
### ④ VCORE Controller debug pin header (JPIC1)

**Function** Reserved For VCORE Controller debug

**Connector Type:** Onboard 2.0mm pitch 6-pin header

**Pin Assignment:**

Pin	Description	Pin	Description
1	NC	2	NC
3	GND	4	PMSCL
5	nPMALERT	6	PMSDA



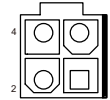
### ⑤ PWRIN1

**Function:** Power Input Connector

**Connector Type:** Onboard 2.54mm pitch 4-pin wafer

**Pin Assignment:**

Pin	Desc.
1	GND
2	GND
3	DCIN
4	DCIN



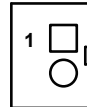
### ⑥ SW2

**Function** System Switch

**Connector Type:** Onboard 2x1-pin box connector

**Pin Assignment:**

Pin	Description
1	PWR_IN_SW#
2	GND



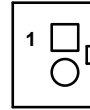
⑦ JACCON2

**Function:** Ignition Power Connector

**Connector Type:** 2-pin wafer

**Pin Assignment:**

Pin	Description
1	ACC_ON
2	GND



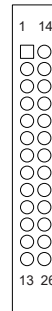
⑧ DIO1

**Function:** Digital IO Connector

**Connector Type:** 2.0mm pitch 2x13 pin box header

**Pin Assignment:**

Pin	Desc.	Pin	Desc.
1	DIO0	14	DIO8
2	DIO1	15	DIO9
3	DIO2	16	DIO10
4	DIO3	17	DIO11
5	DIO4	18	DIO12
6	DIO5	19	DIO13
7	DIO6	20	DIO14
8	DIO7	21	DIO15
9	+5V	22	GND
10	+5V	23	GND
11	N.C	24	N.C
12	N.C	25	N.C
13	N.C	26	N.C



## System Configuration

---

### ⑨ UDIMM1/2/3/4

**Function:** Memory Modules Installation

**Type:** 288-pin UDIMM DDR5



#### Installing Memory Modules (UDIMM)

This motherboard provides four 288-pin DDR5 (Double Data Rate 5) DIMM slots, and supports Dual Channel Memory Technology.

Note:

1. For dual channel configuration, you always need to install identical (the same brand, speed, size and chip-type) DDR5 UDIMM pairs.
2. It is unable to activate Dual Channel Memory Technology with only one or three memory module installed.
3. It is not allowed to install a DDR, DDR2, DDR3 or DDR4 memory module into a DDR5 slot; otherwise, this motherboard and DIMM may be damaged.
4. The DIMM only fits in one correct orientation. It will cause permanent damage to the motherboard and the DIMM if you force the DIMM into the slot at incorrect orientation.

#### Recommended Memory Configuration:

##### 1 UDIMM

UDIMM3	UDIMM4	UDIMM1	UDIMM2
			V

##### 2 UDIMMs

UDIMM3	UDIMM4	UDIMM1	UDIMM2
	V		V

##### 4 UDIMMs

UDIMM3	UDIMM4	UDIMM1	UDIMM2
V	V	V	V

⑪ ⑫ ⑬ SIM1/2/3

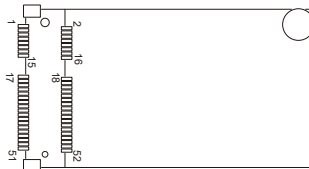
**Function:** SIM Card Socket  
**Connector Type:** 6-pin SIM card socket  
**Pin Assignment:**

Pin	Desc.	Pin	Desc.
C1	VCC	C2	RST
C3	CLK	C5	GND
C6	VPP	C7	I/O



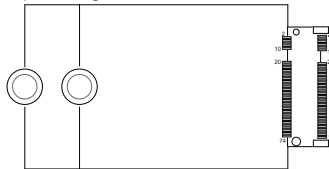
⑭ MC1

**Function:** PCI Express Mini-card Full socked  
**Connector Type:** Onboard 0.8mm pitch 52-pin edge card connector.  
**Pin Assignment:**



⑮ ⑯ MBKEY1/2

**Function:** M.2 B-Key socket  
**Connector Type:** M.2 B-Key  
**Pin Assignment:** The pin assignments conform to the industry standard.

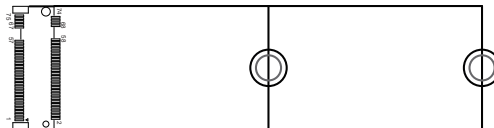


## System Configuration

---

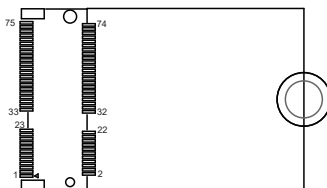
### ⑰ ⑱ MMKEY1/2

- Function:** M.2 M-Key Connector  
**Connector Type:** M.2 75-pin M-Key connector for PCIe x4 SSD storage, supporting 22x42 / 22x80 modules  
**Pin Assignment:** The pin assignments conform to the industry standard.



### ⑲ MEKEY1

- Function:** M.2 E-Key socket (w/ PCIe + USB 2.0) for optional Wi-Fi/BT  
**Connector Type:** M.2 E-Key 2230 Socket  
**Pin Assignment:** The pin assignments conform to the industry standard.



### ⑳ BAT1

- Function:** RTC Battery  
**Connector Type:** Onboard 2x1-pin box connector  
**Pin Assignment:**

Pin	Description
1	BAT+
2	BAT-

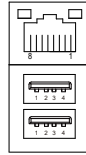


②① LANCN1/2/3/4/5

**Function:** 2.5 GbE RJ-45 Ethernet connectors (includes USB3.2 connectors)

**Connector Type:** 2.5 GbE RJ-45 Ethernet connectors + double stacked USB 3.2 type A connector  
RJ-45 connector that supports 10/100/1000/2500Mbps fast Ethernet

**Pin Assignment:** The Pin assignment conform to the industry standard.

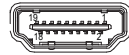


②② HDMI1

**Function:** HDMI connectors

**Connector Type:** HDMI female connectors

**Pin Assignment:** The Pin assignment conform to the industry standard.



②③ DP1

**Function:** DisplayPort connectors

**Connector Type:** DisplayPort connectors

**Pin Assignment:** The Pin assignment conform to the industry standard.



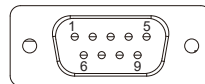
②④ COM1

**Function:** RS-232/422/485 Selectable Serial Port

**Connector Type:** 9-pin D-sub male connector

**Pin Assignment:**

	Pin	Desc.	Pin	Desc.
RS-232	1	DCD	6	DSR
	2	RXD	7	RTS
	3	TXD	8	CTS
	4	DTR	9	RI
	5	GND	10	N.C
RS-422	1	COM_422 TX-		
	2	COM_422 TX+		
	3	COM_422 RX+		
	4	COM_422 RX-		
	5	GND		
RS-485	1	COM_485 D-		
	2	COM_485 D+		
	5	GND		



## System Configuration

---

### ②⑤ AUDIO1

**Function:** Microphone input and Line output

**Connector Type:** 3.5mm audio jack



### ②⑥ USBCN1/2

**Function:** USB 3.0/2.0 Connectors

**Connector Type:** On-board 1.25mm pitch 1x5 pin wafer connector

**Pin Assignment:**

Pin	Description
1	+5V
2	D-
3	D+
4	GND
5	GND



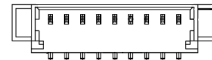
### ②⑦ COM3, 4

**Function:** RS232 Connector(COM3~COM4)

**Connector Type:** Onboard 1.25mm pitch 9-pin Connector

**Pin Assignment:**

Pin	Description
1	XDCD#
2	XDSR#
3	XRXD
4	XRTS#
5	XTXD
6	XCTS#
7	XDTR#
8	XRI#
9	GND



②⑧ SATA1/2

**Function:** Serial ATA Connector  
**Connector Type:** On-board Standard 7-pin Serial ATA Connector

**Pin Assignment:**

Pin	Description
1	GND
2	TX+
3	TX-
4	GND
5	RX-
6	RX+
7	GND



②⑨ PWROUT1/2

**Function:** SATA HDD Power Connector  
**Connector Type:** 2.54mm pitch 1x4-pin one-wall connector

**Pin Assignment:**

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



③⑩ PCIE1

**Function:** PCIe x 16 slot  
**Pin Assignment:** The pin assignments conform to the industry standard.



③⑪ PCIE2

**Function:** PCIe x 16 slot  
**Pin Assignment:** The pin assignments conform to the industry standard.

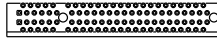


## 3.2.2.2 Riser board Connectors

### ①③④ PCIE5/3/4

**Function:** PCIe x 8 slot / via 4 lanes

**Pin Assignment:** The pin assignments conform to the industry standard.



### ②⑤ PCIE5/3/4

**Function:** PCIe x 16 slot

**Pin Assignment:** The pin assignments conform to the industry standard.



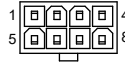
### ⑥⑦ DCIN1/2

**Function:** DC Input

**Connector Type:** Onboard 2.54mm pitch 8-pin wafer

**Pin Assignment:**

Pin	Description
1	GND
2	GND
3	GND
4	GND
5	+12V_5
6	+12V_6
7	+12V_7
8	+12V_8



### ⑧⑨⑩ FAN2/3/1

**Function:** Fan Power Connector

**Connector Type:** Onboard 2.54mm pitch 1x4-pin one-wall wafer connector

**Pin Assignment:**

Pin	Description
1	GND
2	+12V
3	RPM
4	Control



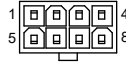
⑪ ⑫ ⑬ ⑭ **DCOUT1/2/3/4**

**Function:** DC Output

**Connector Type:** onboard 2.54mm pitch 8-pin wafer

**Pin Assignment:** **Pin Description**

1	GND1
2	SENSE0
3	GND3
4	GND4
5	+12V_5
6	+12V_6
7	+12V_7
8	SENSE1



---

This page is intentionally left blank.

---

# Chapter 4

## Installation and Maintenance

### 4.1. Install Hardware

The computer is constructed based on modular design to make it easy for users to add or maintain hardware. The following sections will guide you to the simple hardware installations for the computer.

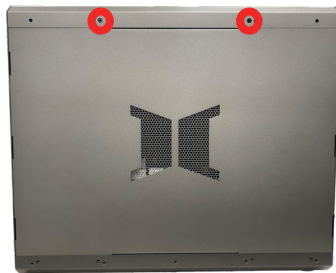
#### 4.1.1. Open the Computer

For the computer, removing the top and side covers is essential to open the computer and access inside. Follow through the steps below to remove the top cover and side cover from the computer.

##### 4.1.1.2. Remove Top Cover

All jumpers, CPU socket, Memory UDIMM slots are built on the top side of the main board. To access these components, the computer's top cover has to be removed. Follow through the steps below to remove the top cover.

1. Loosen and remove the 4 screws as shown below.



2. Carefully lift the top cover by two hands and then completely part the top and slide the side cover from the computer.



The inside of the computer comes to view.



## Installation & Maintenance

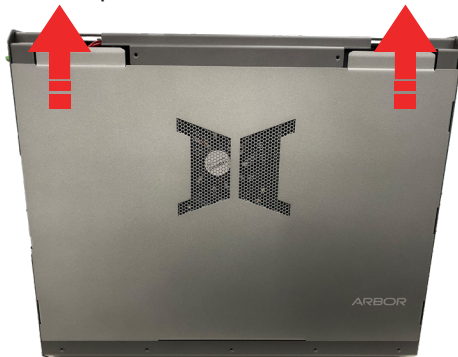
---

### 4.1.1.3. Remove Side Cover

1. Loosen and remove 1 screw as shown below.



2. Carefully slide the side cover and then completely part the side cover from the computer.

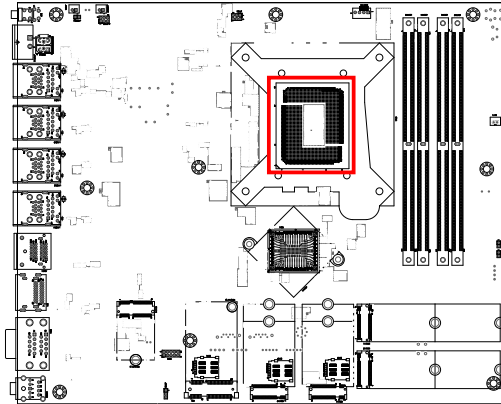


The side of the computer comes to view.



