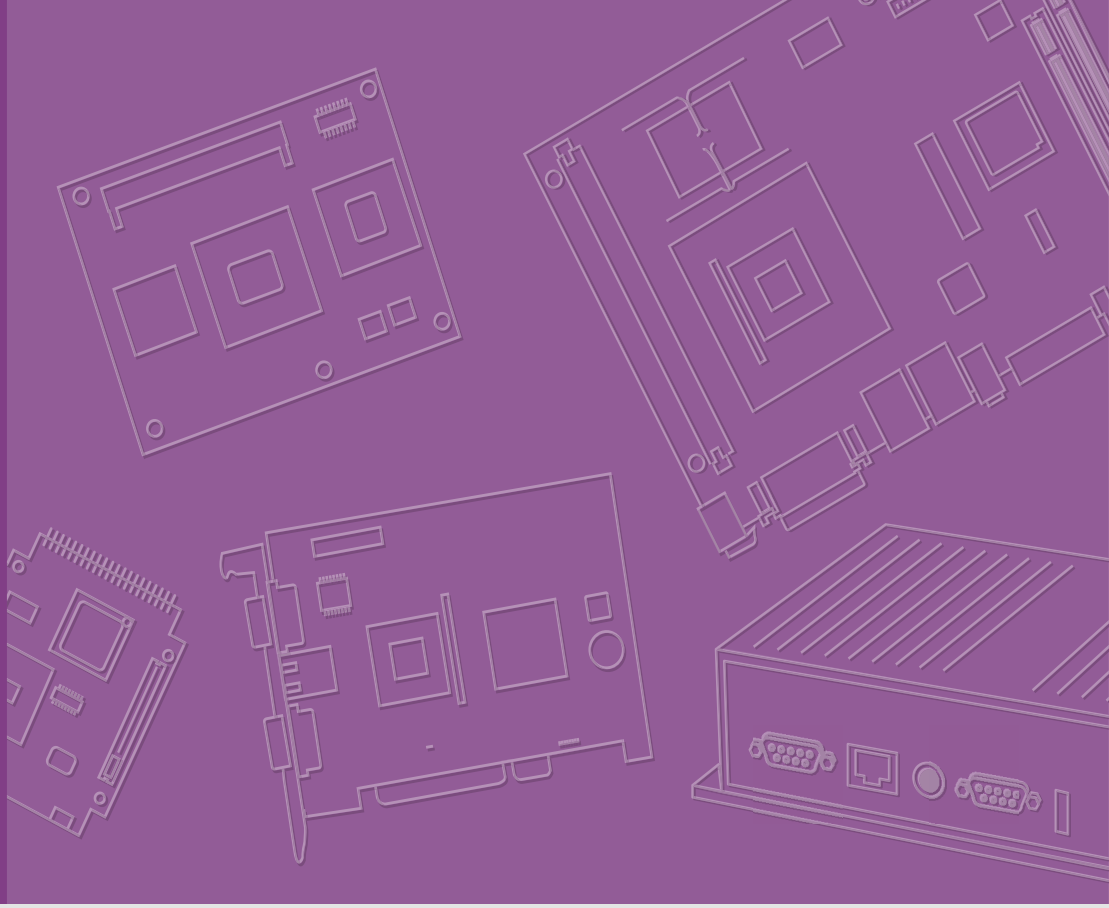

User Manual

AFE-R770

AMR Controller

ADVANTECH

Enabling an Intelligent Planet

Attention!

This product contains a hard copy of the Chinese user manual for China CCC certification purposes. A PDF of the English user manual can be downloaded from the company website. Please disregard the hard copy Chinese user manual if the product is not sold and/or installed in China.

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For technical support and service, please visit our support website at:
http://support.advantech.com.tw/support

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Product Warranty (2 Years)

Advantech warrants the original purchaser that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced free of charge during the warranty period. For out-of-warranty repairs, customers will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.

If you believe your product to be defective, follow the steps outlined below.

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages displayed when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain a return merchandise authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and a proof of purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of purchase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

Declaration of Conformity

FCC Class B

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for assistance.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support to obtain the latest product information.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:
   - Product name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Warnings, Cautions and Notes

Warning! *Warnings indicate conditions that if not observed can cause personal injury!*

Caution! *Cautions are included to help prevent hardware damage and data losses. For example,*

"Batteries are at risk of exploding if incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions."

Note! *Notes provide additional optional information.*

Packing List

Before setting up the system, check that the items listed below are included and in good condition. If any item does not accord with the table, please contact your dealer immediately.

- 1 x AFE-R770 Unit
- 1 x User Manual (Simplified Chinese)
- 1 x China RoHS
- 1 x Mounting kit

Ordering Information

Part No.	CPU	DDR5	Gbe	HDMI	CAN Bus	RS-232/ 422/485	USB	M.2 B-Key	SIM	M.2 E-Key	M.2 M-Key	DIO	Country of Origin
AFE-R770-00A1	LGA1700 Socket Type	Up to 64GB	4	1	2	4	4	1	1	1	1	1-bit	China
AFE-R770-00A1U	LGA1700 Socket Type	Up to 64GB	4	1	2	4	4	1	1	1	1	16-bit	Taiwan

Note! *CPU/Memory/Storage and operating system included by request.*

Optional Items for Default SKU

Part Number	Description
96PSA-A150W24T2-4	AC to DC adapter, DC 24V 150W, 0 ~ 40°C
1702002600	Power cable 3-pin 183 cm (6 ft), USA type
1702002605	Power cable 3-pin 183 cm (6 ft), EU type
1702031801	Power cable 3-pin 183 cm (6 ft), UK type
1700000237	Power cable 3-Pin 183 cm (6 ft), PSE type

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all power outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Protect the equipment from humidity.
6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.
7. The power outlet sockets should have grounded connections.
8. Position the power cord away from high-traffic areas. Do not place anything over the power cord.
9. All cautions and warnings on the equipment should be noted.
10. If the equipment is not used for a long time, disconnect it from the power source to avoid damage from transient overvoltage.
11. Never pour liquid into an opening. This may cause fire or electrical shock.
12. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
13. If any of the following occurs, have the equipment checked by service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated the equipment.
    - The equipment has been exposed to moisture.

- The equipment is malfunctioning, or does not operate according to the user manual.
- The equipment has been dropped and damaged.
- The equipment shows obvious signs of breakage.

14. Do not leave the equipment in an environment with a storage temperature of below -40°C (-40°F) or above 85°C (185°F) as this may damage the components. The equipment should be kept in a controlled environment.
15. Any unverified components may cause unexpected damage. To ensure correct installation, always use the components (e.g., screws) provided in the accessory box.
16. CAUTION: Batteries are at risk of exploding if incorrectly replaced. Replace only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.
17. Always disconnect the power cord from the chassis before manually handling the hardware. Do not implement connections or configuration changes while the device is powered on. Sudden power surges may damage sensitive electronic components.
18. In accordance with IEC 704-1:1982 specifications, the sound pressure level at the operator's position does not exceed 70 dB (A).
19. DISCLAIMER: These instructions are provided according to IEC 704-1 standards.
    Advantech disclaims all responsibility for the accuracy of any statements contained herein.
20. Use a power cord connected to a socket-outlet with a grounded connection.
21. 21.This product is intended to be supplied by a UL-Listed power supply suitable for use at minimum Tma 65°C (149°F) whose output meets ES1 (or SELV) and output is rated: 9-36 Vdc, 16.6-4.16 A. Please contact Advantech for further informa- tion.
22. RESTRICTED ACCESS AREA: The equipment should only be installed in a Restricted Access Area.

Consignes de Sécurité

1. Veuillez lire attentivement ces instructions de sécurité.
2. Veuillez conserver ce manuel de l'utilisateur pour référence ultérieure.
3. Veuillez débrancher cet équipement de la prise secteur avant le nettoyage. Utilisez un chiffon humide. Ne pas utiliser de détergent liquide ou pulvérisé pour le nettoyage. Utilisez une feuille ou un chiffon humide pour le nettoyage.
4. Pour les équipements enfichables, la prise de courant doit être à proximité de l'équipement et doit être facilement accessible.
5. S'il vous plaît garder cet équipement de l'humidité.
6. Posez cet équipement sur une surface fiable lors de l'installation. Une chute ou une chute pourrait causer des blessures.
7. La prise de courant doit avoir une connexion mise à la terre.
8. Placez le cordon d'alimentation de sorte que personne ne puisse marcher dessus.
   Ne placez rien sur le cordon d'alimentation.
9. Tous les avertissements et mises en garde sur l'équipement doivent être notés.
10. Si l'appareil n'est pas utilisé pendant une longue période, débranchez-le du secteur pour ne pas être endommagé par une surtension transitoire.
11. Ne jamais verser de liquide dans les ouvertures de ventilation; Cela pourrait provoquer un incendie ou un choc électrique.

12. N'ouvrez jamais l'équipement. Pour des raisons de sécurité, seul le personnel de maintenance qualifié doit ouvrir l'équipement.
13. Si l'une des situations suivantes se présente, faites vérifier le matériel par le personnel de service:
    - Le cordon d'alimentation ou la fiche est endommagé.
    - Un liquide a pénétré dans l'appareil.
    - L'équipement a été exposé à l'humidité.
    - L'équipement ne fonctionne pas bien ou vous ne pouvez pas le faire. fonctionner conformément au manuel d'utilisation.
    - Equipment L'équipement est tombé et a été endommagé.
    - Equipment L'équipement présente des signes évidents de rupture.
14. Ne laissez pas cet équipement dans un environnement où la température de stockage peut être inférieure à -40°C (-40°F) ou supérieure à 85°C (185°F). Cela pourrait endommager l'équipement. L'équipement doit être dans un environnement contrôlé.
15. Tout composant non vérifié peut causer des dommages inattendus. Pour garantir une installation correcte, veuillez toujours utiliser les composants (ex. Vis) fournis avec la boîte d'accessoires.
16. ATTENTION: L'ordinateur est équipé d'un circuit d'horloge temps réel alimenté par batterie. Il y a un risque d'explosion si la batterie est remplacée de manière incorrecte. Remplacez uniquement avec le même type ou un type équivalent recommandé par le fabricant. Jetez les piles usagées conformément aux instructions du fabricant.
17. Débranchez toujours complètement le cordon d'alimentation de votre châssis lorsque vous utilisez du matériel. Ne faites pas de connexion quand l'appareil est sous tension. Les composants électroniques sensibles peuvent être endommagés par des surtensions soudaines.
18. Niveau de pression acoustique au poste de l'opérateur selon la norme CEI 704-1: 1982 n'est pas supérieur à 70 dB (A).
19. AVERTISSEMENT: Cet ensemble d'instructions est donné conformément à la norme CEI 704-1. Advantech décline toute responsabilité quant à l'exactitude des déclarations contenues dans ce.
20. Au moyen d'un cordon d'alimentation connecté à une prise de courant avec mise à la terre.
21. Ce produit est destiné à être alimenté par un bloc d'alimentation homologué UL adapté à une utilisation à Tma 65 degrés C min. dont la sortie est conforme à ES1 (ou SELV) et dont la sortie est nominale: 9-36Vdc, 16.6-4.16A, si besoin d'aide supplémentaire, veuillez contacter Advantech pour plus d'informations.
22. ZONE D'ACCÈS RESTREINT: L'équipement ne doit être installé que dans une zone d'accès restreint.

Contents

Chapter 1

General Introduction

This chapter details background information on the AFE-R770 series.

1.1 Introduction

Advantech's AFE-R770 is an intelligent, high-performance, fanless desktop system powered by 12/13/14th Gen Intel® Core™ i3/i5/i7/i9 (LGA1700 socket) 35W processors. AFE-R770 supports a maximum 35W processor and broad temperature ranges (-20 ~ 65°C / -4 ~ 149°F).

Rugged Multi-Functional Design

AFE-R770 adopts an advanced thermal design for its desktop processor solution. All models are fanless and feature various unique features. These include wide operating temperature ranges (-20 ~ 65°C / -4 ~ 149°F), diverse expandability options, and structural strengthening. It supports diverse I/O interfaces — up to 4 x Intel® GbE, 4 x USB 3.2 (2 x Gen2 + 2 x Gen1), 2 x CAN bus, 1 x IMU socket (optional), 1 x M.2 B-Key (PCIex2/SATA/USB, selectable in BIOS), 1 x M.2 M-Key (PCIe x4 / SATA), 1 x M.2 E-Key (PCIe x1 / USB 2.0), 4 x COM (RS-232/422/485), 1 x HDMI, and 16-bit DIO.

Built-In Intelligent Management Tools — Advantech SUSI API and WISE-DeviceOn

The Advantech SUSI API offers a range of programmable APIs including multi-level watchdog, hardware monitoring, and other user-friendly interfaces.

SUSI API is an intelligent self-management cross-platform tool that monitors the system's status for problems and takes action in the event of abnormalities. It ensures reliable system boot-up in critical, low-temperature environments, so systems can automatically recover when voltages dip.

By integrating SUSI API, AFE-R770 enhances system reliability and intelligence. Additionally, AFE-R770 supports Advantech's WISE-DeviceOn for effortless remote management, enabling users to monitor, configure, and control a large number of terminals, simplifying maintenance and system recovery processes.

1.2 Product Features

1.2.1 General

- **CPU:** 12th/13th/14th Gen Intel® Core™ i3/i5/i7 (LGA1700) desktop processor (up to 35W)
- **System Chipset:** Intel® R680E& H601E
- **BIOS:** AMI EFI 256Mbit
- **System Memory:** DDR5 4800MHz up to 64GB
- **Watchdog Timer:** Single chip watchdog 255-level interval timer, set up by software
- **I/O Interface:** 4 x COM (RS-232/422/485)
- **USB:** 4 x USB 3.2 (2 x Gen2 + 2 x Gen1)
- **Audio:** High Definition Audio (HD), Line-out/Mic-in
- **Storage:** 1 x M.2 M-Key (PCIe x4 / SATA), 1 x M.2 B-Key (PCIe x2 / SATA / USB)
- **Expansion Interface:**
  - 1 x M.2 with SIM holder (B-Key for NVME, SATA, LTE/5G modules)
  - 1 x M.2 (E-Key for Wi-Fi, suggested installation at Advantech manufacturing)
- **TPM:** TPM 2.0, dTPM by default (Infineon SLB9672XU2.0)

1.2.2 Display

- **Controller:** According to CPU selection

- **Resolution:**
  - HDMI: supports HDMI 1.4, 4096 x 2160 @ 24Hz

1.2.3 Ethernet

- **Chipset:** LAN1/2/3/4 Intel® i226-LM, supporting Wake-on-LAN
- **Speed:** LAN1/2/3/4 10/100/1000/2500 Mbps

1.3 Chipset

1.3.1 Functional Specifications

1.3.1.1 Processor

Table 1.1: Processor	
Processor	Supports 12th/13th/14th Gen Intel® (LGA1700) processor (up to 35W)
Memory	Supports DDR5 4800 MHz up to 64GB (2 x 262-pin SODIMM socket type)

1.3.1.2 Chipset

Internal Graphics Features

- DirectX 12, OpenGL 4.5
- 1 x HDMI

Video Accelerator

- HW accelerated Media Decoding: H.265/HEVC, H.264/MPEG-4 AVC, MPEG-2, VC-1/WMV9, JPEG/MJPEG, VP8 and VP9
- HW accelerated Media Encoding: H. 265/HEVC, H.264/MPEG-4 AVC, MPEG-2, JPEG/MJPEG and VP8

USB Interface

- 1 x XHCI Host Controller, supporting SuperSpeed USB 3.2 Gen1/Gen2
- Supports wake-up from sleep states S3
- USB 1/2 Maximum 1.5A, USB 3/4 Maximum 0.9A

Power Management

- Supports ACPI
- ACPI-defined power states (processor-driven C states)
- ACPI power management timer

1.3.1.3 Others

Serial Ports

- Up to 4 x serial ports
- Supports IRQ sharing among serial ports under Microsoft
- COM1, COM2, COM3, COM4: RS-232/422/485

Ethernet

LAN1/2/3/4 Intel i226LM

- I226LM supports up to 10/100/1000/2500Mbps
- LAN connectors: phone Jack RJ-45 8P 90D (F)

Audio

Audio Codec: ALC888S-VD2-GR

- Compliant with HD Audio specifications

- Supports 16-/20-/24-bit DAC and 16-/20-/24-bit ADC resolution
- Supports: Line-out, Mic-in
- Audio Connectors: 1 x headphone jack, 1 x microphone jack *

Battery Backup

- Battery 3V/550mAh with WIRE x 1

TPM 2.0

- TPM 2.0, dTPM by default (Infineon SLB9672XU2.0)

1.3.2 SUSI 5.0

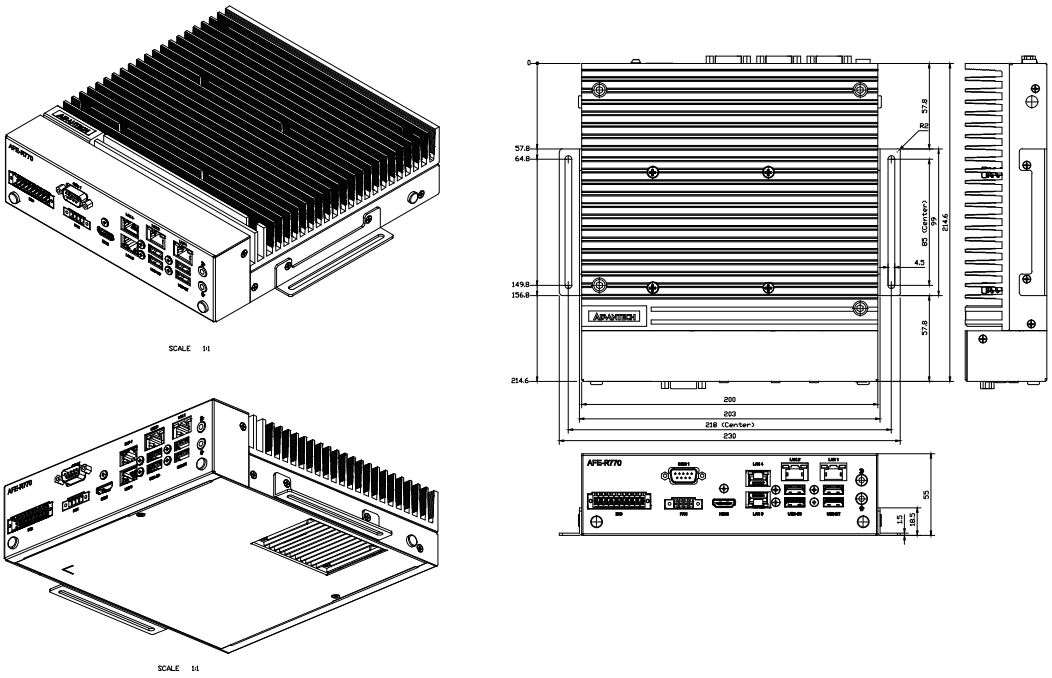
- SUSI API
- Watchdog timer multi-level WDT
- Hardware monitor CPU temperature / input voltage
- 2 x CAN bus ports supported by SUSI API

1.4 Mechanical Specifications

1.4.1 Dimensions

With wallmount:

230 x 55 x 215 mm / 9.06 x 2.17 x 8.46 in (W x H x D)



W/O wallmount:
200 x 55 x 215 mm / 7.87 x 2.17 x 8.46 in (W x H x D)

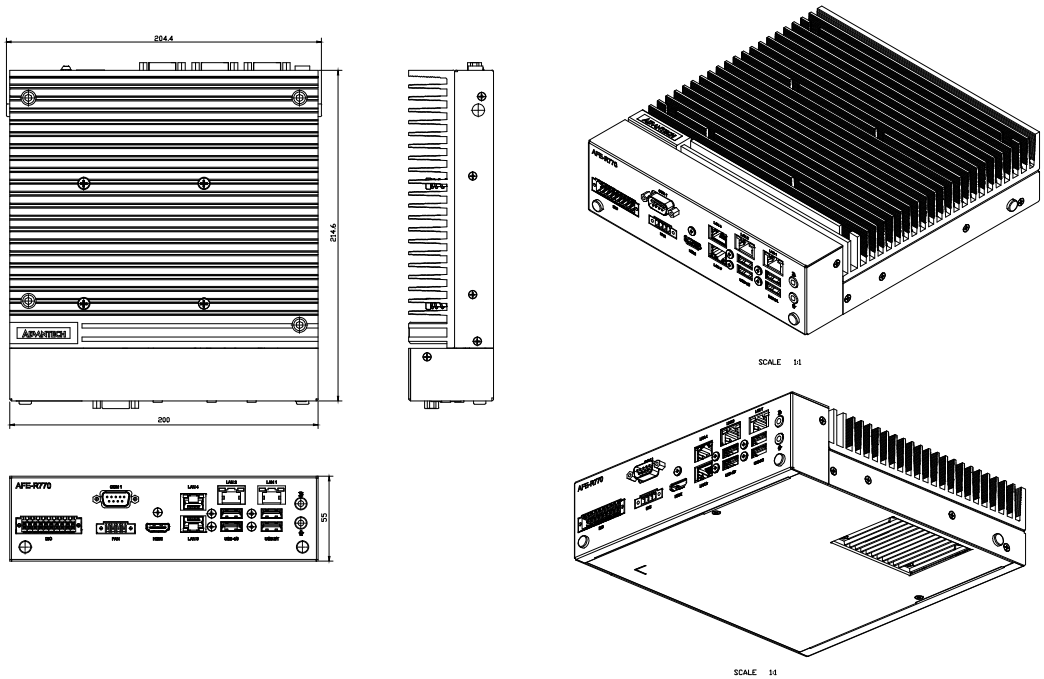


Figure 1.1 AFE-R770 Mechanical Dimensions

1.4.2 Weight

- **Net weight:** 2.7 kg (6 lb)

1.5 Power Requirements

1.5.1 System Power

- **Power Input Range:** 9 ~ 36 V_{DC}
- **Optional Adapter:** 150W @19V/7.89A power adapter (optional)

1.6 Operating Environment Specifications

1.6.1 Operating Temperature

- **With extended peripherals:** -20 ~ 65°C (-4 ~ 149°F) with 0.7 m/s airflow

1.6.2 Relative Humidity

- 95% @ 40°C (104°F) (non-condensing)

1.6.3 Storage Temperature

- -40 ~ 85°C (-4 ~ 185°F)

1.6.4 Safety

- CB, CCC, BSMI, UL

1.6.5 EMC

- CE/FCC Class B, CCC, BSMI

Chapter 2

Hardware Configuration

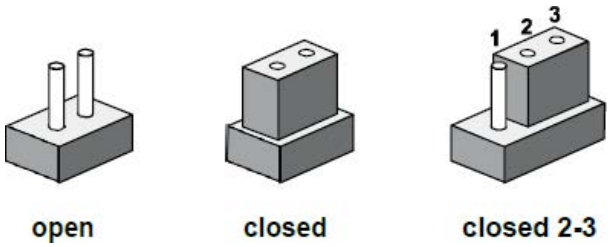
2.1 Introduction

The following sections show the internal jumper settings and the external connector pin assignments for different applications.

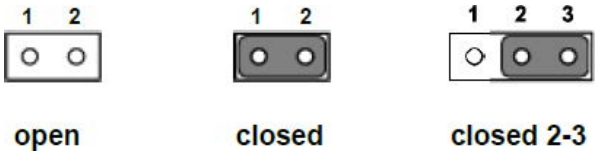
2.2 Jumpers

2.2.1 Jumper Description

You may configure AFE-R770 to match the needs of your application by setting jumpers. A jumper is a metal bridge used to close an electric circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To close a jumper, you connect the pins with the clip. To open a jumper, remove the clip. Sometimes a jumper will have three pins, labeled 1, 2, and 3. In this case you would connect either pins 1 and 2, or 2 and 3.



The jumper settings are schematically depicted in this manual as follows.



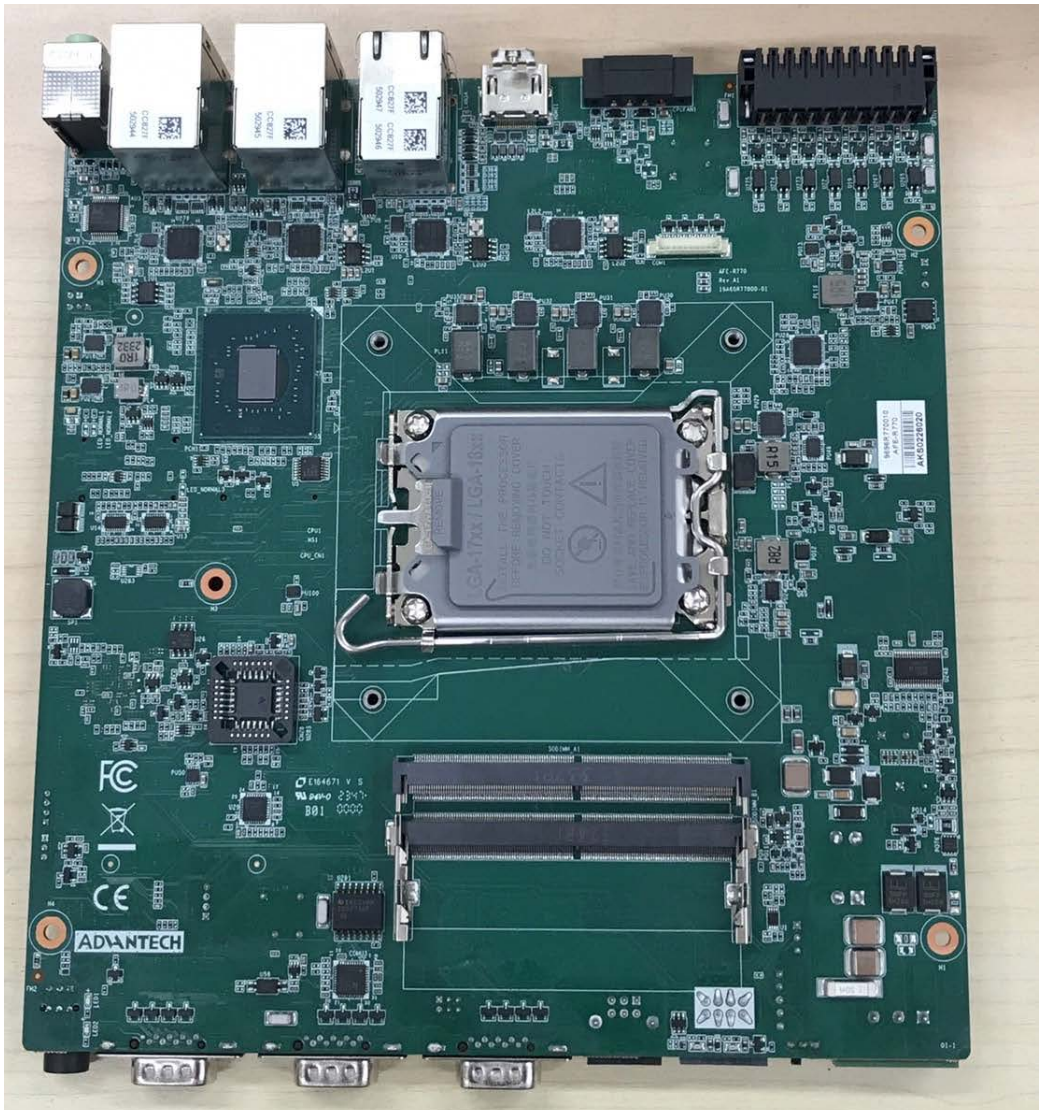
A pair of needle-nose pliers may be helpful when working with jumpers. If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes. Generally, you simply need a standard cable to make most connections.

2.2.2 Jumper List

Table 2.1: Jumper List

PSON1	Auto Power On Setting
CLCMOS1	Clear CMOS
JSETCOM2_V1	COM2 RI power setting
COM3_SEL	COM3 mode setting
ERP1	ERP Mode setting
SW_422_1~4	Termination resistor setting

2.2.3 Jumper Locations



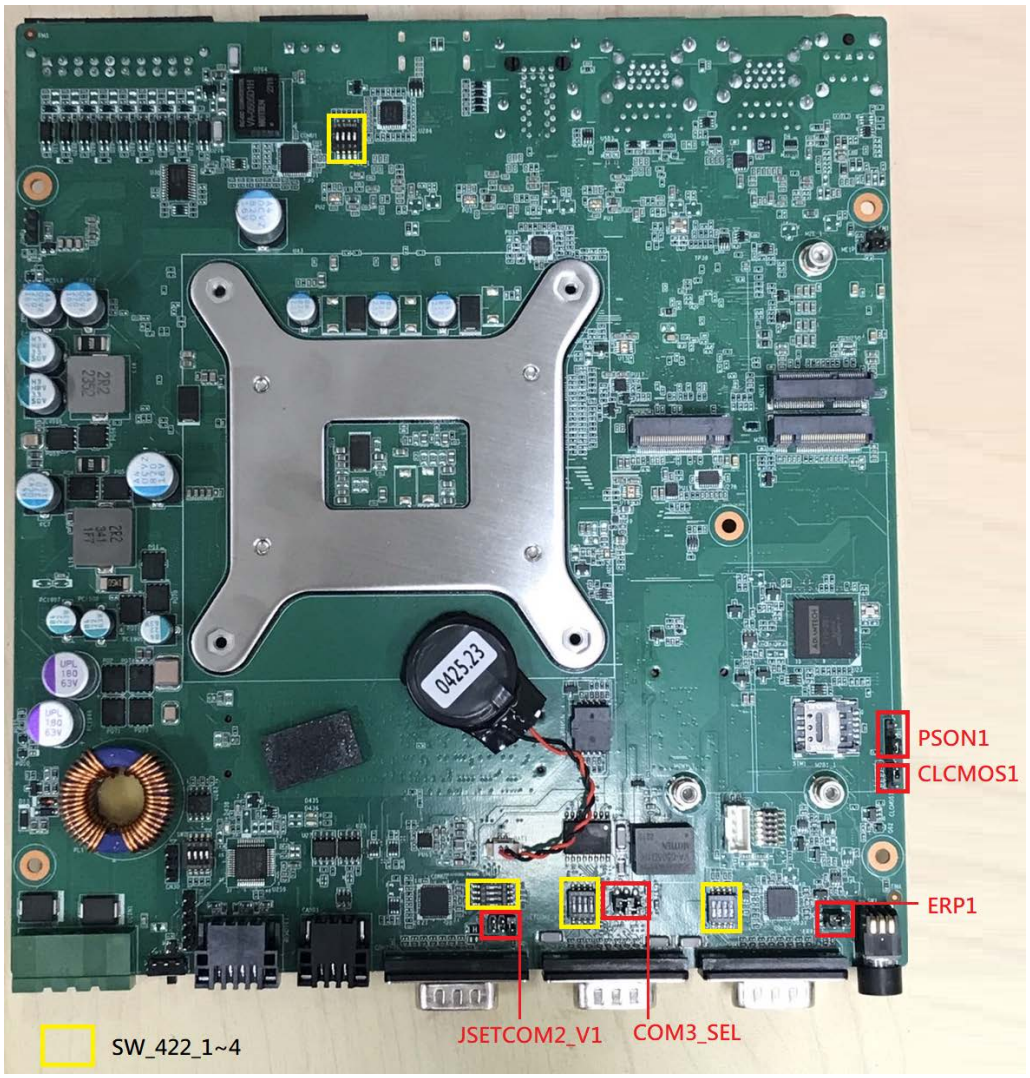
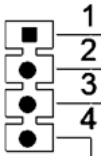


Figure 2.1 Jumper Layout

2.2.4 Jumper Settings

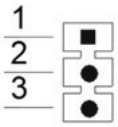
2.2.4.1 AT/ATX Mode Jumper (PSON1)

Table 2.2: PSON1 Auto Power On Setting	
Part Number	1653004101
Description	Pin Header 4x1P 2.0mm 180D(M) DIP 21N12050
Setting	**Function**
(1-2)	Power Button for Power On (default)
(3-4)	Auto Power On



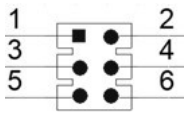
2.2.4.2 Clear CMOS Setting (CLCMOS1)

Table 2.3: CLCMOS1 Clear CMOS Setting	
Part Number	1653003101-03
Description	Pin Header 1X3P 2.00mm 180D(M) DIP 1140-000-03S
Setting	**Function**
(1-2)	Normal Operation (default)
(2-3)	Clear CMOS



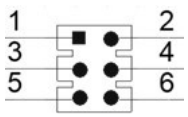
2.2.4.3 COM2 RI Power Setting (JSETCOM2_V1) (Adjusted with Tweezers)

Table 2.4: JSETCOM2_V1 COM1 RI Power Setting	
Part Number	1653003201
Description	Pin Header 3x2P 2.0mm 180D(M) DIP 21N22050
Setting	**Function**
(1-2)	Normal (default)
(3-4)	+5V
(5-6)	+12V



2.2.4.4 COM3 RS232/485/422 Selection (COM3_SEL)

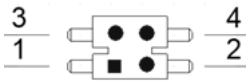
Table 2.5: COM3 RS232/485/422 selection	
Part Number	1653003260
Description	Pin Header 3x2P 2.0mm 180D(M) DIP 21N22050
Setting	**Function**
(1-3) (4-6)	RS232 (default)
(1-3) (2-4)	RS422
(3-5) (2-4)	RS485



Note! *Settings also need to be configured in the BIOS menu.*

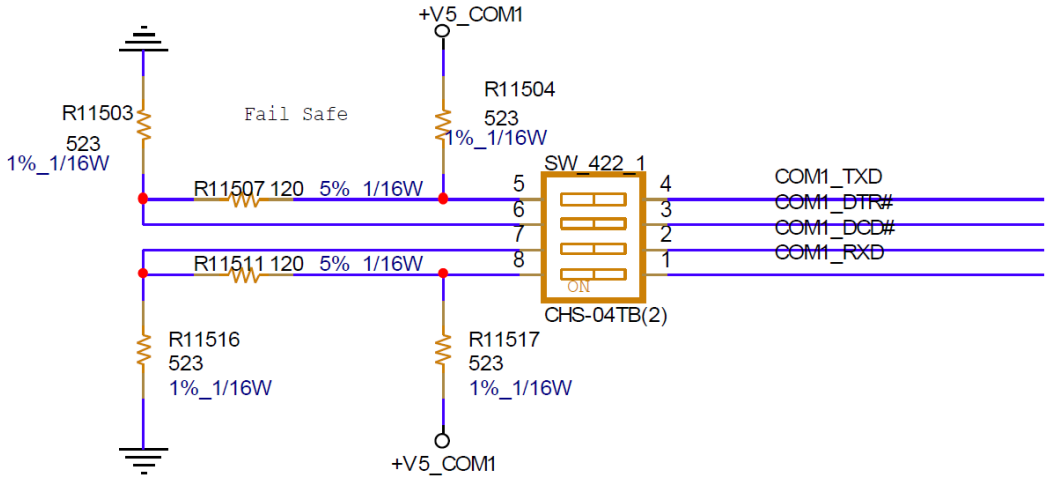
2.2.4.5 ERP Power Saving Mode Setting (ERP1)

Table 2.6: ERP Power Saving Mode Setting	
Part Number	1653000014
Description	Pin Header 2x2P 2.00mm 180D(M) SMD 21N22050
Setting	**Function**
(1-2)	Normal operation (default)
(3-4)	ERP Power saving mode



2.2.4.6 COM1~4 Port Failsafe Setting(SW_422_1/SW_422_2/SW_422_3/SW_422_4)

Table 2.7: COM Port Failsafe Setting	
Part Number	1600000402
Description	DIP SW SMD 8P SPST P=1.27mm W=5.4mm KHS42E
Setting	**Function**
Switch Off	Normal operation (default)
Switch ON	Enable safe and termination resistor



2.3 Connectors

2.3.1 AFE-R770 External I/O Locations

1. LAN 1/2/3/4 up to 10/100/1000/2500Mbps
2. USB 3.2 Gen2: USB1~2
   USB 3.2 Gen1: USB3~4
   RS-232/422/485: COM1/2/3/4

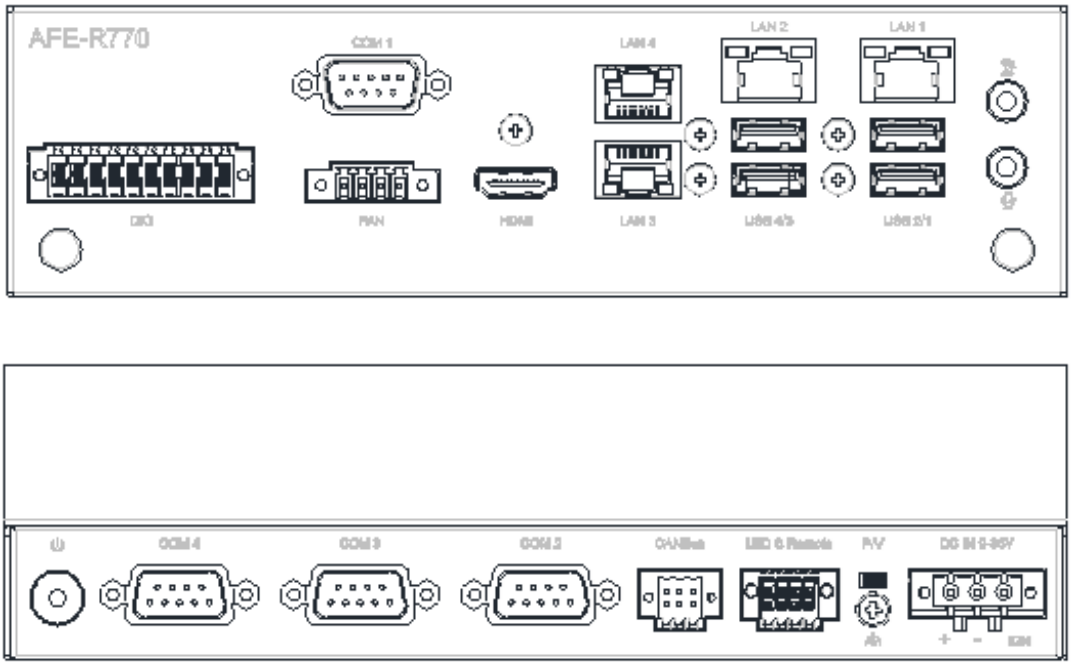


Figure 2.2 AFE-R770 Front and Rear I/O Connector Diagram

2.3.1.1 COM Connector

AFE-R770 provides up to eight D-sub 9-pin connectors, which offer RS-232/422/485 serial communication interface ports. The default setting is RS-232, and the RS-422/485 can be supported via the BIOS settings. Only COM3 supports RI/+5V/+12V; the other COM support RI.

