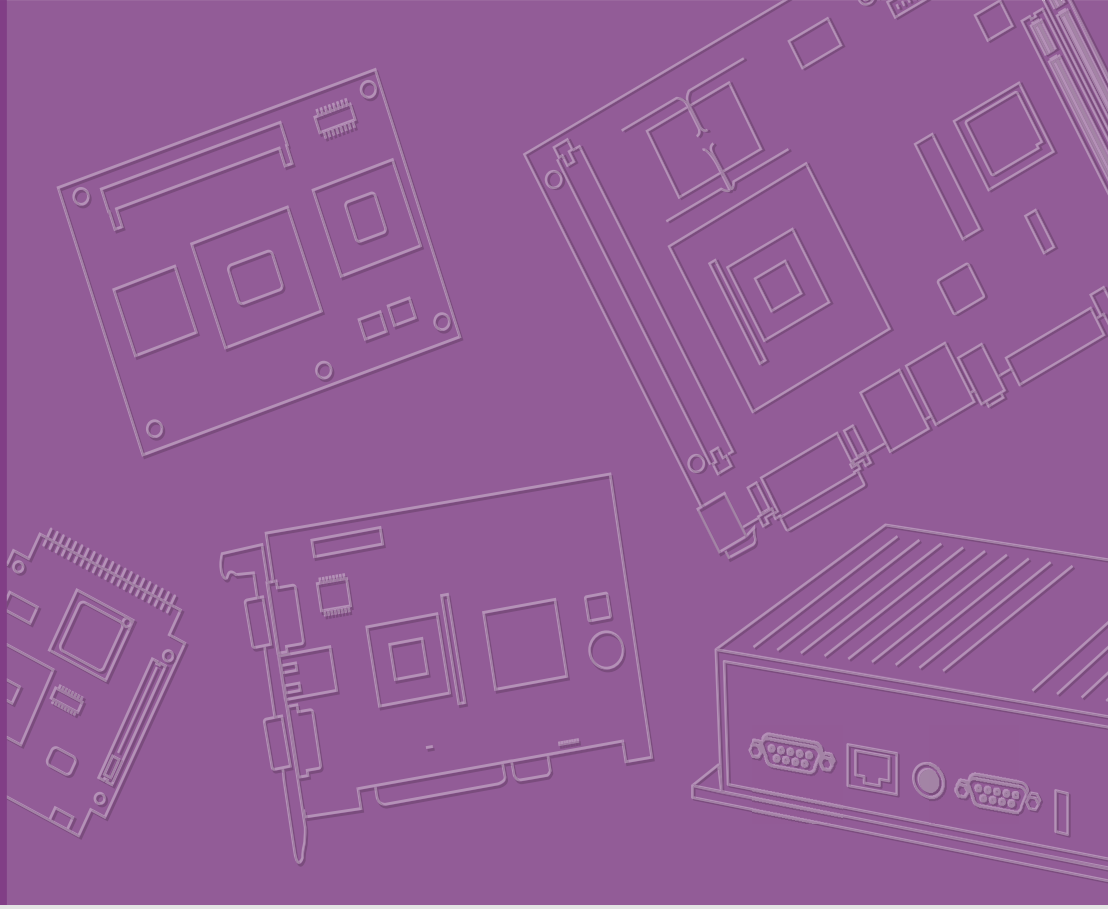

User Manual

ARK-1220

Fanless Embedded Box PC

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 is included on the accompanying CD. 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 customer service, 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 all 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 are billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.

If you believe that your product is 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, 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 residential installations. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, 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, users are 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 your dealer or an experienced radio/TV technician for help

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.*

Note! *Notes provide additional optional information.*

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all AC outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or sprayed detergent.
4. For pluggable equipment, the power outlet should be 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 openings on the enclosure are for air convection and protect the equipment from overheating. Do not cover the openings.
8. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
9. Position the power cord away from high-traffic areas. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect the equipment from the power source to avoid damage from transient overvoltage.
12. Never pour liquid into an opening as this can cause fire or electrical shock.
13. Never open the equipment. For safety reasons, only qualified service personnel should open the equipment.
14. If one of the following occurs, have the equipment checked by service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated into 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.
15. 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 cause damage. The equipment should be stored in a controlled environment.
16. Any unverified component may cause unexpected damage. To ensure correct installation, always use the components (e.g., screws) provided in the accessory box.
17. CAUTION: The equipment is equipped with a battery-powered real-time clock circuit. There is a risk of explosion if a battery is incorrectly replaced. Replace only with same or equivalent type as recommended by the manufacturer. Discard all used batteries according to the manufacturer's instructions.
18. 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.
19. In accordance with IEC 704-1:1982 specifications, the sound pressure level at the operator's position does not exceed 70 dB (A).
20. The equipment should only be installed in a restricted access area.
21. DISCLAIMER: These instructions are provided according to IEC 704-1 specifications. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

22. This model is intended to be supplied by an UL-certified power supply (Adapter: FSP/ FSP060-DAAN2) suitable for use at TMA 60 °C min., and the output is rated 24 V_{DC}, 2.5A min., ES1. If you need further assistance, contact Advantech for additional information.