#### 4.1.2. Install CPU

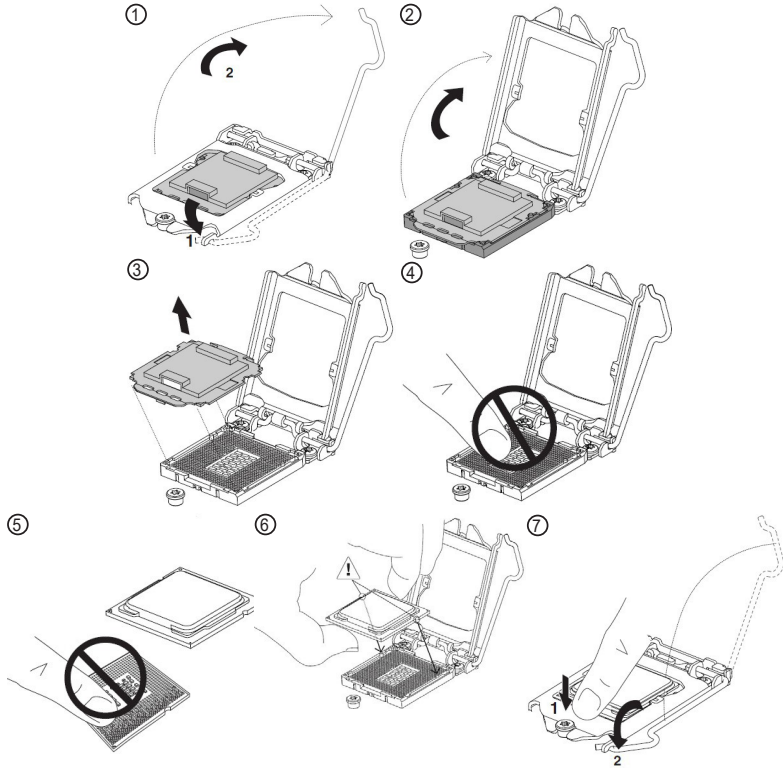
1. Remove the top and side cover from the computer as described in [4.1.1.3. Remove Side Cover](#) on page [36](#).
2. Locate the CPU socket on the main board



## Installation & Maintenance

---

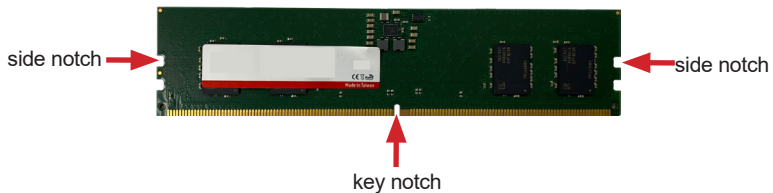
The processor socket comes with a lever to secure the processor. Please refer to the pictures step by step as below and note that the cover of the socket must always be installed during transportation to avoid damage to the socket.



3. Restore the top and side cover to the computer by fastening the all screws.

### 4.1.3. Install/Uninstall Memory Modules

The main board has four memory module (UDIMM) sockets. Increase memory capacity to make programs run faster on the system. The memory module should be a 288-pin DDR5 with a “key notch” off the centre among the pins, which enables the memory module for particular applications. There are notches at each left and right side of the memory module to help fix the module in the socket.

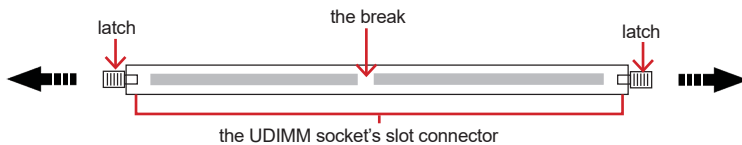


#### To install a DDR5 memory module:

1. Remove the side cover from the computer as described in [4.1.1.3. Remove Side Cover on page 36](#).
2. Locate the UDIMM sockets on the main board.

The UDIMM sockets are vertical type, and each socket has two latches for fixing the memory modules. The memory module can only be installed by one direction due to the notch.

3. Pull back both latches from the socket.



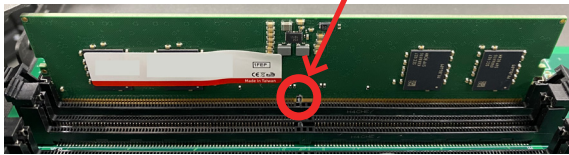
vertical-type UDIMM socket (overview)

## Installation & Maintenance

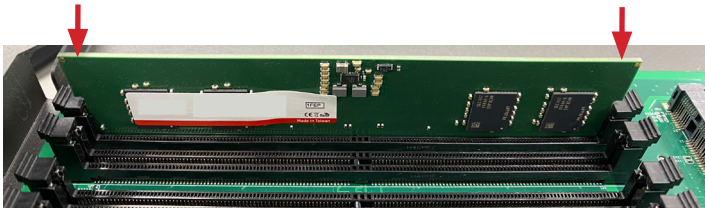
---

4. Confront the memory module's edge connector side at the UDIMM socket. Position the memory module at the UDIMM socket, with the memory module's key notch aligned at the break of the UDIMM's slot connector.

Align the notch on the memory module with the notch in the memory socket.



5. Vertically plug the memory module to the UDIMM socket. "Fully" plug the memory module until both latches auto-lock the memory module in place.



6. Restore the top and side cover to the computer.

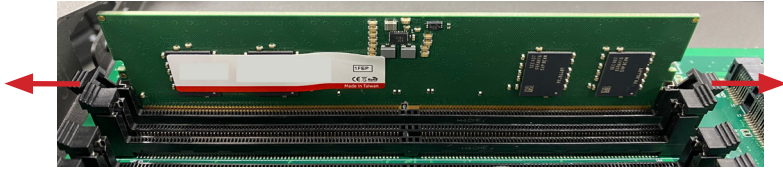
**Note:**

To see the Recommended Memory Configuration, refer to Page 24.

**To uninstall a DDR4 memory module:**

1. Pull back both latches from the UDIMM socket.

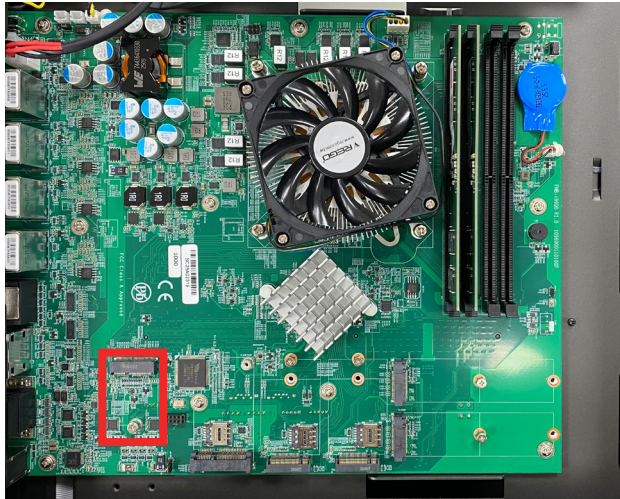
The DDR5 memory module will be auto-released from the socket.



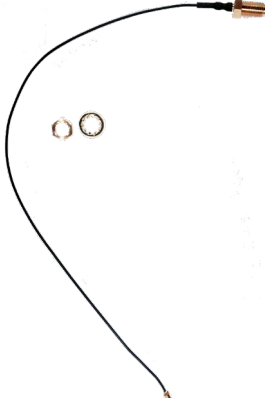
2. Remove the memory module.
3. Restore the top and side cover to the computer.

### 4.1.4. Install Wi-Fi Module

1. Remove the side cover from the computer as described in [Section 4.1.1.3. Remove Side Cover on page 36.](#)
2. Locate the **M.2 E-Key** socket for wireless module.



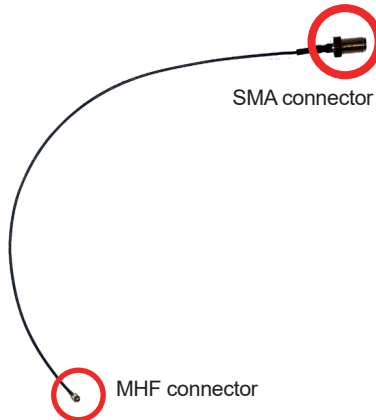
3. Prepare the Wi-Fi module kit. The module is a **M.2 E-Key** socket form factor, with two U.FL connectors, one is “MAIN”, and the other is “AUX”.



Two U.FL connectors, one is “MAIN” (marked 2), the other is “AUX” (marked 1).



4. Have the RF antenna. The antenna has an SMA connector on one end and an MHF connector on the other.

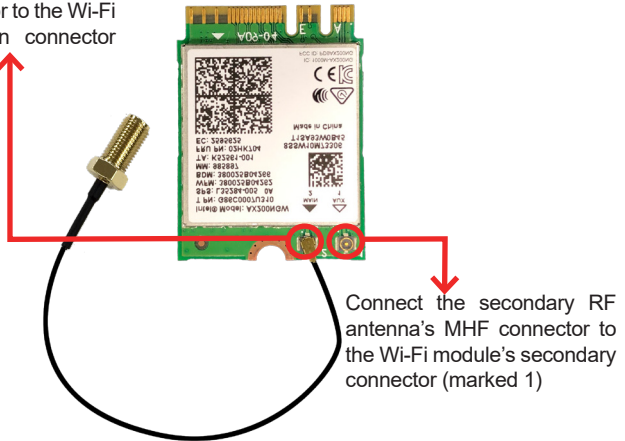


5. Connect the RF antenna's MHF connector to the Wi-Fi module's main connector marked 0. If you are going to connect a secondary antenna, connect it to the connector marked 1.

## Installation & Maintenance

---

Connect the RF antenna's MHF connector to the Wi-Fi module's main connector (marked 2)



6. Plug the Wi-Fi module to the socket's connector by a slanted angle. Fully plug the module, and note the notch on the wireless module should meet the break of the connector.



The module's key notch should meet the connector's break.

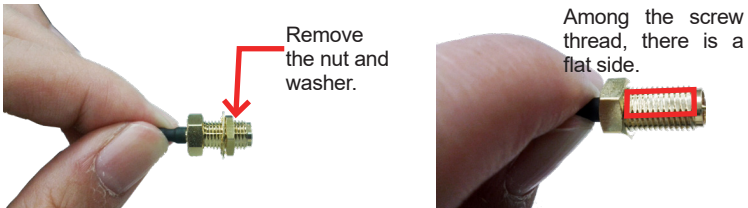
7. Press the module down and fix the module in place using one screw.



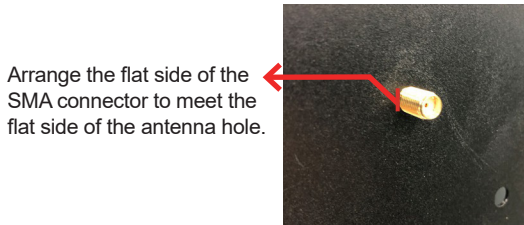
---

## Installation & Maintenance

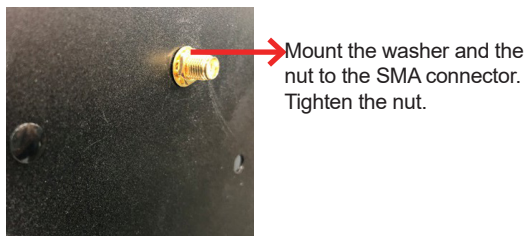
8. Locate the SMA antenna holes on front panel. Remove the plastic plug to make an antenna hole. Keep the plastic plug for any possible restoration in the future.
9. From the other end of the RF antenna, which is an SMA connector, remove the washer and the nut. Note the SMA connector has the form of a threaded bolt, with one flat side.



10. Pull the SMA connector through the above mentioned antenna hole. Note to meet the aforesaid flattened side with the antenna hole's flat side.



11. Mount the washer first and then the nut to the SMA connector. Make sure the nut is tightened.



## Installation & Maintenance

---

12. Have the external antenna(s). Screw and tightly fasten the antenna(s) to the SMA connector.



### 4.1.5. Install SATA Storage Devices

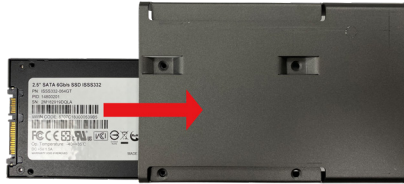
#### 4.1.5.1. Install Internal SATA Storage Device

The computer supports two 2.5" SATA storage devices to work inside the computer for RAID. The following will guide you to install two SATA HDD/SSD.