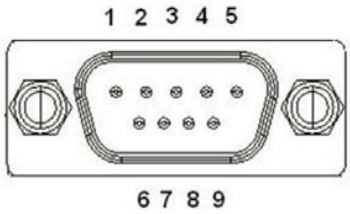


Figure 2.3 COM Connector

Table 2.8: COM Connector Pin Assignments

	RS-232	RS-422	RS-485
Pin	**Signal Name**	**Signal Name**	**Signal Name**
1	DCD	Tx-	DATA-
2	RxD	Tx+	DATA+
3	TxD	Rx+	NC
4	DTR	Rx-	NC
5	GND	GND	GND
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	RI/+5V/+12V	NC	NC

Note! *NC represents “No Connection”.*
NC représente "No Connection".

2.3.1.2 Ethernet Connector (LAN)

AFE-R770 is equipped with up to 4 x Ethernet controllers. These Ethernet ports provide a standard RJ-45 jack connector with LED indicators on the front side to show Active/ Link status (Green LED) and Speed status (LED Yellow:1G /Green:2.5G).

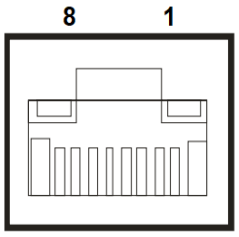


Figure 2.4 Ethernet Connector

Table 2.9: Ethernet Connector Pin Assignments

Pin	10/100/1000/2500 BaseT Signal Name
1	TX+
2	TX-
3	RX+
4	MDI2+
5	MDI2-
6	RX-
7	MDI3+
8	MDI3-

2.3.1.3 Power On/Off Button

AFE-R770 has a Power On/Off button with LED indicators on the front side that show “On” (Green LED) and “Off/Suspend” status (Orange LED). The Power button supports dual functions: Soft Power-On/Off (Instant off or Delay 4 Seconds then off), and Suspend.

Figure 2.5 Power ON/OFF Button

2.3.1.4 Audio Connector

AFE-R770 features one phone jack connector that supports stereo Line-Out or Mic-In audio ports. The audio chip is controlled by ALC888S and compliant with the Azalea standard.

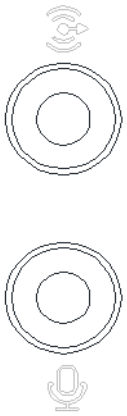


Figure 2.6 Audio Connector

2.3.1.5 HDMI Connector

An integrated, 19-pin receptacle connector HDMI Type A Interface is provided. The HDMI link supports resolutions up to 4096 x 2160 @ 24 Hz.

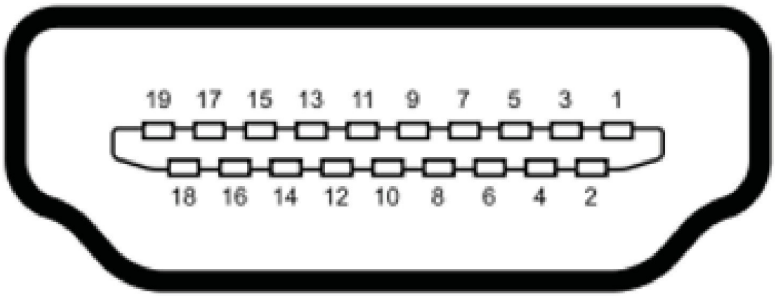


Figure 2.7 HDMI Receptacle Connector

Table 2.10: HDMI Connector Pin Assignments

Pin	Signal Name	Pin	Signal Name
1	TMDS Data 2+	2	TMDS Data 2 shield
3	TMDS Data 2-	4	TMDS Data 1+
5	TMDS Data 1 shield	6	TMDS Data 1-
7	TMDS Data 0+	8	TMDS Data 0 shield
9	TMDS Data 0-	10	TMDS clock+
11	TMDS clock shield	12	TMDS clock-
13	CEC	14	Reserved
15	SCL	16	SDA
17	DDC/CEC Ground	18	+5V
19	Hot Plug Detect		

2.3.1.6 USB 3.2 - Gen2 and Gen1

AFE-R770 supports 2 x USB 3.2 (Gen2, 10G), and 2 x USB 3.2 (Gen1, 5G). The USB interfaces comply with USB UHCI, Rev. 3.0 standards. Please refer to Table 2.10 for its pin assignments.

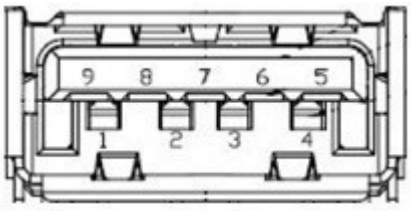


Figure 2.8 USB 3.2 Connector

Table 2.11: USB 3.2 Gen1/2 Connector Pin Assignments

Pin	Signal Name	Pin	Signal Name
1	+5V	2	USB_data-
3	USB_data+	4	GND
5	SSRX-	6	SSRX+
7	GND	8	SSTX-
9	SSTX+		

2.3.1.7 DIO Connector

DO1~8 output type: OD

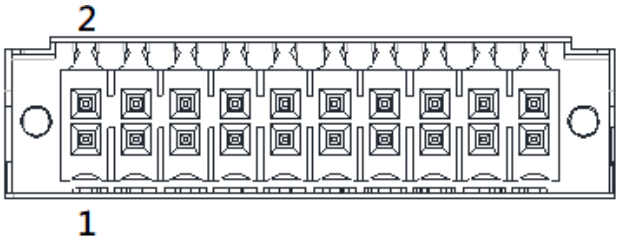


Figure 2.9 DIO Connector

Table 2.12: DIO Connector Pin Assignment

Pin	Signal Name	SUSI API	Pin	Signal Name	SUSI API
1	GND		2	GND	
3	DI1	GPIO0	4	DO1	GPIO8
5	DI2	GPIO1	6	DO2	GPIO9
7	DI3	GPIO2	8	DO3	GPIO10
9	DI4	GPIO3	10	DO4	GPIO11
11	GND		12	GND	
13	DI5	GPIO4	14	DO5	GPIO12
15	DI6	GPIO5	16	DO6	GPIO13
17	DI7	GPIO6	18	DO7	GPIO14
19	DI8	GPIO7	20	DO8	GPIO15

2.3.1.8 LED& Remote Switch Connector

AFE-R770 provides the remote switch connector for power on/off, power LED, and SATA LED with an external cable. When WDT is enabled, this pin will go low for 1 second.

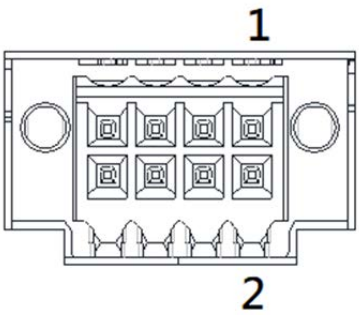


Figure 2.10 LED & Remote Switch Connector

Table 2.13: Remote control Connector Pin Assignment

Pin	Signal Name	Pin	Signal Name
1	Power LED-	2	WDT
3	Power LED+	4	Power Button
5	SATA LED-	6	GND
7	SATA LED+	8	Reset Button

2.3.1.9 Phoenix Terminal Connector

AFE-R770 supports one 3-pin Phoenix terminal power input connector. Connect the positive and negative power cables to the terminals in the power distribution connector correctly at the same time.

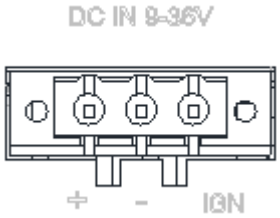


Figure 2.11 Phoenix Terminal Connector

Note!

1. *For supply connections use wires suitable for at least 105°C.*
   Pour les connexions d'alimentation, utilisez des fils adaptés à une température d'au moins 105°C.
2. *The terminal block is suitable for 14 AWG. Torque value is 7 lb-in. User copper conductors only. It must be installed by skilled person.*
   Le bornier est adapté à un calibre de 14 AWG. Le couple de serrage est de 7 lb-in. Conducteurs en cuivre pour l'utilisateur uniquement. Il doit être installé par une personne qualifiée
3. *The terminal block uses two sets of interfaces to be installed at the same time to make it split to meet the maximum current limit, and a single pin will be limited below 16 A.*
   Le bornier utilise deux jeux d'interfaces à installer en même temps pour le diviser afin de respecter la limite de courant maximale, et une seule broche sera limitée à moins de 16 A.

Table 2.14: Phoenix Terminal Connector

Pin	Signal Name
-	GND
+	V-in (9-36 V)
IGN	Ignition (for vehicle mode)

2.3.1.10 CAN Bus

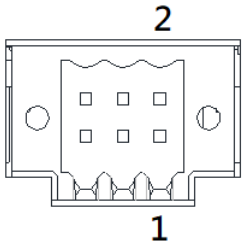


Figure 2.12 CAN Bus Connector

Table 2.15: CAN Bus Connector

Pin	Signal Name
1	CAN1_DN
2	CAN2_DP
3	GND
4	GND
5	CAN1_DP
6	CAN2_DN

2.3.1.11 FAN Connector

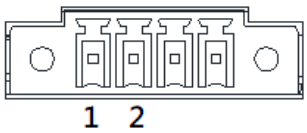


Figure 2.13 FAN Connector

Table 2.16: FAN Connector

Pin	Signal Name
1	GND
2	+12V
3	FAN_TACH
4	FAN_PWM

2.3.1.12 PC/Vehicle Mode Switch

Figure 2.14 P/V Mode Switch

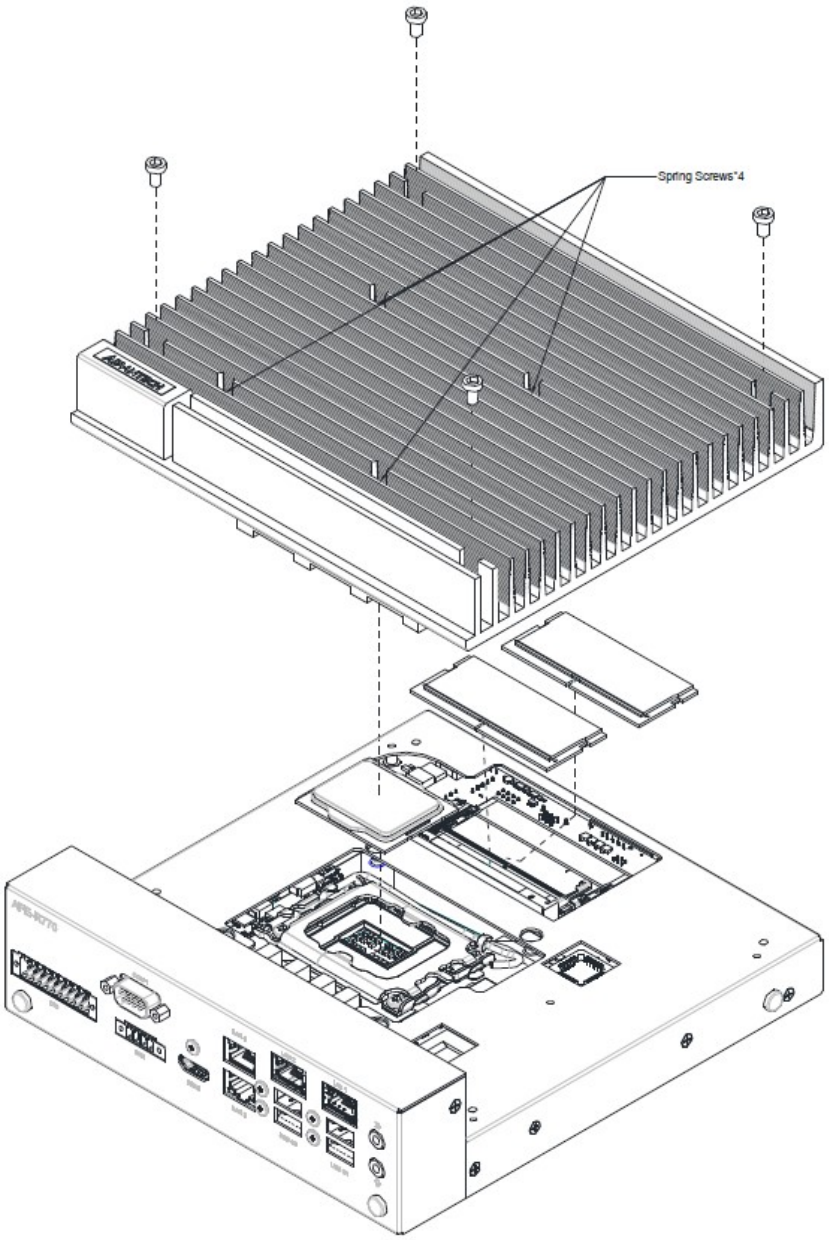
Table 2.17: P/V Mode Switch

Pin	Function
Switch to P	Operate in PC mode (default)
Switch to V	Operate in vehicle mode

2.4 Installation

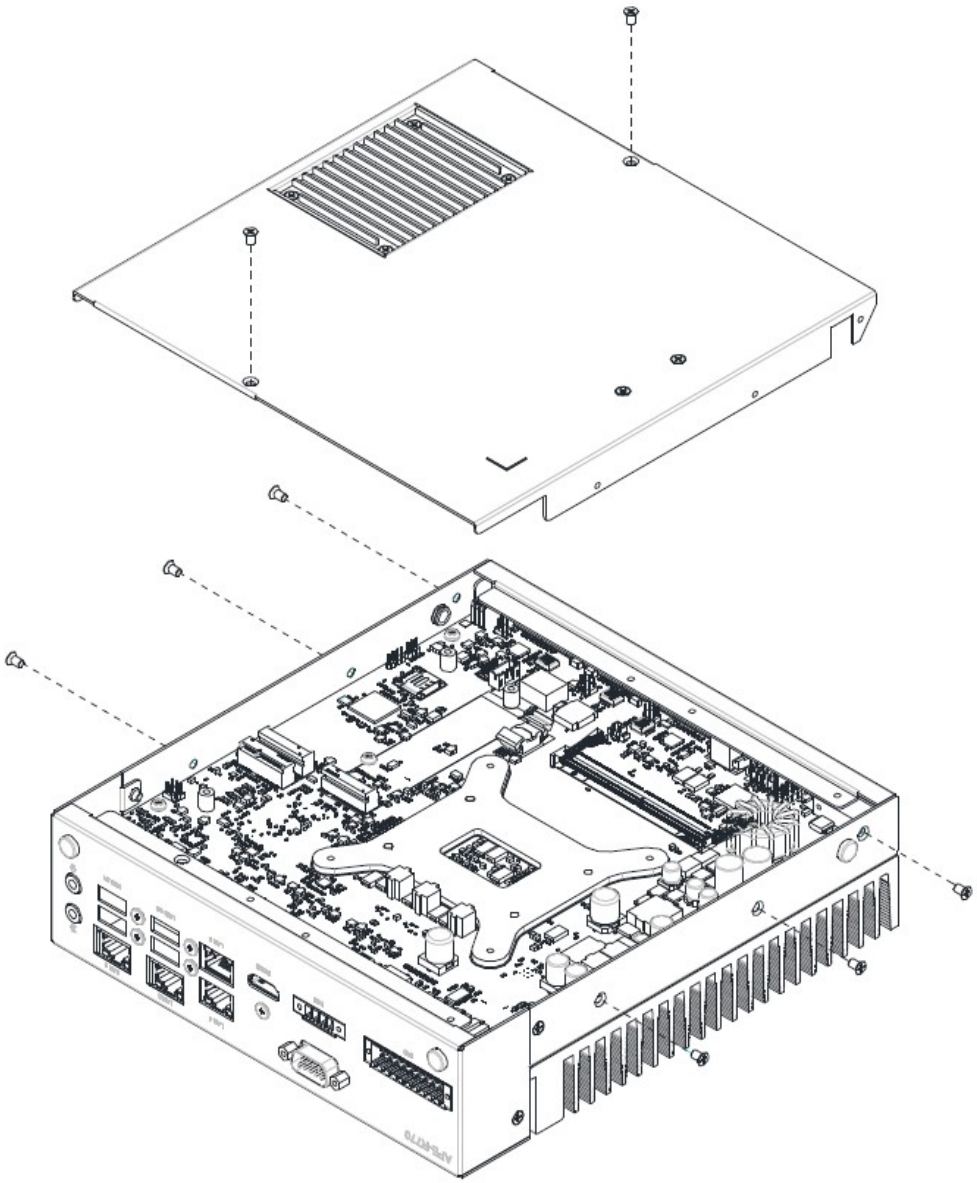
2.4.1 CPU/Memory Installation

1. Unscrew the 4 spring screws and 4 hex head screws on the top cover, and remove the top cover.
2. Install the CPU (LGA1700) and memory into the system.
3. Replace the top cover.



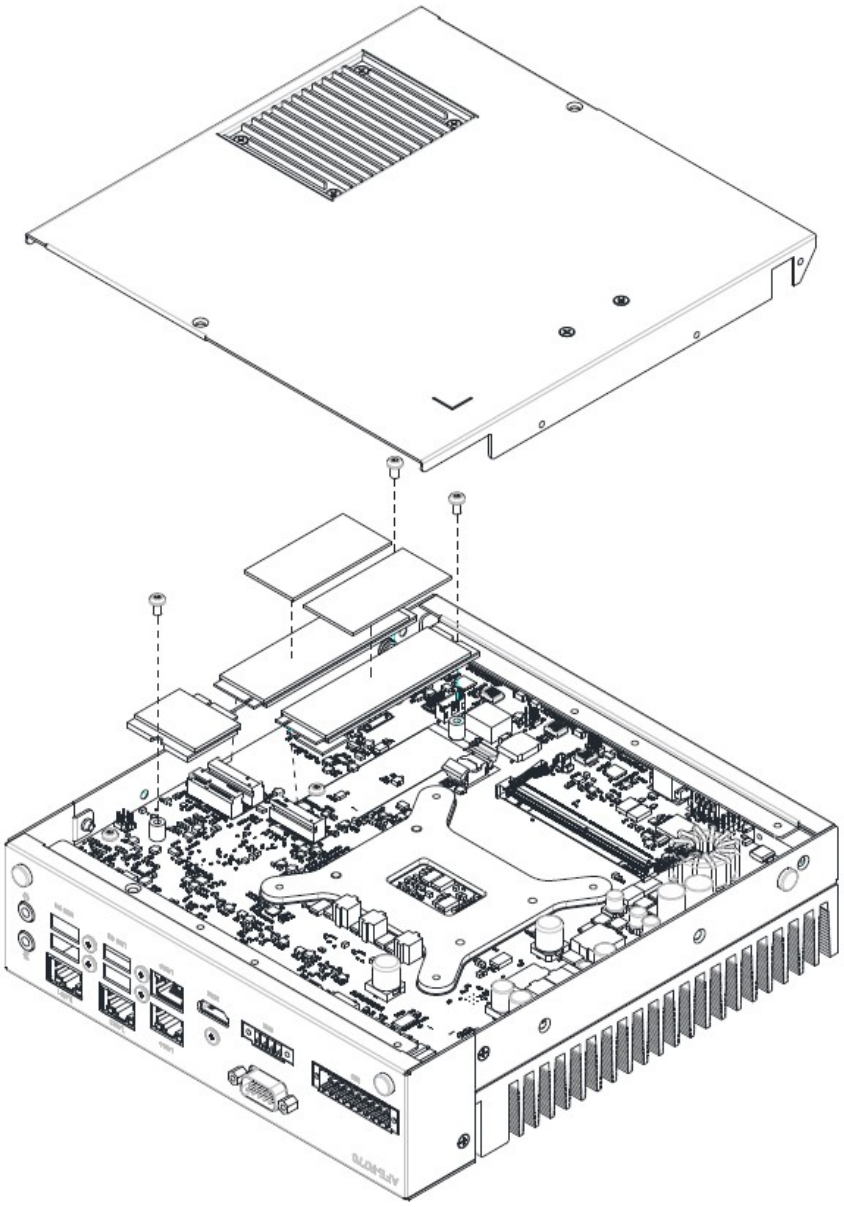
2.4.2 Remove the Bottom Cover

Unscrew the 8 screws on the bottom cover.



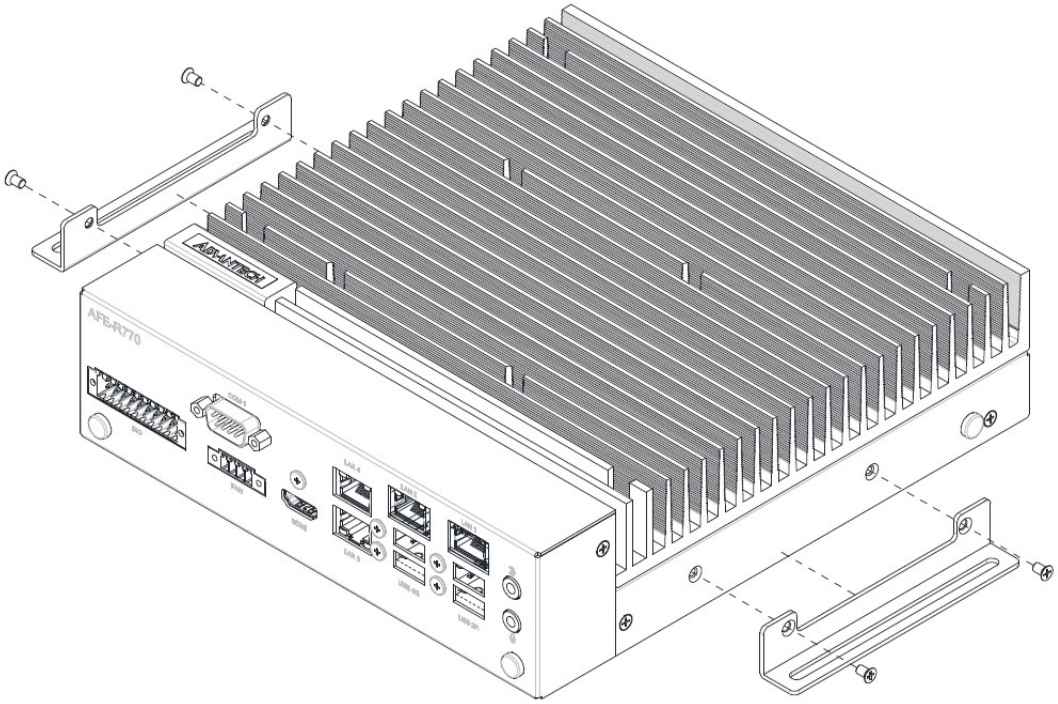
2.4.3 M.2 Module Installation

1. Remove the bottom cover (2.4.2).
2. Install the M.2 module with 1 screw (per socket).
3. Replace the bottom cover and fix it in place with 8 screws.



2.4.4 Mounting Kit Installation

1. Take out the mounting kit and 4 screws (M3x6L) from the accessory box.
   Retirez le kit de montage et les 4 vis (M3x6L) de la boîte d'accessoires.
2. Screw 2 of the screws (M3x6L) into each side to attach the system horizontally.
   Vissez chaque 2 vis (M3x6L) sur les côtés gauche et droit et fixez le système horizontalement.



2.4.5 Wide Operating Temperature Support

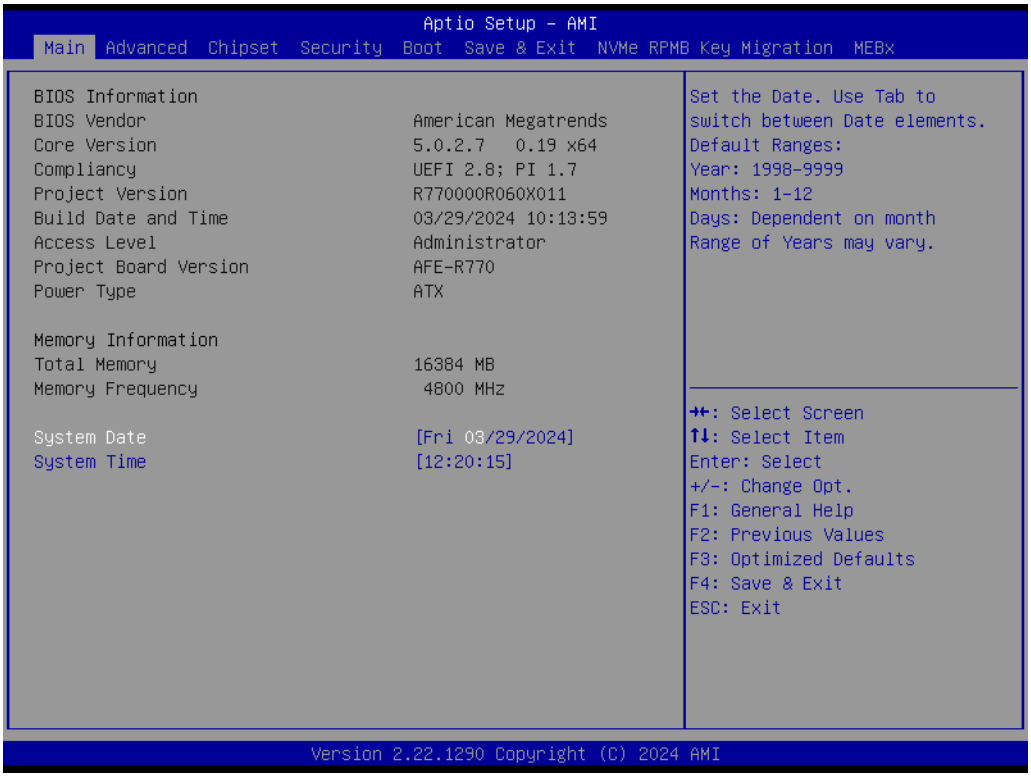
To make sure the system works well under 0°C (32°F) or over 40°C (104°F), please ensure your peripherals are I-grade. These support wide temperature operation.

Chapter 3

BIOS Settings

3.1 Introduction

AMIBIOS has been integrated into motherboards for over two decades. With the AMIBIOS Setup program, users can modify BIOS settings and control various system features. This chapter describes the basic navigation of the AFE-R770 BIOS setup screens.



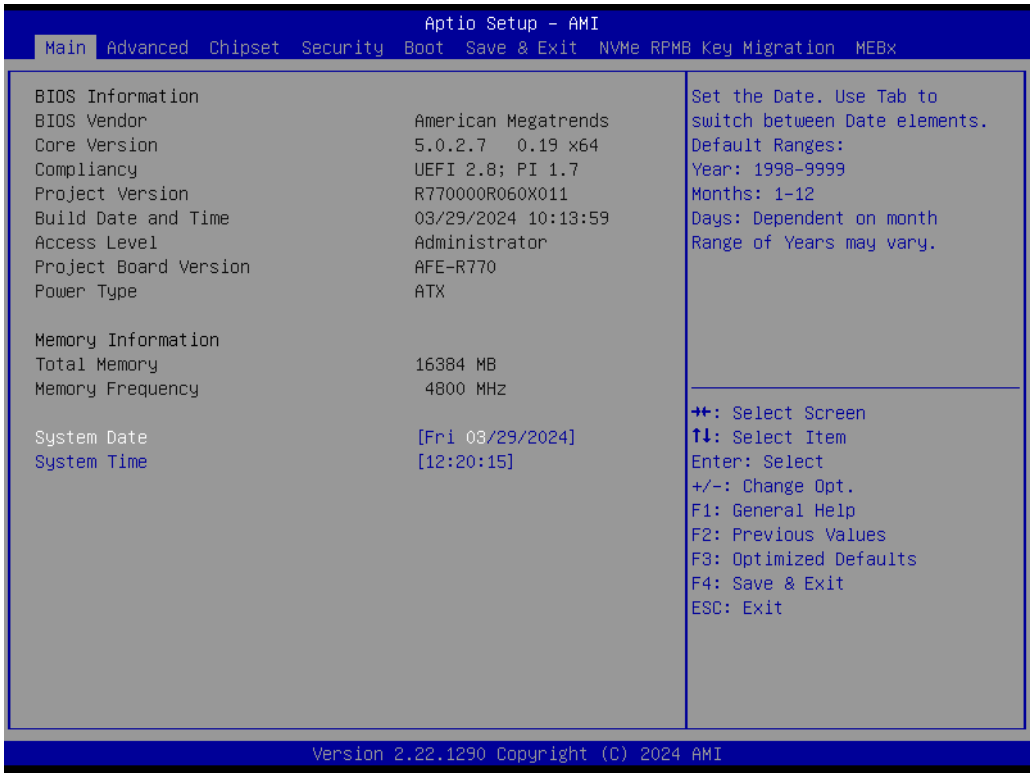
AMI's BIOS ROM has a built-in setup program that allows users to modify the basic system configuration. This information is stored in flash ROM so it retains the setup information when the power is turned off.

3.2 Entering Setup

Turn on the computer and check for the patch code. If there is a number assigned to the patch code, it means the BIOS supports your CPU. If there is no number assigned to the patch code, please contact an Advantech application engineer to obtain an up-to-date patch code file. This will ensure that your CPU's system status is valid. After ensuring that you have a number assigned to the patch code, press <DEL> and you will immediately be allowed to enter Setup.

3.2.1 Main Setup

When users first enter the BIOS Setup Utility, they will enter the Main setup screen. Users can always return to the Main setup screen by selecting the Main tab. There are two Main Setup options. They are described in this section. The Main BIOS Setup screen is shown below.



The Main BIOS setup screen has two main frames. The left frame displays all the options that can be configured. Grayed-out options cannot be configured; options in blue can. The right frame displays the key legend.

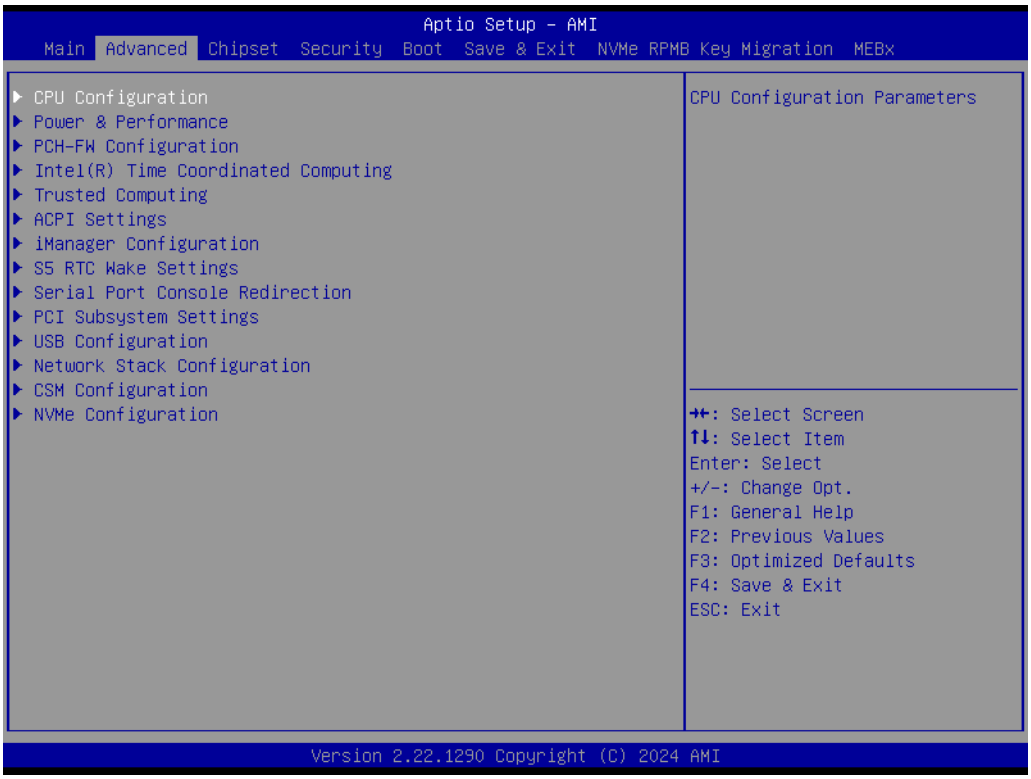
Above the key legend is an area reserved for a text message. When an option is selected in the left frame, it is highlighted in white. Often a text message will accompany it.