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. Les ouvertures sur le boîtier sont destinées à la convection d'air, protégeant. ainsi l'équipement de la surchauffe. NE COUVREZ PAS LES OUVERTURES.
8. Assurez-vous de la tension de la source d'alimentation lorsque vous connectez l'équipement à la prise secteur.
9. Placez le cordon d'alimentation de sorte que personne ne puisse marcher dessus. Ne placez rien sur le cordon d'alimentation.
10. Tous les avertissements et mises en garde sur l'équipement doivent être notés.
11. Si l'appareil n'est pas utilisé pendant une longue période, débranchez-le du secteur pour ne pas être endommagé par une surtension transitoire.
12. Ne jamais verser de liquide dans les ouvertures de ventilation; Cela pourrait provoquer un incendie ou un choc électrique.
13. N'ouvrez jamais l'équipement. Pour des raisons de sécurité, seul le personnel de maintenance qualifié doit ouvrir l'équipement.
14. 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
15. 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.
16. 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.
17. 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.

18. 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.
19. Niveau de pression acoustique au poste de l'opérateur selon la norme CEI 704-1: 1982 n'est pas supérieur à 70 dB (A).
20. L'équipement ne doit être installé que dans une zone d'accès restreint.
21. 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.
22. Ce modèle est destiné à être alimenté par une alimentation certifiée UL (adaptateur: FSP / FSP060-DAAN2), adaptée à une utilisation à 60 degrés Celsius. et la sortie est nominale 24Vcc, 2,5A min., ES1, si vous avez besoin d'une assistance supplémentaire, veuillez contacter Advantech pour plus.

Packing List

Before installation, check that the following items were included with the product:

- 1 x ARK-1220 unit
- 1 x 3-pin phoenix connector to DC-in
- 1 x DIN-rail bracket
- 1 x Registration and 2-year warranty card
- 1 x China RoHS
- 1 x Utility CD
- 1 x Simplified Chinese user manual

Ordering Information

Model Number	Description
ARK-1220L-S6A1E	Intel E3940 QC 1.6GHz w/ 2 x HDMI and 2 x GbE
ARK-11-S1A1E*	Intel N3350 DC 1.1GHz w/ 2 x HDMI, 2 x GbE, and adaptor

* Available for purchase online only

Optional Accessories

Part Number	Description
96PSA-A60W24T2	AC to DC adaptor, 24V/2.5A 60W
1702002600	Power cable 3-pin 183 cm, USA type
1702002605	Power cable 3-pin 183 cm, EU type
1702031801	Power cable 3-pin 183 cm, UK type
1700000237	Power cable 3-pin 183 cm, PSE type
AMK-W003	ARK-112X series wall mount kit
1700023855-01	1M lockable HDMI cable
1700023856-01	3M lockable HDMI cable
1700019967	GPIO cable, F cable 2*5P-2.0/D-SUB 9P(F) 15 cm

Contents

Chapter 1 General Introduction 1

1.1 Introduction 2
1.2 Product Features 2
1.2.1 General 2
1.2.2 Display 3
1.2.3 Ethernet 3
1.3 Chipset 3
1.3.1 Functional Specifications 3
1.3.2 WISE-PaaS/DeviceOn 4
1.4 Mechanical Specifications 5
1.4.1 System Dimensions 5
Figure 1.1 ARK-1220 Mechanical Dimensions 5
1.4.2 Weight 5
1.5 Power Requirements 5
1.5.1 System Power 5
1.5.2 RTC Battery 5
1.6 Environmental Specifications 6
1.6.1 Operating Temperature 6
1.6.2 Relative Humidity 6
1.6.3 Storage Temperature 6
1.6.4 Vibration Tolerance 6
1.6.5 Shock Tolerance 6
1.6.6 Safety Certification 6
1.6.7 EMC Certification 6