1. Find the HDD/SSD 1 or 2 brackets. Loosen the screws as marked in the illustration below and take the bracket out. Then dismount the bracket from the computer.



2. For the 1st storage bracket, slide the HDD/SSD storage device into the bracket.



3. Fix the storage device in place by fastening the four screws of the bracket.



4. If you are going to install the 2nd HDD/SSD storage device, slide the storage device into the bracket and fix it in place in the same way.
5. Restore the HDD/SSD bracket to the computer.

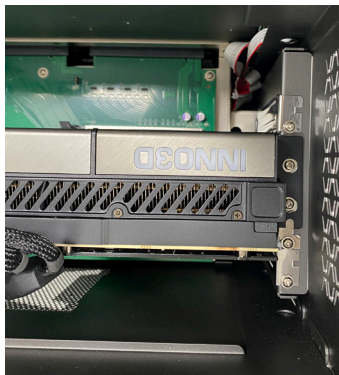
### 4.1.6. Install graphic cards

To install a graphic cards:

1. Remove the top and side cover from the computer, and then remove the PCIe Slot Cover for graphic card installation.
2. Install a graphic card into the computer.



3. Use a cross head screwdriver to tighten the screws to secure the graphic card.



4. Plug the power plug of graphic card to computer



5. Use a cross-head screwdriver to tighten the screws to secure the graphic card holder.



6. Restore the top and side cover to the computer.

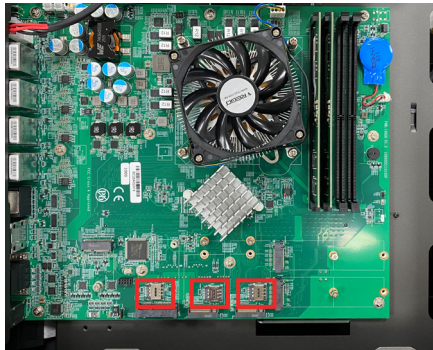
## Installation & Maintenance

---

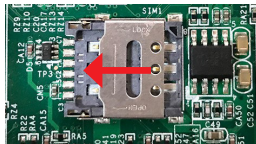
### 4.1.7. Install/Uninstall SIM Card

This section will guide you through the SIM card installation steps:

1. Remove the side cover from the computer as described in [4.1.1.3. Remove Side Cover](#) on page [36](#).
2. Locate the SIM card slot on the main board.



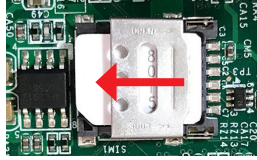
3. Slide the SIM card holder cover towards the OPEN edge and then lift the cover to open it.



4. Insert the SIM card into the card holder as shown below.



5. Close the SIM card holder door and slide the door to the LOCK edge to lock into place.



### To uninstall the SIM card:

1. Loosen and remove the card door screw and open the card door.
2. Push-eject the SIM card.
3. Remove the SIM card.
4. Refasten the screw to close the card door.

Note: Make sure to refasten the screw to close the card door each time the SIM card is installed or uninstalled.

## 4.2. Wire DC-in Power Source

### 4.2.1. Automation Mode

Follow the instructions below for connecting the computer to a DC-input power source.



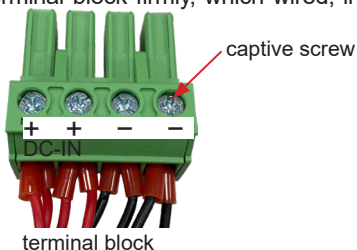
**Warning** Only trained and qualified personnel are allowed to install or replace this equipment.

1. Before wiring, make sure the power source is disconnected.
2. Find the terminal block in the accessory box.
3. Use the wire-stripping tool to strip a short insulation segment from the output wires of the DC power source.
4. Identify the positive and negative feed positions for the terminal block connection. See the symbols printed on the rear panel indicating the polarities and DC-input power range in voltage.

## Installation & Maintenance

---

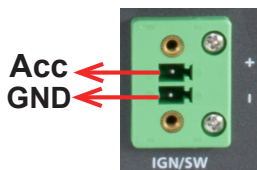
5. Insert the exposed wires into the terminal block plugs. Only wires with insulation should extend from the terminal block plugs. Note that the polarities between the wires and the terminal block plugs must be positive to positive and negative to negative.
6. Use a slotted screwdriver to tighten the captive screws. Plug the terminal block firmly, which wired, into the receptacle on the rear panel.



### 4.2.2. Vehicle Application Mode

Follow the instructions below for connecting the computer to a vehicle power source.

1. Make sure JACCON2 jumper is open for vehicle power mode. (Refer to [Section 3.2.1. Jumpers on page 20](#)).
2. For vehicle application, DC power Input wiring pin configuration is as below. Please connect the Acc pin with your car Acc, and the device will be activated when you turn your ignition key to Acc.



---

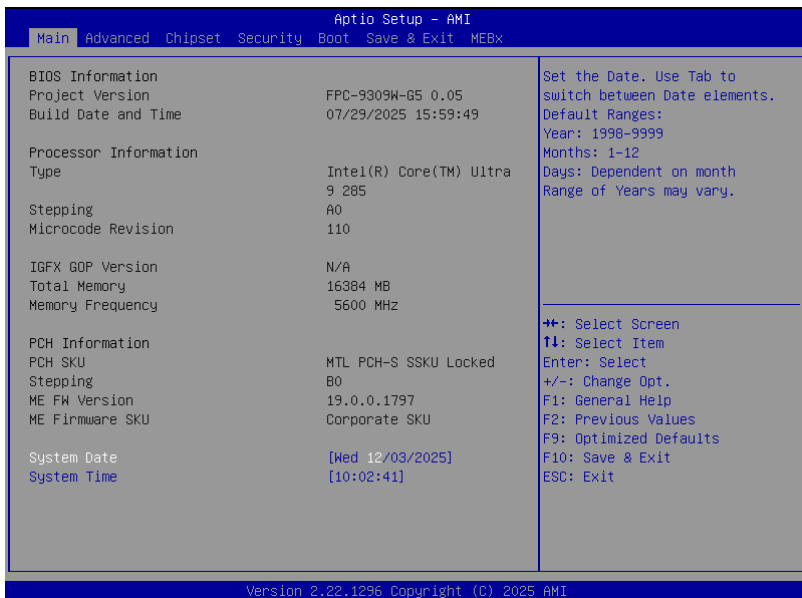
# Chapter 5

## BIOS

## BIOS

The BIOS Setup utility is featured by American Megatrends Inc to configure the system settings stored in the system’s BIOS ROM. The BIOS is activated once the computer powers on. When the computer is off, the battery on the main board supplies power to BIOS RAM.

To enter the BIOS Setup utility, keep hitting the “Delete” key upon powering on the computer.



The featured settings are:

Menu	Description
<b>Main</b>	See <a href="#">5.1. Main on page 56</a>
<b>Advanced</b>	See <a href="#">5.2. Advanced on page 57</a>
<b>Chipset</b>	See <a href="#">5.3. Chipset on page 76</a>
<b>Security</b>	See <a href="#">5.4. Security on page 86</a>
<b>Boot</b>	See <a href="#">5.5. Boot on page 88</a>
<b>Save &amp; Exit</b>	See <a href="#">5.6. Save &amp; Exit on page 90</a>
<b>MEBx</b>	See <a href="#">5.7. MEBx on page 91</a>

## Key Commands

The BIOS Setup utility relies on a keyboard to receive user's instructions. Hit the following keys to navigate within the utility and use the utility.

Keystroke	Function
← →	Moves left/right between the top menus.
↓ ↑	Moves up/down between highlight items.
<b>Enter</b>	Selects an highlighted item/field.
<b>Esc</b>	<ul style="list-style-type: none"> <li>▶ On the top menus: Use <b>Esc</b> to quit the utility without saving changes to CMOS. (The screen will prompt a message asking you to select <b>OK</b> or <b>Cancel</b> to exit discarding changes.</li> <li>▶ On the submenus: Use <b>Esc</b> to quit current screen and return to the top menu.</li> </ul>
<b>Page Up / +</b>	Increases current value to the next higher value or switches between available options.
<b>Page Down / -</b>	Decreases current value to the next lower value or switches between available options.
<b>F1</b>	Opens the <b>Help</b> of the BIOS Setup utility.
<b>F2</b>	Previous values
<b>F9</b>	Optimized defaults
<b>F10</b>	Exits the utility saving the changes that have been made. (The screen then prompts a message asking you to select <b>Yes</b> or <b>No</b> to exit saving changes.)

Note:

This BIOS Setup utility is updated from time to time to improve system performance and hence the screenshots hereinafter may not fully comply with what you actually have onscreen.

# BIOS

## 5.1. Main

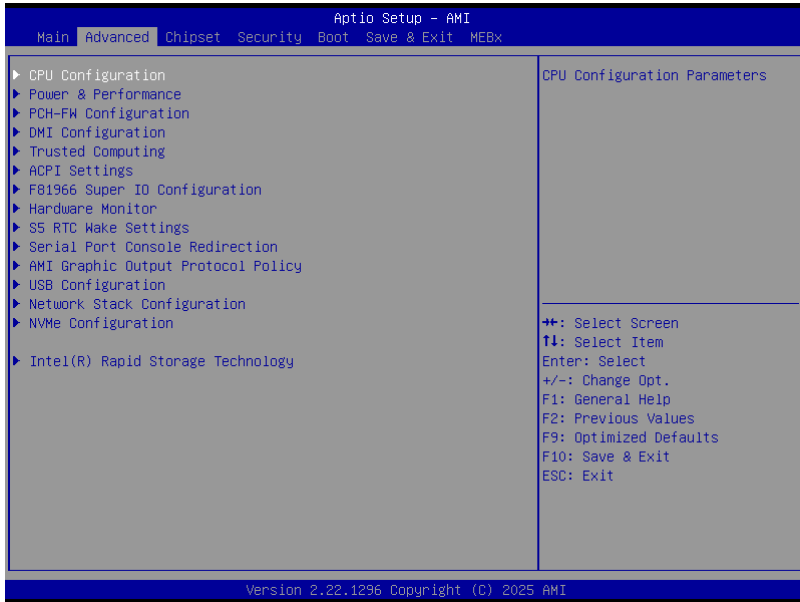
The **Main** menu features the settings of **System Date** and **System Time** and displays some BIOS info.



The featured settings are:

Setting	Description
<b>System Date</b>	<p>Set the system date. Use Tab to switch between Date elements. Note that the 'Day' automatically changes when you set the date.</p> <ul style="list-style-type: none"> <li>▶ The date format is: <ul style="list-style-type: none"> <li><b>Day:</b> Sun to Sat</li> <li><b>Month:</b> 1 to 12</li> <li><b>Date:</b> 1 to 31</li> <li><b>Year:</b> 1998 to 9999</li> </ul> </li> </ul>
<b>System Time</b>	<p>Set the system time. Use Tab to switch between Time elements.</p> <ul style="list-style-type: none"> <li>▶ The time format is: <ul style="list-style-type: none"> <li><b>Hour:</b> 00 to 23</li> <li><b>Minute:</b> 00 to 59</li> <li><b>Second:</b> 00 to 59</li> </ul> </li> </ul>

## 5.2. Advanced



The featured settings and submenus are:

Setting	Description
<b>CPU Configuration</b>	See <a href="#">5.2.1. CPU Configuration on page 58</a>
<b>Power &amp; Performance</b>	See <a href="#">5.2.2. Power &amp; Performance on page 59</a>
<b>PCH-FW Configuration</b>	See <a href="#">5.2.3. PCH-FW Configuration on page 60</a>
<b>DMI Configuration</b>	See <a href="#">5.2.4. DMI Configuration on page 61</a>
<b>Trusted Computing</b>	See <a href="#">5.2.5. Trusted Computing on page 62</a>
<b>ACPI Settings</b>	See <a href="#">5.2.6. ACPI Settings on page 64</a>
<b>F81966 Super IO Configuration</b>	See <a href="#">5.2.7. F81966 Super IO Configuration on page 65</a>
<b>Hardware Monitor</b>	See <a href="#">5.2.8. Hardware Monitor on page 66</a>
<b>S5 RTC Wake Settings</b>	See <a href="#">5.2.9. S5 RTC Wake Settings on page 67</a>
<b>Serial Port Console Redirection</b>	See <a href="#">5.2.10. Serial Port Console Redirection on page 68</a>

## BIOS

<b>AMI Graphic Outut Protocol Policy</b>	See <a href="#">5.2.11. AMI Graphic Output Protocol Policy on page 70</a>
<b>USB Configuration</b>	See <a href="#">5.2.12. USB Configuration on page 71</a>
<b>Network Stack Configuration</b>	See <a href="#">5.2.13. Network Stack Configuration on page 73</a>
<b>NVMe Configuration</b>	See <a href="#">5.2.14. NVMe Configuration on page 74</a>
<b>Intel(R) Rapid Storage Technology</b>	See <a href="#">5.2.15. Intel(R) Rapid Storage Technology on page 75</a>

### 5.2.1. CPU Configuration

The screenshot shows the 'Advanced' menu in the Aptio Setup - AMI BIOS. The 'CPU Configuration' section is expanded, showing 'Efficient-core Information' and 'Performance-core' options. The 'Performance-core' option is selected, displaying the following settings:

ID	0xC0662
Brand String	Intel(R) Core(TM) Ultra 9 285
VMX	Supported
SMX/TXT	Supported
Intel (VMX) Virtualization Technology	[Enabled]
Active Performance-cores	[All]

On the right side of the screen, there is a description: 'Displays the E-core Information'. At the bottom right, a list of navigation keys is provided:

- ++: Select Screen
- ↑↓: Select Item
- Enter: Select
- +/-: Change Opt.
- F1: General Help
- F2: Previous Values
- F9: Optimized Defaults
- F10: Save & Exit
- ESC: Exit

At the bottom of the screen, the version information is displayed: 'Version 2.22.1296 Copyright (C) 2025 AMI'.