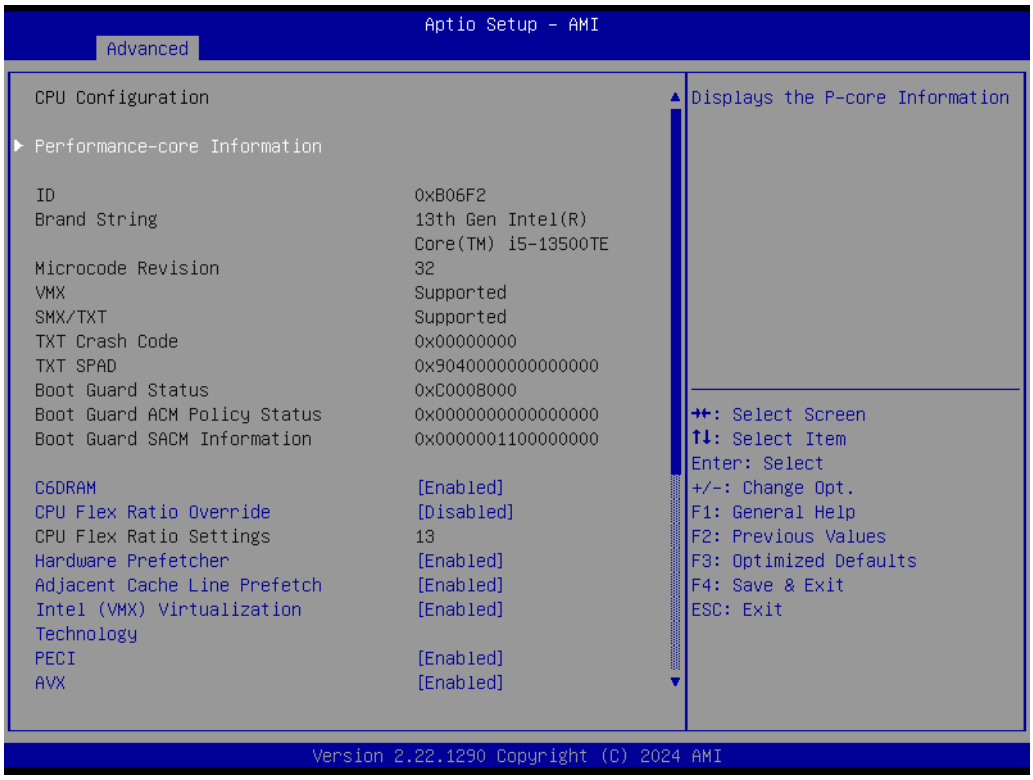
- **System Time / System Date**
  Use this option to change the system time and date. Highlight System Time or System Date using the <Arrow> keys. Enter new values through the keyboard. Press the <Tab> key or the <Arrow> keys to move between fields. The date must be entered in MM/DD/YY format. The time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

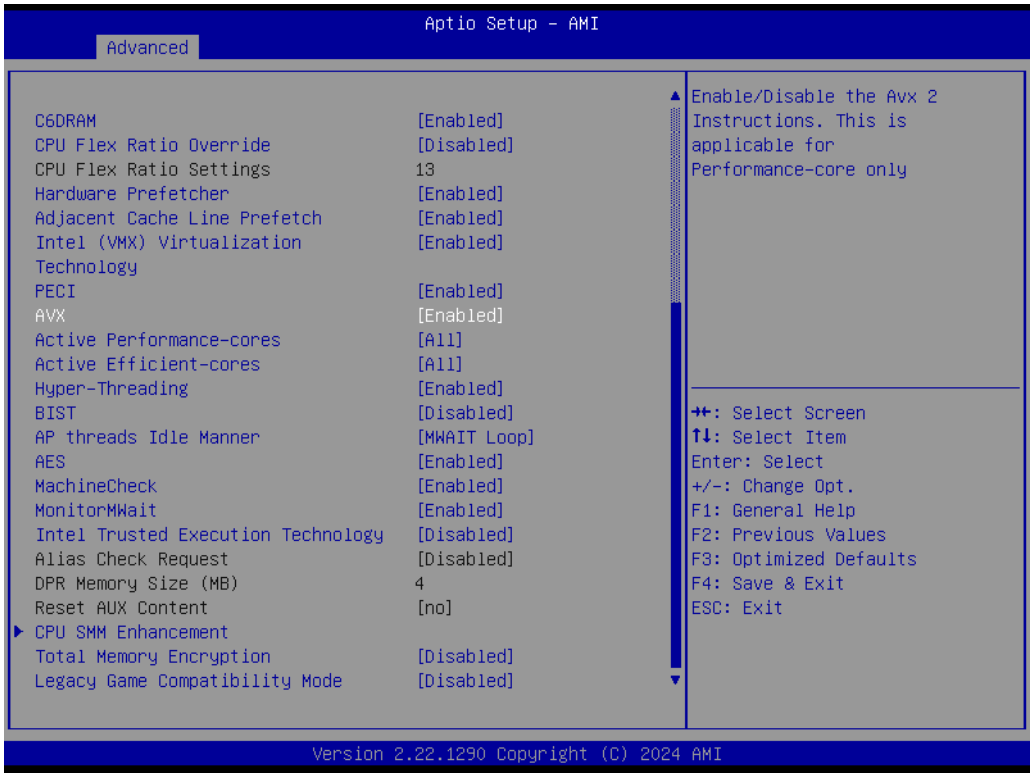
3.2.2 Advanced BIOS Features Setup

Select the Advanced tab from the AFE-R770 setup screen to enter the Advanced BIOS Setup screen. Users can select any item in the left frame of the screen, such as CPU Configuration, to go to the sub-menu for that item. Users can display an Advanced BIOS Setup option by highlighting it using the <Arrow> keys. All Advanced BIOS Setup options are described in this section. The Advanced BIOS Setup screens are shown below. The sub-menus are described on the following pages.

3.2.2.1 CPU Configuration

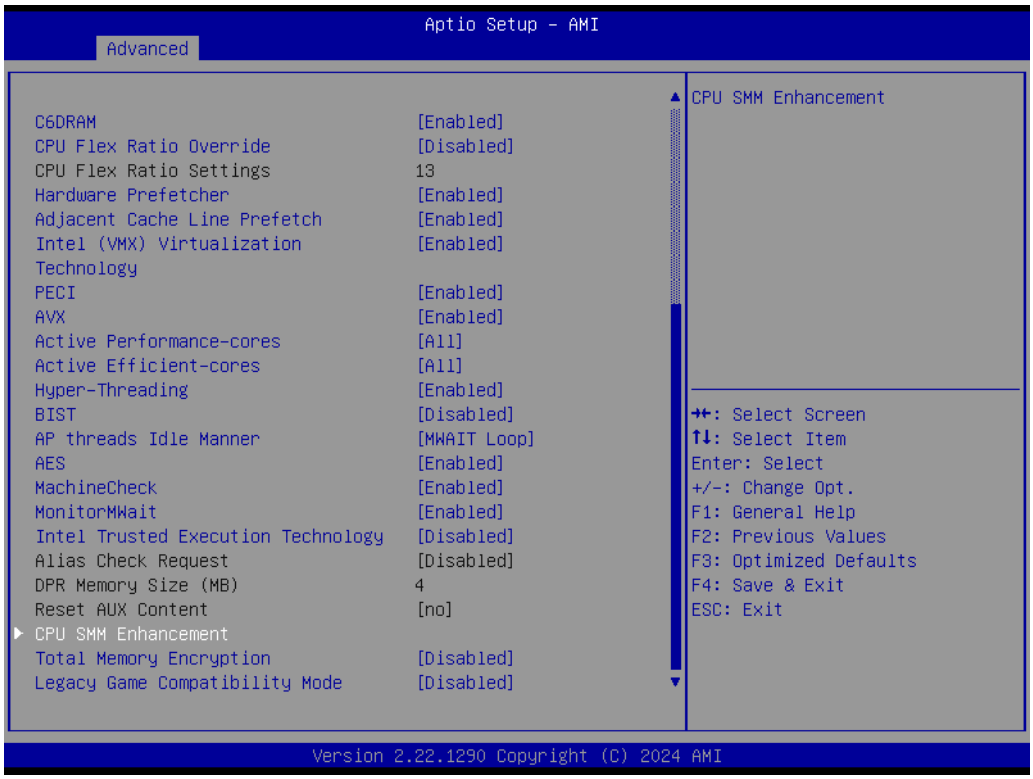


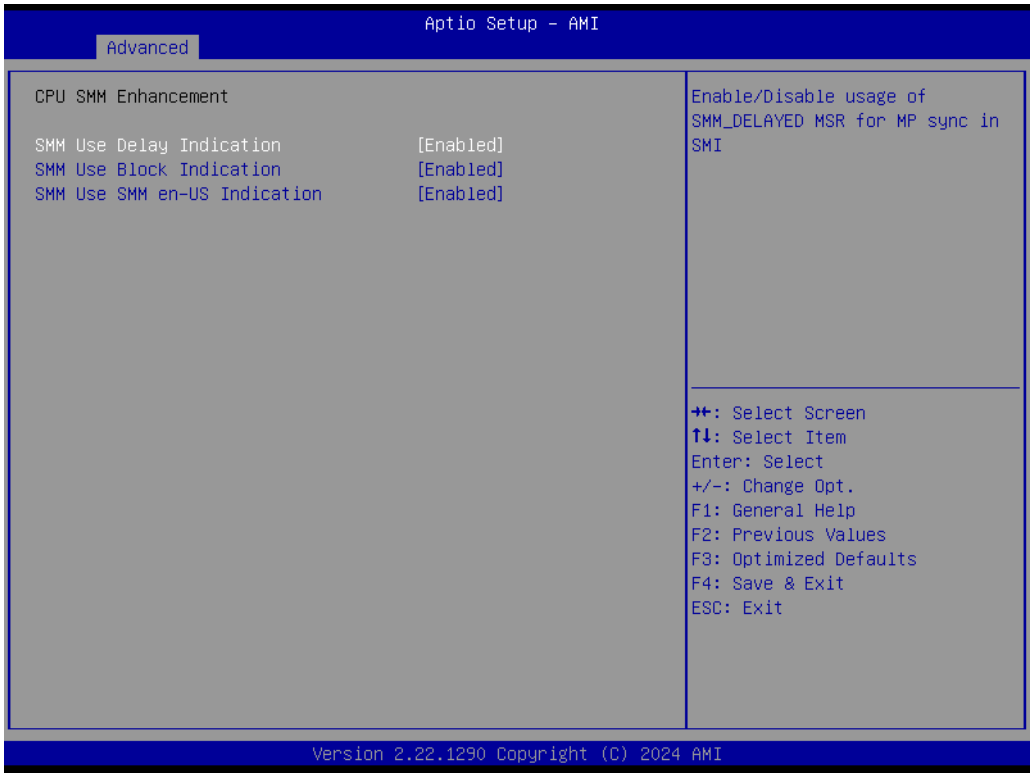




- **Performance-core Information**
  Displays the P-core Information.
- **C6DRAM**
  Enable/Disable moving of DRAM contents to PRM memory when the CPU is in C6 state.

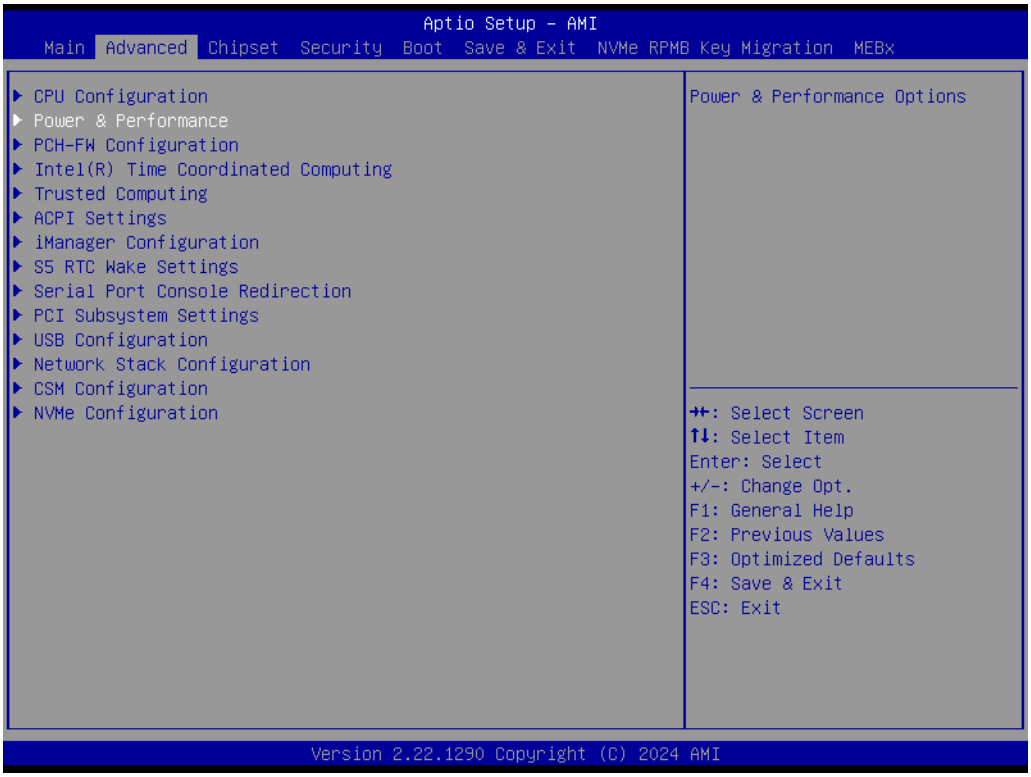
- **CPU Flex Ratio Override**
  Enable/Disable CPU Flex Ratio Programming.
- **CPU Flex Ratio Settings**
  This value must be between the Max Efficiency Ratio (LFM) and the Maximum non-turbo ratio set by hardware (HFM).
- **Hardware Prefetcher**
  To turn on/off the MLC streamer prefetcher.
- **Adjacent Cache Line Prefetch**
  To turn on/off prefetching of adjacent cache lines.
- **Intel (VMX) Virtualization Technology**
  When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.
- **PECI**
  Enable/Disable PECI.
- **AVX**
  Enable/Disable the Avx 2 Instructions. This is applicable for Performance-core only.
- **Active Performance-Cores**
  Number of cores to enable in each processor package.
- **Active Efficient-cores**
  Enable/Disable Per Core Disable. When Per Core Disable Configuration is enabled, selection of Active Cores and Active Efficient-cores will be disabled.
- **Hyper-Threading**
  Enable or Disable Hyper-Threading Technology.
- **BIST**
  Enable/Disable BIST (Built-in Self Test) on reset.
- **AP threads Idle Manner**
  AP threads Idle Manner for waiting signal to run.
- **AES**
  Enable/Disable AES. (Advanced Encryption Standard).
- **MachineCheck**
  Enable/Disable Machine Check.
- **MonitorMWait**
  Enable/Disable MonitorMWait. If Disabled, the AP threads Idle Manner should not be set to MWAIT Loop.
- **Intel Trusted Execution Technology**
  Enables utilization of additional hardware capabilities provided by Intel® Trusted Execution Technology.
- **Alias Check Request**
  Enables Txt Alias Checking capability.
- **DPR memory size (MB)**
  Reserve DPR memory size (0-255) MB.
- **Reset AUX Content**
  Reset TPM Aux content. Txt may not functional after AUX content gets reset.
- **Total Memory Encryption**
  Configure Total Memory Encryption (TME) to protect DRAM data from physical attacks.
- **Legacy Game Compatibility Mode**
  When enabled, pressing the scroll lock key will toggle the Efficient-cores between being parked when Scroll Lock LED is on and un-parked when the LED is off.

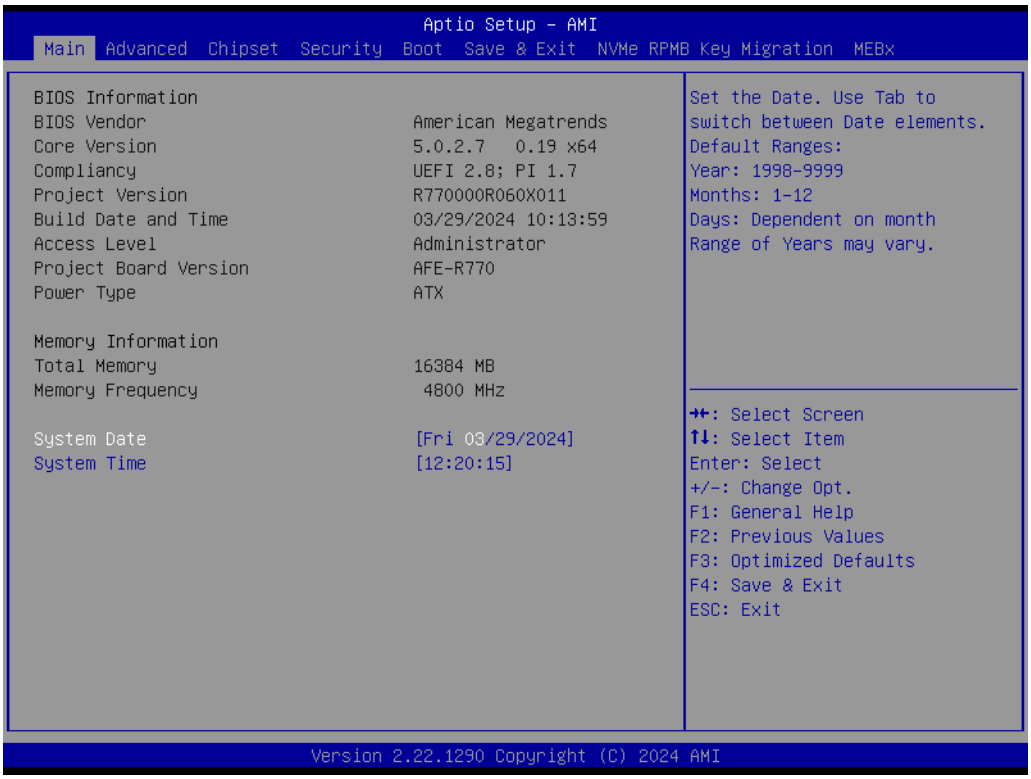


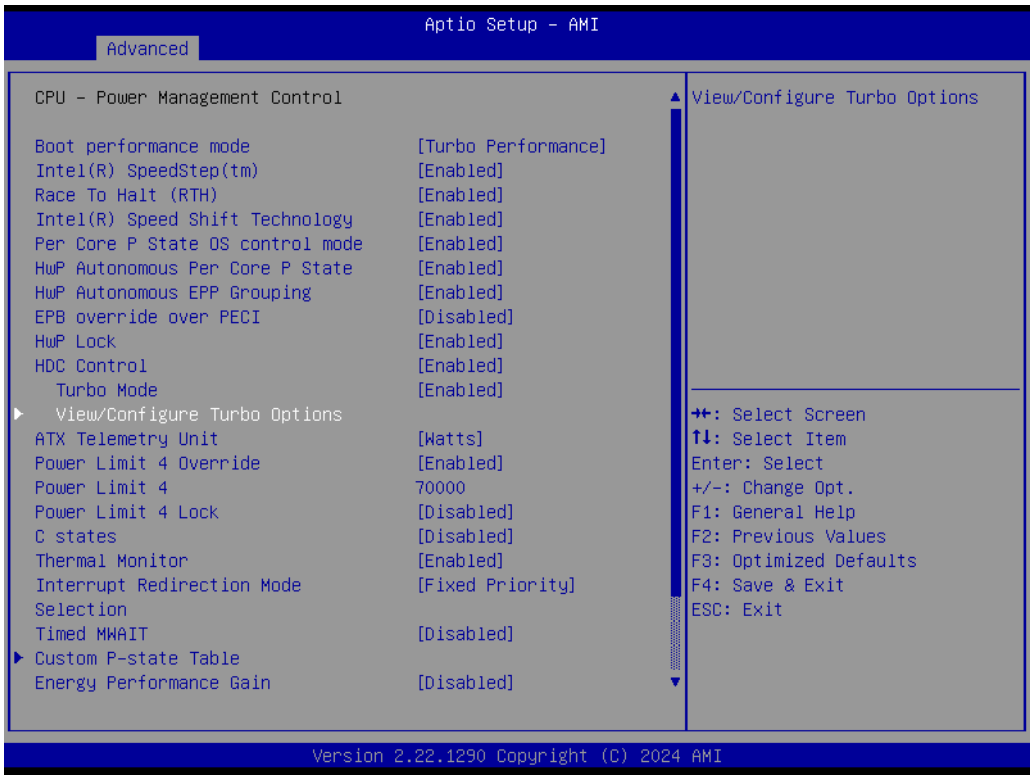


- **SMM Use Delay Indication**
  Enable/Disable usage of SMM_DELAYED MSR for MP sync in SMI.
- **SMM Use Block Indication**
  Enable/Disable usage of SMM_BLOCKED MSR for MP sync in SMI.
- **SMM Use en-US Indication**
  Enable/Disable usage of SMM_ENABLE MSR for MP sync in SMI.

3.2.2.2 Power and Performance – CPU Power Management Control

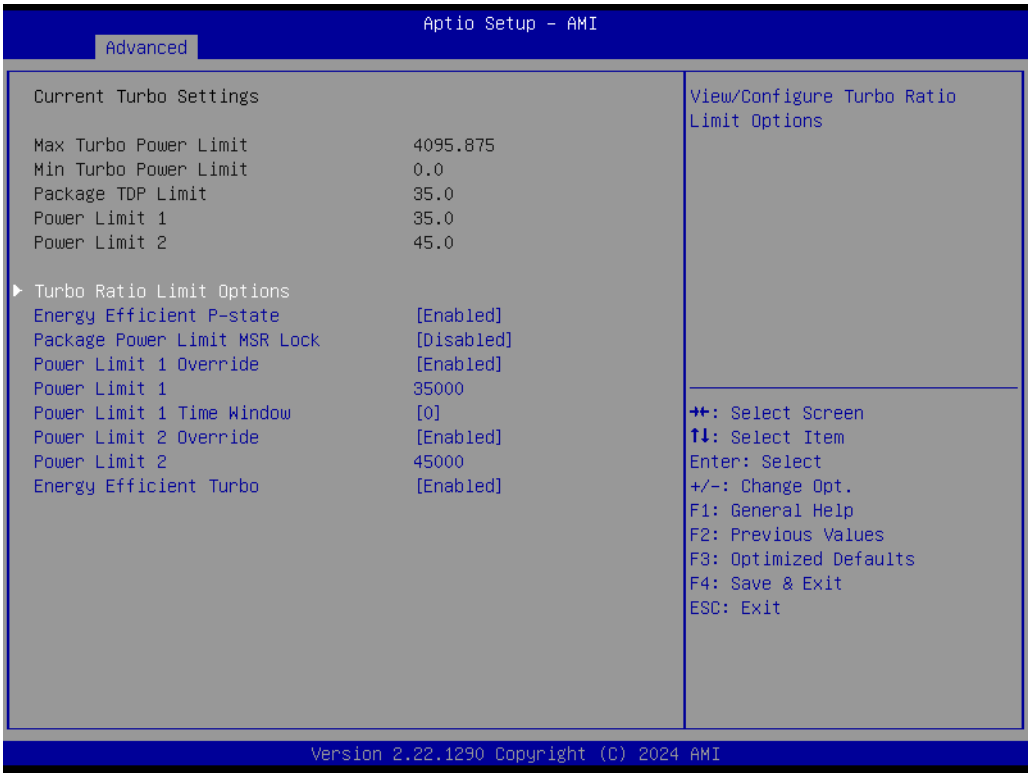






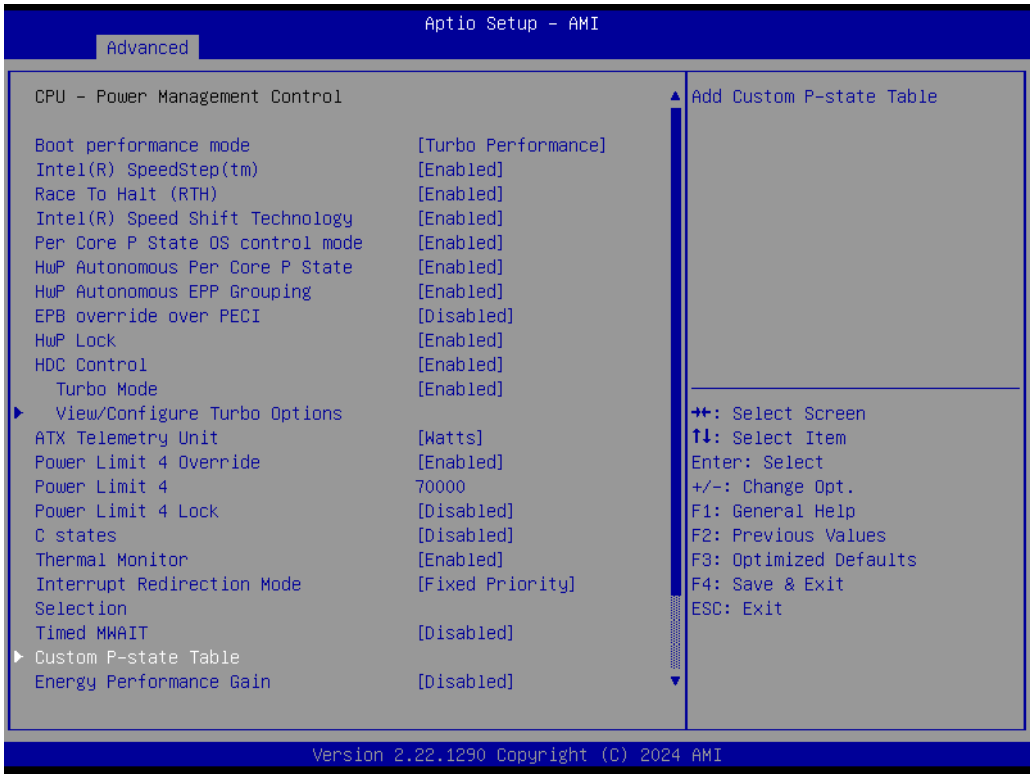
- **Boot Performance**
  Select the performance state that the BIOS will set before OS hand-off.
- **Intel® Speedstep™**
  Allows more than two frequency ranges to be supported.
- **Race to Halt (RTH)**
  Enable/Disable the Race To Halt feature. RTH will dynamically increase CPU frequency in order to enter pkg C-State faster to reduce overall power. (RTH is controlled through MSR 1FC bit 20)
- **Intel® Speed Shift Technology**
  Enable/Disable Intel® Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states.
- **Per core P state OS control mode**
  Enable/Disable Per Core P state OS control mode. Disabling will set Bit 31 = 1 command 0x06. When set, the highest core request is used for all other core requests.
- **Hwp Autonomous Per core P state**
  Disable Autonomous PCPS (Bit 30 = 1, command 0x11) Autonomous will request the same value for all cores all the time. Enable PCPS (default Bit 30 = 0, command 0x11)
- **Hwp Autonomous EPP grouping**
  Enable EPP grouping (default Bit 29 =0, command 0x11) Autonomous will request the same values for all cores with the same EPP. Disable EPP grouping (Bit 29 =1, command 0x11) autonomous will not necessarily request the same values for all cores with the same EPP.
- **EPB override over PECI**
  Enable/Disable EPB override over PECI. Enable by sending pcode command 0x2b, subcommand 0x3 to 1. This will allow OOB EPB PECI override control.
- **HWP Lock**
  Enable/Disable HWP Lock support in Misc Power Management MSR.

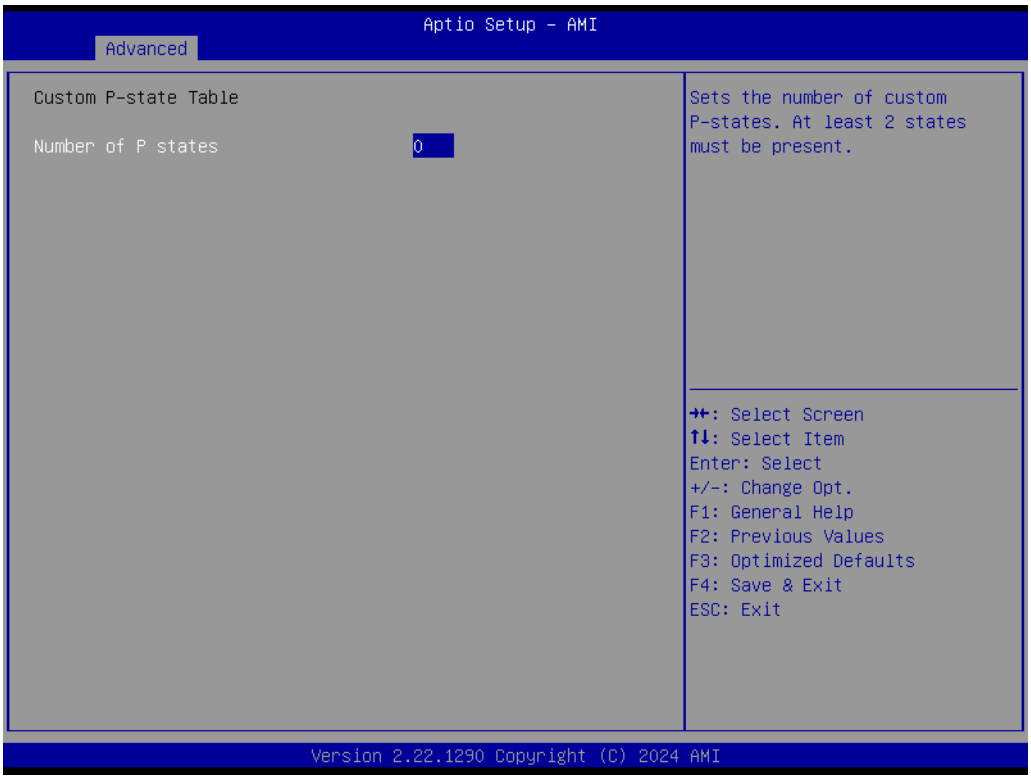
- **HDC Control**
  This option allows HDC configuration.
- **Turbo Mode**
  Enable/Disable processor Turbo Mode (requires Intel Speed Step or Intel Speed Shift to be available and enabled).
- **Power Limit 4 Override**
  Enable/Disable Power Limit 4 override.
- **Power Limit 4**
  Power Limit 4 in milliwatts.
- **Power Limit 4 Lock**
  Power Limit 4 MSR 601h Lock. When enabled PL4 configurations are locked during OS. When disabled PL4 configuration can be changed during OS.
- **C states**
  Enable/Disable CPU Power Management.
- **Thermal Monitor**
  Enable/Disable Thermal Monitor.
- **Interrupt Redirection Mode Selection**
  Interrupt Redirection Mode Select for Logical Interrupts.
- **Timed MWAIT**
  Enable/Disable Timed MWAIT Support.
- **Energy Performance Gain**
  Enable/disable Energy Performance Gain.



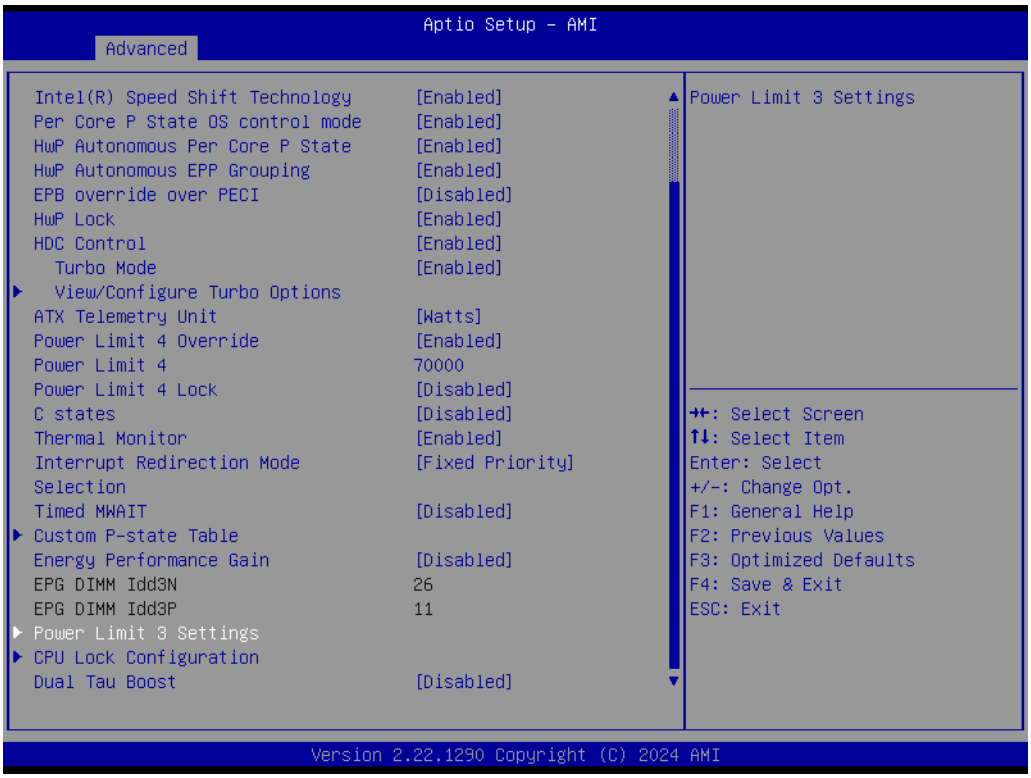
- **Energy Efficient P-state**
  Enable/Disable Energy Efficient P-state feature.
- **Package Power Limit MSR Lock**
  Enable/Disable locking of Package Power Limit settings.
- **Power Limit 1 Override**
  Enable/Disable Power Limit 1 override.

- **Power Limit 1**
  Power Limit 1 in milliwatts.
- **Power Limit 1 Time Window**
  Power Limit 1 Time Window value in seconds.
- **Power Limit 2 Override**
  Enable/Disable Power Limit 2 override.
- **Power Limit 2**
  Power Limit 2 value in milliwatts.
- **Energy Efficient Turbo**
  Enable/Disable Energy Efficient Turbo Feature. This feature will opportunistically lower the turbo frequency to increase efficiency.