Chapter 2 Hardware Installation 7

2.1 Introduction 8
2.2 Jumpers 8
2.2.1 Jumper Description 8
2.2.2 Jumper List 9
Table 2.1: Jumper Settings 9
2.2.3 Jumper Location 9
2.2.4 Jumper Settings 10
Table 2.2: J1: ATX/AT Mode 10
Table 2.3: J2: mPCIE/mSATA 10
Table 2.4: CN12: COM2 5V/12V Power 10
2.3 System I/O 11
2.4 External I/O 12
2.4.1 Power On/Off Button 12
Figure 2.1 Power On/Off Button 12
2.4.2 Power Input Connector 12
2.4.3 Ethernet Connector (LAN) 12
Figure 2.2 Ethernet Connector (LAN) 12
Table 2.5: Ethernet Connector (LAN) Pin Definition 12
2.4.4 USB 3.0 Connector 13
Figure 2.3 USB Connector 13
Table 2.6: USB Connector Pin Definition 13
2.4.5 Audio Connector 13
Figure 2.4 Audio Connector 13
Table 2.7: Audio Connector Pin Definition 13
2.4.6 COM Connector 14
Figure 2.5 COM Connector 14
Table 2.8: COM Connector Pin Definition 14

2.4.7 HDMI Connector 15
Figure 2.6 HDMI Connector 15
Table 2.9: HDMI Connector Pin Definition 15
2.4.8 HDD LED Indicators 16
Figure 2.7 HDD LED Indicators 16
2.4.9 Antenna Socket 16
Figure 2.8 Antenna Socket 16
2.4.10 GPIO (Optional) 17
Table 2.10: HDMI Connector Pin Definition 17
2.5 Installation 18
2.5.1 2.5” HDD/SSD Installation 18
2.5.2 Memory Installation 19
2.5.3 mPCIe/mSATA Installation 20
2.5.4 M.2 Installation 21
2.5.5 Optional Adaptor Installation 22

Chapter 3 BIOS Settings 23

3.1 Introduction 24
3.2 Entering BIOS Setup 25
3.2.1 Main Setup 25
3.2.2 Advanced BIOS Setup 26
3.2.3 Chipset Configuration 40
3.2.4 Security 48
3.2.5 Boot 49
3.2.6 Save & Exit 49

Appendix A Watchdog Sample Code 51

A.1 Watchdog Function 52

Appendix B SUSI API Introduction 55

B.1 SUSI API Introduction 56
B.1.1 Watchdog API 56
B.1.2 Hardware Monitor API 56

Chapter 1

General Introduction

This chapter gives background information on the ARK-1220 series

1.1 Introduction

ARK-1220 is a compact, fanless DIN-rail embedded system that features an Intel® Atom™ E3940 quad-core/Celeron® N3350 dual-core processor and essential I/O on the front bezel for easy access.

Rugged Design with Compact Dimensions

ARK-1220 is equipped with a dual channel memory slot that supports up to 8 GB of DDR3L 1866 Mhz SODIMM. Designed for operation in harsh industrial environments, the ruggedized system supports a wide operating temperature (-30 ~ 70 °C/22 ~ 158 °F) and wide input power range (12 ~ 28 VDC). The system I/O includes 4 x USB 3.0, 2 x RS232/422/485, and 2 x 10/100/1000 Mbps LAN ports, as well as 1 x Mic In and 1 x Line Out. ARK-1220 also features 1 x full-size mini PCIE and 1 x M.2 2230 E key, and supports a 2.5" SSD. It is suitable for installation in environments with limited space.

Multiple Display Support

ARK-1220 provides two HDMI output ports that enable dual independent 4K displays of up to 3840 x 2160 @ 30 hz. The Gen 9 graphics engine supports DirectX 12, OpenCL 2.0, and media codec H.264, MPEG2, MVC, WMV9, and JPEG format.

Built-In Intelligent Management Tools - WISE-PaaS/DeviceOn

Advantech's WISE-PaaS/DeviceOn platform provides a valuable suite of programmable APIs, such as a multi-level watchdog, hardware monitor, system restore, and other user-friendly interfaces. With the inclusion of WISE-PaaS/DeviceOn, ARK-1220 can be used for remotely managing, monitoring, configuring, and controlling numerous terminals to ensure easy maintenance and recovery.