The features settings are:

Setting	Description
<b>Efficient-core Information</b>	Displays the E-core Information.
<b>Performance-core</b>	Displays the P-core Information.
<b>Intel (VMX) Virtualization Technology</b>	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology. ▶ Options: <b>Enabled</b> (default) or <b>Disabled</b>
<b>Active Performance-cores</b>	Number of P-cores to enable in each processor package. ▶ Options: <b>1 to ALL</b> (default)

### 5.2.2. Power & Performance



The feature settings are:

Setting	Description
<b>CPU - Power Management Control</b>	CPU - Power Management Control Options Boot performance mode: ▶ Options: Boot performance mode: <b>Max Battery, Max Non-Turbo Performance, Turbo Performance</b>  Intel(R) SpeedStep(tm): ▶ Options: <b>Disabled, Enabled</b>  Intel(R) Speed Shift Technology: ▶ Options: <b>Disabled, Enabled</b>  Turbo Mode: ▶ Options: <b>Disabled, Enabled</b>  View/Configure Turbo Options: ▶ View/Configure Turbo Ratio Limit Options  C States: Enable/Disable CPU Power Management ▶ Options: <b>Disabled, Enabled</b>

## BIOS

<b>GT/Media - Power Management Control</b>	RC6(Render Standby): Check to enable render standby ▶ Options: <b>Disabled / Enabled</b> (Default)
	MC6(Media Standby): Check to enable Media standby ▶ Options: <b>Disabled / Enabled</b> (Default)
	Maximum GT frequency: Maxium GT frequency limited by the user. ▶ Options: <b>Default Max Frequency</b> (Default), <b>100Mhz~1200Mhz</b>
	Disable Turbo GT Frequency: Enabled/Disabled GT Frequency. ▶ Options: <b>Disabled</b> (Default) / <b>Enabled</b>

### 5.2.3. PCH-FW Configuration

The screenshot shows the 'Advanced' menu of the Aptio Setup - AMI BIOS. The menu is titled 'Advanced' and 'Aptio Setup - AMI'. It lists several ME Firmware parameters and TPM Device Selection. The parameters are:

ME Firmware Version	19.0.0.1797
ME Firmware Mode	Normal Mode
ME Firmware SKU	Corporate SKU
ME Firmware Status 1	0x90000255
ME Firmware Status 2	0x60008100
ME Firmware Status 3	0x00000030
ME Firmware Status 4	0x00000004
ME Firmware Status 5	0x02600000
ME Firmware Status 6	0x00000000
TPM Device Selection	[dTPM]

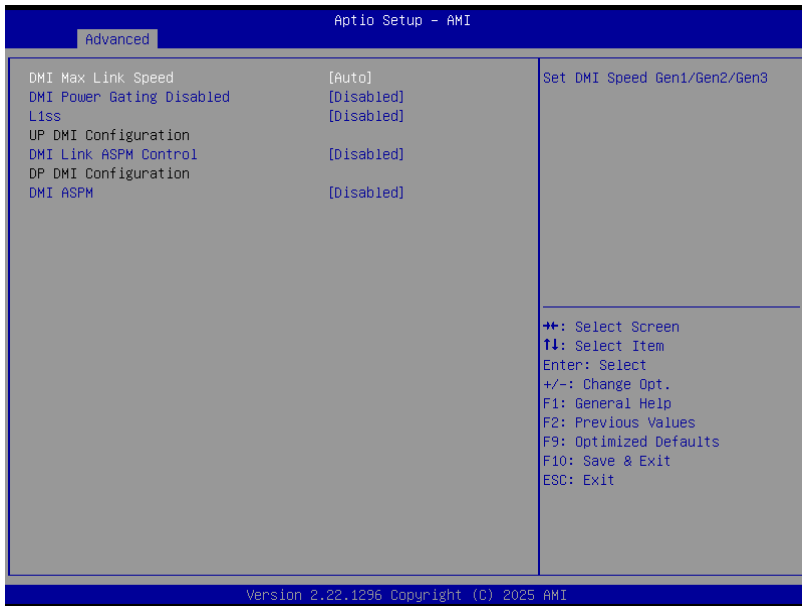
Navigation instructions are listed on the right side of the screen:

- +/: Select Screen
- ↑↓: Select Item
- Enter: Select
- +/-: Change Opt.
- F1: General Help
- F2: Previous Values
- F9: Optimized Defaults
- F10: Save & Exit
- ESC: Exit

Version 2.22.1296 Copyright (C) 2025 AMI

Configure Management Engine Technology Parameters.

### 5.2.4. DMI Configuration



The features settings are:

Setting	Description
<b>DMI Max Link Speed</b>	Set DMI Speed Gen1/Gen2/Gen3. ▶ Options: <b>Auto</b> (default), <b>Gen1</b> , <b>Gen2</b> , <b>Gen3</b> and <b>Gen4</b>
<b>DMI Power Gating Disabled</b>	Enable/Disable DMI Power Gating Disable. ▶ Options: <b>Enabled</b> or <b>Disabled</b> (default)
<b>L1ss</b>	L1.2/Disable L1ss. ▶ Options: <b>Enabled</b> or <b>Disabled</b> (default)
<b>DMI Link ASPM Control</b>	The control of Active State Power Management of the DMI Link. ▶ Options: <b>Disabled</b> (default), <b>L0s</b> , <b>L1</b> , <b>L0sL1</b> and <b>Auto</b>
<b>DMI ASPM</b>	DMI ASPM Support. ▶ Options: <b>Disabled</b> (default), <b>Auto</b> , <b>ASPM L0s</b> , <b>ASPM L1</b> and <b>L0sL1</b>

### 5.2.5. Trusted Computing

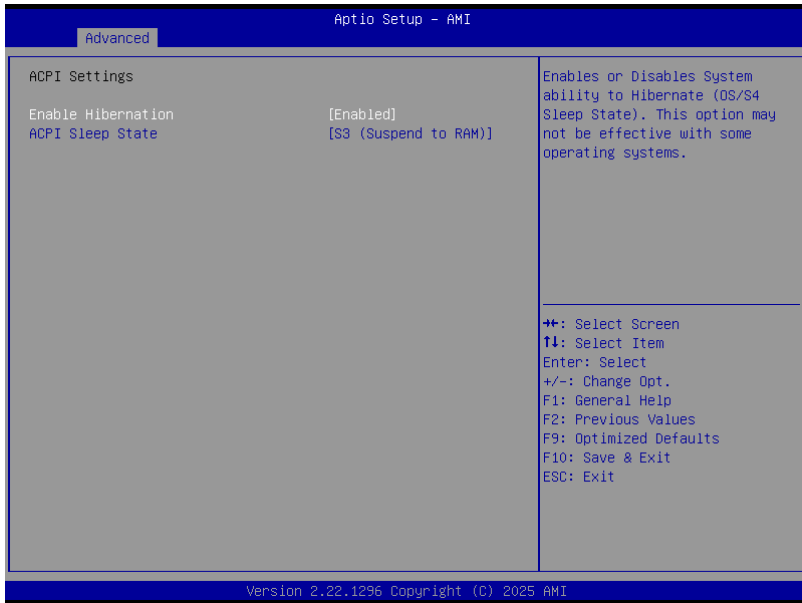


The features settings are:

Setting	Description
<b>Security Device Support</b>	Enables or disables BIOS support for security device. OS will not show Security Device. ▶ Options: <b>Enabled</b> (Default) / <b>Disabled</b>
<b>SHA256 PCR Bank</b>	Enables or disables SHA256 PCR Bank. ▶ Options: <b>Enabled</b> (Default) / <b>Disabled</b>
<b>Pending operation</b>	Schedule an operation for the security device. ▶ Options: <b>None</b> (Default) / <b>TPM Clear</b>
<b>Platform Hierarchy</b>	Enables or disables Platform Hierarchy. ▶ Options: <b>Enabled</b> (Default) / <b>Disabled</b>
<b>Storage Hierarchy</b>	Enables or disables Storage Hierarchy. ▶ Options: <b>Enabled</b> (Default) / <b>Disabled</b>
<b>Endorsement Hierarchy</b>	Enables or disables Endorsement Hierarchy. ▶ Options: <b>Enabled</b> (Default) / <b>Disabled</b>
<b>Physical Presence Spec Vision</b>	This item select to tell O.S. to support PPI Spec Version 1.2 or 1.3. ▶ Options: <b>1.3</b> (Default) / <b>1.2</b>

<b>Device Select</b>	TPM 1.2 will restrict support to TPM 1.2 devices, TPM 2.0 will restrict support to TPM 2.0 devices, Auto will support both the default set to TPM 2.0 devices if not found, TPM1.2 devices will be enumerated. ▶ Options: <b>Auto</b> (Default) / <b>TPM1.2</b> / <b>TPM2.0</b>
----------------------	--

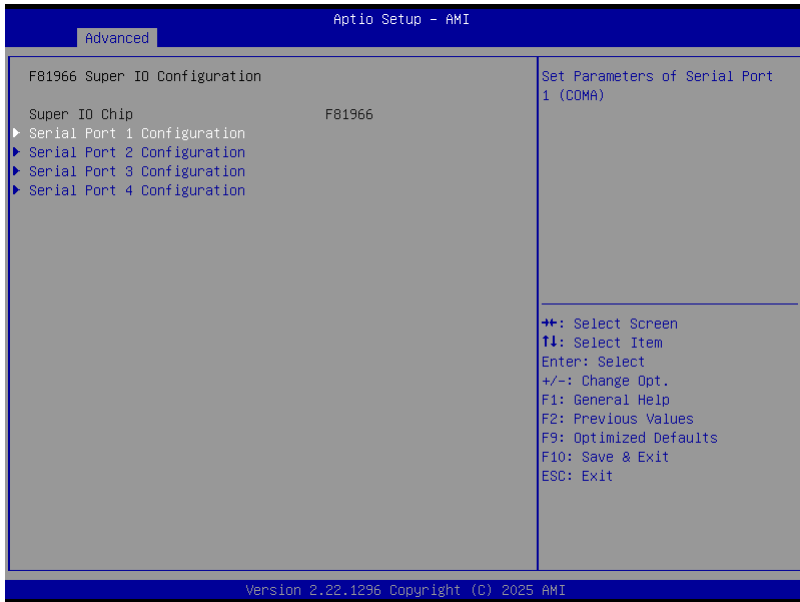
5.2.6. ACPI Settings



The features settings are:

Setting	Description
Enable Hibernation	<b>Enables</b> (default) or <b>Disables</b> System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some Operating Systems.
ACPI Sleep State	Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed. ► Options: <b>Suspend Disabled</b> and <b>S3 (Suspend to RAM)</b> (default)