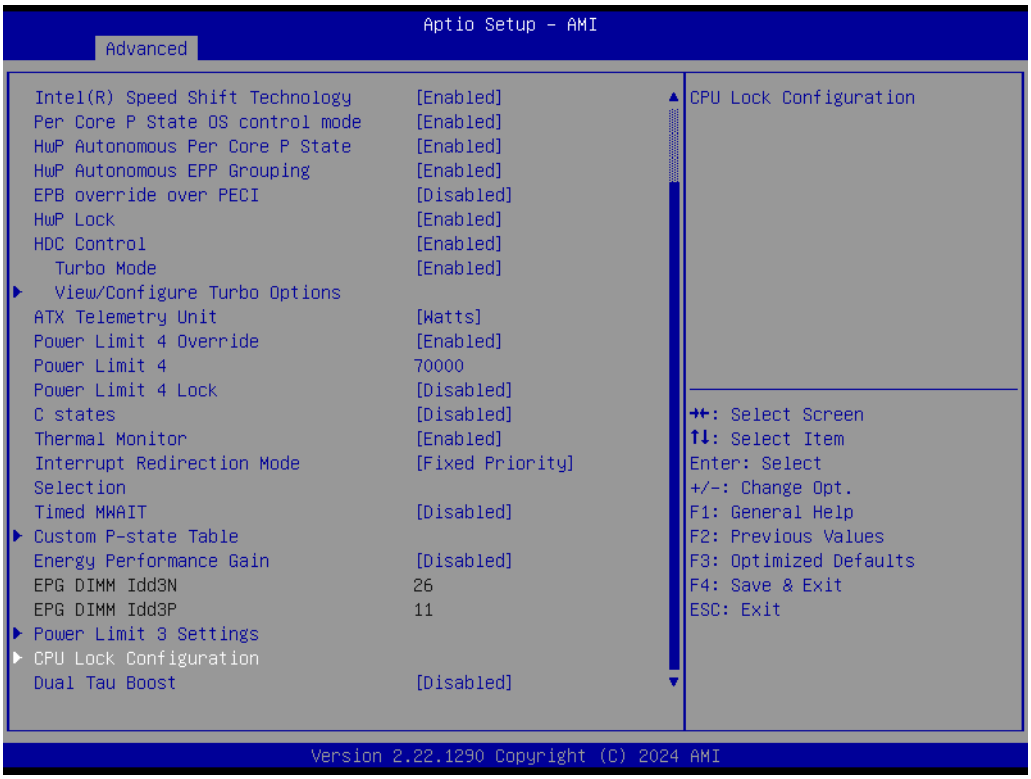


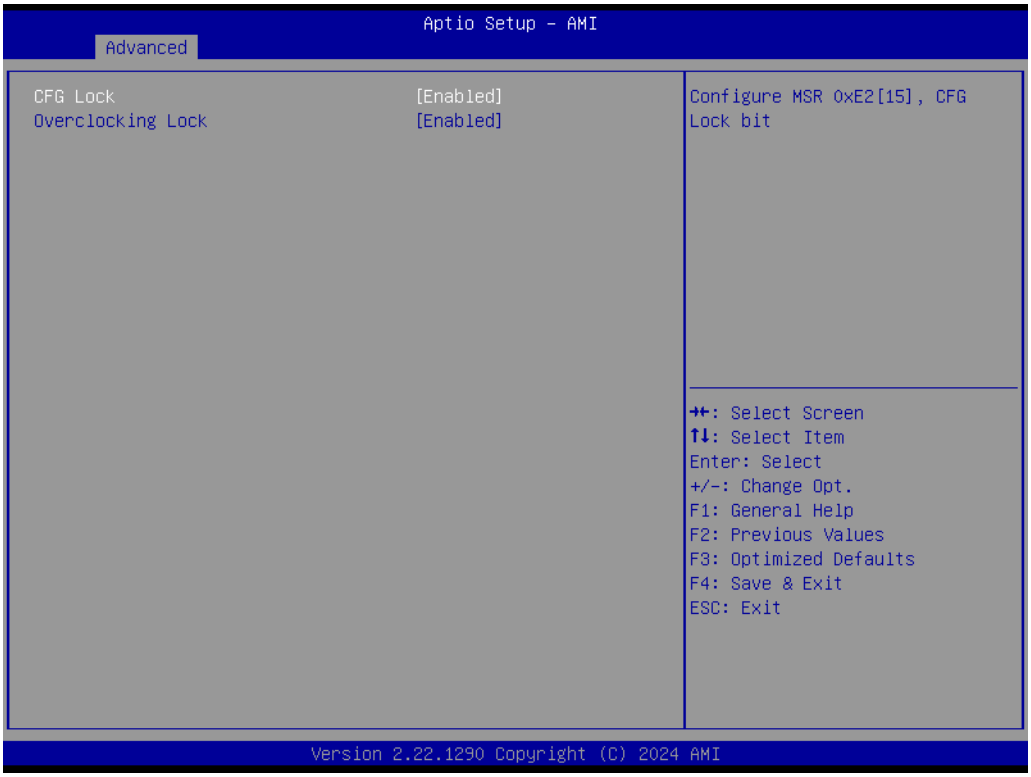


- **Number of P states**
  Sets the number of custom P-states. At least 2 states must be present.

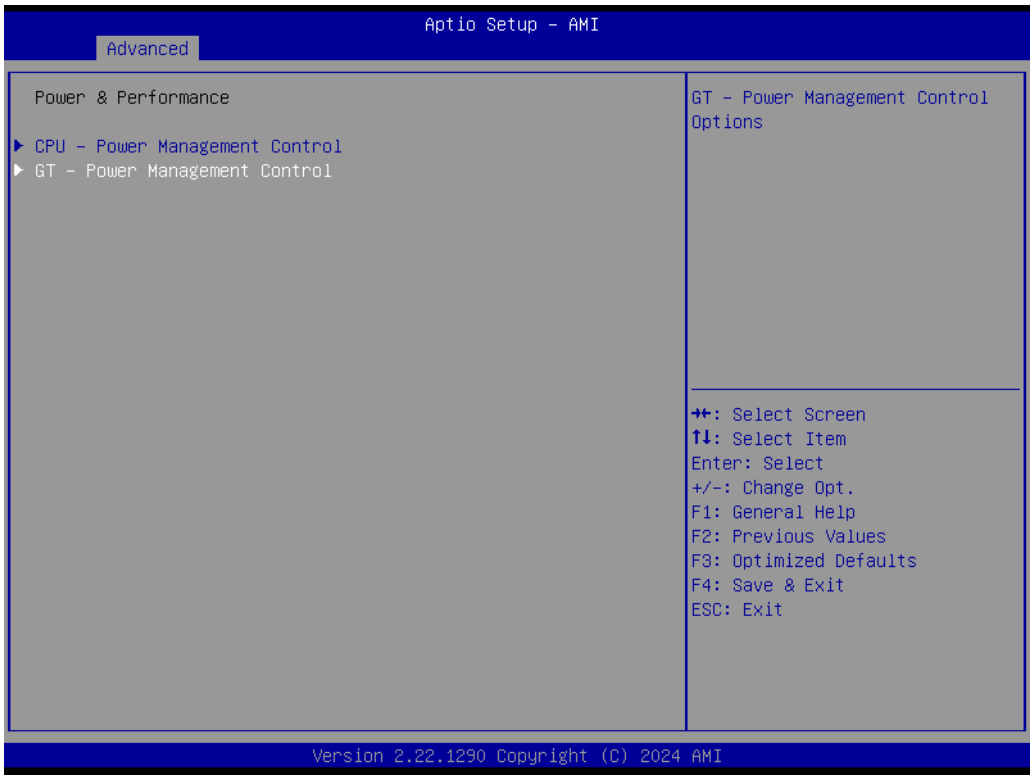


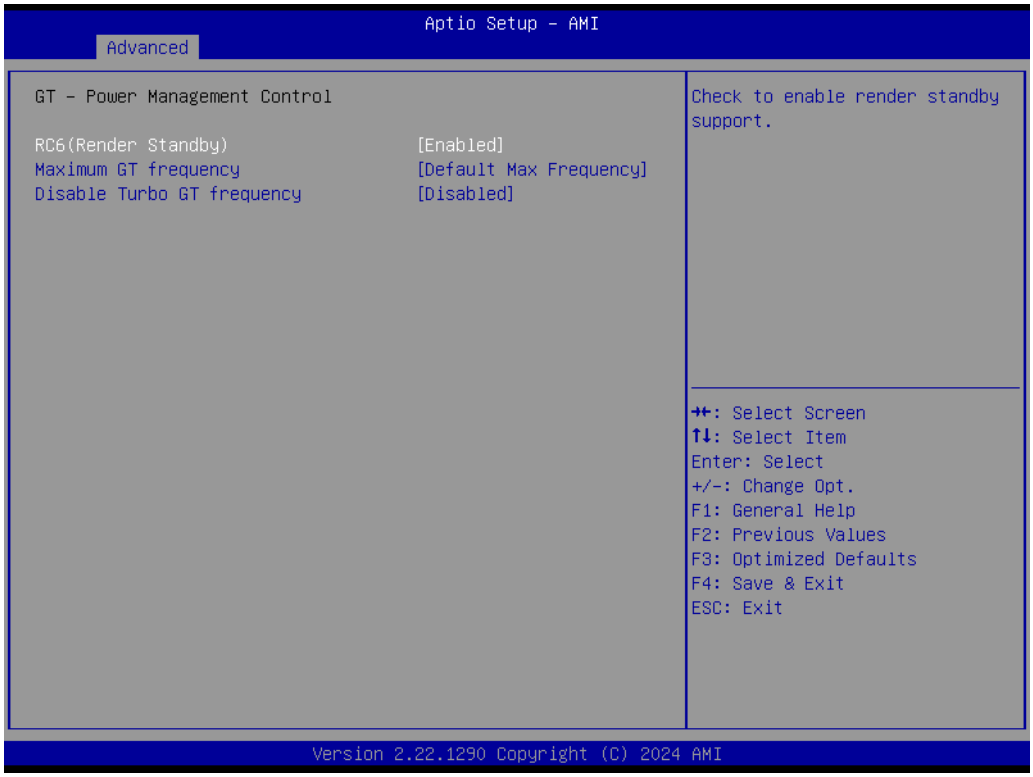
- **Power Limit 3 Override**
  Enable/Disable Power Limit 3 override.
- **Power Limit 3**
  Power Limit 3 in milliwatts.
- **Power Limit 3 Time Window**
  Power Limit 3 Time Window value in milliseconds.
- **Power Limit 3 Duty Cycle**
  Specify the duty cycle in percentage that the CPU is required to maintain over the configured time window. The range is 0-100.
- **Power Limit 3 Lock**
  Power Limit 3 MSR 615h Lock. When enabled, PL3 configurations are locked when the OS is running. When disabled, PL3 configuration can be changed when the OS is running.





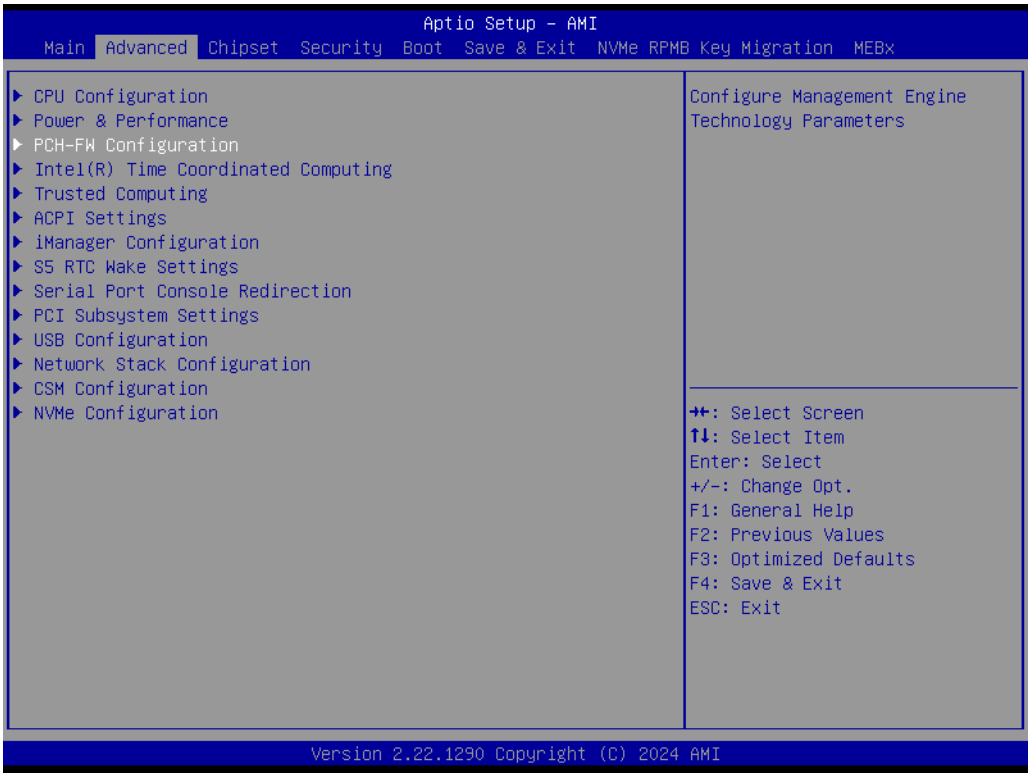
- **CFG Lock**
  Configure MSR 0xE2[15], CFG Lock bit.
- **Overclocking Lock**
  Enable/Disable Overclocking Lock (BIT 20) in FLEX_RATIO(194) MSR.

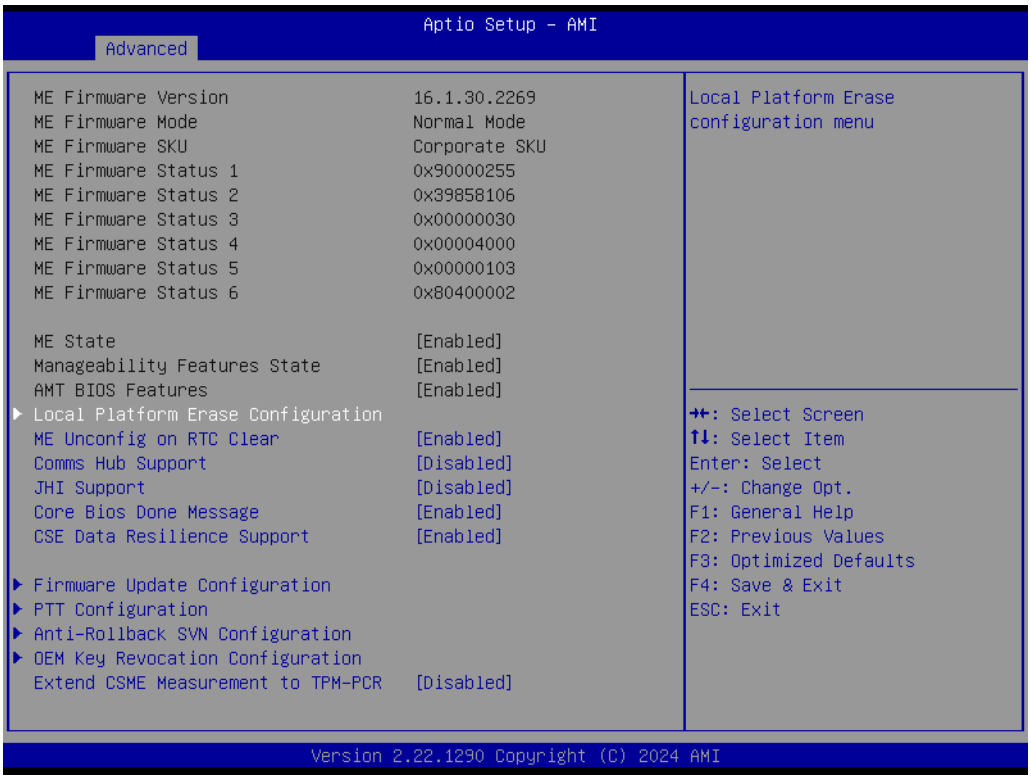




- **RC6 (Render Standby)**
  Check to enable render standby support.
- **Maximum GT frequency**
  Maximum GT frequency limited by the user.
- **Disable Turbo GT frequency**
  Enabled: Disables Turbo GT frequency. Disabled: GT frequency is not limited.

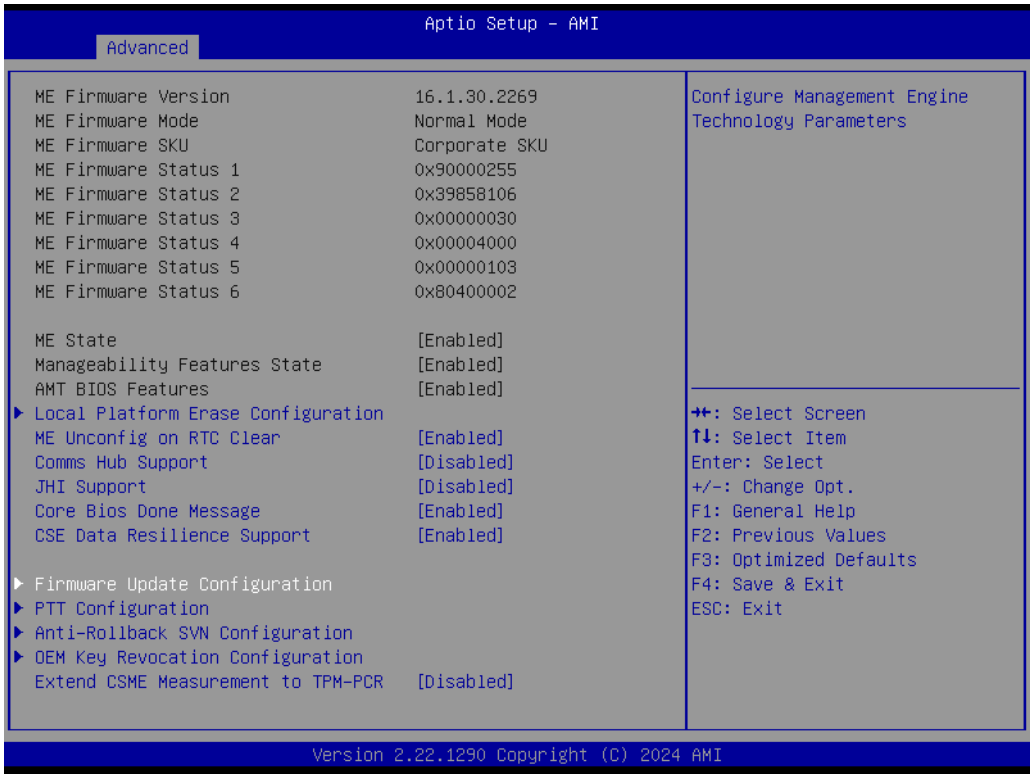
3.2.2.3 PCH-FW Configuration

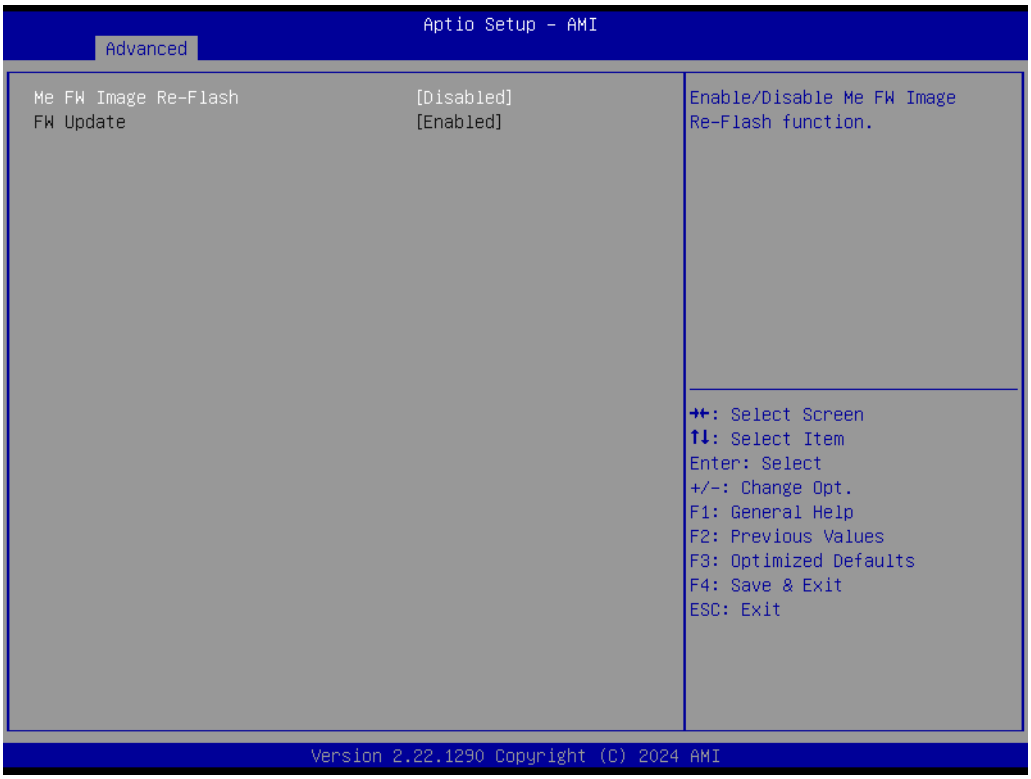




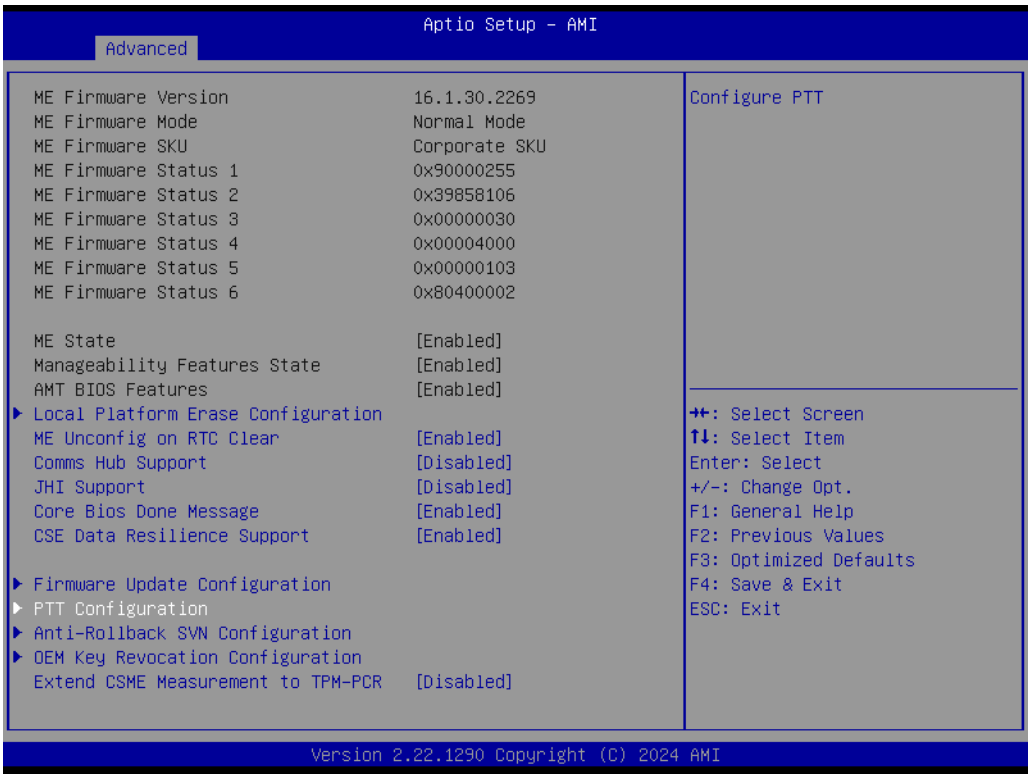
- **ME State**
  When Disabled, ME will be put into ME Temporarily Disabled Mode.
- **Manageability Features State**
  Enable/Disable Intel Manageability features.

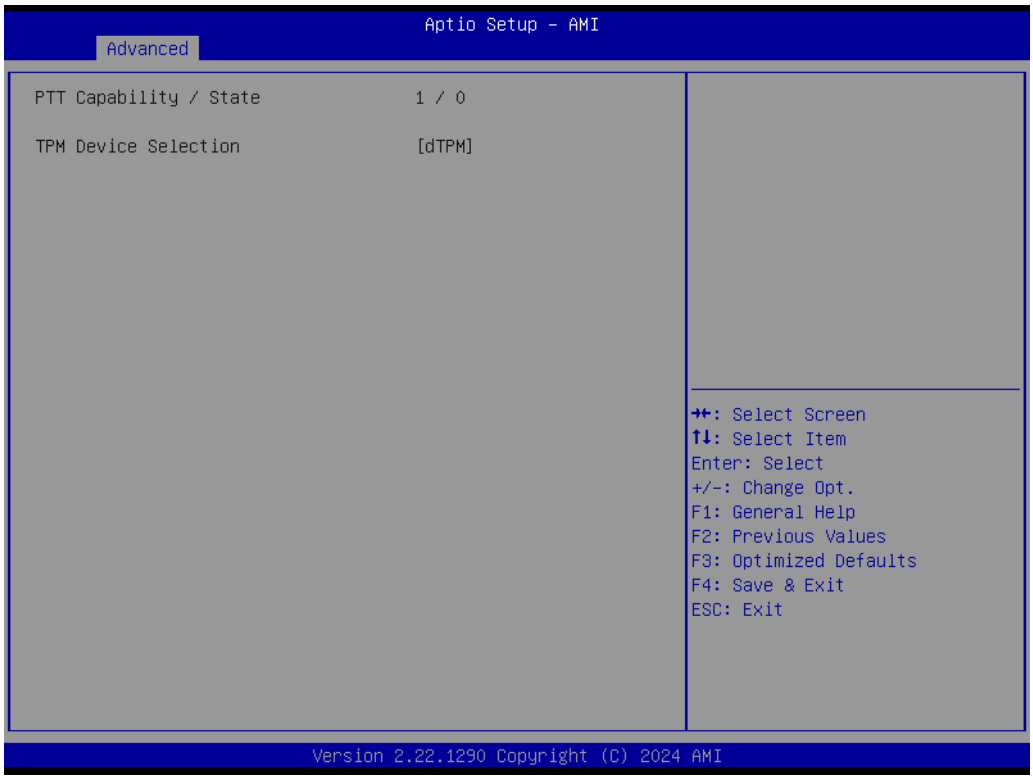
- **AMT BIOS Features**
  When disabled, AMT BIOS Features are no longer supported and the user is no longer able to access MEBx Setup.
- **ME Unconfig on RTC Clear**
  When Disabled, ME will not be unconfigured on RTC Clear.
- **Comms hub support**
  Enables/Disables support for Comms Hub.
- **JHI support**
  Enable/Disable Intel® DAL Host Interface Service (JHI).
- **Core BIOS Done Message**
  Enable/Disable Core BIOS Done message sent to ME.



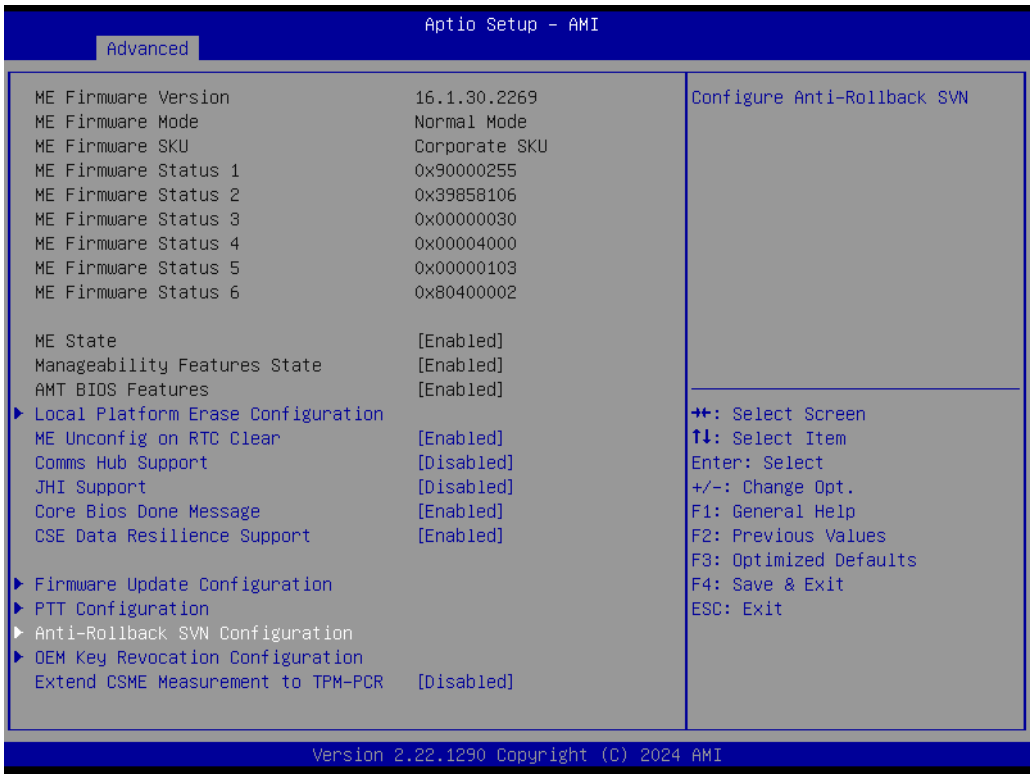


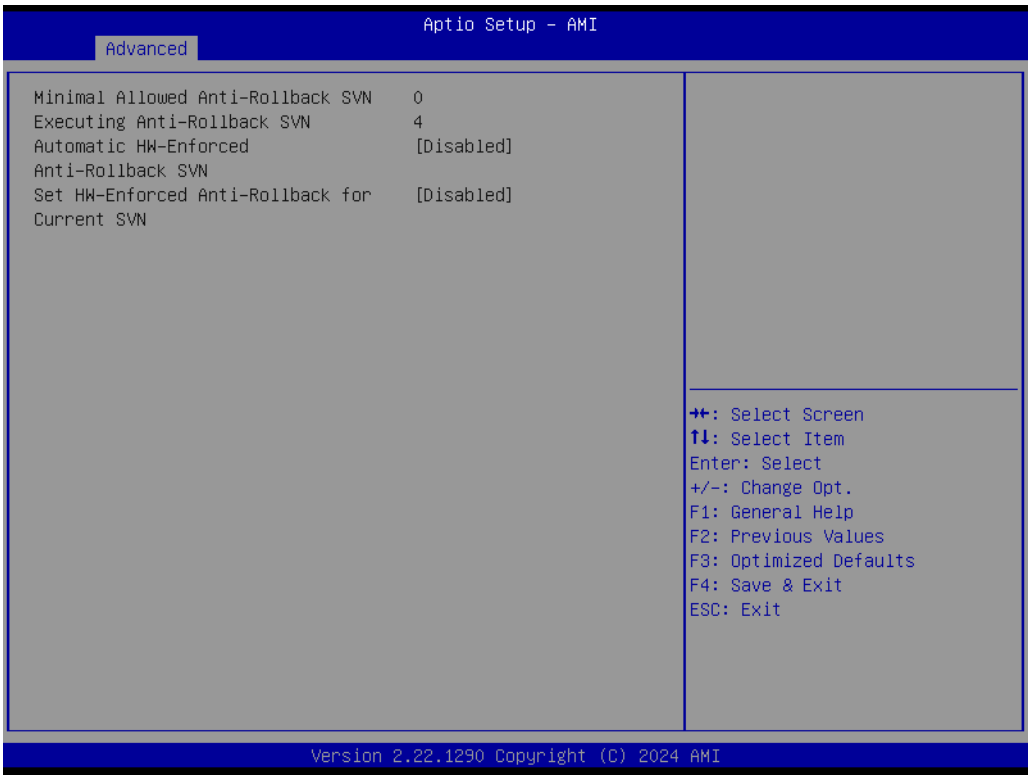
- **ME FW Image Re-Flash**
  Enable/Disable ME FW Image Re-Flash function.
- **FW Update**
  Enable/Disable ME FW Update function.



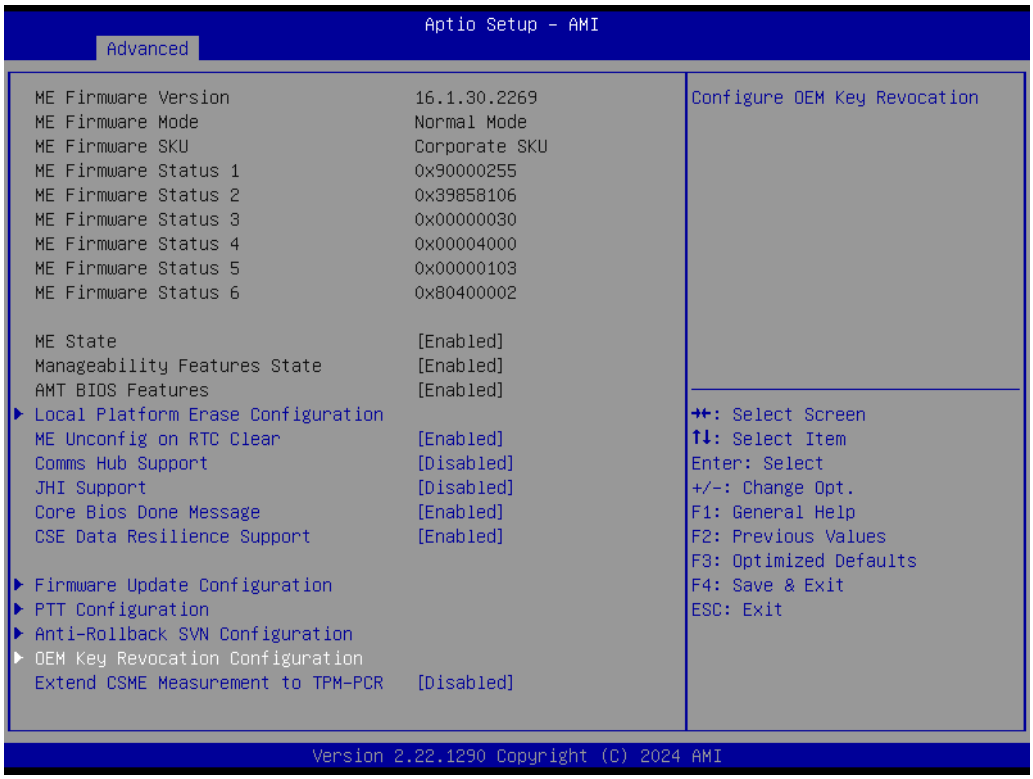


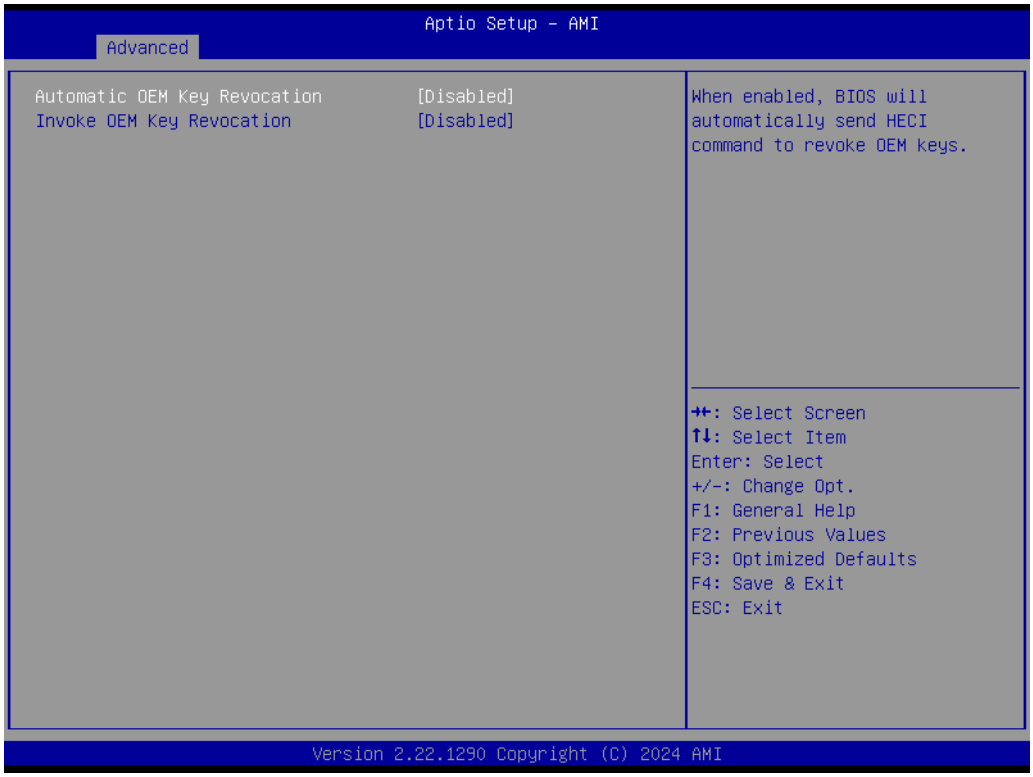
- **TPM Device Selection**
  Configure TPM device.





- **Automatic HW-Enforced Anti-Rollback SVN**
  When enabled, the hardware-enforced Anti-Rollback mechanism is automatically activated: once ME FW was successfully run on a platform, FW with lower ARB-SVN will be blocked from execution.
- **Set HW-Enforced Anti-Rollback for Current SVN**
  Enable the hardware-enforced Anti-Rollback mechanism for current ARB-SVN value. FW with lower ARB-SVN will be blocked from execution. The value will be restored to disable after the command is sent.