1.2 Product Features

1.2.1 General

- **CPU:**
  - Intel® Atom™ E3940 quad-core SoC 1.6 GHz, boost up to 1.8 GHz
  - Intel® Celeron® N3350 dual-core SoC 1.1 GHz, boost up to 2.4 GHz
- **BIOS:** AMI UEFI 64 Mbit
- **System Memory:** 2 x DDR3L 1866 MHz, up to 8 GB
- **Watchdog Timer:** Single-chip watchdog with 255-level interval timer, setup via software
- **Serial Port:**
  - 2 x RS-232/422/485 with auto flow control, COM2 with 5V/12V power via jumper
- **USB:**
  - 4 x USB 3.0
- **Audio:** High-definition (HD) audio, Line Out, Mic In

- **Storage:**
  - 1 x full-size mSATA (shared with mPCIe) and 1 x 2.5" SATA SSD (max. height: 15 mm)
- **Expansion Interface:**
  - 1 x Full-size mini PCIe with SIM holder
  - 1 x M.2 2230 E key for Wi-Fi module

1.2.2 Display

- **Controller:** Intel® HD Graphics 500
- **Resolution:**
  - 2 x HDMI 1.4b, supports up to 3840 x 2160 @ 30 Hz
- **Dual Display:** HDMI + HDMI

1.2.3 Ethernet

- **Chipset:**
  - LAN1 Intel® i210
  - LAN2 Intel® i210
- **Speed:** 10/100/1000 Mbps
- **Interface:** 2 x RJ45
- **Standard:** Compliant with IEEE 802.3, IEEE 802.3u, IEEE 802.3x, IEEE 802.3y, IEEE 802.ab.

1.3 Chipset

1.3.1 Functional Specifications

1.3.1.1 Processor

Processor	Intel® Celeron® N3350 DC SoC 1.1 GHz, boost up to 2.4 GHz Intel® Atom™ E3940 QC SoC 1.6 GHz, boost up to 1.8 GHz
Memory	Supports DDR3L 1866 MHz up to 8 GB 2 x 204-pin SODIMM socket type

1.3.1.2 Chipset

Internal Graphics Features	DirectX 12, OpenCL 2.0 Display Ports 2 x HDMI (HDMI 1.4b)
Video Accelerator	H/W accelerated video decoding Video decoder: AVC/VC1/MPEG2 HW decoder Supports DVD, Blu-ray, and HD video
SATA Interface	Supports several optional sections of Serial ATA II: Extensions to Serial ATA 1.0 specification, Revision 1.0 Supports SATA transfers to 300 Mbytes/sec. Supports mSATA socket (shared with mPCIe)
USB Interface	USB host interface with support for up to 4 x USB 3.0 ports All ports are High-Speed, Full-Speed, and Low-Speed capable Supports legacy keyboard/mouse software
BIOS	■ UEFI 64 Mbit

1.3.1.3 Others

Serial Ports	■ 2 x RS-232/422/485, supports auto-flow control; COM2 supports 5V/12V power **COM Connector:** D-SUB connector 9P
Ethernet	**LAN1 Intel i210, LAN2 Intel i210** ■ Compliant with IEEE 802.3, IEEE 802.3u, IEEE 802.3x, IEEE 802.3y, and IEEE 802.ab ■ Supports 10/100/1000 Mbps. LAN Connectors: Phone Jack RJ45 8P 90D(F)
Audio	**Audio Codec: Realtek ALC888S:** ■ Compliant with HD audio specifications ■ Supports 16/20/24-bit DAC and 16/20/24-bit ADC resolution ■ Supports Line Out and Mic In audio **Connectors:** 2 x Earphone jacks
Battery	■ 1 x 3V/210 mAh battery with wire

1.3.2 WISE-PaaS/DeviceOn

Sequence Control	Supported
Watchdog Timer	Multi-level WDT, programmable 1 ~ 255 sec/min

Hardware Monitor	CPU temperature/input current/input voltage
Power Saving	Deep sleep S5 mode
System Information	Running HR/boot record

1.4 Mechanical Specifications

1.4.1 System Dimensions

158 x 53.5 x 114 mm (6.22 x 2.11 x 4.49 in)