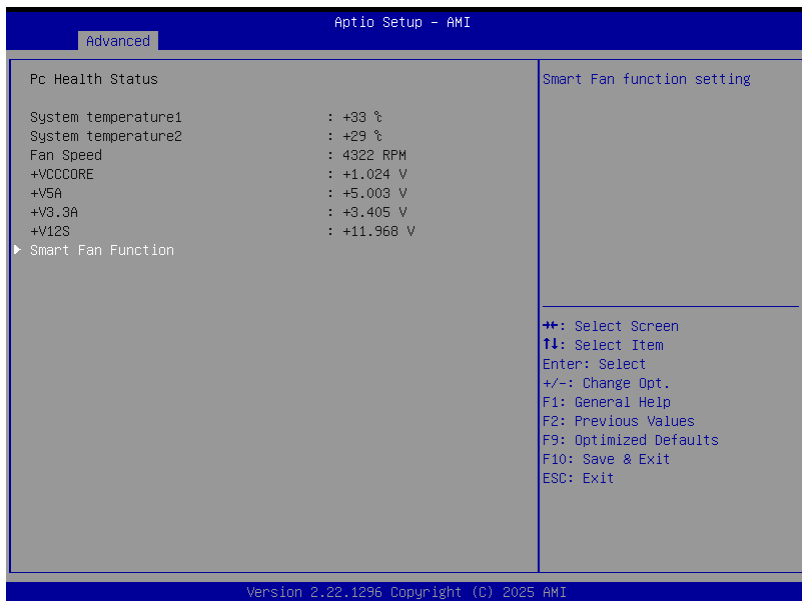
### 5.2.7. F81966 Super IO Configuration



The features settings are:

Setting	Description
<b>Serial Port 1 Configuration</b>	Serial Port: Enable or disable serial port (COM) ▶ Options: <b>Disabled, Enabled</b> Mode Select: Select RS-232 or RS-422 or RS-485 ▶ Options: <b>RS-232</b> (Default), <b>RS-422, RS-422, RS-485, RS-485 Termination Resistor</b>
<b>Serial Port 2 Configuration</b>	Serial Port: Enable or disable serial port (COM) ▶ Options: <b>Disabled, Enabled</b> Mode Select: Select RS-232 or RS-422 or RS-485 ▶ Options: <b>RS-232</b> (Default), <b>RS-422, RS-422, RS-485, RS-485 Termination Resistor</b>
<b>Serial Port 3 Configuration</b>	Serial Port: Enable or disable serial port (COM) ▶ Options: <b>Disabled, Enabled</b>
<b>Serial Port 4 Configuration</b>	Serial Port: Enable or disable serial port (COM) ▶ Options: <b>Disabled, Enabled</b>

### 5.2.8. Hardware Monitor

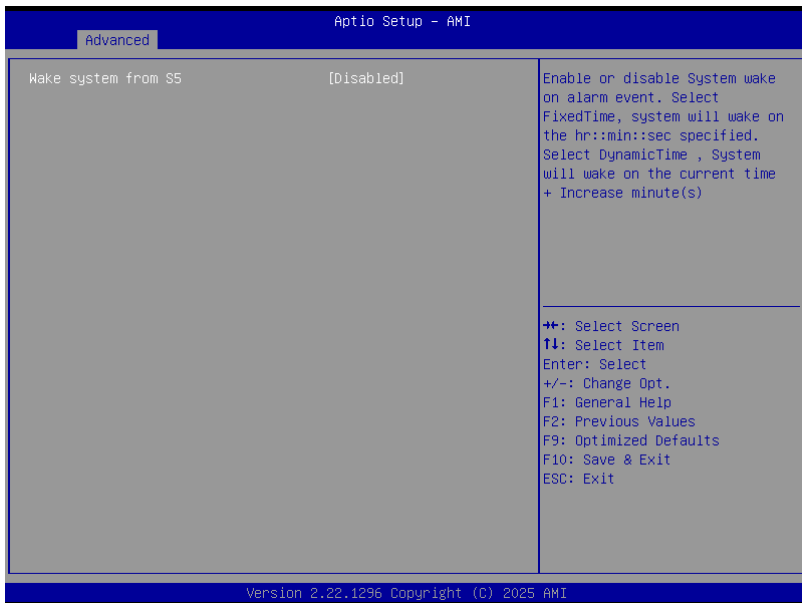


The features settings are:

Setting	Description
Smart Fan Function	Smart Fan1 Configuration FAN_TYPE: FAN1 output type selection. ▶ Options: <b>PWM, DAC(linear)</b> (Default), <b>PWM(Intel 4-wire)</b>  FAN_MODE: FAN1 output mode selection. ▶ Options: <b>Auto-RPM, Auto-Duty Cycle</b> (Default), <b>Manual-RPM, Manual-Duty Cycle</b>  Boundary 1~4 & Speed 1~5: Auto fan speed control. Fan speed will follow different temperature by different RPM 1-100.

**Note:** Smart Fan function only apply to SKUs with smart fan. If your SKU doesn't come with smart fan, ignore these settings.

### 5.2.9. S5 RTC Wake Settings

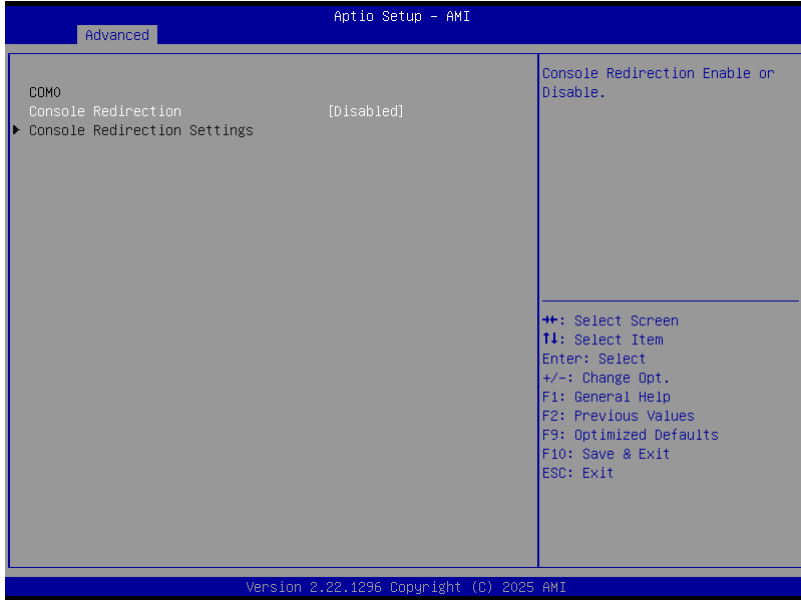


The features settings are:

Setting	Description
Wake System from S5	<p><b>Enable</b> or <b>Disable</b> (default) system wake on alarm event.</p> <ul style="list-style-type: none"> <li>Options available are:                             <ul style="list-style-type: none"> <li><b>Disabled</b> (default):</li> <li><b>Fixed Time:</b> System will wake on the hr::min::sec specified.</li> <li><b>DynamicTime:</b> If selected, you need to set <b>Wake up minute increase</b> from 1 - 5. System will wake on the current time + increase minute(s).</li> </ul> </li> </ul>

# BIOS

## 5.2.10. Serial Port Console Redirection



The features settings are:

Setting	Description
<b>Console Redirection</b>	Console Redirection Enable or Disable. ▶ Options: <b>Disabled, Enabled</b>

<b>Console Redirection Settings</b>	<p>When <b>Console Redirection</b> is set to <b>Enabled</b>, below settings are available:</p> <p>Terminal Type: Emulation ANSI: Extended ASCII char set. VT100: ASCII char set. VT100Plus: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes. ▶ Options: <b>VT100, VT100Plus, VT-UTF8</b> and <b>ANSI</b>.</p> <p>Bits per second: Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds. ▶ Options: <b>9600, 19200, 38400, 57600, 115200, 230400, 460800</b> and <b>921600</b>.</p> <p>Data Bits: Data Bits selection ▶ Options: <b>7</b> and <b>8</b>.</p> <p>Parity: A parity bit can be sent with the data bits to detect some transmission errors. ▶ Options: <b>None, Even, Odd, Mark</b> and <b>Space</b>.</p> <p>Stop Bits: Stop bits indicate the end of a serial data packet. ▶ Options: <b>1</b> and <b>2</b>.</p> <p>Flow Control: Flow control can prevent data loss from buffer overflow. ▶ Options: <b>None</b>, and <b>Hardware RTS/CTS</b>.</p> <p>VT-UTF8 Combo Key Support: Enable VT-UTF8 Combination Key Support for ANSI/VT100 terminals. ▶ Options: <b>Disabled, Enabled</b>.</p> <p>Recorder Mode: With this mode enabled only text will be sent. This is to capture Terminal data. ▶ Options: <b>Disabled, Enabled</b>.</p> <p>Resolution 100x31: Enables or disables extended terminal resolution. ▶ Options: <b>Disabled, Enabled</b>.</p> <p>Putty KeyPad: Select FunctionKey and KeyPad on Putty. ▶ Options: <b>VT100, LINUX, XTERMR6, SCO, ESCN</b> and <b>VT400</b>.</p>
-------------------------------------	--

# BIOS

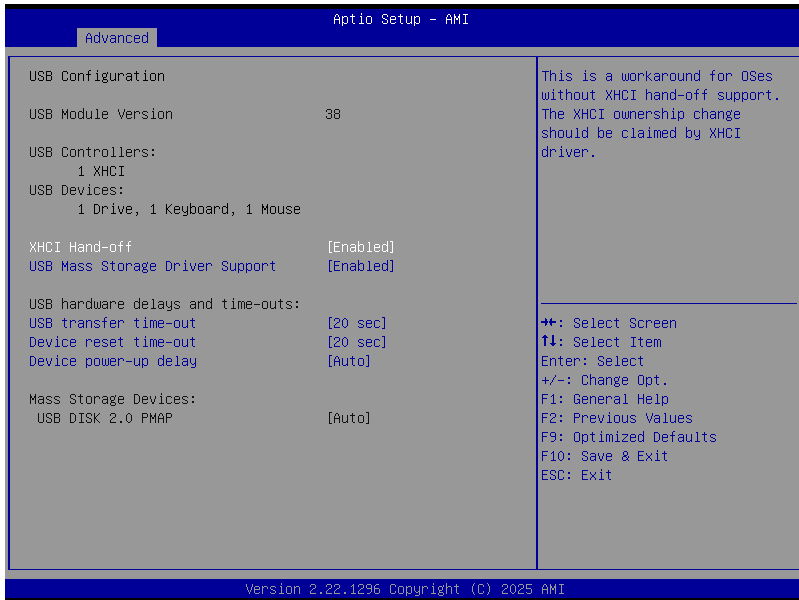
## 5.2.11. AMI Graphic Output Protocol Policy



The features settings are:

Setting	Description
Output Select	Output Interface selection.

## 5.2.12. USB Configuration



The features settings are:

Setting	Description
<b>XHCI Hand-off</b>	This is a workaround for OSES without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver. ▶ The optional settings are: <b>Enabled</b> (default) / <b>Disabled</b>
<b>USB Mass Storage Driver Support</b>	Enables/disables USB Mass Storage Driver Support. ▶ The optional settings are: <b>Enabled</b> (default) / <b>Disabled</b>
<b>USB transfer time-out</b>	Use this item to set the time-out value for control, bulk, and interrupt transfers. ▶ Options: <b>1 sec, 5 sec, 10 sec, 20 sec</b> (default)

## BIOS

---

<b>Device reset time-out</b>	Use this item to set USB mass storage device start unit command time-out. ▶ Options: <b>10 sec, 20 sec</b> (default), <b>30 sec, 40 sec</b>
<b>Device power-up delay</b>	Use this item to set maximum time the device will take before it properly reports itself to the host controller. 'Auto' uses default value: for a root port it is 100 ms, for a hub port the delay is taken from hub descriptor. ▶ Options available are: <b>Auto:</b> Default <b>Manual:</b> Select <b>Manual</b> you can set value for the following sub-item: 'Device Power-up delay in seconds', the delay range in from 1 to 40 seconds, in one second increments.