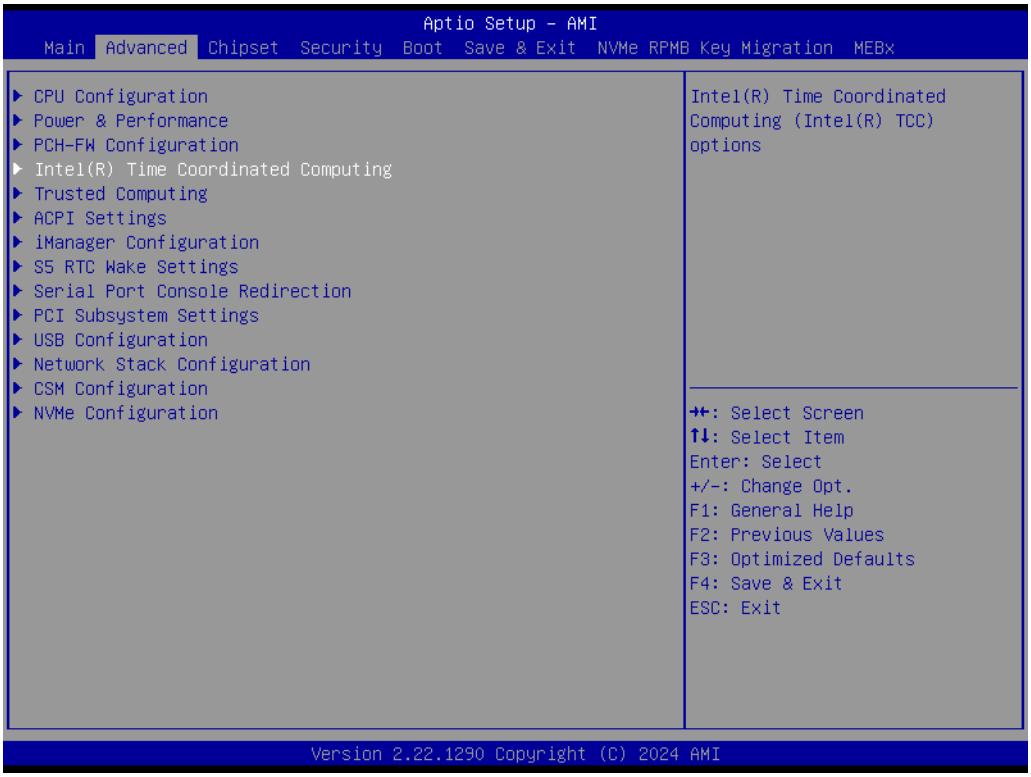


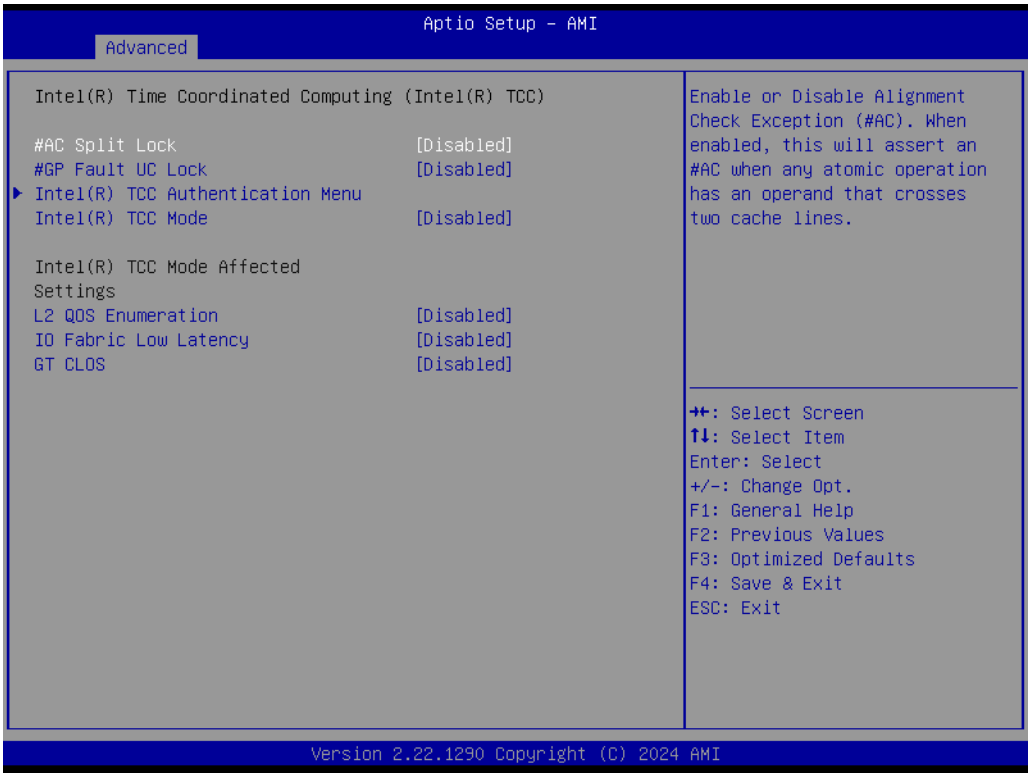


- **Automatic OEM Key Revocation**
  When enabled, the BIOS will automatically send HECI command to revoke OEM keys.
- **Invoke OEM Key Revocation**
  A Heci command will be send to revoke the OEM key.

- **Extend CSME Measurement to TPM-PCR**
  Enable/Disable Extend CSME Measurement to TPM-PCR[0] and AMT Config to TPM-PCR[1].

3.2.2.4 Intel(R) Time Coordinated Computing

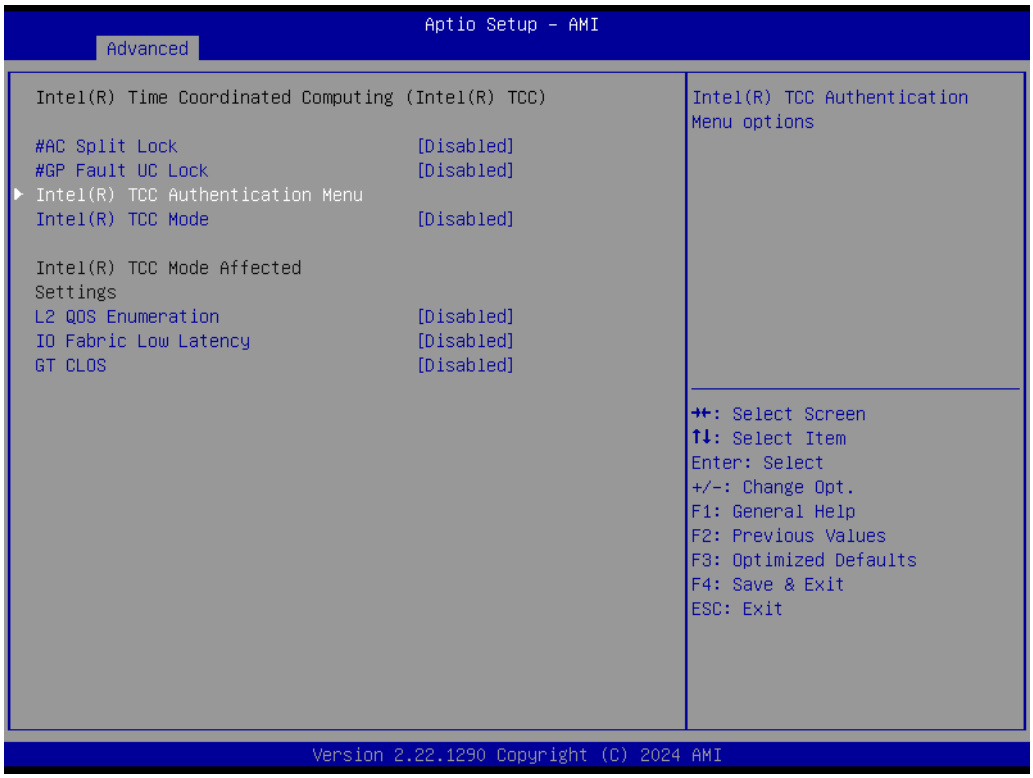




- **#AC Split Lock**
  Enable or Disable Alignment Check Exception (#AC). When enabled, this will

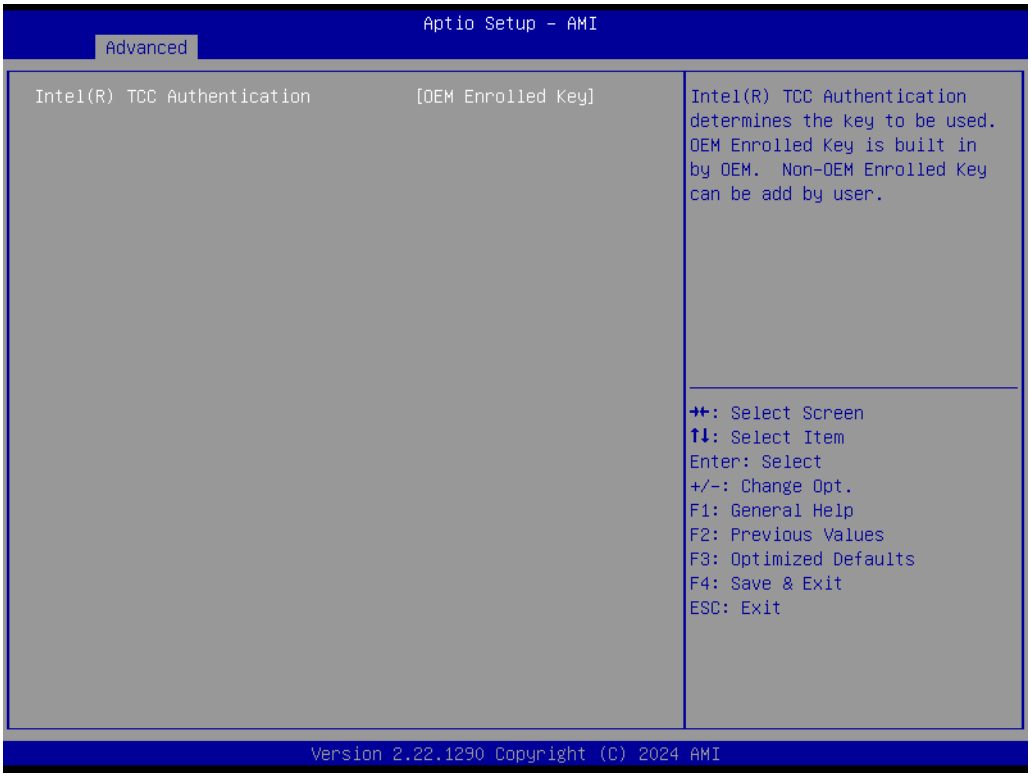
assert an #AC when any atomic operation has an operand that crosses two cache lines.

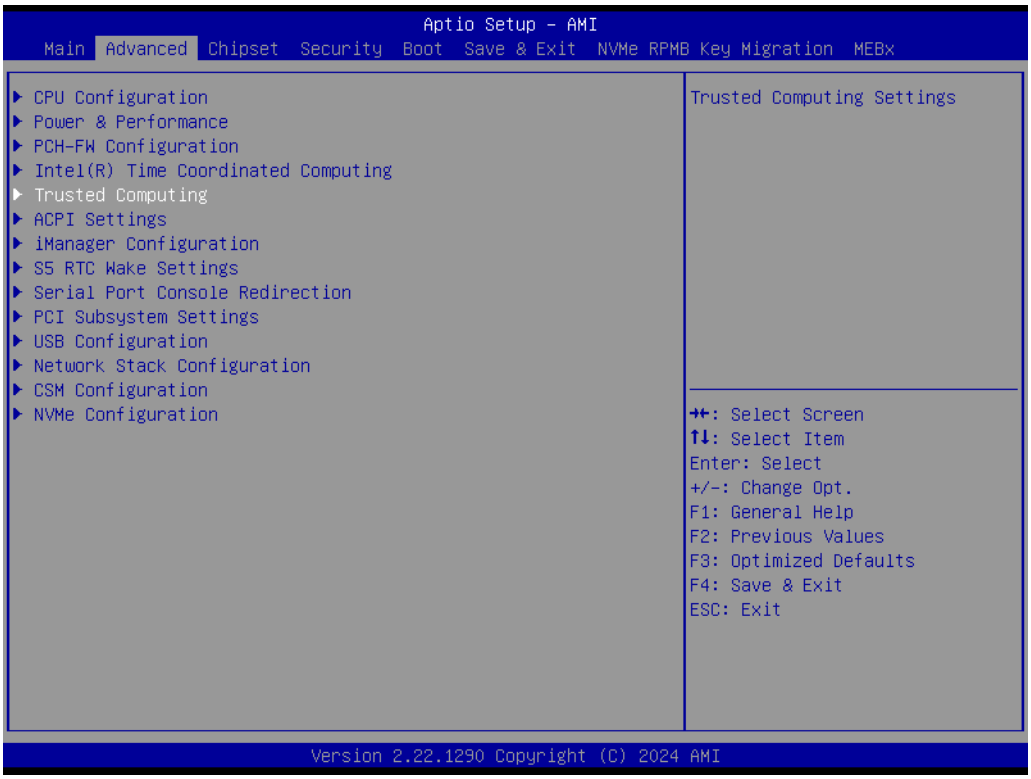
- **#GP Fault UC Lock**
  Enable or Disable GP Fault Exception (GP#). When enabled, this will assert an GP# when encountering a Lock to un-cacheable memory before the bus is locked.
- **L2 QOS Enumeration**
  Enable or Disable L2 QOS Enumerate.When Enable CPUID Enumeration for L2 QOS gets enabled.
- **IO Fabric Low Latency**
  Enable or Disable IO Fabric Low Latency. This will turn off some power management in the PCH IO fabric. This option provides the most aggressive IO Fabric performance setting. S3 state is NOT supported.
- **GT CLOS**
  Enable or Disable Graphics Technology (GT) Class of Service. Enable will reduce Gfx LLC allocation to minimize impact of Gfx workload on LLC.



- **Intel(R) TCC Authentication**
  Intel(R) TCC Authentication determines the key to be used. An OEM Enrolled Key is built in by OEM. A non-OEM Enrolled Key can be added by the user.

3.2.2.5 Trusted Computing

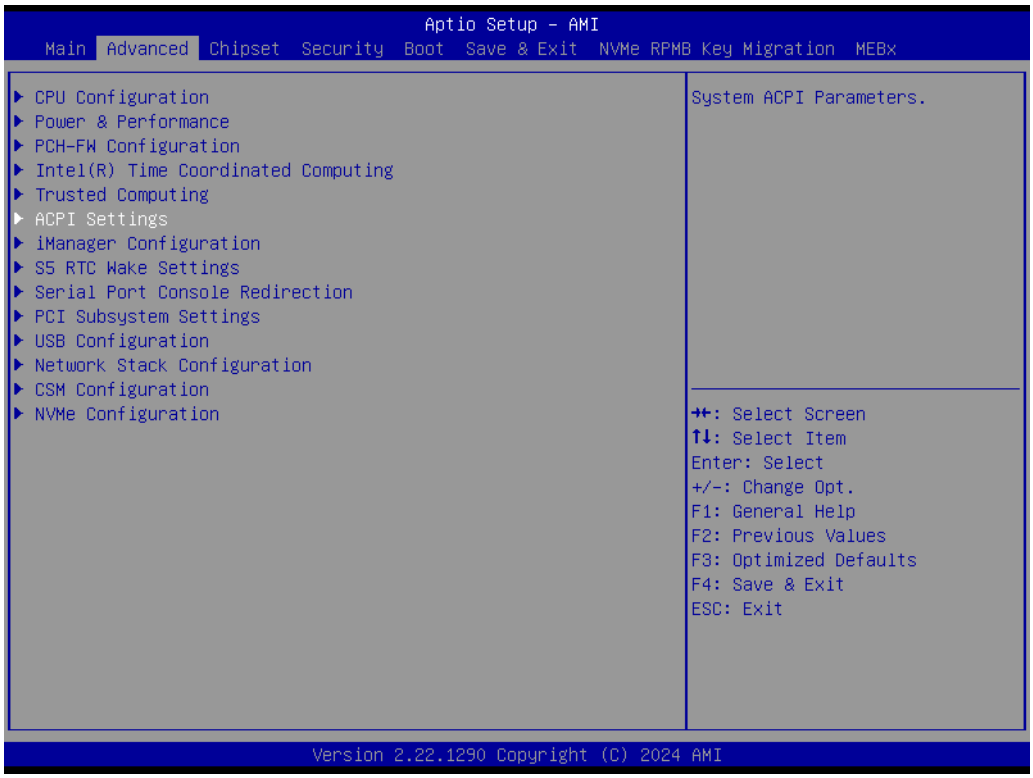


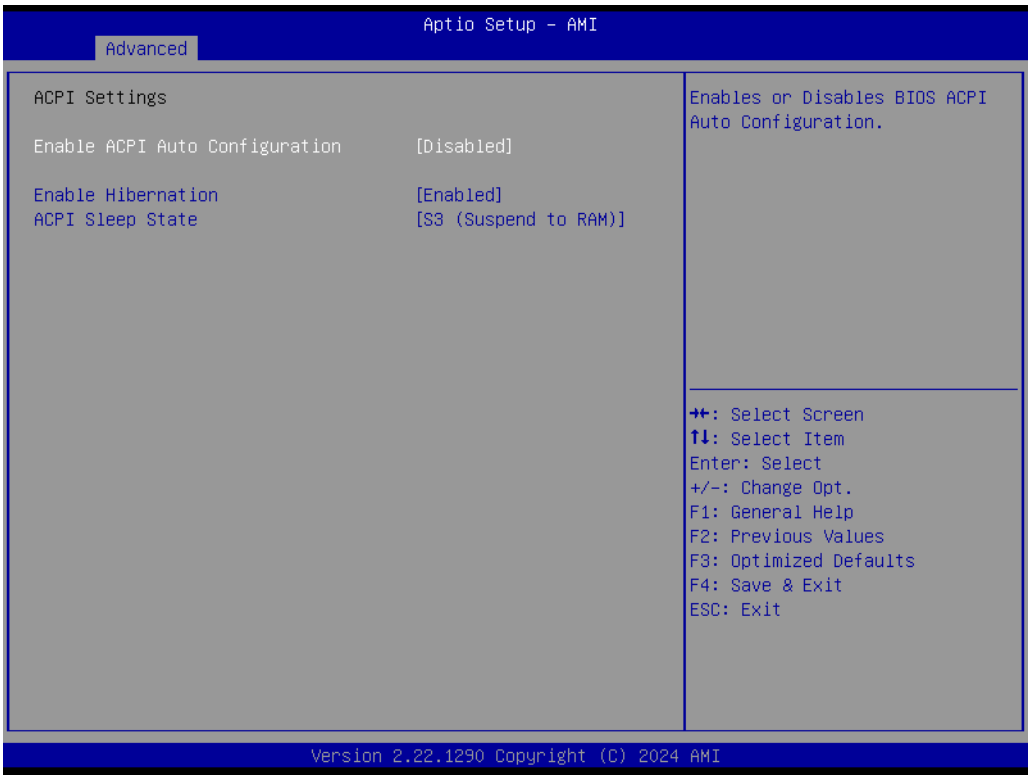


- **Security Device Support**
  Enables or Disables BIOS support for security device. The OS will not show the Security Device. TCG EFI protocol and INT1A interface will not be available.
- **SHA256 PCR Bank**
  Enable or Disable SHA256 PCR Bank.

- **SHA384 PCR Bank**
  Enable or Disable SHA384 PCR Bank.
- **Pending operation**
  Schedule an Operation for the Security Device. NOTE: Your Computer will reboot during restart in order to change State of Security Device.
- **Platform Hierarchy**
  Enable or Disable Platform Hierarchy.
- **Storage Hierarchy**
  Enable or Disable Storage Hierarchy.
- **Endorsement Hierarchy**
  Enable or Disable Endorsement Hierarchy.
- **Physical Presence Spec Version**
  Select to Tell O.S. to support PPI Spec Version 1.2 or 1.3. Note some HCK tests might not support 1.3.
- **Device Select**
  TPM 1.2 will restrict support to TPM 1.2 devices; TPM 2.0 will restrict support to TPM 2.0 devices; Auto will support both with the default set to TPM 2.0 devices if not found; TPM 1.2 devices will be enumerated.

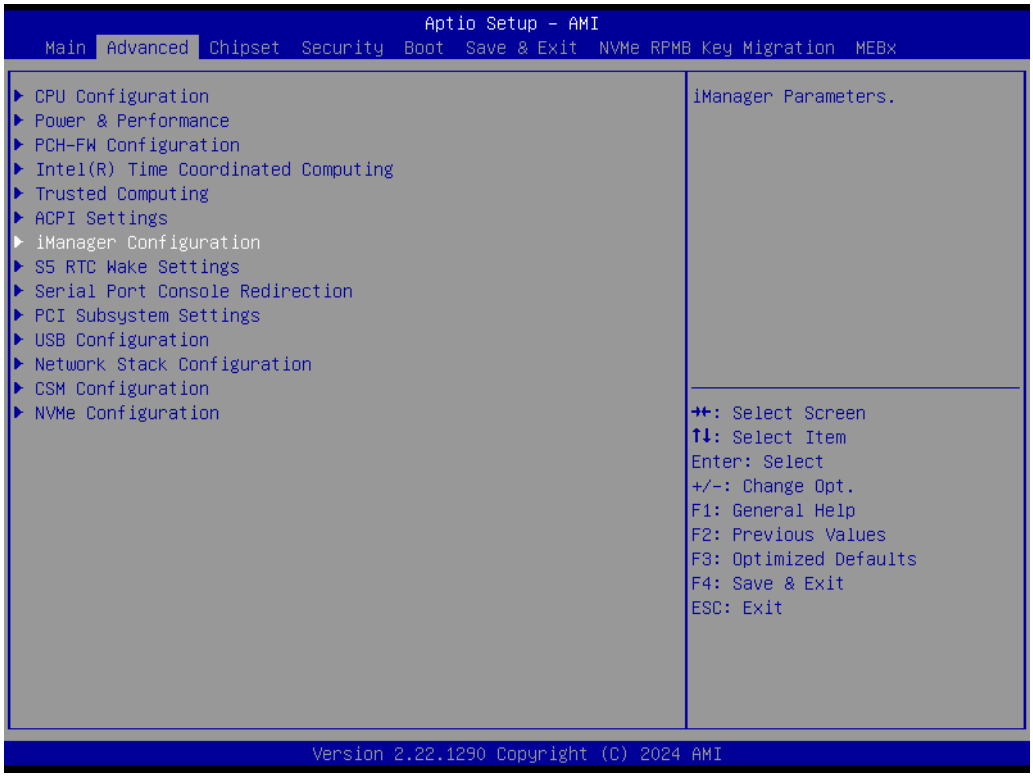
3.2.2.6 ACPI Settings

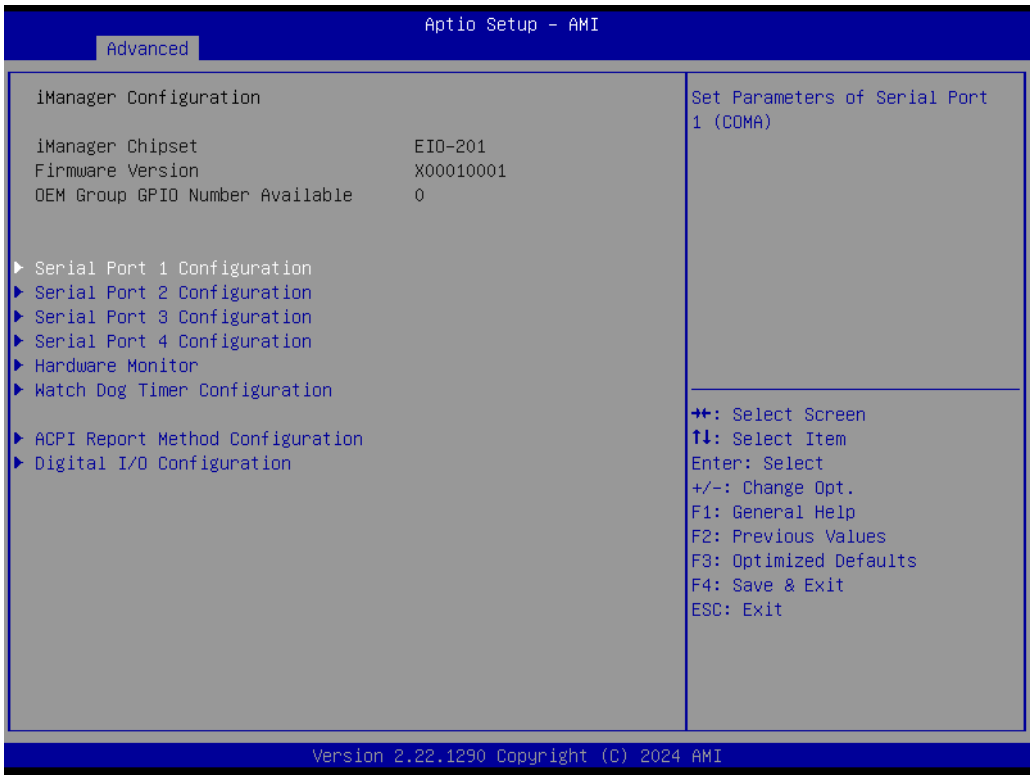




- **Enable ACPI Auto Configuration**
  Enables or Disables BIOS ACPI Auto Configuration.
- **Enable Hibernation**
  Enables or Disables the system's ability to hibernate (OS/S4 Sleep State).
- **ACPI Sleep State**
  Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.

3.2.2.7 iManager Configuration

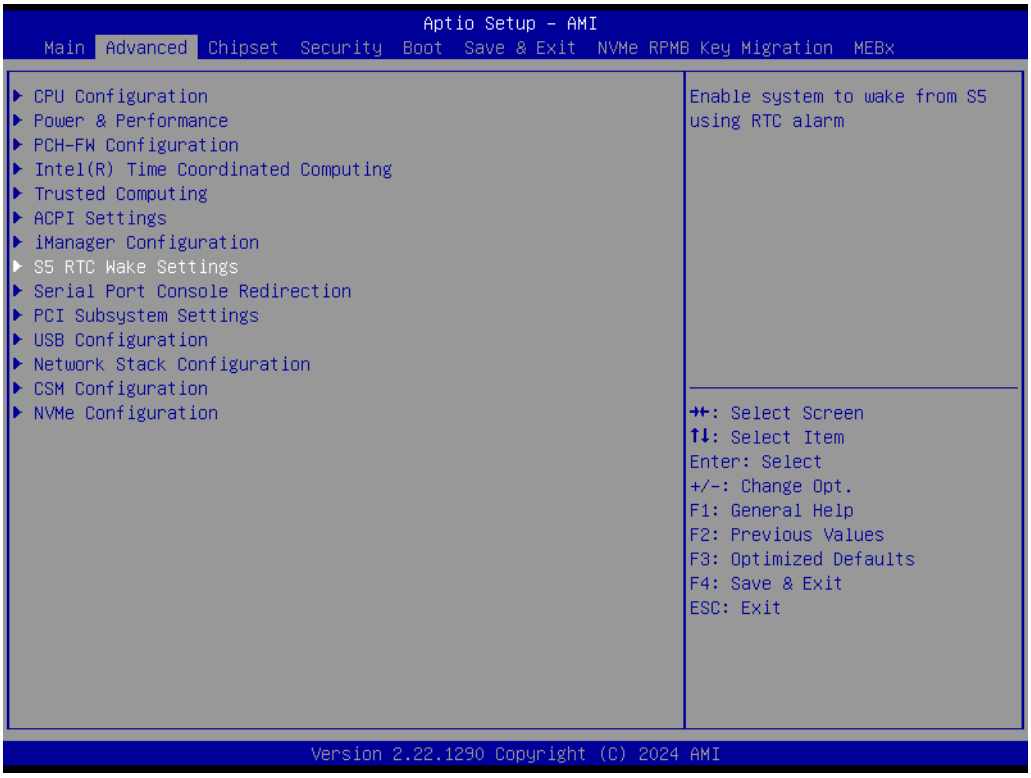


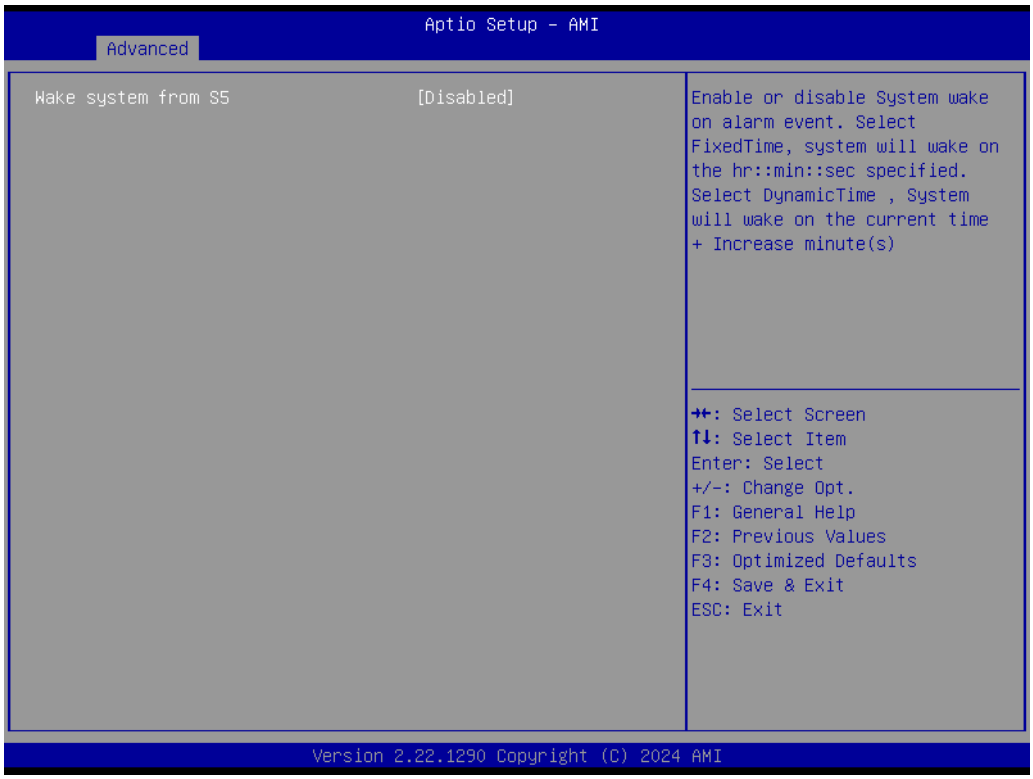


- **Serial Port 1~4 Configuration**
  Set Parameters of Serial Port 1~4.
- **Hardware Monitor**
  Monitor hardware status.

- **Watch Dog Timer Configuration**
  Watch Dog Timer Configuration page.
- **ACPI Report Method Configuration**
  Select ACPI Reporting Method for EC Devices.
- **Digital I/O Configuration**
  Configure the digital I/O pins.

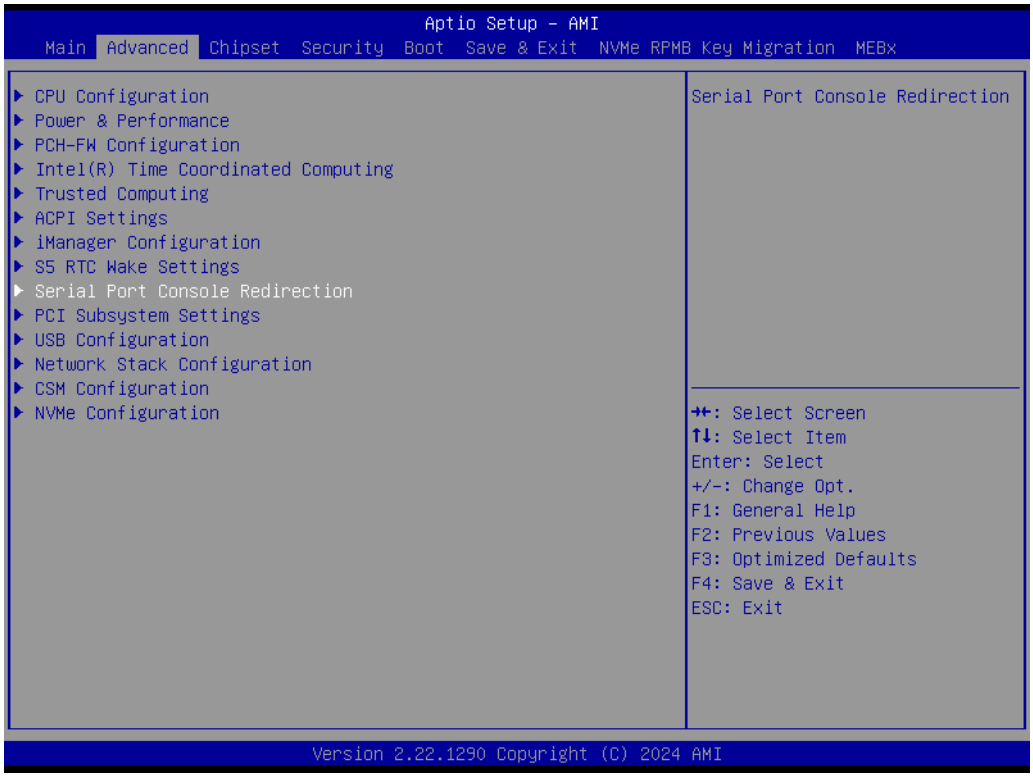
3.2.2.8 S5 RTC Wake Settings

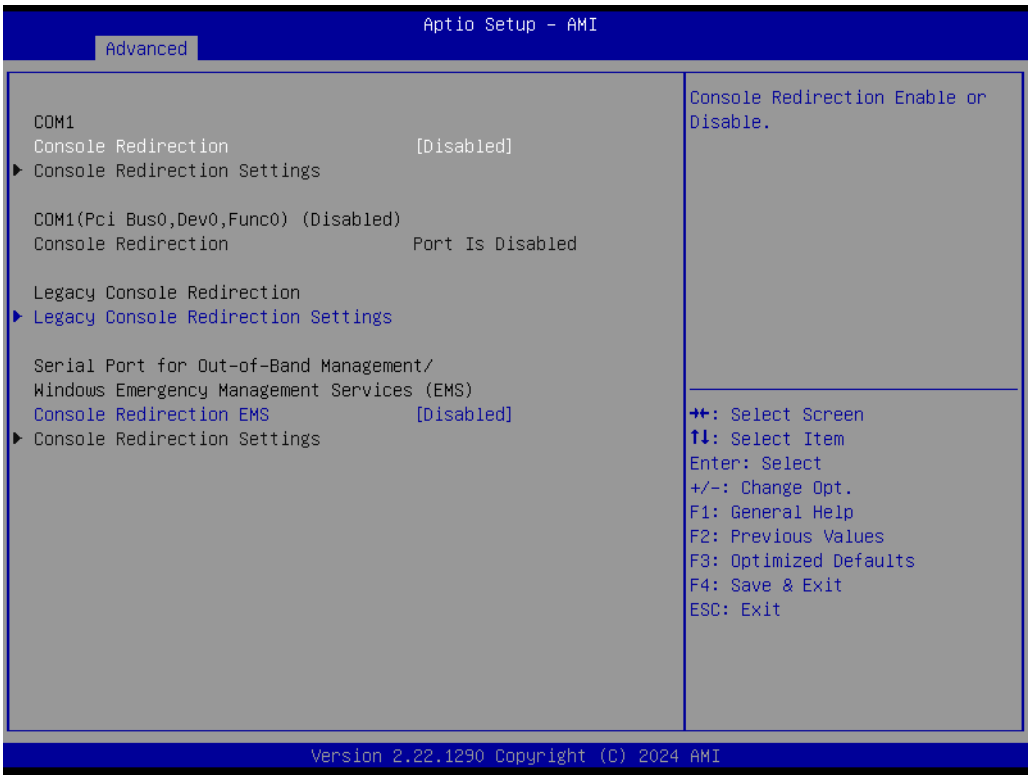




- **Wake system from S5**
  Enable or disable system wake on alarm event.