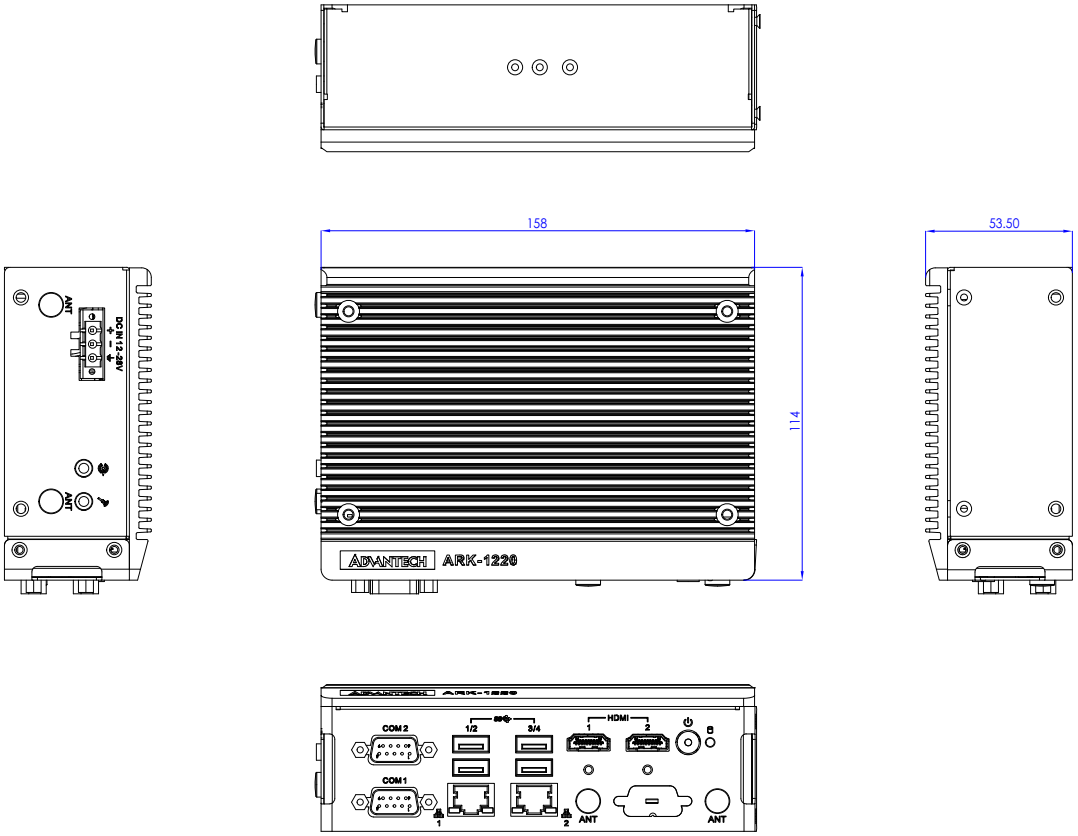


Figure 1.1 ARK-1220 Mechanical Dimensions

1.4.2 Weight

1.2 kg (2.65 lb)

1.5 Power Requirements

1.5.1 System Power

- **Minimum Power Input:** 12 ~ 28 VDC
- **Optional 60 W Adaptor:** 24V/2.5A

1.5.2 RTC Battery

- **Lithium:** 3 V/210 mAH

1.6 Environmental Specifications

1.6.1 Operating Temperature

- With industrial-grade SSD/mSATA: -30 ~ 70 °C (22 ~ 158 °F), with airflow rate = 0.7 m/sec
- With 2.5-inch hard disk: 0 ~ 45 °C (32 ~ 113 °F), with airflow rate = 0.7 m/sec

1.6.2 Relative Humidity

- 95% @ 40 °C (non-condensing)

1.6.3 Storage Temperature

- -40 ~ 85 °C (-40 ~ 185 °F)

1.6.4 Vibration Tolerance

- When the system is equipped with an SSD/mSATA: 3 Grms, IEC 60068-2-64, random, 5 ~ 500 Hz, 1 hr/axis, (x, y, z) 3 axes

1.6.5 Shock Tolerance

- When the system is equipped with an SSD/mSATA: 30 G, IEC 60068-2-27, half sine, 11 ms duration

1.6.6 Safety Certification

- UL, CB, CCC, BSMI

1.6.7 EMC Certification

- CE, FCC, CCC, BSMI

Chapter 2

Hardware Installation

This chapter provides instructions for installing ARK-1220 hardware and external I/O

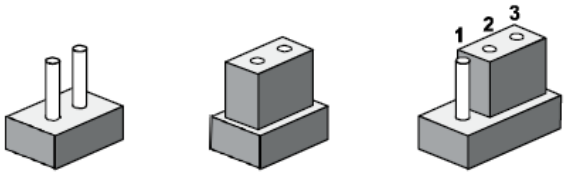
2.1 Introduction

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

2.2 Jumpers

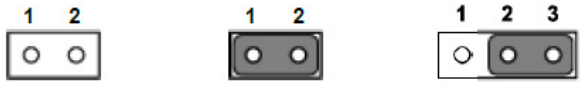
2.2.1 Jumper Description

ARK-1220 can be configured to satisfy specific application requirements 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, 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. For these jumpers, connect either pins 1 and 2, or 2 and 3.