### 5.2.13. Network Stack Configuration



The features settings are:

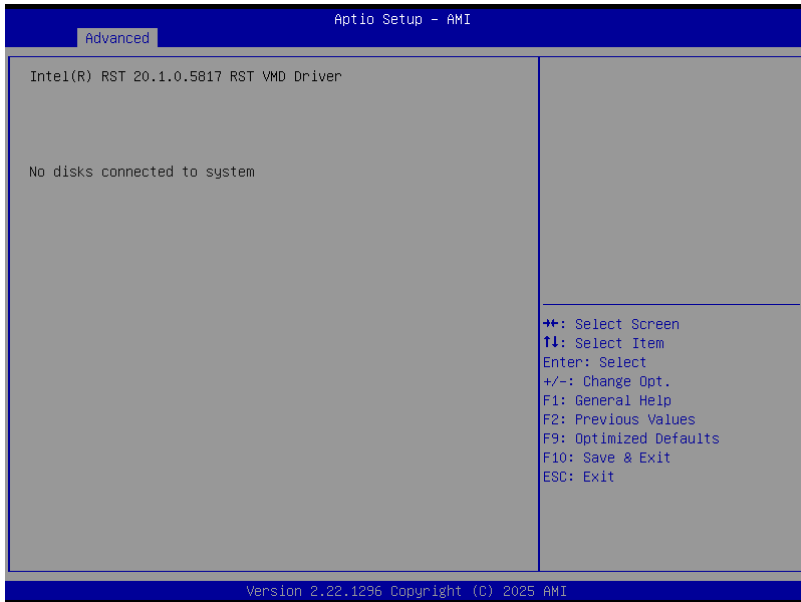
Setting	Description
<b>Network Stack</b>	Enable or Disable(default) UEFI network stack

### 5.2.14. NVMe Configuration



Access this submenu to view the NVMe controller and driver information.

### 5.2.15. Intel(R) Rapid Storage Technology



Access this submenu to view the Intel RST VMD driver information.

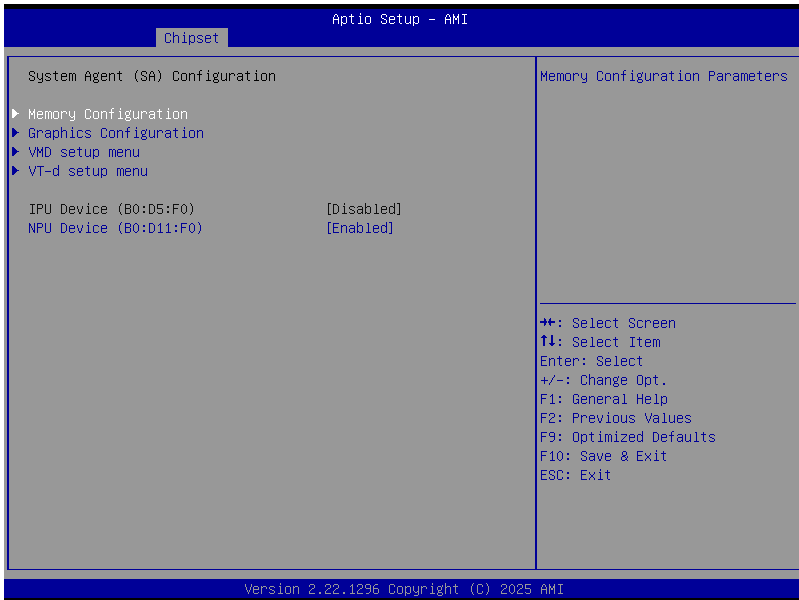
### 5.3. Chipset



The features settings are:

Setting	Description
<b>System Agent (SA) Configuration</b>	See <a href="#">5.3.1. System Agent (SA) Configuration on page 77</a>
<b>PCH-IO Configuration</b>	See <a href="#">5.3.2. PCH-IO Configuration on page 82</a>

### 5.3.1. System Agent (SA) Configuration

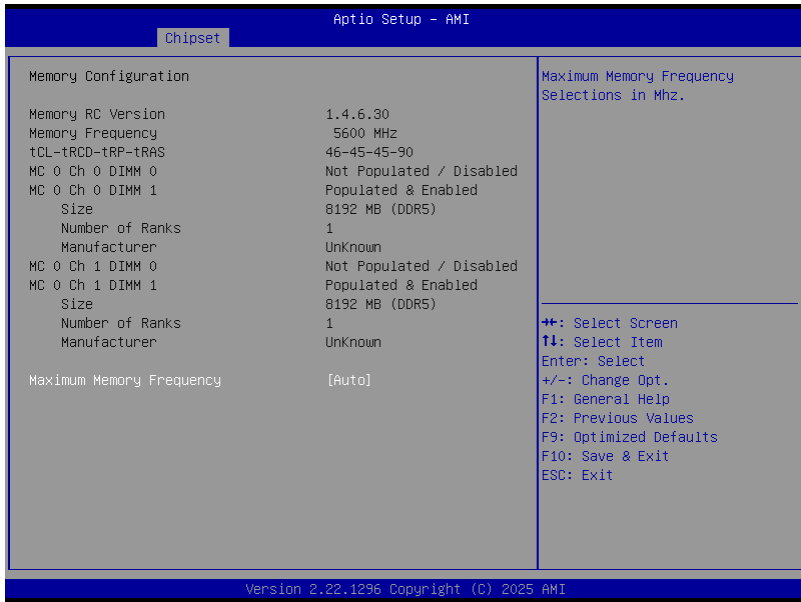


The features settings are:

Setting	Description
Memory Configuration	See <a href="#">5.3.1.1. Memory Configuration on page 78</a>
Graphics Configuration	See <a href="#">5.3.1.2. Graphics Configuration on page 79</a>
VMD setup menu	See <a href="#">5.3.1.3. VMD Configuration on page 80</a>
VT-d setup menu	See <a href="#">5.3.1.4. VT-d Configuration on page 81</a>
NPU Device*	Enable/Disable NPU (Neural Processing Unit) Device. ▶ Options: <b>Disabled, Enabled</b>

**Note\*:** NPU Device setting only support with Windows 11 NPU driver (do not support with Windows 10 system).

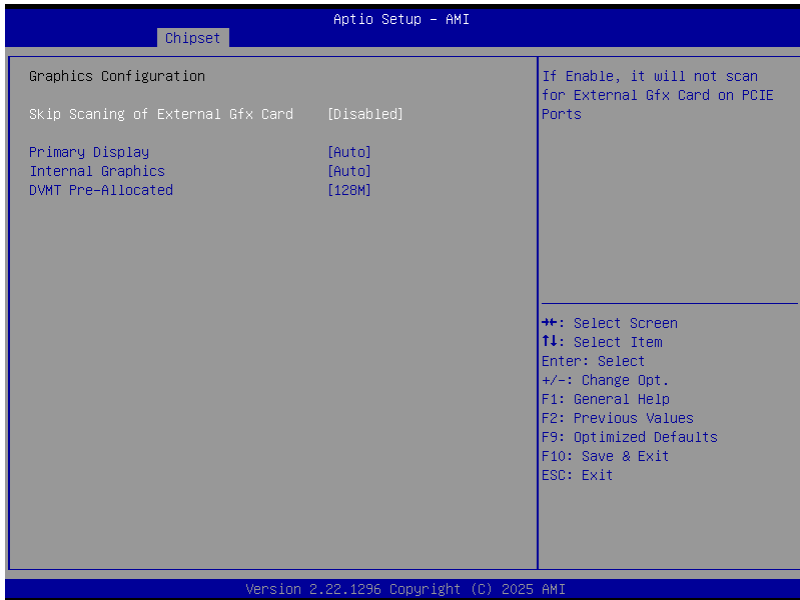
### 5.3.1.1. Memory Configuration



The features settings are:

Setting	Description
<b>Maximum Memory Frequency</b>	Maximum Memory Frequency Selections in Mhz. ▶ Options available are <b>Auto</b> (default), <b>1067 to 12800</b>

### 5.3.1.2. Graphics Configuration

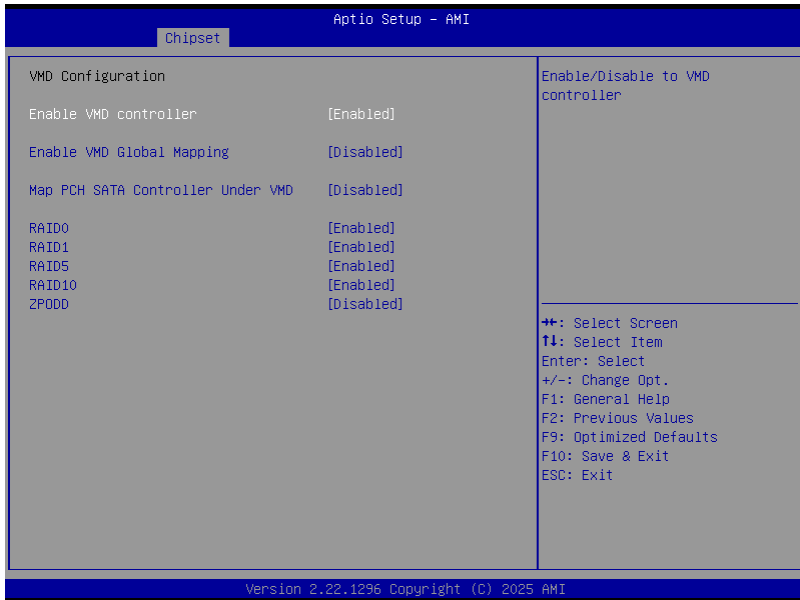


The features settings are:

Setting	Description
<b>Skip Scanning of External Gfx Card</b>	If Enable, it will not scan for External Gfx Card on PCIE Ports. ▶ Options: <b>Disabled</b> (default), <b>Enabled</b>
<b>Primary Display</b>	Select AUTO set IGD to be Primary Display if no external Graphics Device connected otherwise external Graphics Device detected on first PCIe port will be Primary Display or Select IGFX for IGD to be Primary Display or select HG for Hybrid Gfx. ▶ Options: <b>Auto</b> (default), <b>IGFX</b> and <b>HG</b>
<b>Internal Graphics</b>	Keep IGFX enabled based on the setup options. ▶ Options: <b>Auto</b> (default), <b>Disabled</b> and <b>Enabled</b>
<b>DVMT Pre-Allocated</b>	Select the DVMT 5.0 Pre-allocated (Fixed) Graphic Memory size used by the Internal Graphic Device. ▶ Options: <b>0M to 128M</b>

# BIOS

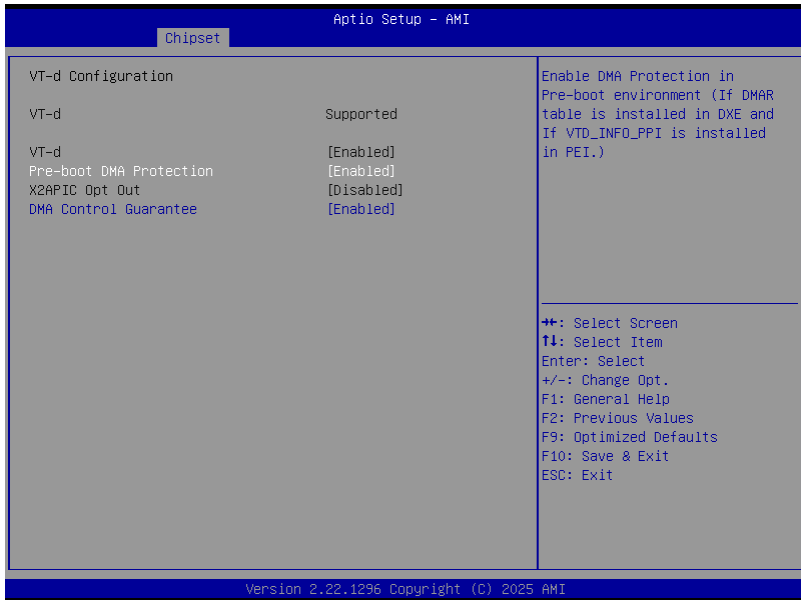
## 5.3.1.3. VMD Configuration



The features settings are:

Setting	Description
<b>Enable VMD controller</b>	Enable/Disable to VMD controller. ▶ Options: <b>Enabled</b> (default), <b>Disabled</b>
<b>Enable VMD Global Mapping</b>	Enable/Disable to VMD Global Mapping. ▶ Options: <b>Enabled</b> , <b>Disabled</b> (default)
<b>Map PCH SATA Controller Under VMD</b>	Map/UnMap this Root Port to VMD. ▶ Options: <b>Enabled</b> , <b>Disabled</b> (default)
<b>RAID0/1/5/10</b>	Enable/Disable RAID0/1/5/10 support. ▶ Options: <b>Enabled</b> (default), <b>Disabled</b>
<b>ZPODD</b>	Enable/Disable ZPODD. The option is only needed to be enabled when ZPODD is connected in VMD mode. ▶ Options: <b>Enabled</b> , <b>Disabled</b> (default)