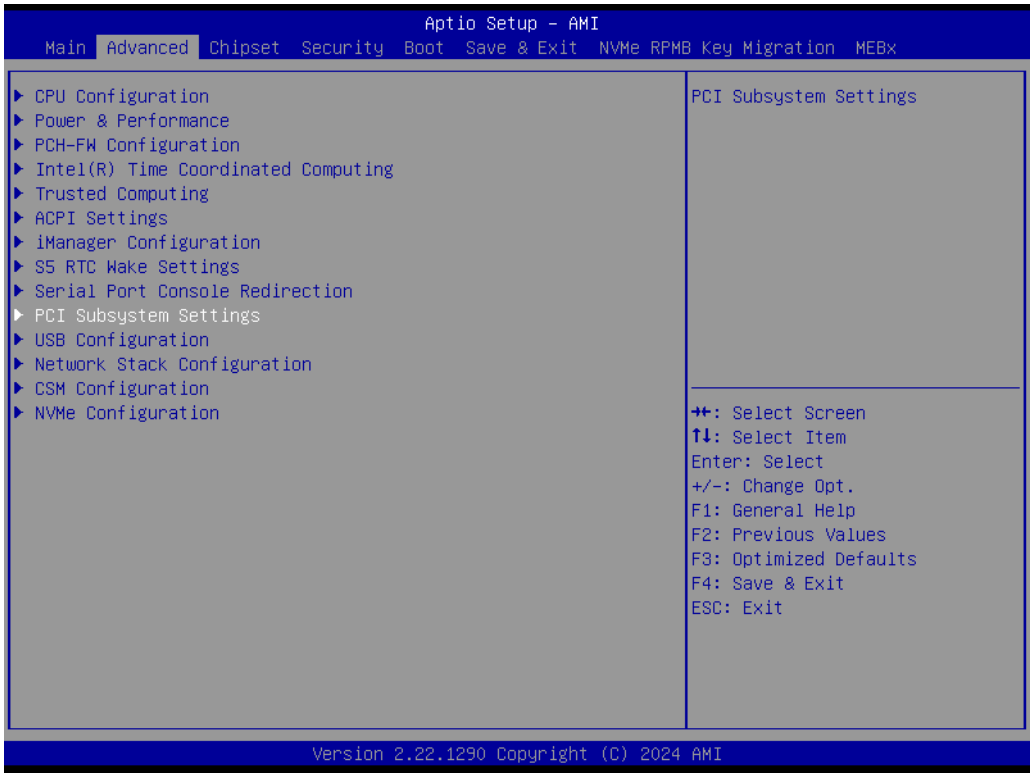
3.2.2.9 Serial Port Console Redirection

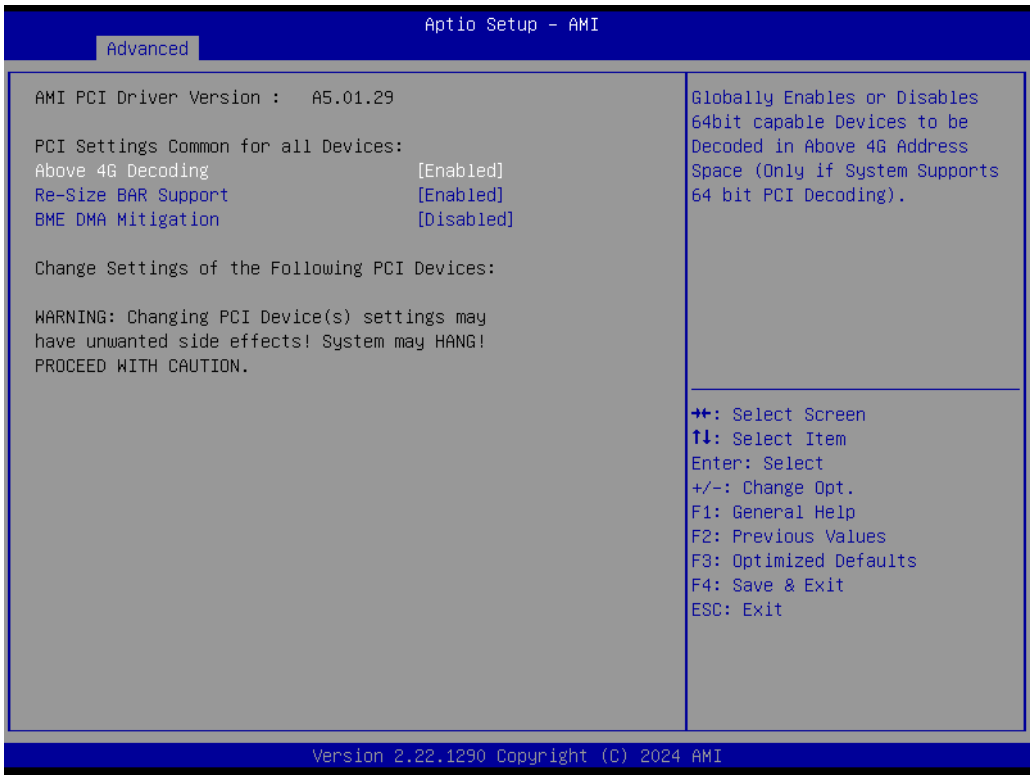




- **Console Redirection**
  Console Redirection Enable or Disable.
- **Legacy Console Redirection Settings**
  Legacy Console Redirection Settings.
- **Console Redirection EMS**
  Console Redirection Enable or Disable.

3.2.2.10 PCI Subsystem Settings

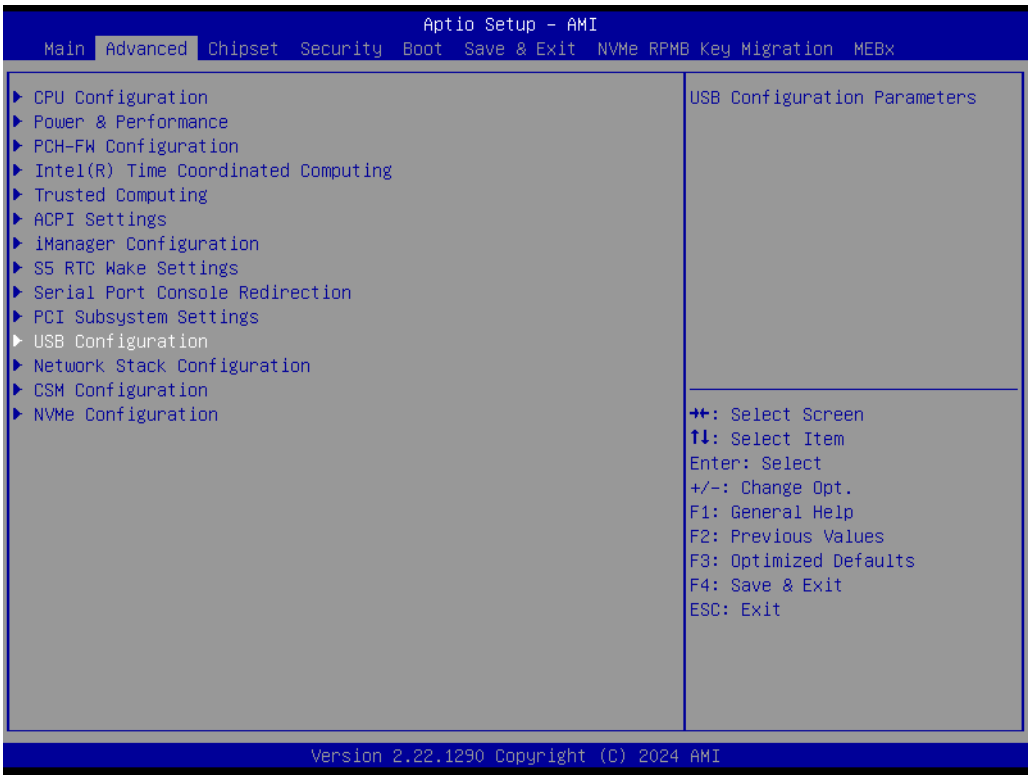


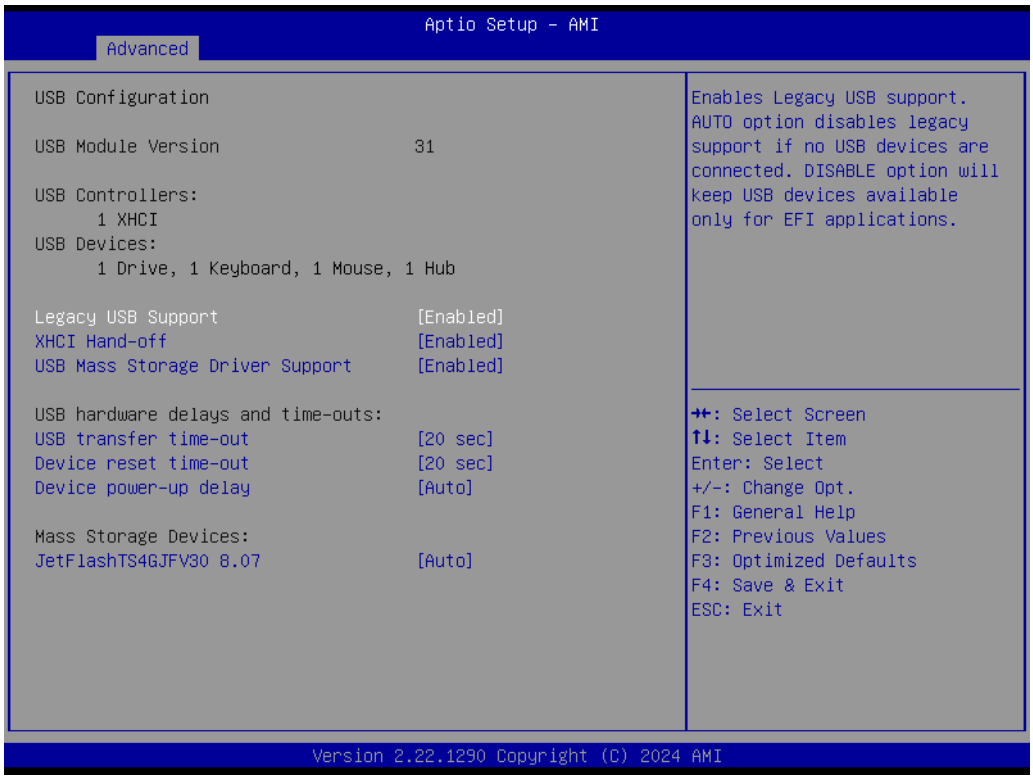


- **Above 4G Decoding**
  Globally Enables or Disables 64-bit capable devices to be decoded in Above 4G Address Space (only if the system supports 64-bit PCI decoding).

- **Re-Size BAR Support**
  If the system has Resizable BAR capable PCIe Devices, this option Enables or Disables Resizable BAR Support.
- **BME DMA Mitigation**
  Re-enable Bus Master Attribute disabled during Pci enumeration for PCI Bridges after SMM is Locked.

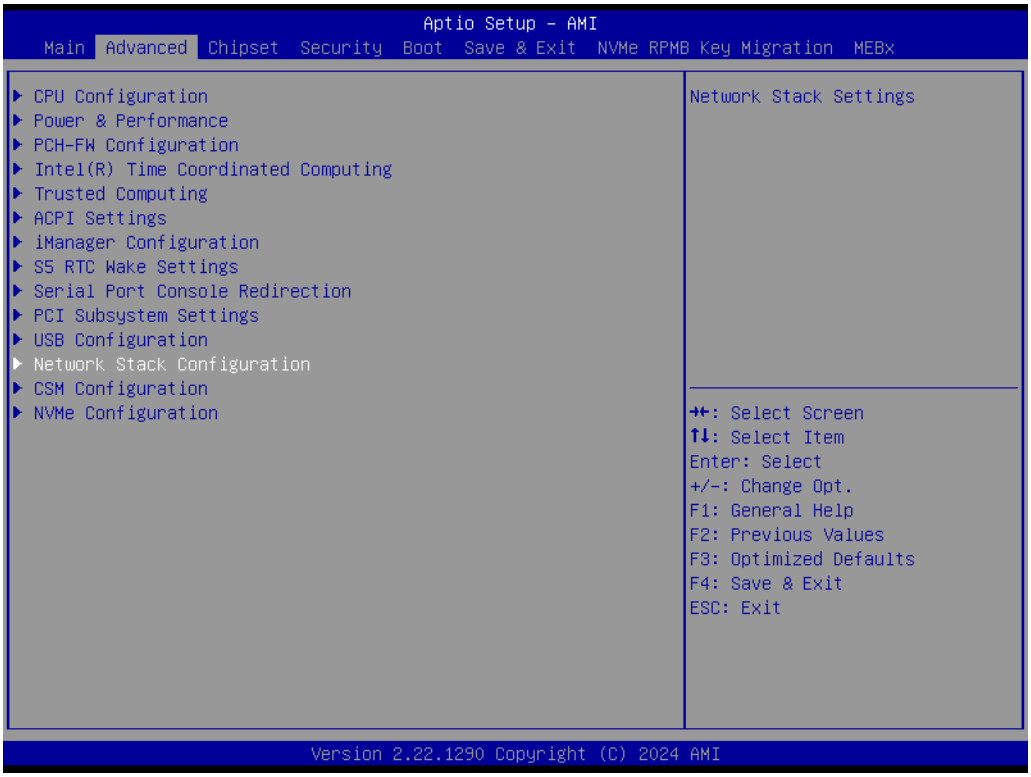
3.2.2.11 USB Configuration





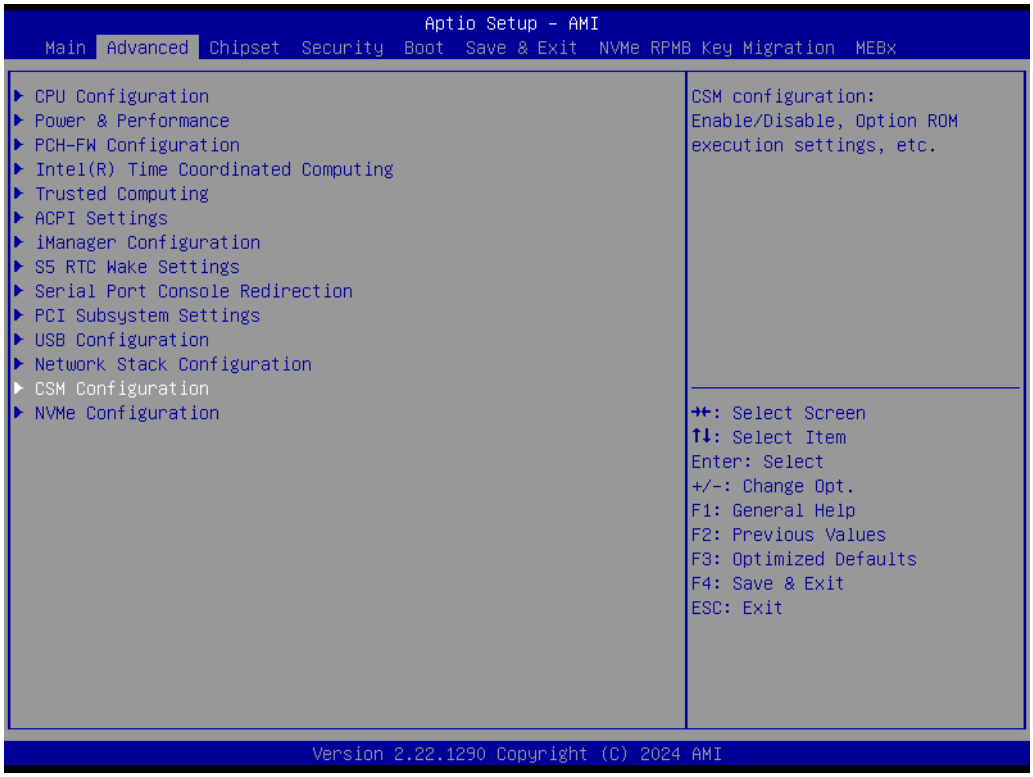
- **Legacy USB Support**
  Enables Legacy USB support.
- **XHCI Hand-off**
  This is a workaround for OS without XHCI hand-off support.
- **USB Mass Storage Device Configuration**
  Configure the USB Mass Storage Devices.
- **USB transfer time-out**
  The time-out value for Control, Bulk, and Interrupt transfers.
- **Device reset time-out**
  USB mass storage device Start Unit command time-out.
- **Device power-up delay**
  Maximum time the device will take before it properly reports itself to the Host Controller.

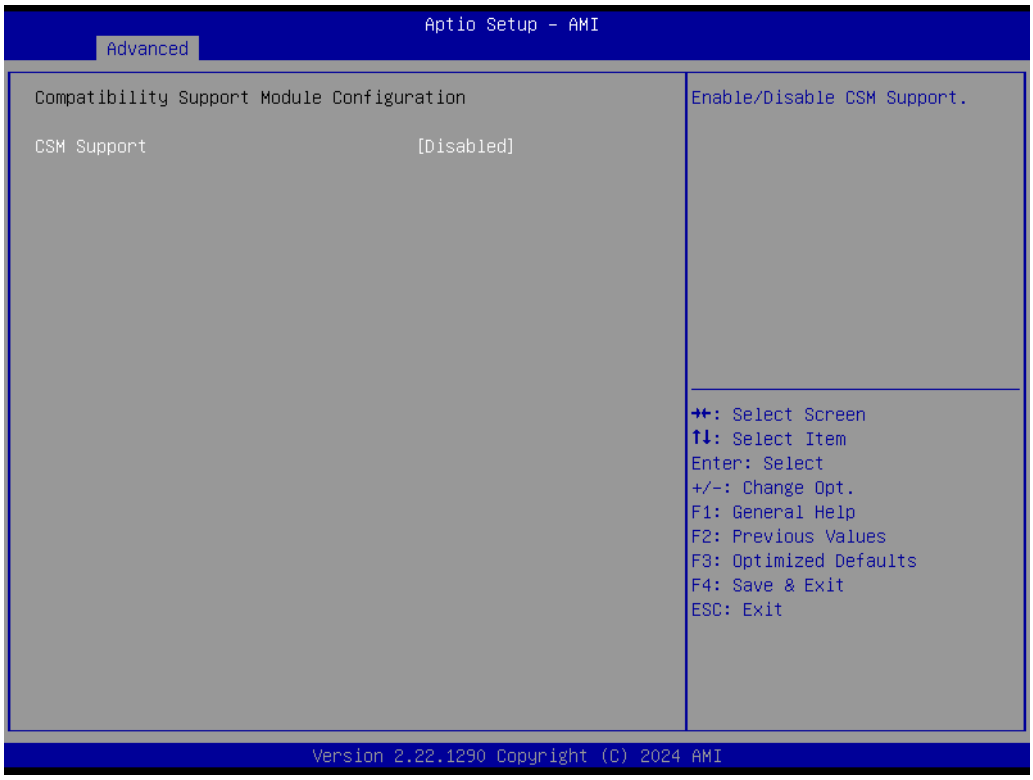
3.2.2.12 Network Stack Configuration



- **Network Stack**
  Enable/Disable UEFI Network Stack.

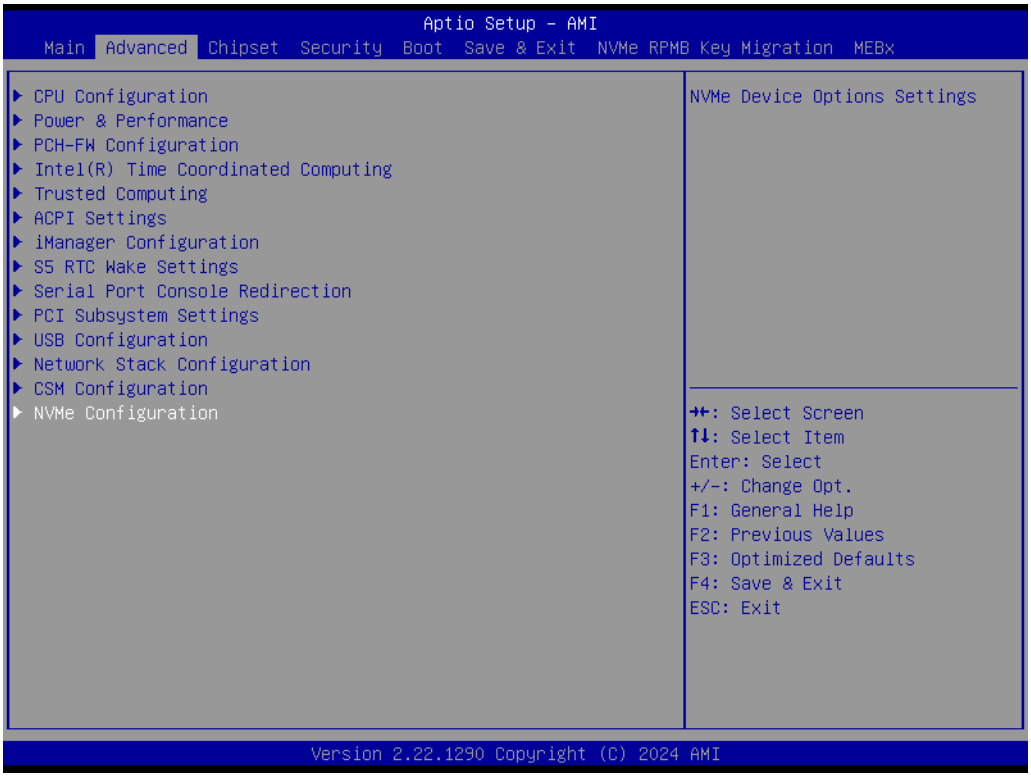
3.2.2.13 CSM Configuration

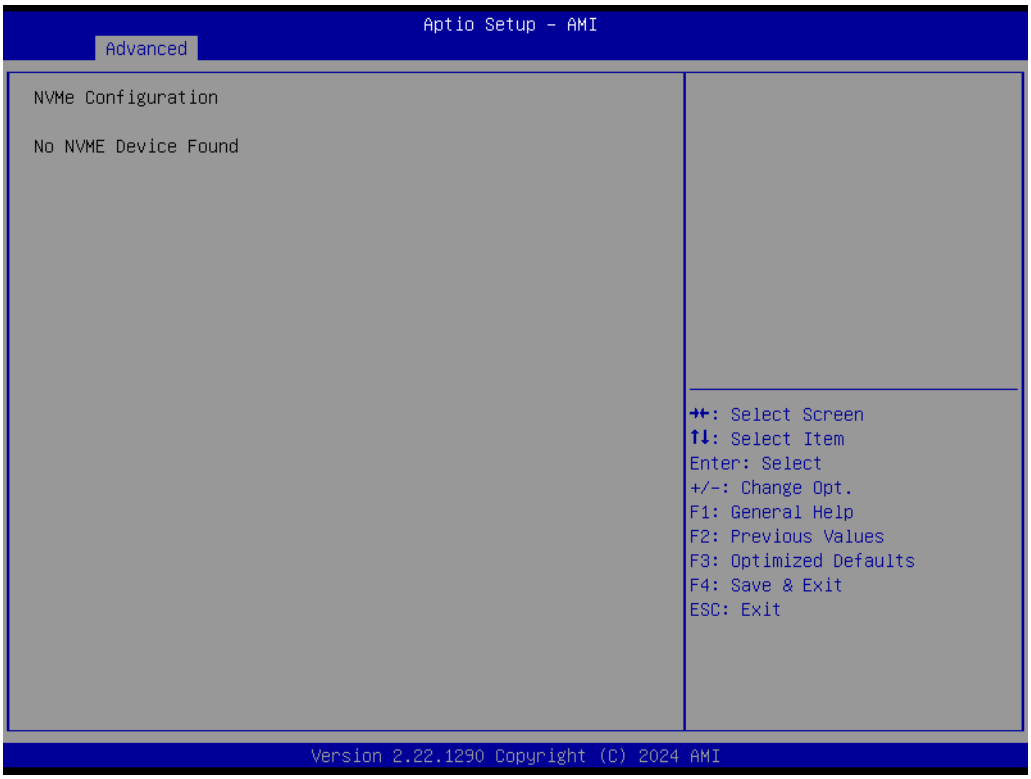




- **CSM Support**
  Enable/Disable CSM Support.

3.2.2.14 NVMe Configuration



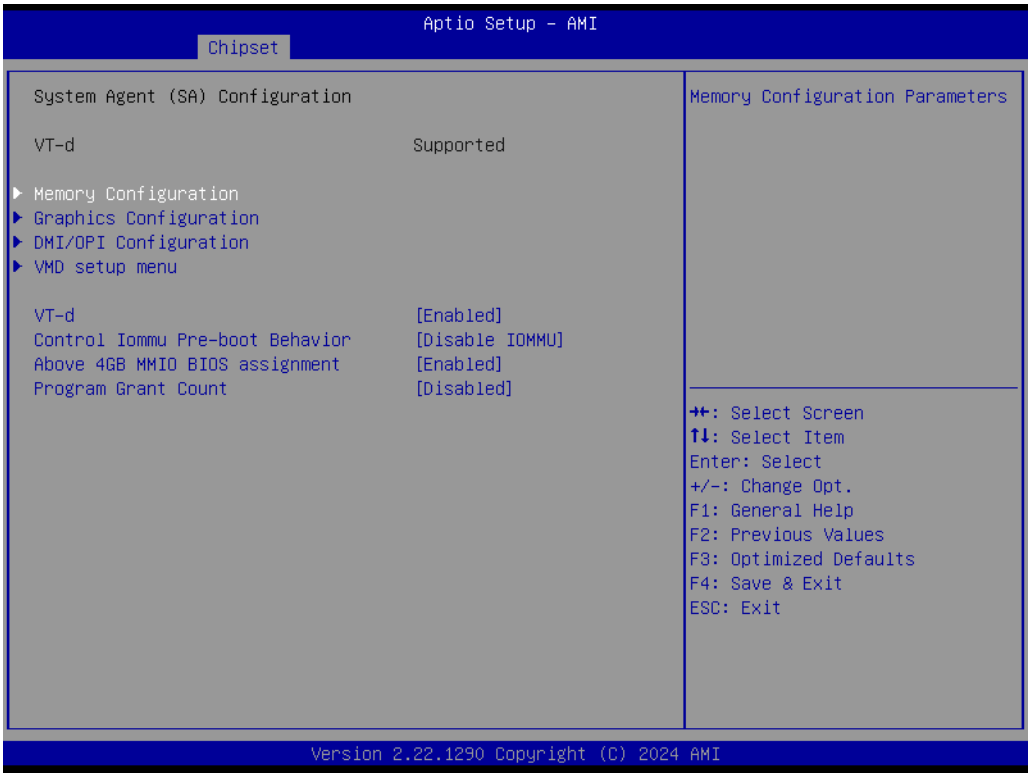


3.2.3 Chipset Configuration

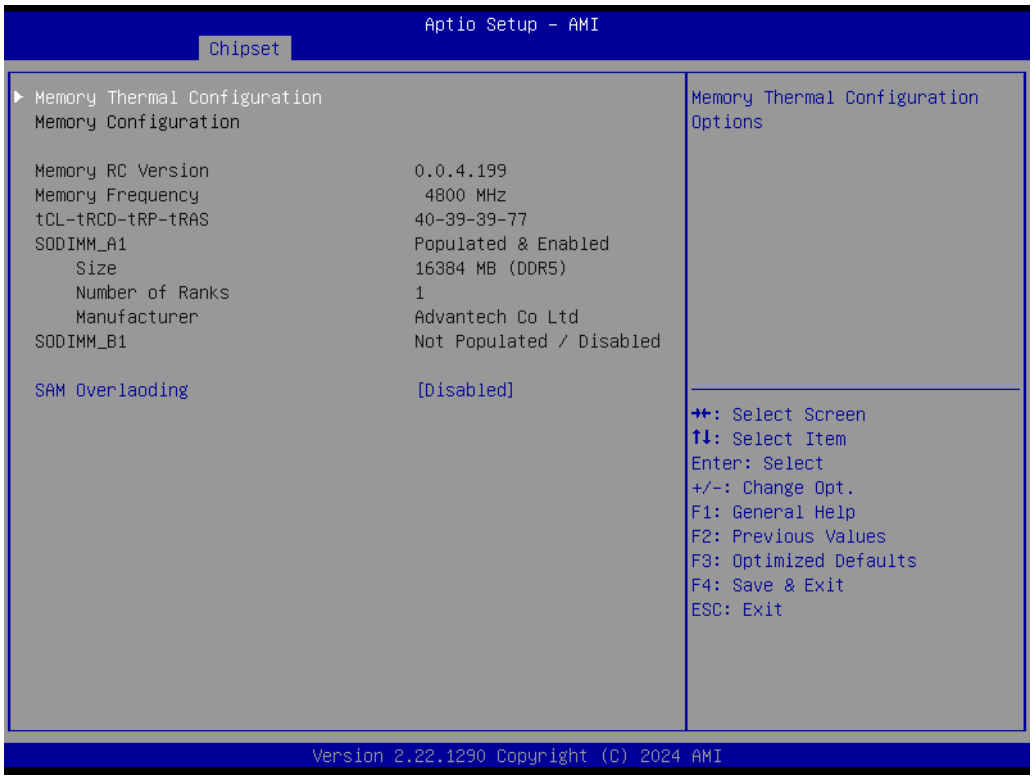
Select the Chipset tab from the AFE-R770 setup screen to enter the Chipset BIOS Setup screen. You can display a Chipset BIOS Setup option by highlighting it using the <Arrow> keys. All Plug-and-Play BIOS Setup options are described in this section. The Plug-and-Play BIOS Setup screen is shown below.

3.2.3.1 System Agent Configuration

Memory Configuration Options

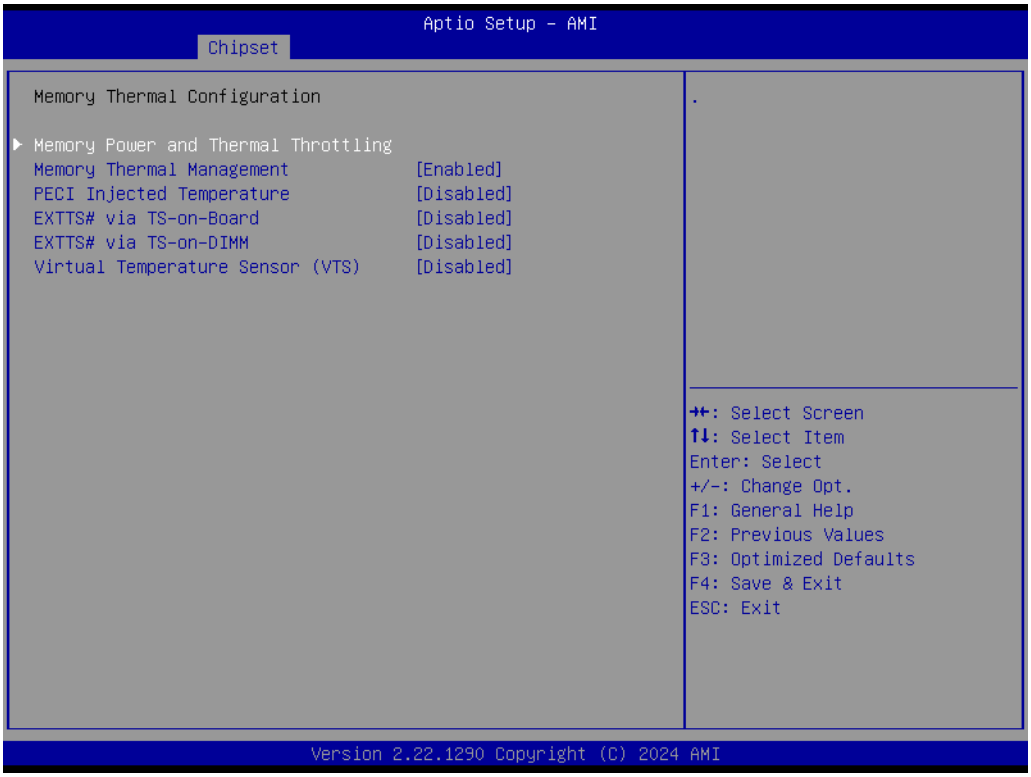


- **VT-d**
  VT-d capability.
- **Control Iommu Pre-boot Behavior**
- **Above 4GB MMIO BIOS assignment**
  Enable/Disable above 4GB Memory Mapped I/O BIOS assignment. This is enabled automatically when Aperture Size is set to 2048MB.
- **Program Grant Count**
  Enable/Disable Programming Of Grant Count.



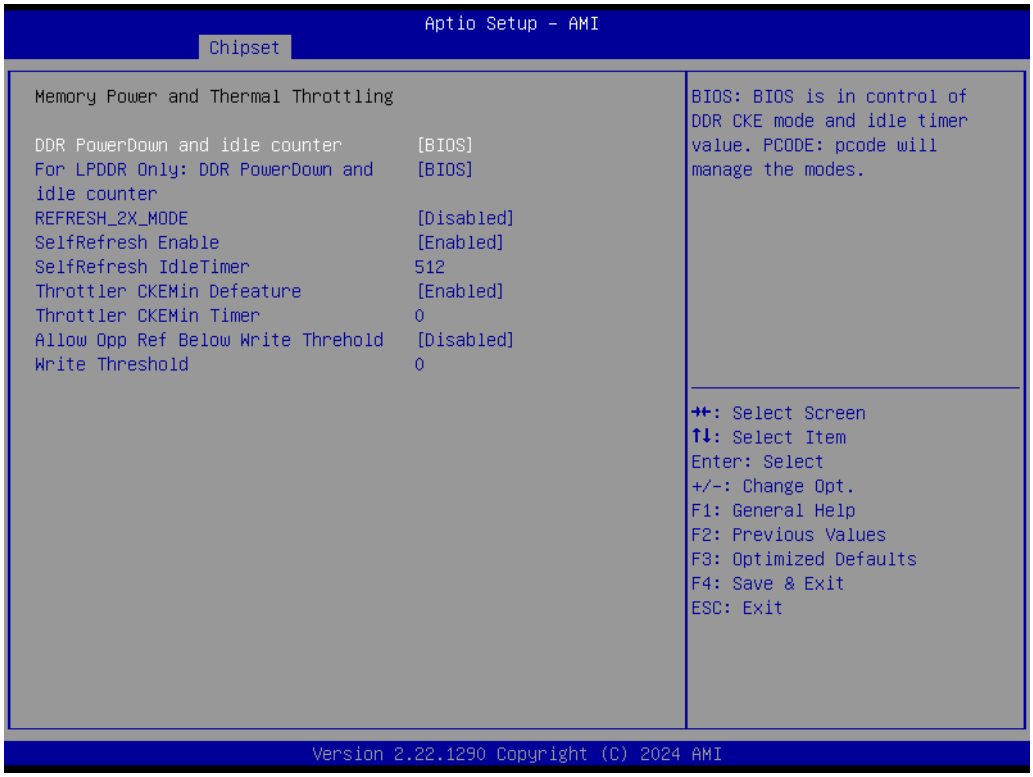
– **SAM Overloading**
Enable/Disable SAM Overloading.