open closed closed 2-3

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



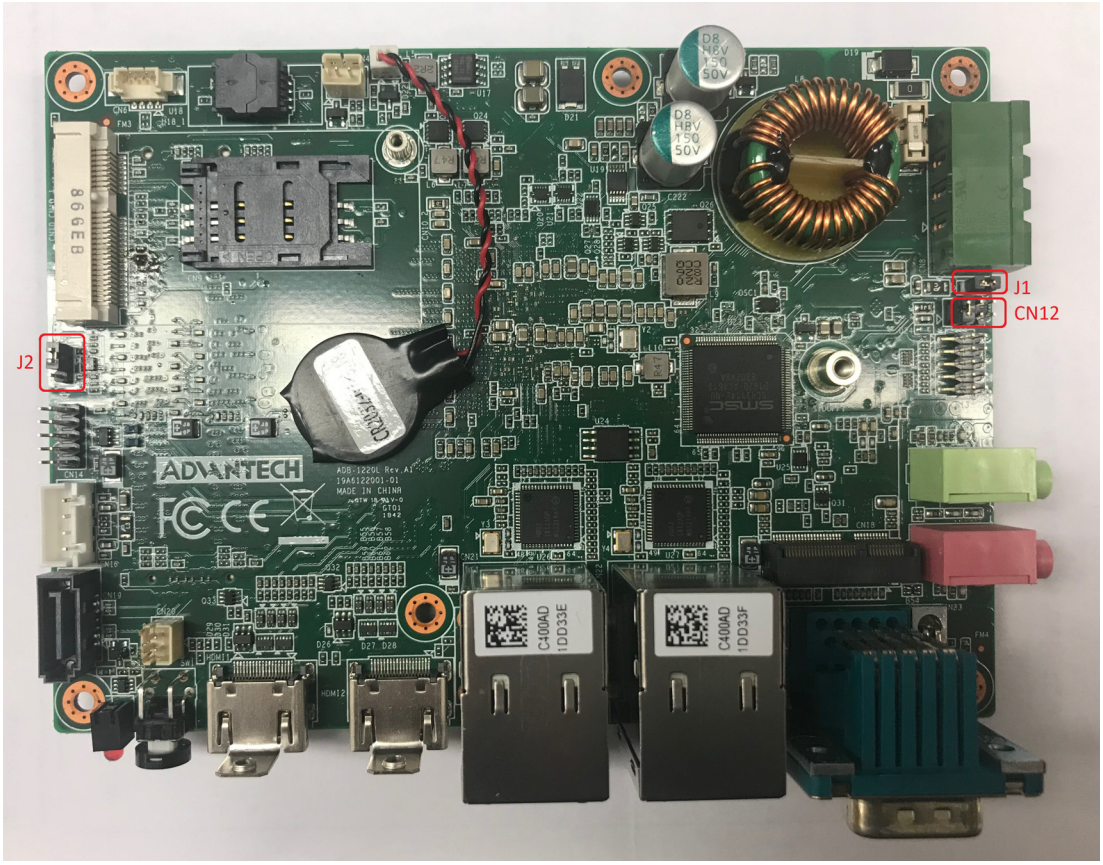
open closed closed 2-3

A pair of needle-nose pliers may be necessary when working with jumpers. Users with concerns regarding the ideal hardware configuration for your application should contact your local distributor or sales representative before making any changes. Generally, only a standard cable is required to make most connections.

2.2.2 Jumper List

Table 2.1: Jumper Settings	
Location	**Function**
J1	ATX/AT mode
J2	mPCIe/mSATA
CN12	COM2 5V/12V power

2.2.3 Jumper Location



2.2.4 Jumper Settings

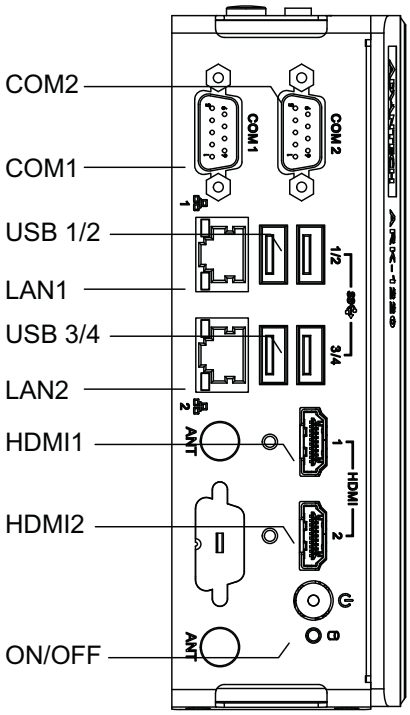
Table 2.2: J1: ATX/AT Mode	
Part Number	**1653000125**
Description	Pin header 2 x 1P 2.0 mm 180D (M) DIP
Default Setting	NC: ATX mode; power on via power button
Jumper Setting	(1-2): AT mode