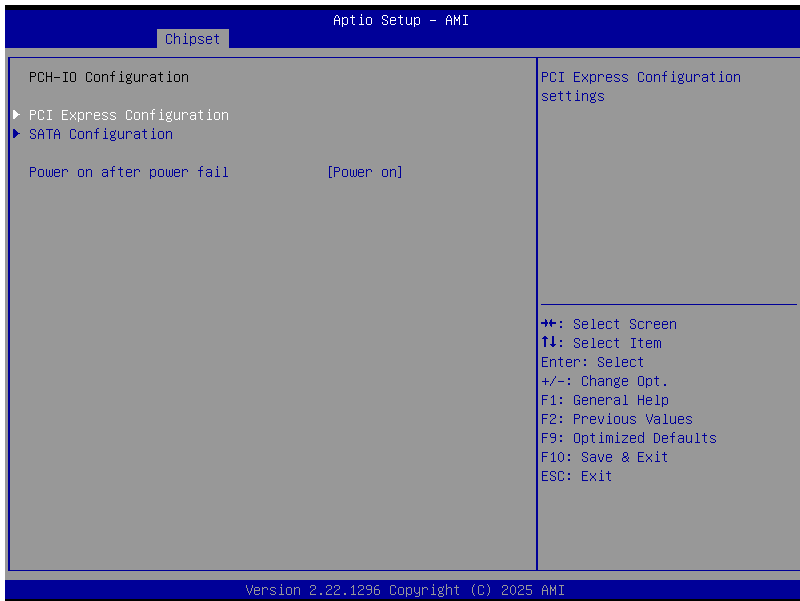
### 5.3.1.4. VT-d Configuration



The features settings are:

Setting	Description
<b>VT-d</b>	Enable/Disable VT-d capability. ▶ Options: <b>Enabled</b> (default), <b>Disabled</b>
<b>Pre-boot DMA Protection</b>	Enable DMA Protection in Pre-boot environment. ▶ Options: <b>Enabled</b> (default), <b>Disabled</b>
<b>X2APIC Opt Out</b>	Enable/Disable X2APIC Opt Out. ▶ Options: <b>Enabled</b> , <b>Disabled</b> (default)
<b>DMA Control Guarantee</b>	Enable/Disable DMA_CONTROL_GUARANTEE bit. ▶ Options: <b>Enabled</b> (default), <b>Disabled</b>

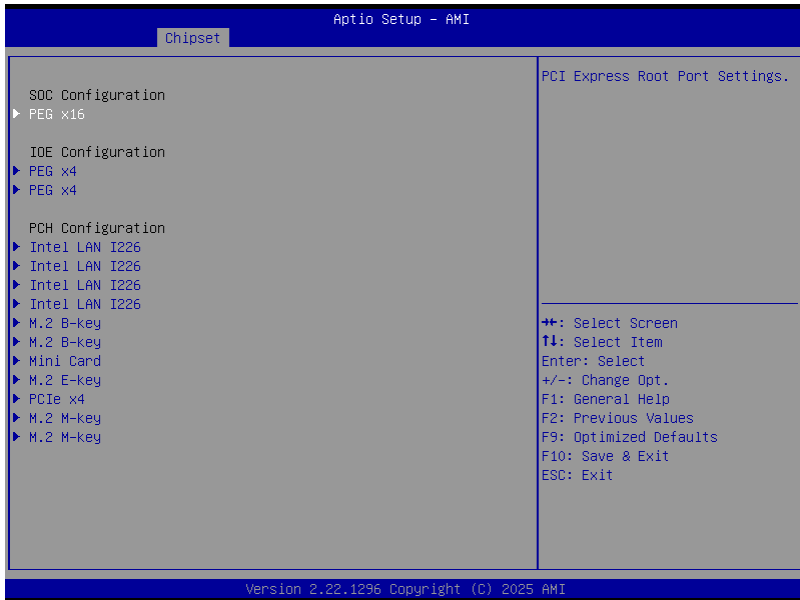
## 5.3.2. PCH-IO Configuration



The features settings are:

Setting	Description
PCI Express Configuration	See <a href="#">5.3.2.1 PCI Express Configuration on page 83</a>
SATA Configuration	See <a href="#">5.3.2.2. SATA Configuration on page 85</a>
Power on after power fail	Specify what state to go to when power is re-applied after a power failure (G3 state). ▶ Options: <b>Power on / Power off</b>

### 5.3.2.1 PCI Express Configuration



The features settings are:

Setting	Description
<b>PEG x16</b>	PEG x16: Control the PCI Express Root Port. ▶ Options: <b>Enabled</b> (default), <b>Disabled</b> ASPM: Set the ASPM Level. ▶ Options: <b>Disabled</b> (default), <b>L0s</b> , <b>L1</b> , <b>L0sL1</b> , <b>Auto</b> L1 Substates: PCI Express L1 Substates settings. ▶ Options: <b>Disabled</b> (default), <b>L1.1</b> , <b>L1.1 &amp; L1.2</b> PCIe Speed: Configure PCIe Speed. ▶ Options: <b>Auto</b> , <b>Gen1</b> , <b>Gen2</b> , <b>Gen3</b> , <b>Gen4</b> , <b>Gen5</b>
<b>PEG x4</b>	PEG x4: Control the PCI Express Root Port. ▶ Options: <b>Enabled</b> (default), <b>Disabled</b> ASPM: Set the ASPM Level. ▶ Options: <b>Disabled</b> (default), <b>L0s</b> , <b>L1</b> , <b>L0sL1</b> , <b>Auto</b> L1 Substates: PCI Express L1 Substates settings. ▶ Options: <b>Disabled</b> (default), <b>L1.1</b> , <b>L1.1 &amp; L1.2</b> PCIe Speed: Configure PCIe Speed. ▶ Options: <b>Auto</b> , <b>Gen1</b> , <b>Gen2</b> , <b>Gen3</b> , <b>Gen4</b> , <b>Gen5</b>

<p><b>Intel LAN I226</b></p>	<p>Intel LAN I226: Control the PCI Express Root Port.          ▶ Options: <b>Enabled</b> (default), <b>Disabled</b></p> <p>ASPM: Set the ASPM Level.          ▶ Options: <b>Disabled</b> (default), <b>L0s, L1, L0sL1, Auto</b></p> <p>L1 Substates: PCI Express L1 Substates settings.          ▶ Options: <b>Disabled</b> (default), <b>L1.1, L1.1 &amp; L1.2</b></p> <p>PCIe Speed: Configure PCIe Speed.          ▶ Options: <b>Auto, Gen1, Gen2, Gen3, Gen4</b></p>
<p><b>M.2 B-key</b></p>	<p>M.2 B-key: Control the PCI Express Root Port.          ▶ Options: <b>Enabled</b> (default), <b>Disabled</b></p> <p>ASPM: Set the ASPM Level.          ▶ Options: <b>Disabled</b> (default), <b>L0s, L1, L0sL1, Auto</b></p> <p>L1 Substates: PCI Express L1 Substates settings.          ▶ Options: <b>Disabled</b> (default), <b>L1.1, L1.1 &amp; L1.2</b></p> <p>PCIe Speed: Configure PCIe Speed.          ▶ Options: <b>Auto, Gen1, Gen2, Gen3, Gen4</b></p>
<p><b>Mini Card</b></p>	<p>Mini Card: Control the PCI Express Root Port.          ▶ Options: <b>Enabled</b> (default), <b>Disabled</b></p> <p>ASPM: Set the ASPM Level.          ▶ Options: <b>Disabled</b> (default), <b>L0s, L1, L0sL1, Auto</b></p> <p>L1 Substates: PCI Express L1 Substates settings.          ▶ Options: <b>Disabled</b> (default), <b>L1.1, L1.1 &amp; L1.2</b></p> <p>PCIe Speed: Configure PCIe Speed.          ▶ Options: <b>Auto, Gen1, Gen2, Gen3, Gen4</b></p>
<p><b>M.2 E-key</b></p>	<p>M.2 E-key: Control the PCI Express Root Port.          ▶ Options: <b>Enabled</b> (default), <b>Disabled</b></p> <p>ASPM: Set the ASPM Level.          ▶ Options: <b>Disabled</b> (default), <b>L0s, L1, L0sL1, Auto</b></p> <p>L1 Substates: PCI Express L1 Substates settings.          ▶ Options: <b>Disabled</b> (default), <b>L1.1, L1.1 &amp; L1.2</b></p> <p>PCIe Speed: Configure PCIe Speed.          ▶ Options: <b>Auto, Gen1, Gen2, Gen3, Gen4</b></p>
<p><b>PCIe x4</b></p>	<p>PCIe x4: Control the PCI Express Root Port.          ▶ Options: <b>Enabled</b> (default), <b>Disabled</b></p> <p>ASPM: Set the ASPM Level.          ▶ Options: <b>Disabled</b> (default), <b>L0s, L1, L0sL1, Auto</b></p> <p>L1 Substates: PCI Express L1 Substates settings.          ▶ Options: <b>Disabled</b> (default), <b>L1.1, L1.1 &amp; L1.2</b></p> <p>PCIe Speed: Configure PCIe Speed.          ▶ Options: <b>Auto, Gen1, Gen2, Gen3, Gen4</b></p>

<b>M.2 M-key</b>	<p>M.2 M-key: Control the PCI Express Root Port.                  ▶ Options: <b>Enabled</b> (default), <b>Disabled</b></p> <p>ASPM: Set the ASPM Level.                  ▶ Options: <b>Disabled</b> (default), <b>L0s, L1, L0sL1, Auto</b></p> <p>L1 Substates: PCI Express L1 Substates settings.                  ▶ Options: <b>Disabled</b> (default), <b>L1.1, L1.1 &amp; L1.2</b></p> <p>PCIe Speed: Configure PCIe Speed.                  ▶ Options: <b>Auto, Gen1, Gen2, Gen3, Gen4</b></p>
------------------	---

### 5.3.2.2. SATA Configuration

Aptio Setup - AMI
Chipset

<p>SATA Configuration</p> <p>SATA Controller(s) [Enabled]</p> <p>Serial ATA Port 0                  Software Preserve                  Port 0 [Enabled]</p> <p>Serial ATA Port 1                  Software Preserve                  Port 1 [Enabled]</p> <p>Serial ATA Port 2                  Software Preserve                  Port 2 [Enabled]</p> <p>Serial ATA Port 3                  Software Preserve                  Port 3 [Enabled]</p>	<p>Enable/Disable SATA Device.</p> <hr/> <p>                     ++: Select Screen                      T↓: Select Item                      Enter: Select                      +/-: Change Opt.                      F1: General Help                      F2: Previous Values                      F9: Optimized Defaults                      F10: Save &amp; Exit                      ESC: Exit                 </p>
---	---

Version 2.22.1296 Copyright (C) 2025 AMI

The features settings are:

Setting	Description
<b>SATA Controller(s)</b>	Enables (default) / disables SATA device.
<b>Port 0/1/2/3</b>	Enables (default) / disables the SATA port.

## 5.4. Security



The features settings are:

Setting	Description
<b>Administrator Password</b>	To set up an administrator password: <ol style="list-style-type: none"> <li>1. Select <b>Administrator Password</b>.</li> <li>2. An <b>Create New Password</b> dialog then pops up onscreen.</li> <li>3. Enter your desired password that is no less than 3 characters and no more than 20 characters.</li> <li>4. Hit [Enter] key to submit.</li> </ol>
<b>Disable Sanitize Freeze Lock</b>	If this option is enabled, then sending Sanitize Freeze Lock command to HDDs will be skipped in next boot. <ul style="list-style-type: none"> <li>► Options: <b>Enabled, Disabled</b> (default)</li> </ul>
<b>Secure Boot</b>	See <a href="#">5.4.1. Secure Boot on page 87</a> .