Memory Thermal Configuration



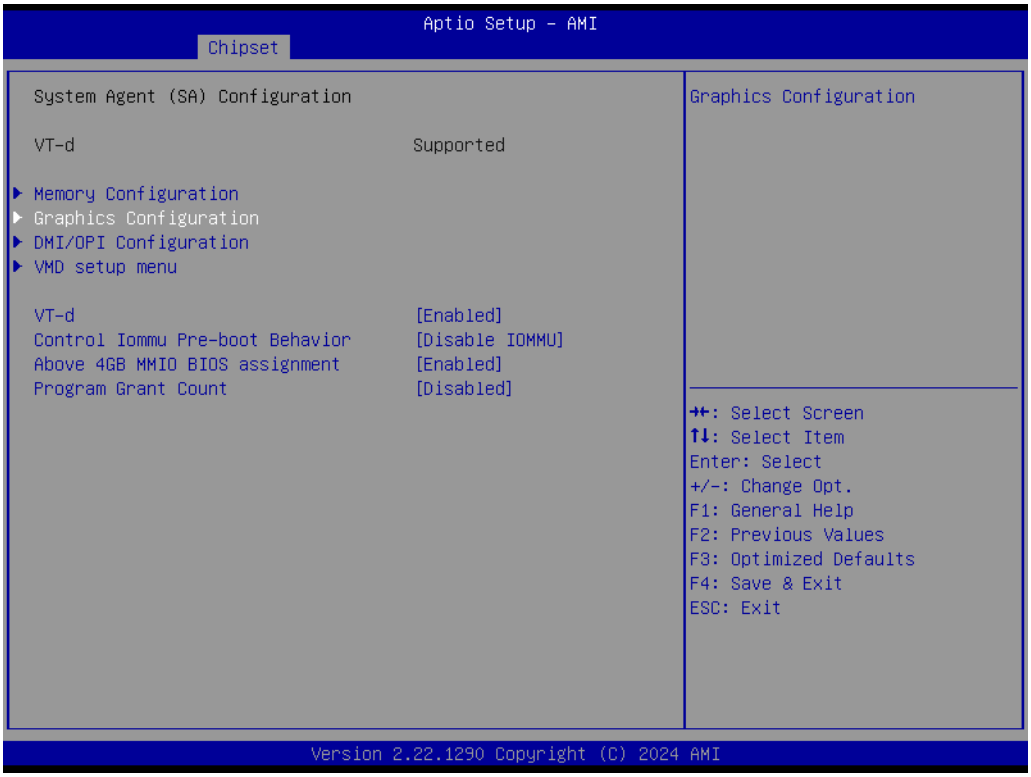
- **Memory Thermal Management**
  Enable/Disable Memory Thermal Management.
- **PECI Injected Temperature**
  Enable/Disable memory temperatures to be injected to the processor via PECI.
- **EXTTS# via TS-on-Board**
  Enable/Disable routing TS-on-Board's ALERT# and THERM# to EXTTS# pins on the PCH.
- **EXTTS# via TS-on-DIMM**
  Enable/Disable routing TS-on-DIMM's ALERT# to EXTTS# pin on the PCH.
- **Virtual Temperature Sensor (VTS)**
  Enable/Disable Virtual Temperature Sensor (VTS).

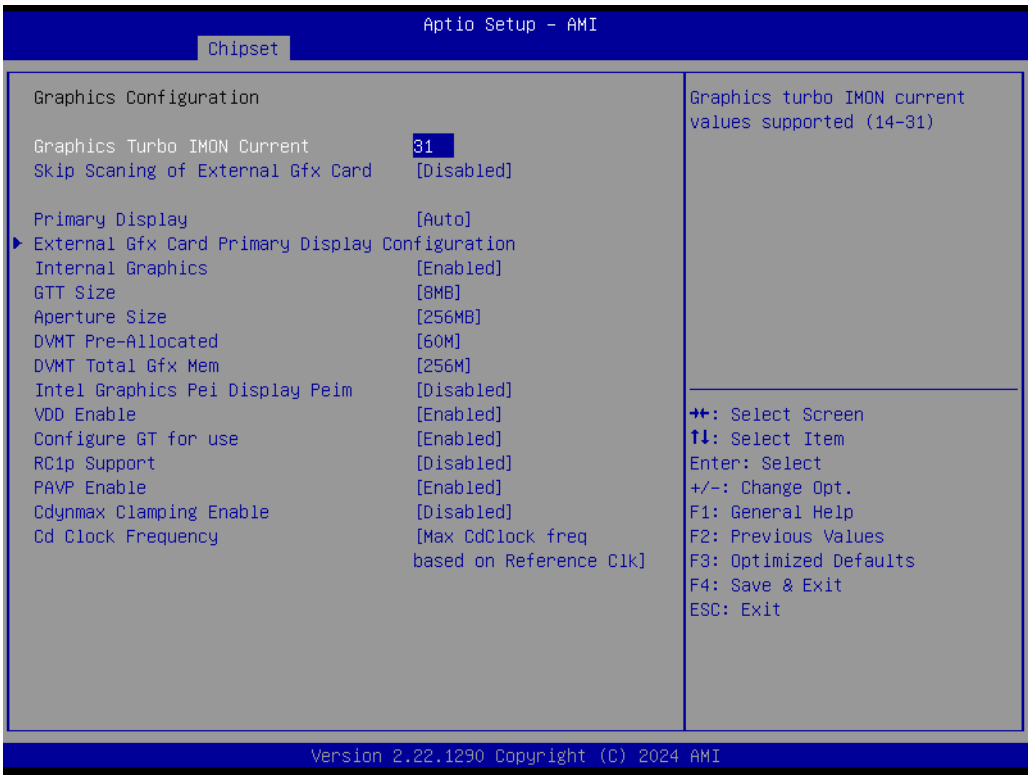
Memory Power and Thermal Throttling



- **DDR PowerDown and idle counter**
  BIOS: BIOS is in control of DDR CKE mode and idle timer value. PCODE: pcode will manage the modes.
- **For LPDDR only: DDR PowerDown and idle counter**
  For LPDDR Only: BIOS: BIOS is in control of DDR CKE mode and idle timer value. PCODE: pcode will manage the modes.
- **REFRESH_2X_MODE**
  0- Disabled 1-iMC enables 2xRef when Warm and Hot 2- iMC enables 2xRef when Hot.
- **SelfRefresh Enable**
  Enable, Disable(Enable= Def)
- **SelfRefresh IdleTimer**
  Range [64K-1;512]in DLCK800s, (512= Def)
- **Throttler CKEMin Defeature**
  On, Off.
- **Throttler CKEMin Timer**
  Timer value for CKEMin, range[255;0]. Req'd min of SC_ROUND_T + BYTE_LENGTH (4).
- **Allow Opp Ref Below Write Threshold**
  Allow opportunistic refreshes while not exiting power down.
- **Write Threshold**
  Number of writes that can be accumulated while CKE is low before CKE is asserted.

Graphics Configuration

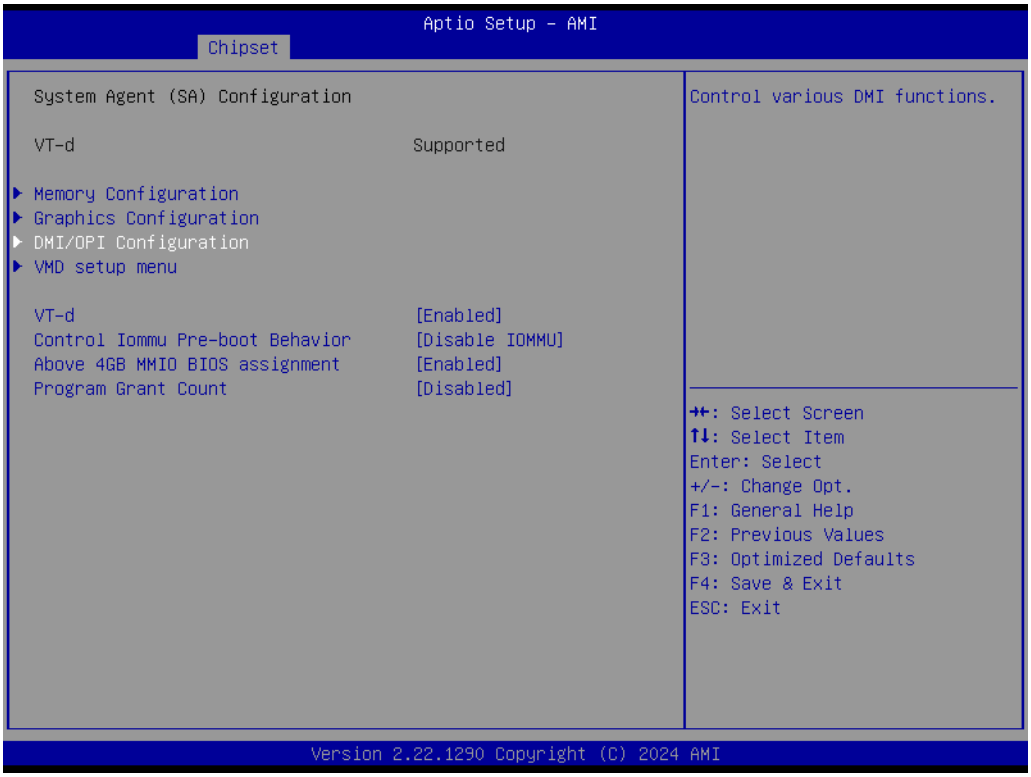




- **Graphics Turbo IMON current**
  Graphics turbo IMON current values supported (14-31).
- **Skip Scanning of External Gfx Card**
  If Enabled, it will not scan for an External Gfx Card on PEG and PCH PCIE Ports.

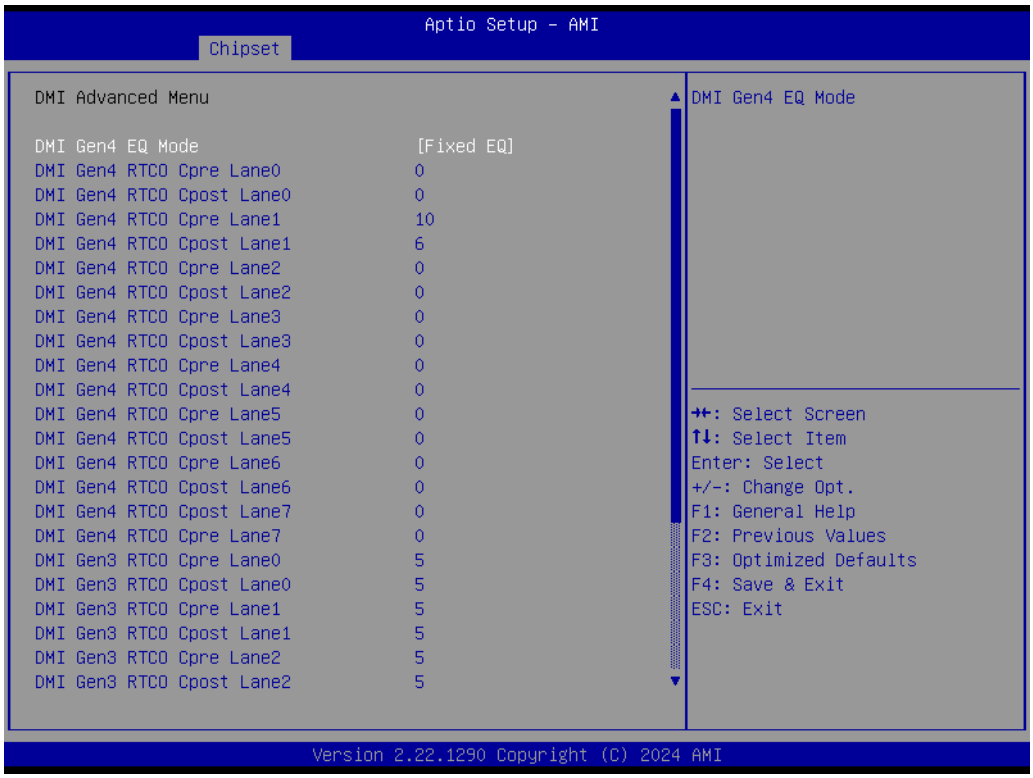
- **Primary Display**
  Select from IGFX/PEG/PCI which graphics device should be the Primary Display or select SG for Switchable Gfx.
- **External Gfx Card Primary Display Configuration**
  Select the card used on the platform.
- **Internal Graphics**
  Keep IGFX enabled based on the setup options.
- **GTT Size**
  Select the GTT Size.
- **Aperture Size**
  Select the Aperture Size.
- **PSMI SUPPORT**
  PSMI Enable/Disable.
  DVMT Pre-Allocated
  Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
- **Intel Graphics Pei Display Peim**
  Enable/Disable Pei (Early) Display.
- **VDD Enable**
  Enable/Disable forcing of VDD in the BIOS.
- **Configure GT for use**
  Enable/Disable GT configuration in BIOS.
- **RC1p Support**
  Enable/Disable RC1p support. If RC1p is enabled, send a RC1p frequency request to PMA based other conditions being met.
- **PAVP Enable**
  Enable/Disable PAVP.
- **Cdynmax Clamping Enable**
  Enable/Disable Cdynmax Clamping.
- **Cd Clock Frequency**
  Select the highest Cd Clock frequency supported by the platform.

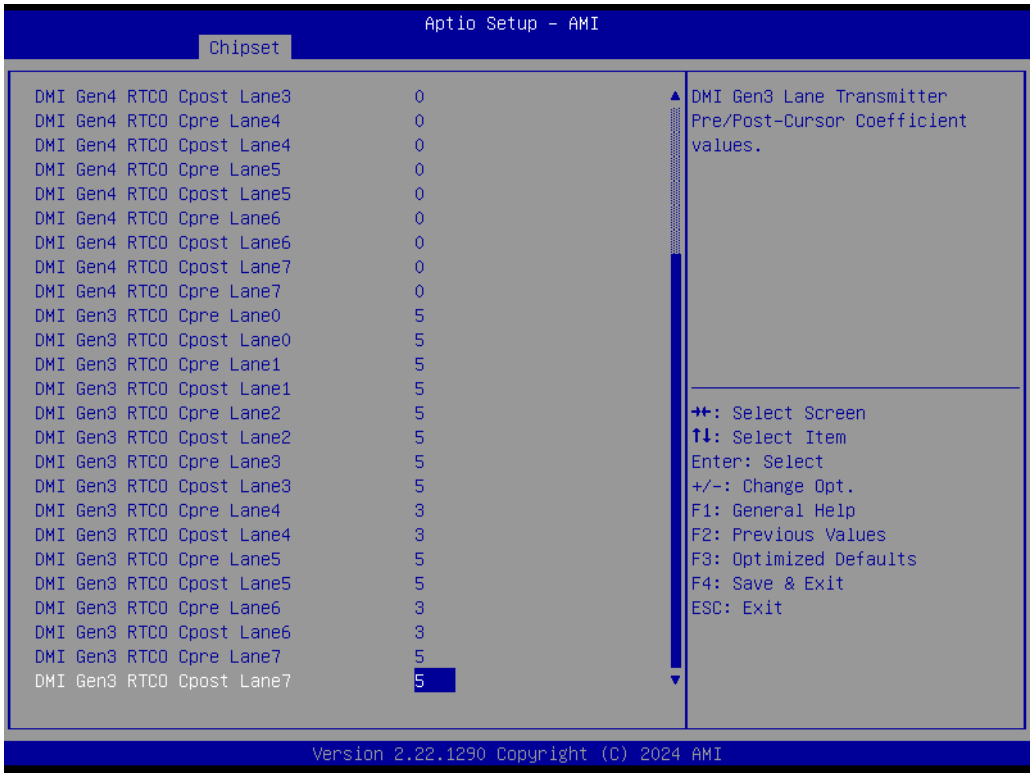
DMI/OPI Configuration



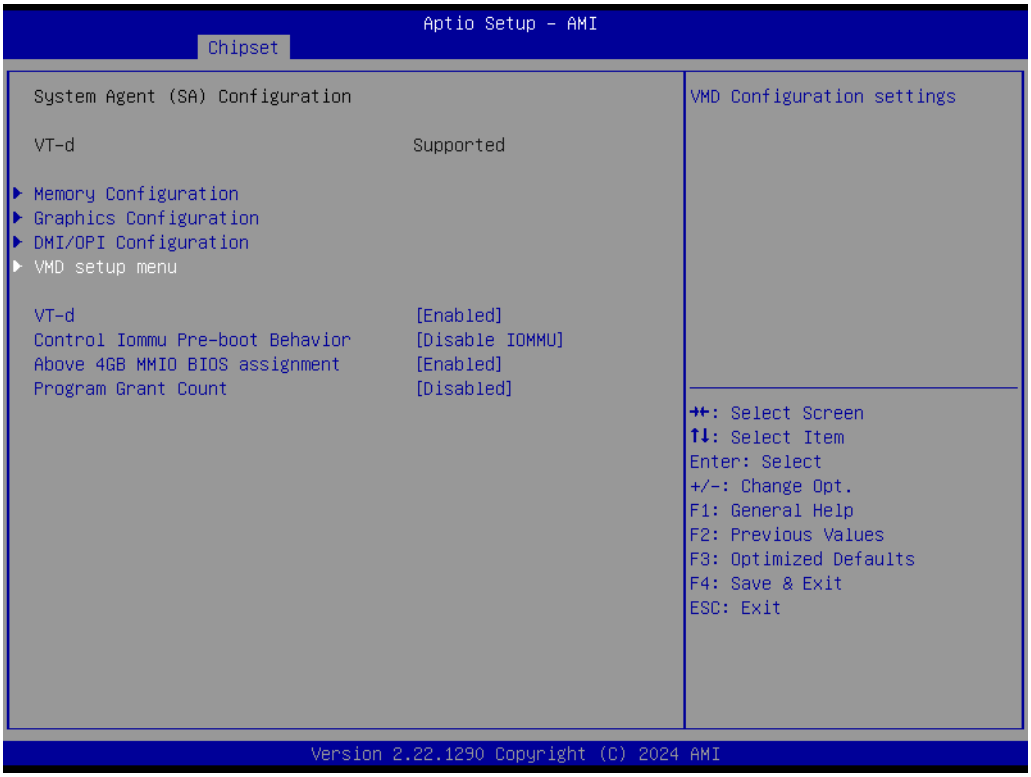
- **DMI Max Link Speed**
  Set DMI Speed Gen1/Gen2/Gen3.
- **CDR Relock for CPU DMI**
  Enable/Disable CDR Relock.

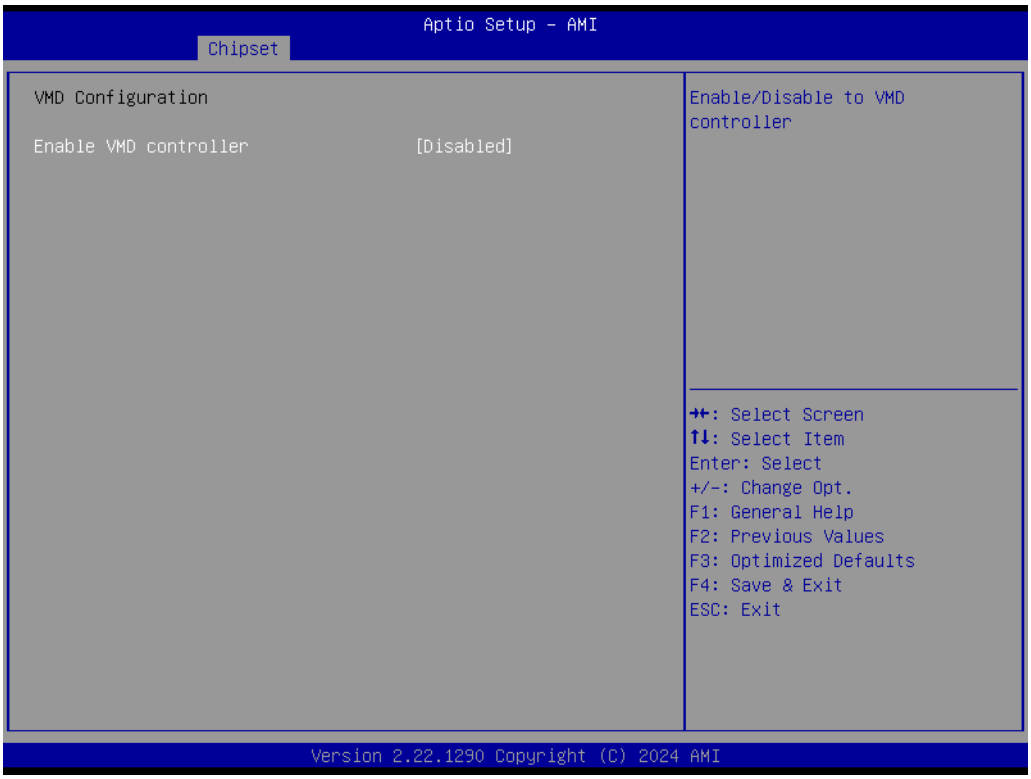
- **DMI ASPM**
  DMI ASPM Support.
- **DMI Gen3 L1 Latency**
  DMI Gen3 L1 Exit Latency.
- **New FOM for CPU DMI**
  Enable/Disable New FOM.





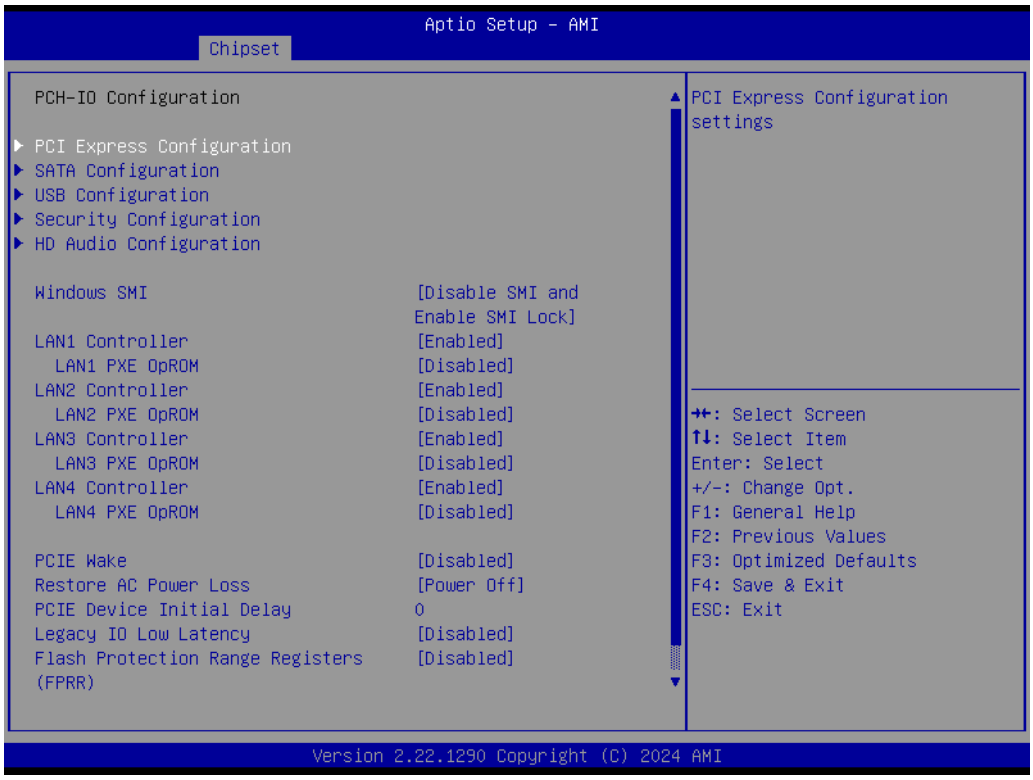
VMD Setup Menu

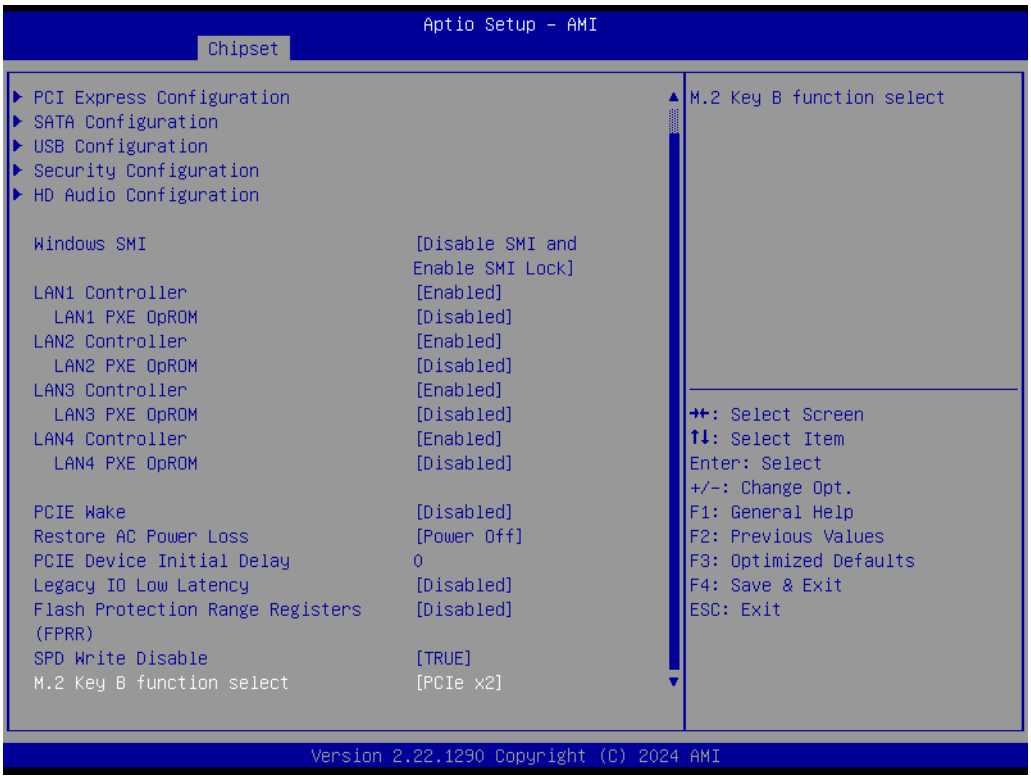




– **Enable VMD Controller**
Enable/Disable to VMD controller.

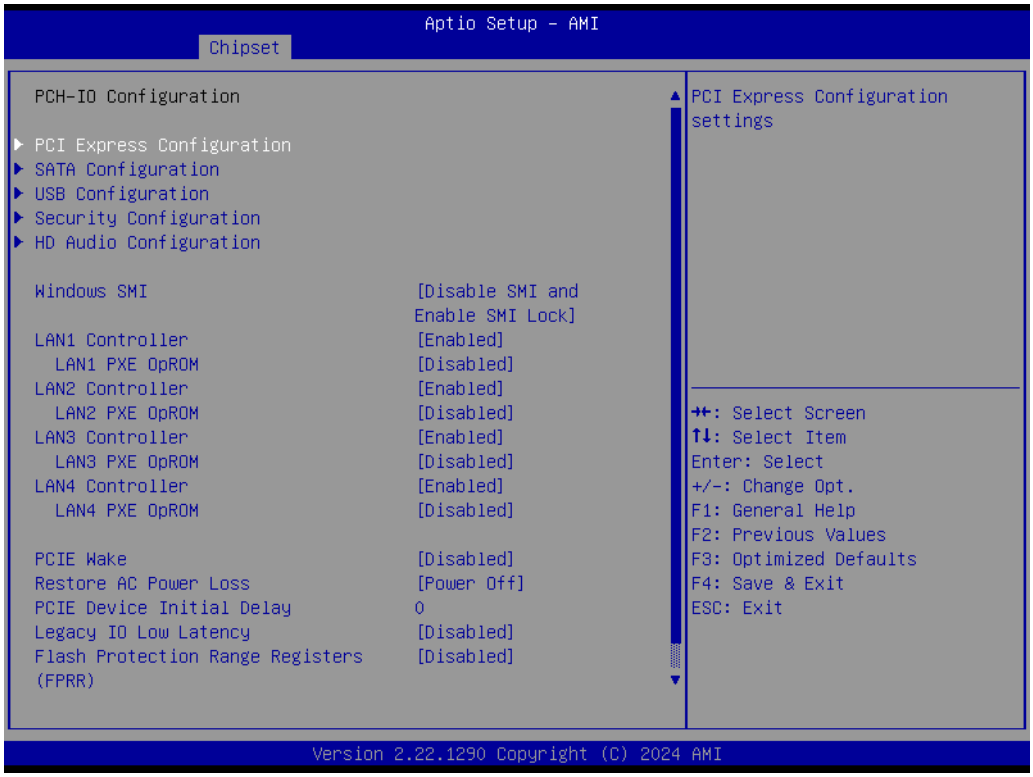
3.2.3.2 PCH-IO Configuration

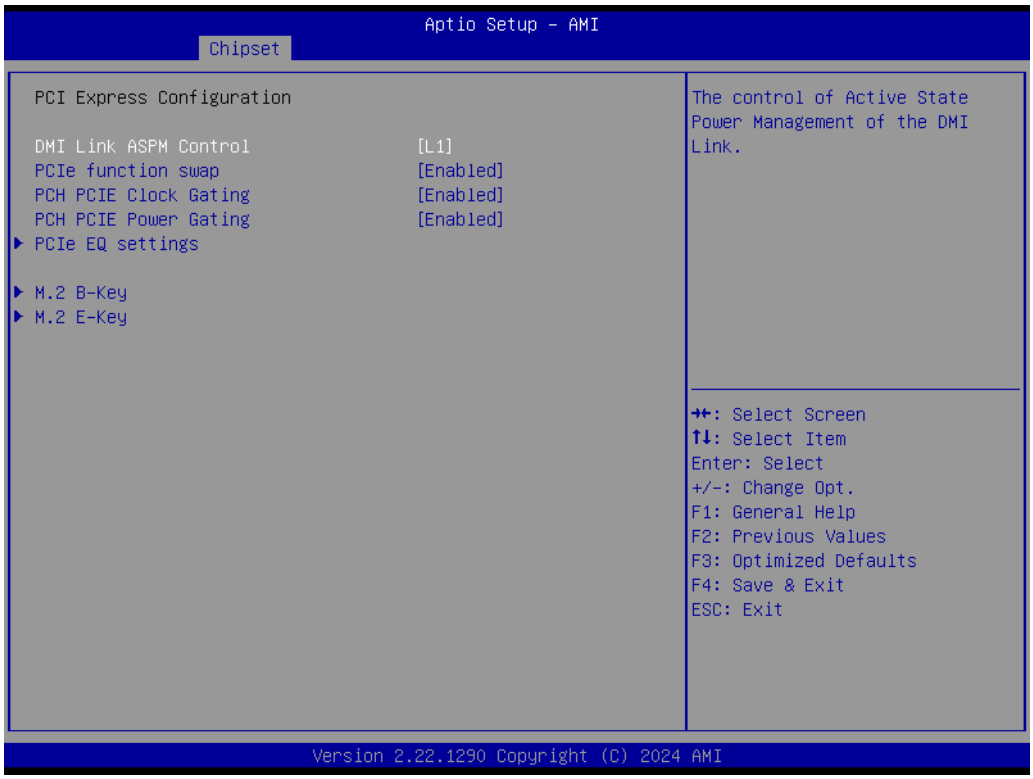




- **LAN1~4 Controller**
  Enable/Disable onboard NIC.
- **LAN1~4 PXE OpROM**
  Enable or disable boot option for LAN1 Controller.
- **Wake on LAN Enable**
  Enable/Disable integrated LAN to wake the system.
- **PCIE Wake**
  Enable or disable PCIE to wake the system from S5.
- **Restore AC Power Loss**
  Specify what state to go to when power is re-applied after a power failure (G3 state).
- **PCIE Device Initial Delay**
  The PCIE device initial delay 0~30 seconds.
- **Legacy IO Low Latency**
  Set to enable low latency of legacy IO. Some systems require lower IO latency irrespective of power. This is a tradeoff between power and IO latency.
- **Flash Protection Range Registers (FPRR)**
  Enable Flash Protection Range Registers.
- **SPD Write Disable**
  Enable/Disable setting SPD Write Disable. For security recommendations, SPD write disable bit must be set.
- **M.2 Key B function select**
  M.2 Key B function select.

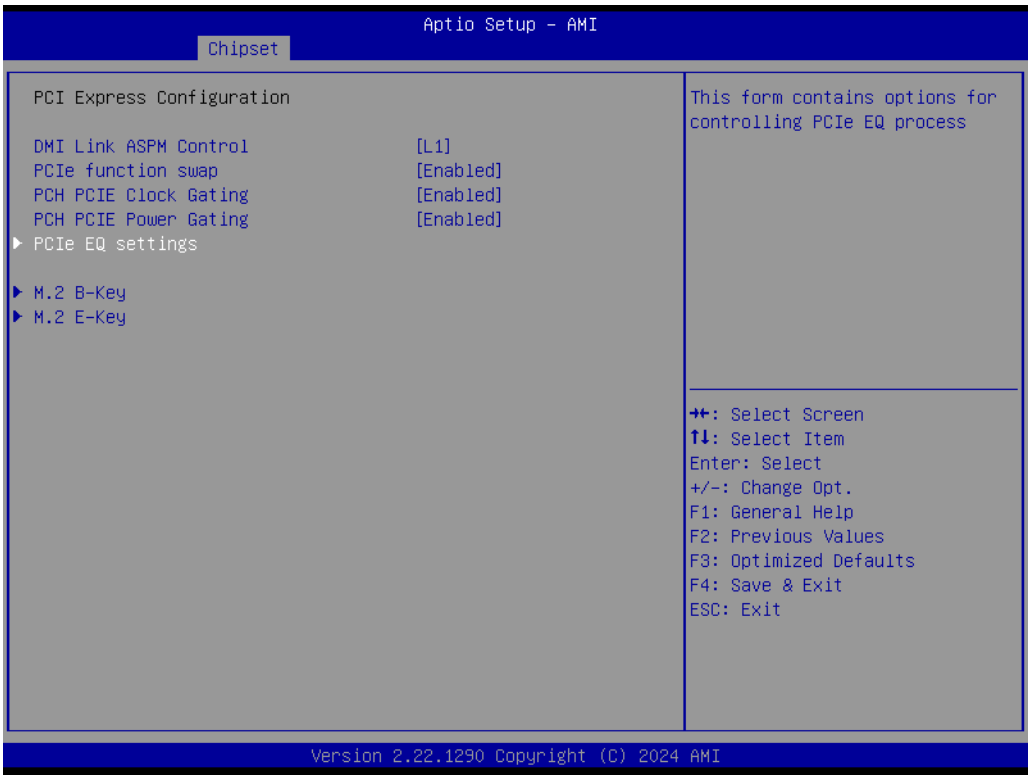
PCI Express Configuration

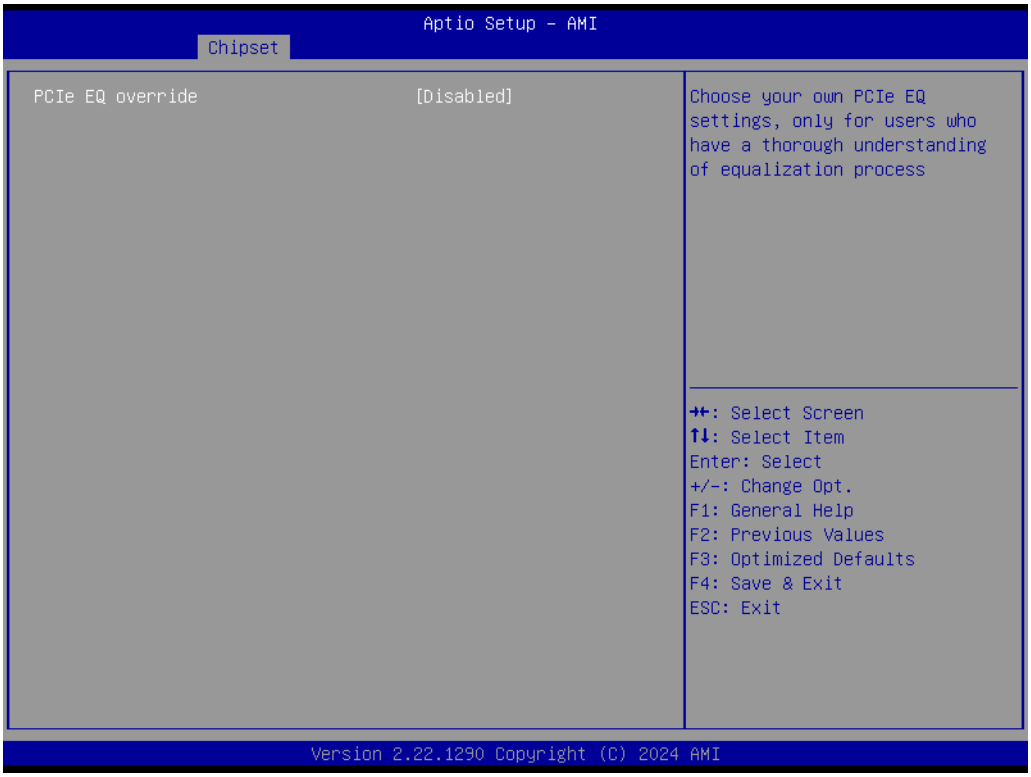




– **DMI Link ASPM Control**
The control of Active State Power Management of the DMI Link.