Table 2.3: J2: mPCIE/mSATA	
Part Number	**1653003101**
Description	Pin header 3 x 1P 2.0 mm 180D (M) DIP 2000-13 WS
Default Setting	(1-2): mPCIE
Jumper Setting	(2-3): mSATA

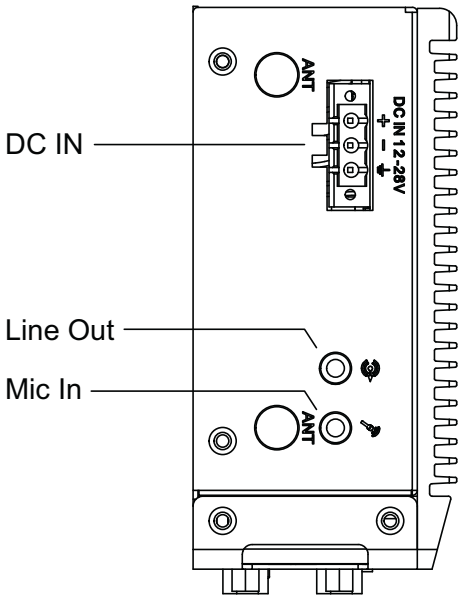
Table 2.4: CN12: COM2 5V/12V Power	
Part Number	**1653003201**
Description	Pin header 3 x 2P 2.0 mm 180D (M) DIP 21N22050
Default Setting	(1-2): without power
Jumper Setting	(3-5): +12 V power
Jumper Setting	(4-6): +5 V power

2.3 System I/O

Front View



Top View



2.4 External I/O

2.4.1 Power On/Off Button

ARK-1220 features a Power On/Off button with an LED indicators on the top side that show On status (Green LED)

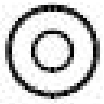
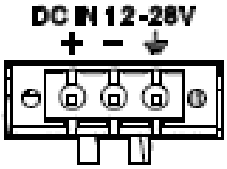


Figure 2.1 Power On/Off Button

2.4.2 Power Input Connector

The power input connector supports 12 ~ 28 V. The 3 pins are defined as +, -, and GND



2.4.3 Ethernet Connector (LAN)

ARK-1220 is equipped with two Intel® i210 Ethernet controllers that are fully compliant with IEEE 802.3u 10/100/1000 Mbps CSMA/CD standards and connected to LAN1 and LAN2. The Ethernet port provides a standard RJ45 jack connector with LED indicators on the front side to show its Active/Link status (Green LED) and Speed status (Yellow LED).

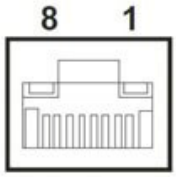


Figure 2.2 Ethernet Connector (LAN)

Table 2.5: Ethernet Connector (LAN) Pin Definition

Pin	10/100/1000 Mbps Signal Name
1	BI_DA+(GHz)
2	BI_DA-(GHz)
3	BI_DB+(GHz)
4	BI_DC+(GHz)
5	BI_DC-(GHz)
6	BI_DB-(GHz)
7	BI_DD+(GHz)
8	BI_DD-(GHz)
H3	GND
H4	GND

2.4.4 USB 3.0 Connector

ARK-1220 supports four USB 3.0 interfaces, which support Plug-and-Play functionality and hot swapping for up to 127 external devices. The USB interfaces comply with USB UHCI, Rev. 3.0.

USB 3.0 connectors contain legacy pins to interface to USB 2.0 devices and a new set of pins for USB 3.0 connectivity.

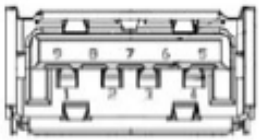


Figure 2.3 USB Connector

Table 2.6: USB Connector Pin Definition

Pin	Signal Name
1	+5V
2	D-_0
3	D+_0
4	GND
5	USB0_SSRX-
6	USB0_SSRX+
7	GND
8	USB0_SSTX-
9	USB0_SSTX+

2.4.5 Audio Connector

ARK-1220 features two phone jack connectors that support stereo Line Out and Mic In audio ports. The audio chip is controlled by ALC888S and compliant with the Azalea standard.

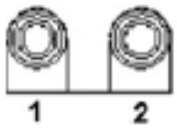


Figure 2.4 Audio Connector

Table 2.7: Audio Connector Pin Definition

Pin	Signal Name
1	Mic In
2	Line Out

2.4.6 COM Connector

ARK-1220 provides one 9-pin D-sub connector, which supports RS232/422/485 serial communication interface ports. Default setting is RS-232, if you want to use RS-422/ 485, you can find the BIOS manual to change setting.