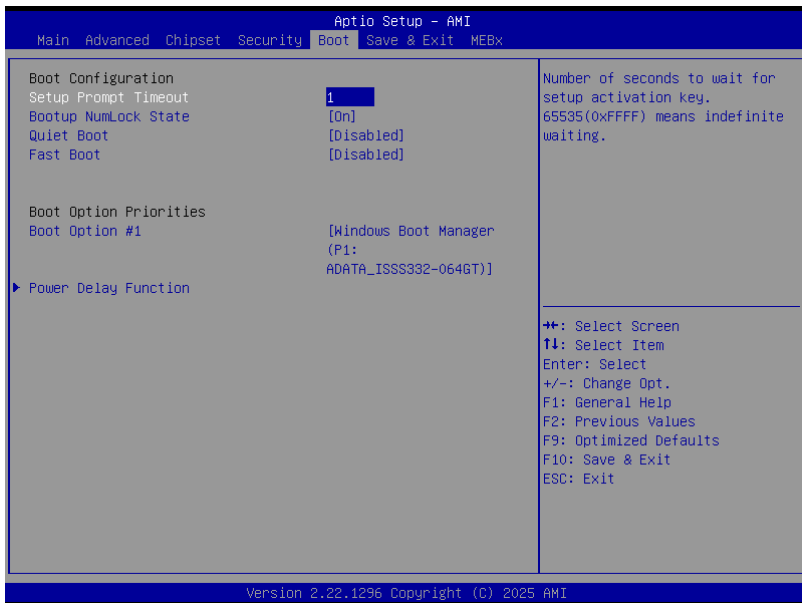
### 5.4.1. Secure Boot



The features settings are:

Setting	Description
<b>Secure Boot</b>	<b>Enable/Disable</b> (default) secure boot.
<b>Secure Boot Mode</b>	Allow users to set the secure boot selector. ▶ Options: <b>Standard</b> (default) / <b>Custom</b> mode.
<b>Restore Factory Keys</b>	Force system to restore default secure boot key database.
<b>Reset to Setup Mode</b>	Delete all secure boot key databases.
<b>Expert Key Management</b>	Enables expert users to modify Secure Boot Policy variables without variable authentication.

## 5.5. Boot

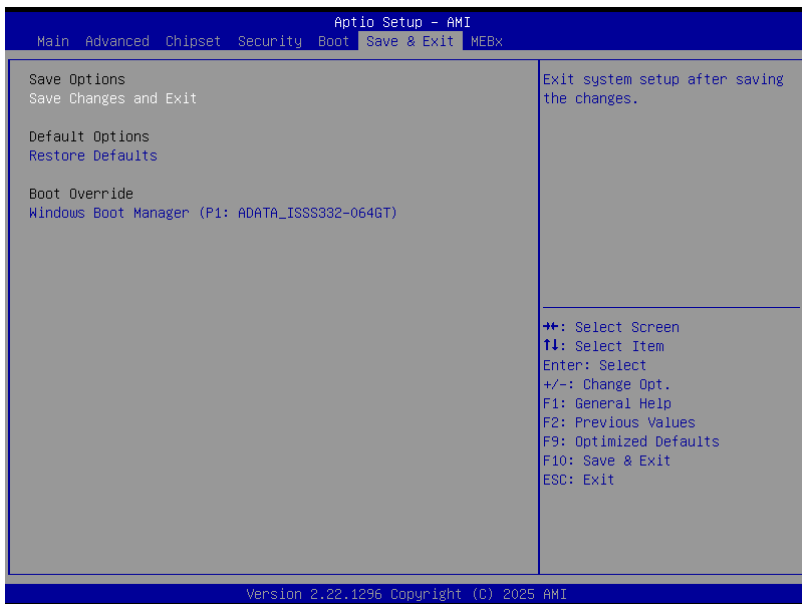


The features settings are:

Setting	Description
<b>Setup Prompt Timeout</b>	Set how long to wait for the prompt to show for entering BIOS Setup. <ul style="list-style-type: none"> <li>▶ The default setting is <b>1</b> (sec).</li> <li>▶ Set it to <b>65535</b> to wait indefinitely.</li> </ul>
<b>Bootup NumLock State</b>	Sets whether to enable or disable the keyboard's NumLock state when the system starts up. <ul style="list-style-type: none"> <li>▶ Options available are <b>On</b> (default) and <b>Off</b>.</li> </ul>
<b>Quiet Boot</b>	Sets whether to display the POST (Power-on Self Tests) messages or the system manufacturer's full screen logo during booting. <ul style="list-style-type: none"> <li>▶ Select <b>Disabled</b> to display the normal POST message, which is the default.</li> </ul>
<b>Fast Boot</b>	Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.

<b>Boot Option Priority</b>	Set the system boot priorities.
<b>Power Delay Function</b>	<p><b>Power Delay Function</b> Set the system support power delay function.</p> <p>▶ Options: <b>Enable</b> (default): Support power delay function. <b>Disable</b>: Power on/off manually operated.</p> <p>When <b>Power Delay Function</b> is set to <b>Enabled</b>, below settings are available:</p> <p><b>Power on delay</b> Select the time which the system will power on.</p> <p>▶ Options: <b>Manually Operator</b> (default), <b>04 Seconds</b>, <b>08 Seconds</b> and <b>16 Seconds</b>.</p> <p><b>Power off delay</b> Select the time which the system will shutdown.</p> <p>▶ Options: <b>Manually Operator</b> (default), <b>30 Seconds</b>, <b>60 Seconds</b> and <b>90 Seconds</b>.</p>

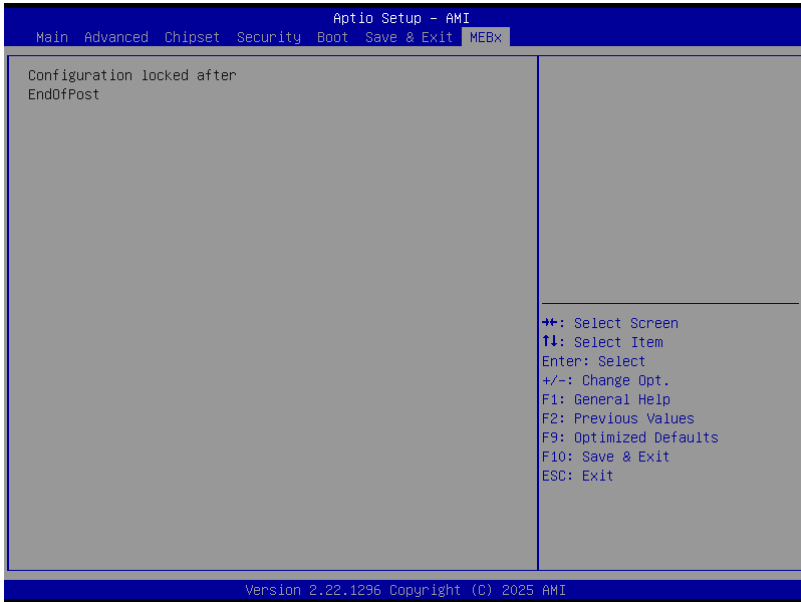
## 5.6. Save & Exit



The features settings are:

Setting	Description
<b>Save Changes and Exit</b>	Saves the changes and quits the BIOS Setup utility.
<b>Restore Defaults</b>	Restores all settings to defaults. ▶ This is a command to launch an action from the BIOS Setup utility.
<b>Boot Override</b>	<b>Boot Override</b> presents a list in context with the boot devices in the system. ▶ <b>P0</b> : Select the device to boot up the system regardless of the currently configured boot priority. ▶ <b>Launch EFI Shell from filesystem device</b> : Attempts to launch EFI Shell Application (Shell.efi) from one of the available filesystem devices.

## 5.7. MEBx



Access this submenu to view the MEBx configuration.

# BIOS

---

## 5.8. RAID Setting Steps

To configure the RAID, follow the steps below:

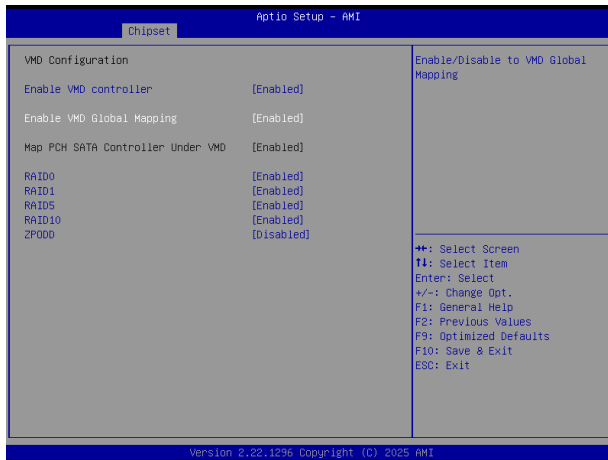
Step1. [Chipset->System Agent (SA) Configuration]



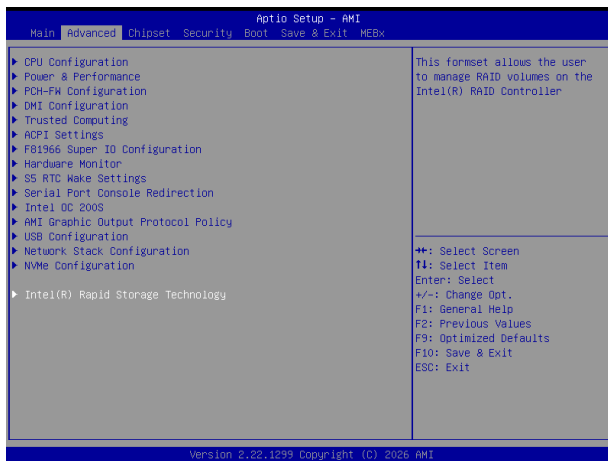
Step2. [System Agent (SA) Configuration->VMD setup menu]



Step3. [Enable VMD Global Mapping: Enable]; Save&Exit



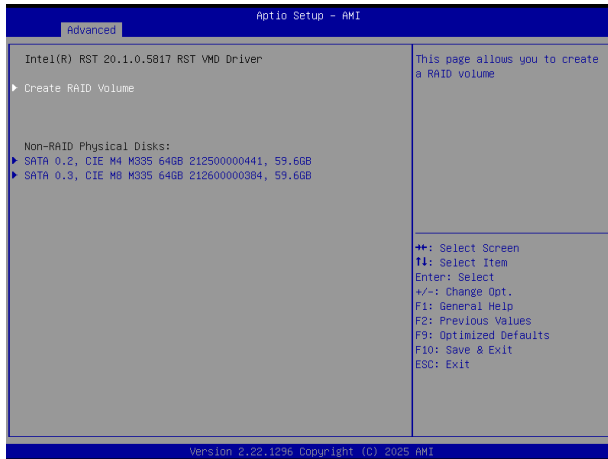
Step4. [Advanced->Intel Rapid Storage Technology]



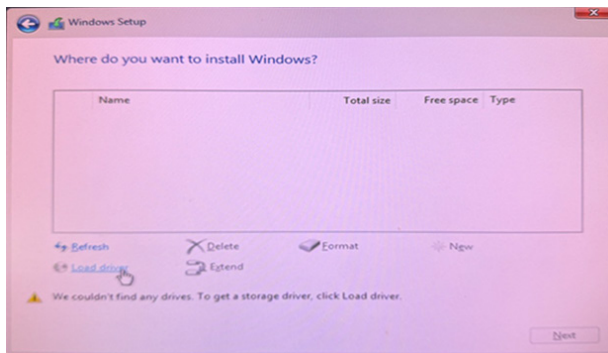
# BIOS

---

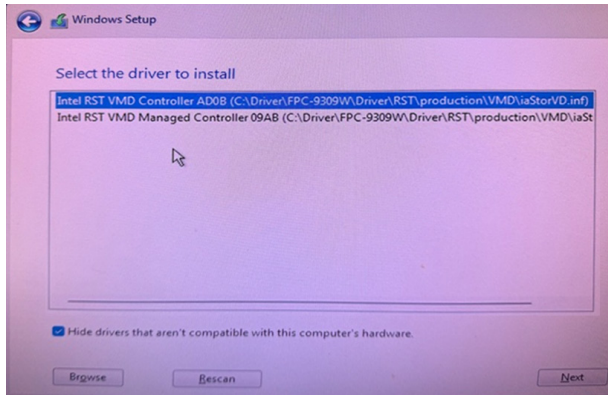
## Step5. Create Raid Volume



## Step6. When install OS, select Load Driver



## Step7. Intel RST VMD Controller AD0B



Step8. When the driver is installed successfully, you will see the space