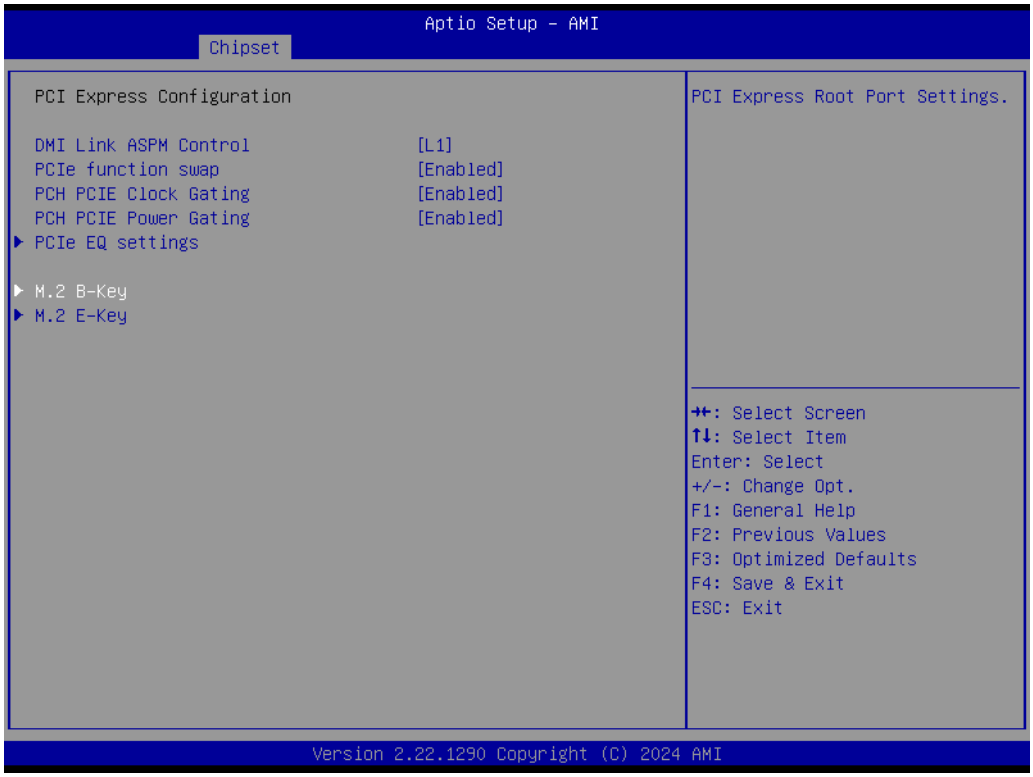
– **PCIe function swap**
Enable/Disable PCIe function swap.





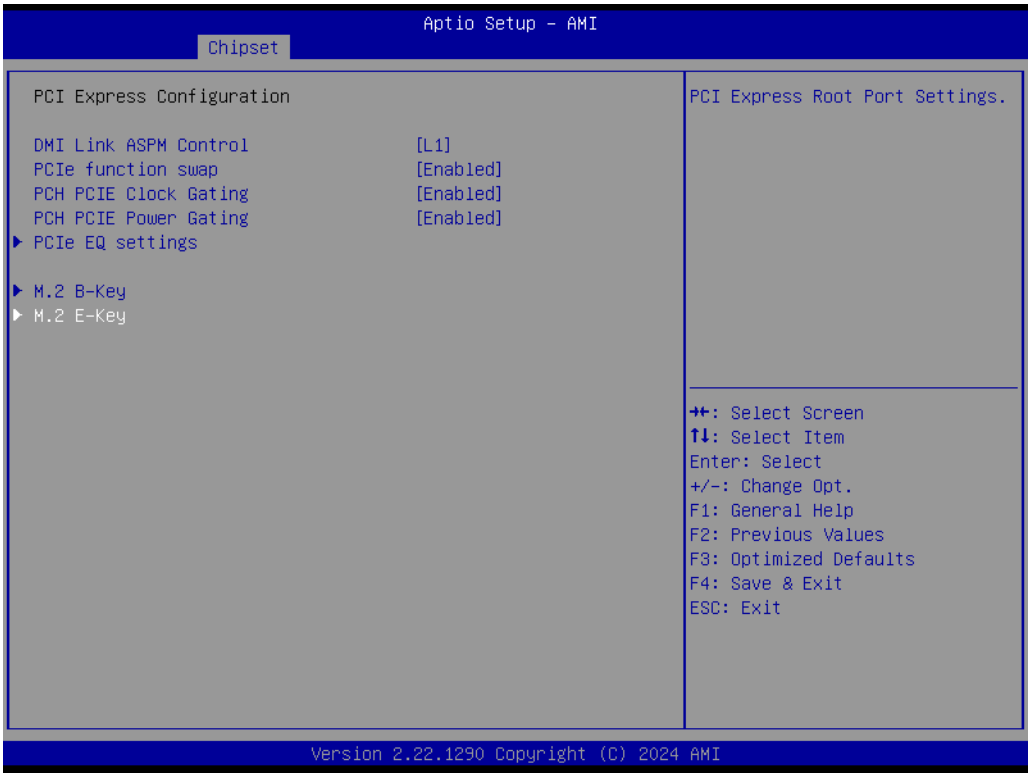
– **PCIe EQ override**
  Choose your own PCIe EQ settings, only for users who have a thorough understanding of the equalization process.

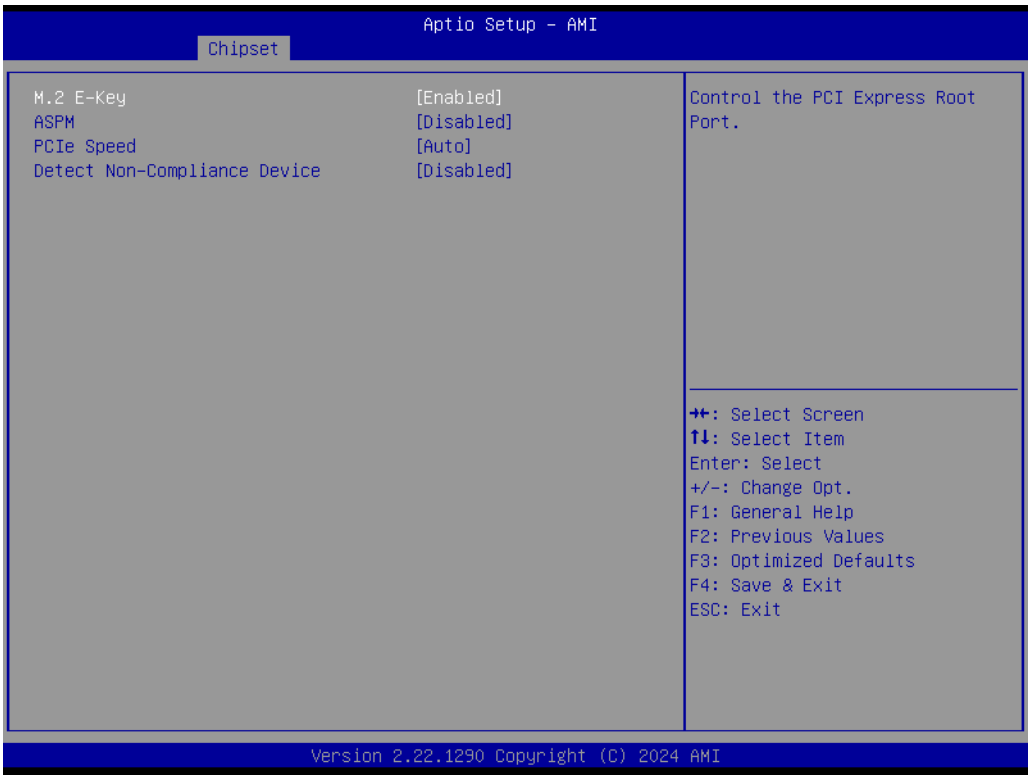
M.2 B-Key



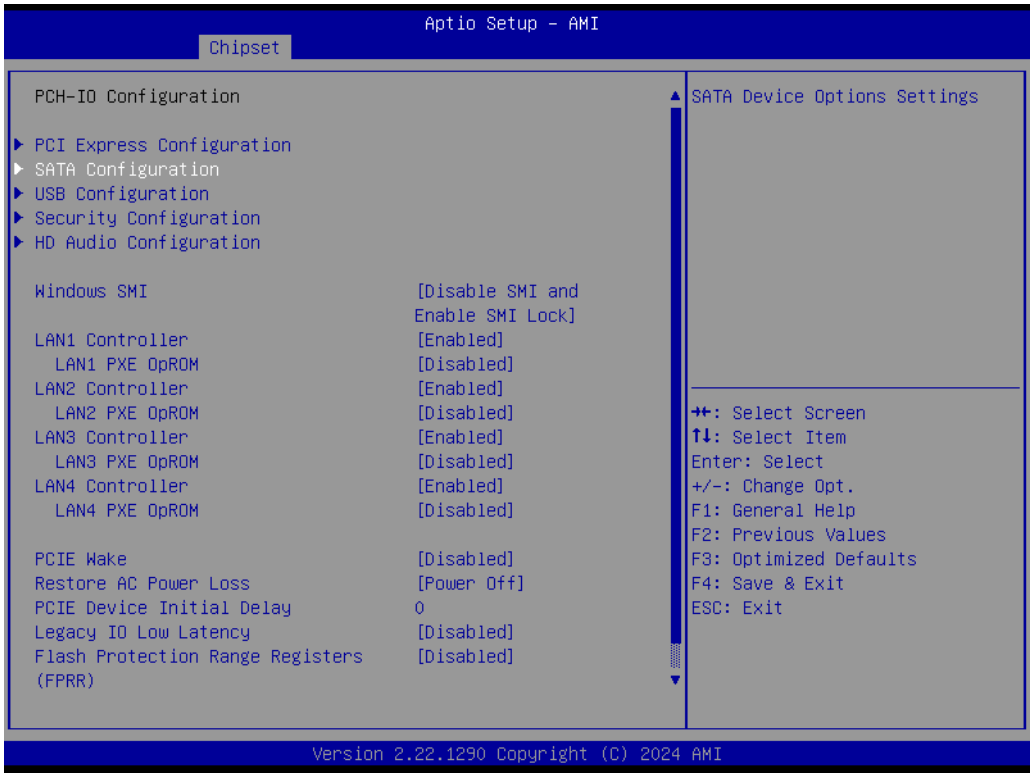
- **ASPM**
  PCI Express Active State Power Management settings.
- **PCIe Speed**
  Configure PCIe Speed.
- **Detect Non-Compliance Device**
  Detect Non-Compliance PCI Express Device. If enabled, it will take more time during POST.

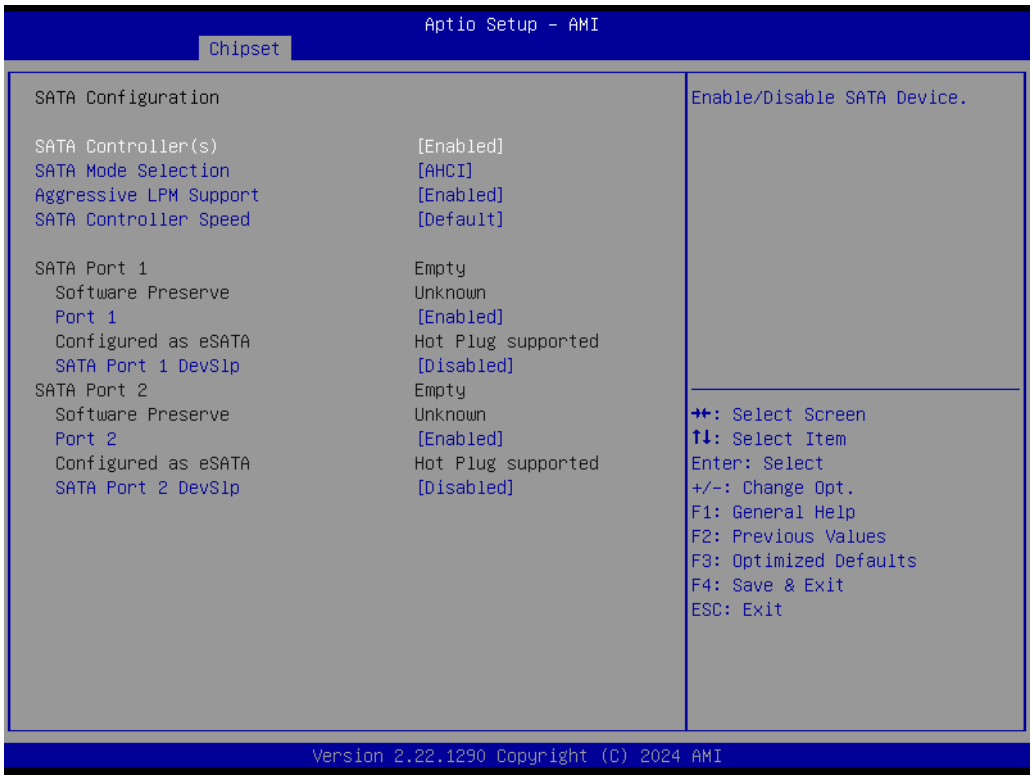
M.2 E-Key


Aptio Setup – AMI
Chipset
PCI Express Configuration
DMI Link ASPM Control [L1]
PCIe function swap [Enabled]
PCH PCIE Clock Gating [Enabled]
PCH PCIE Power Gating [Enabled]
PCIe EQ settings
M.2 B-Key
M.2 E-Key
PCI Express Root Port Settings.
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.22.1290 Copyright (C) 2024 AMI


Aptio Setup – AMI
Chipset
M.2 E-Key [Enabled]
ASPM [Disabled]
PCIe Speed [Auto]
Detect Non-Compliance Device [Disabled]
Control the PCI Express Root Port.
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.22.1290 Copyright (C) 2024 AMI

SATA Configuration



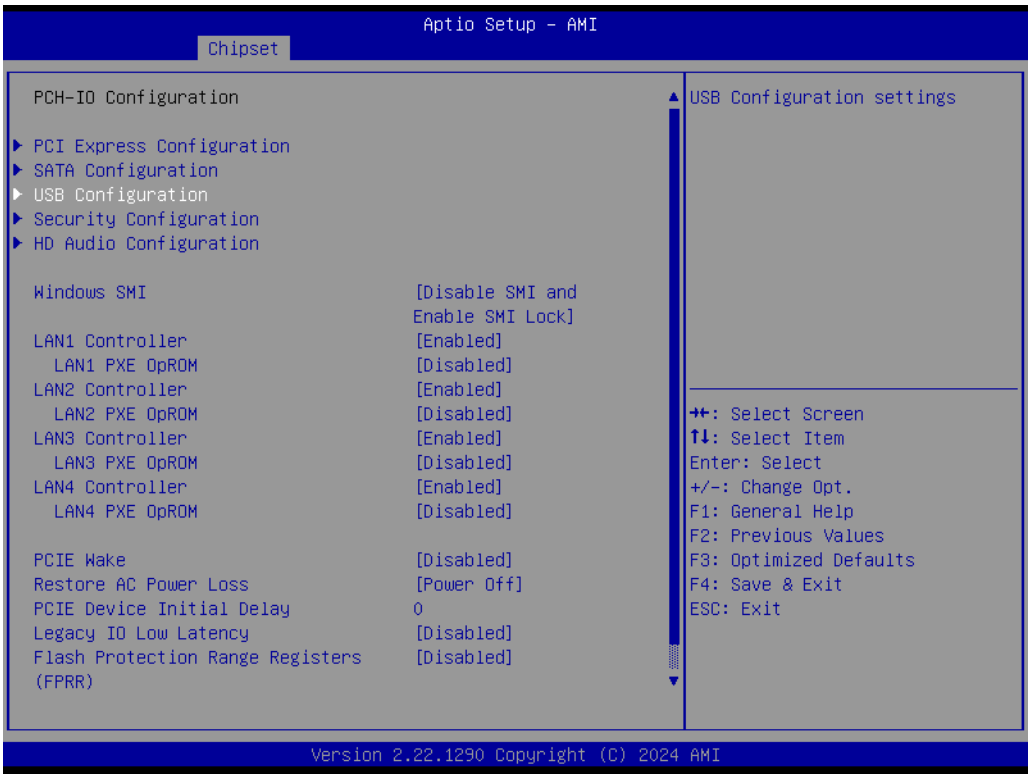


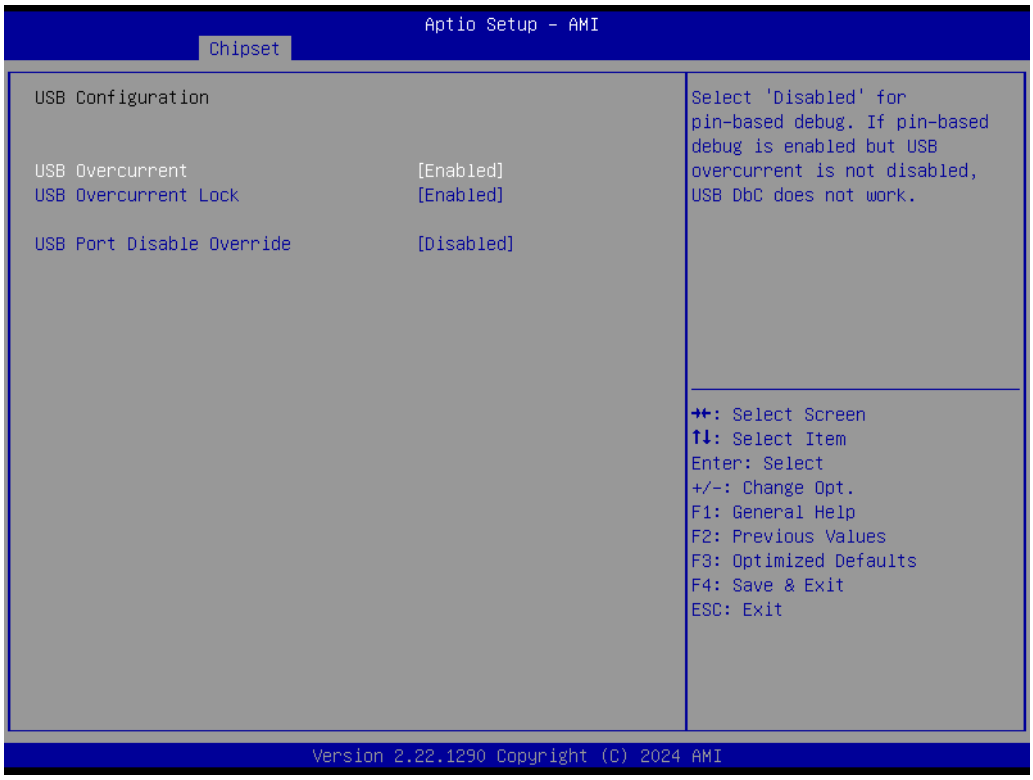
– **SATA Controller(s)**
Enable/Disable SATA Device.

– **SATA Mode Selection**
Determines how SATA controller(s) operate.

- **Aggressive LPM Support**
  Enable PCH to aggressively enter link power state.
- **SATA Controller Speed**
  Indicates the maximum speed the SATA controller can support.
- **SATA Port 1~2**
  Enable or Disable SATA Port.
- **SATA Port 1 DevSlp**
  Enable/Disable SATA Port 1 DevSlp. For DevSlp to work, both the hard drive and SATA port need to support the DevSlp function; otherwise, an unexpected behavior might occur. Please check the board design before enabling it.

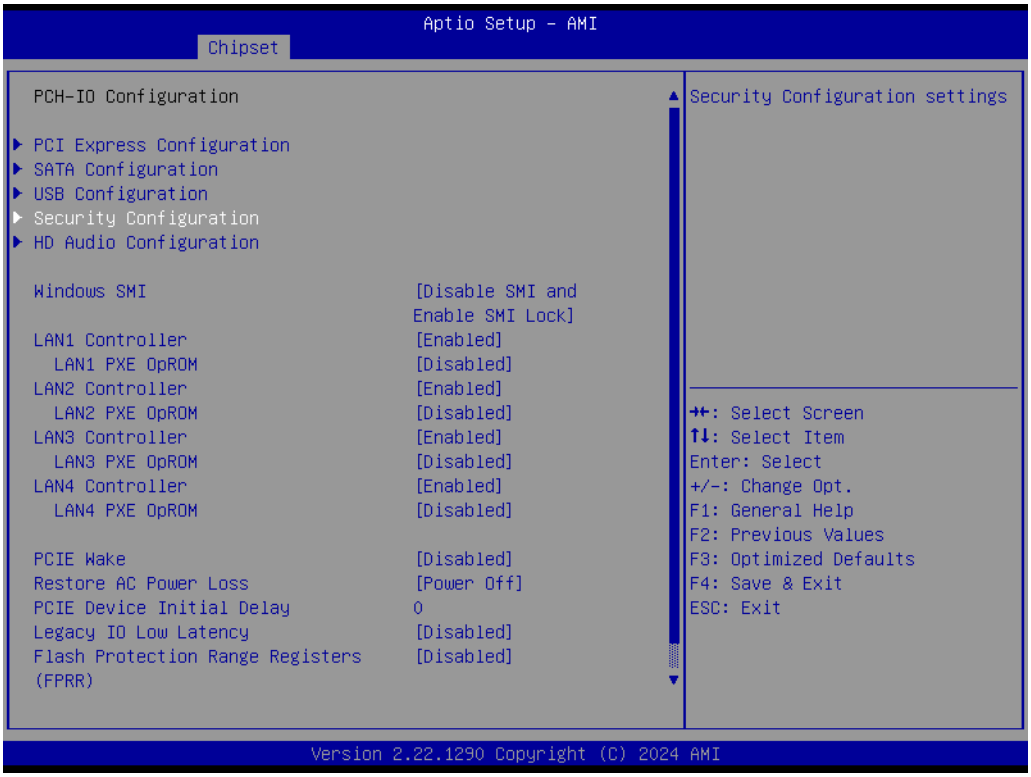
USB Configuration

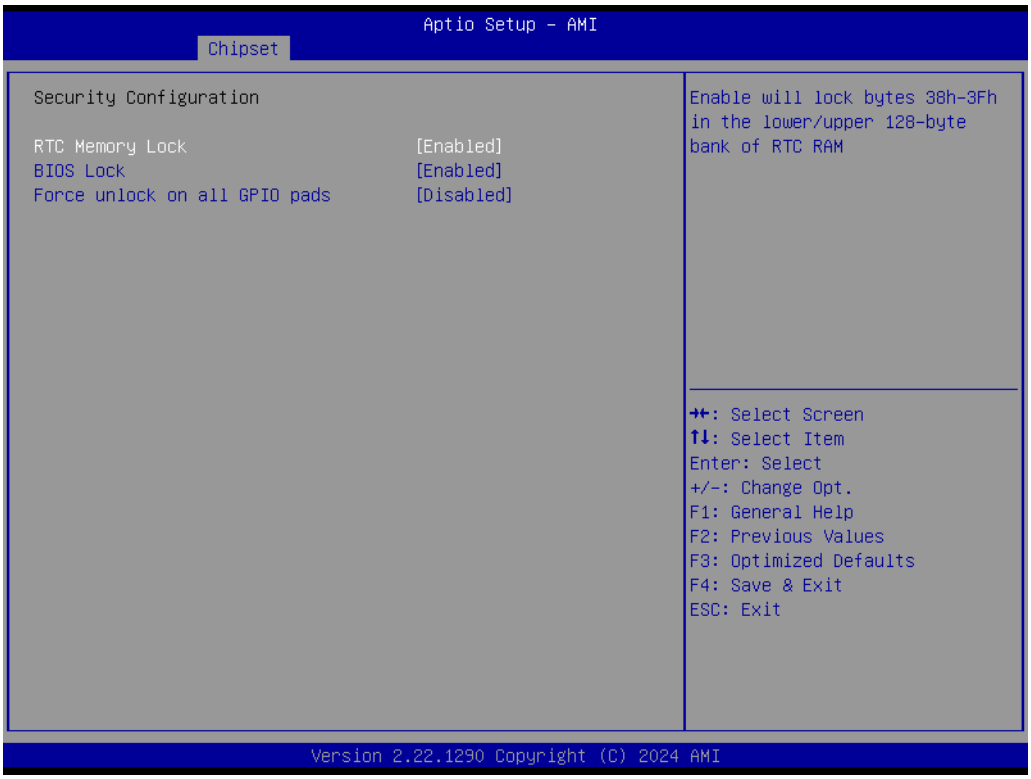




– **USB Overcurrent**
  Select 'Disabled' for pin-based debug. If pin-based debug is enabled but USB overcurrent is not disabled, USB DbC will not work.
– **USB Overcurrent Lock**
  Select 'Enabled' if Overcurrent functionality is used. Enabling this will make the xHCI controller consume the Overcurrent mapping data.
– **USB Port Disable Override**
  Selectively Enable/Disable the corresponding USB port from reporting a Device Connection to the controller.

Security Configuration

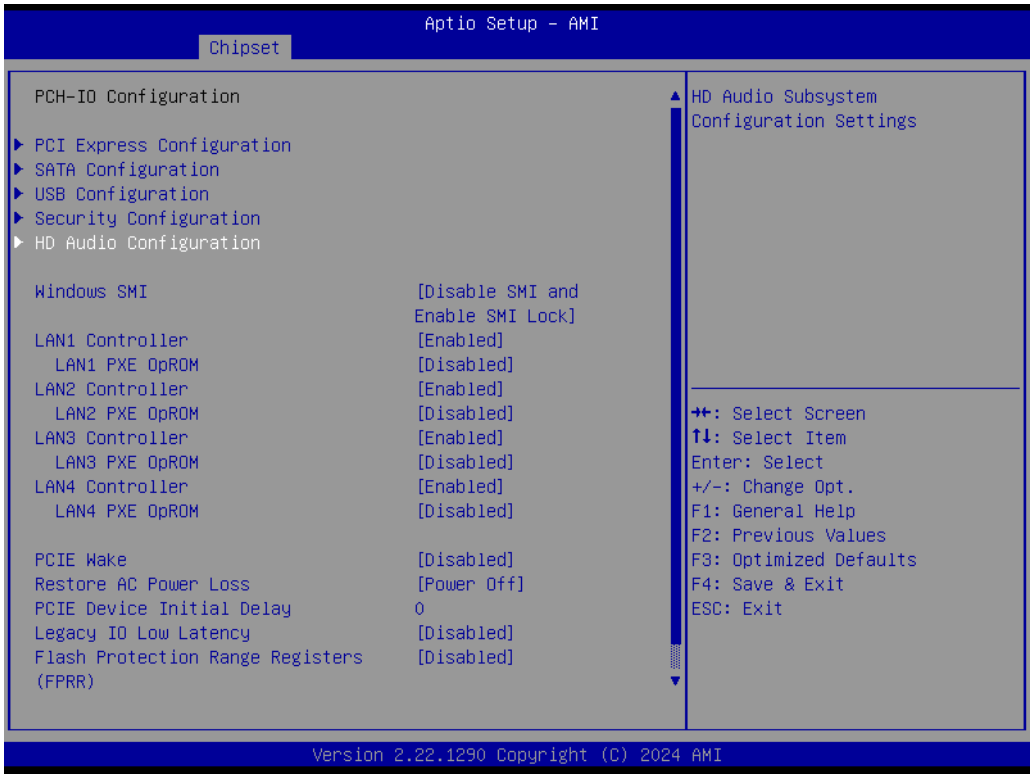




– **RTC Memory Lock**
  Enable will lock bytes 38h-3Fh in the lower/upper 128-byte bank of RTC RAM.

– **BIOS Lock**
  Enable/Disable the PCH BIOS Lock Enable feature. It is required to be enabled to ensure SMM protection of flash.
– **Force unlock on all GPIO pads**
  If enabled, the BIOS will force all GPIO pads to be in the unlocked state.

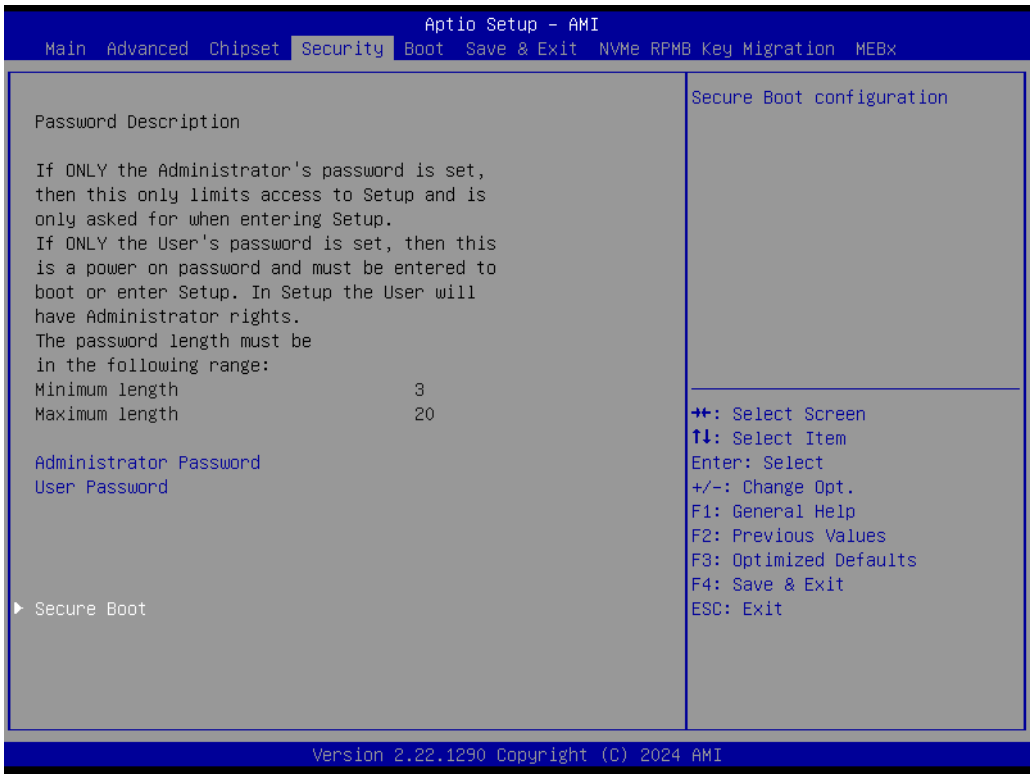
HD Audio Configuration

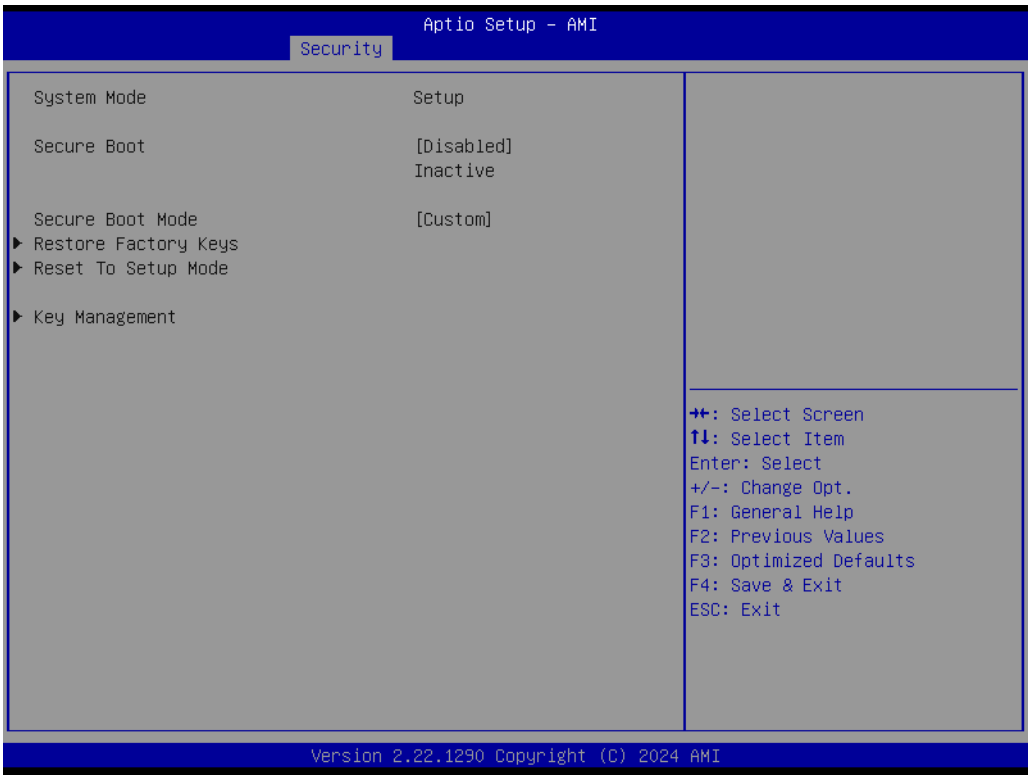


– **HD Audio**
  Control Detection of the HD-Audio device.

3.2.4 Security

- **Administrator Password**
  Set Administrator Password.
- **User Password**
  Set User Password.





- **Secure Boot**
  The Secure Boot feature is Active if Secure Boot is Enabled, Platform Key (PK) is enrolled, and the System is in User mode. The mode change requires a platform reset.
- **Secure Boot Mode**
  Secure Boot mode options: Standard or Custom.

3.2.5 Boot

- **Setup Prompt Timeout**
  Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.
- **Bootup NumLock State**
  Select the keyboard NumLock state.
- **Quiet Boot**
  Enables or disables the Quiet Boot option.

3.2.6 Save & Exit

- **Save Changes and Exit**
  Exit system setup after saving the changes.
- **Discard Changes and Exit**
  Exit system setup without saving any changes.
- **Save Changes and Reset**
  Reset the system after saving the changes.
- **Discard Changes and Reset**
  Reset system setup without saving any changes.
- **Save Changes**
  Save changes done so far to any of the setup options.
- **Discard Changes**
  Discard changes done so far to any of the setup options
- **Restore Defaults**
  Restore/Load default values for all the setup options.
- **Save as User Defaults**
  Save the changes done so far as user defaults.
- **Restore User Defaults**
  Restore the user defaults to all the setup options.

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