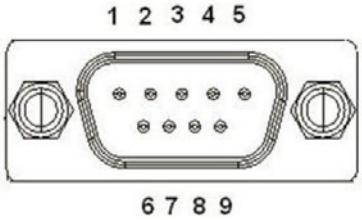


Figure 2.5 COM Connector

Table 2.8: COM Connector Pin Definition

Pin	RS-232	RS-422	RS-485
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	NC	NC

NC represents “No Connection”.

2.4.7 HDMI Connector

ARK-1220 offers two integrated 19-pin receptacle connector HDMI 1.4b interfaces. The HDMI link supports resolutions up to 3840 x 2160 @ 30 Hz.

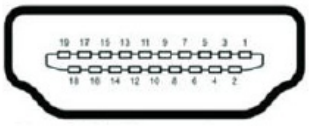


Figure 2.6 HDMI Connector

Table 2.9: HDMI Connector Pin Definition

Pin	Signal Name
1	HDMI_TX2+
2	GND
3	HDMI_TX2-
4	HDMI_TX1+
5	GND
6	HDMI_TX1-
7	HDMI_TX0+
8	GND
9	HDMI_TX0-
10	HDMI_CLK+
11	GND
12	HDMI_CLK-
13	NC
14	NC
15	HDMI_DCLK
16	HDMI_DDAT
17	GND
18	+V5_HDMI-HPD
19	DDP0_HPD

NC represents “No Connection”.

2.4.8 HDD LED Indicators

ARK-1220 provides one LED on the front panel that indicates the SSD/HDD status.

Figure 2.7 HDD LED Indicators

2.4.9 Antenna Socket

ARK-1220 reserves four antenna sockets for installing wireless/LTE device antennas. Each antenna socket is labelled “ANT” for easy identification.

Figure 2.8 Antenna Socket

2.4.10 GPIO (Optional)

ARK-1220 offers a reserved 8-bit DI/O with the inclusion of an optional additional cable.

M/B location: CN13

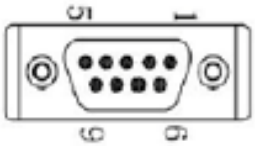
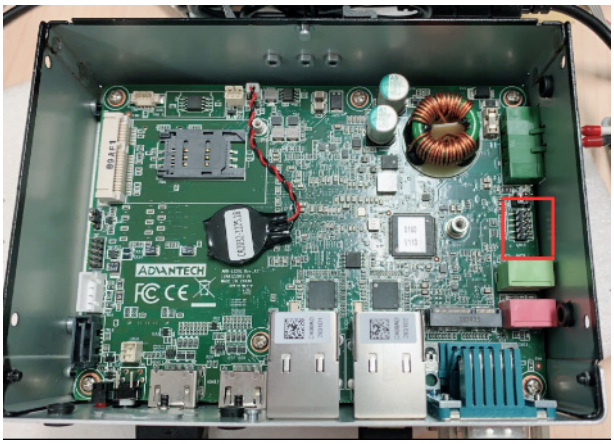


Table 2.10: HDMI Connector Pin Definition

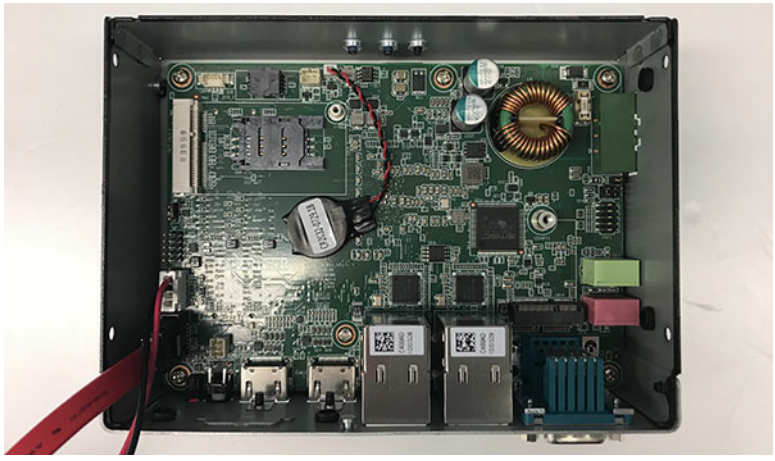
Pin	Signal Name
1	DI/O bit 0
2	DI/O bit 1
3	DI/O bit 2
4	DI/O bit 3
5	DI/O bit 4
6	DI/O bit 5
7	DI/O bit 6
8	DI/O bit 7
9	GND



2.5 Installation

2.5.1 2.5” HDD/SSD Installation

1. Loosen the 4 screws affixing screws and remove the rear cover



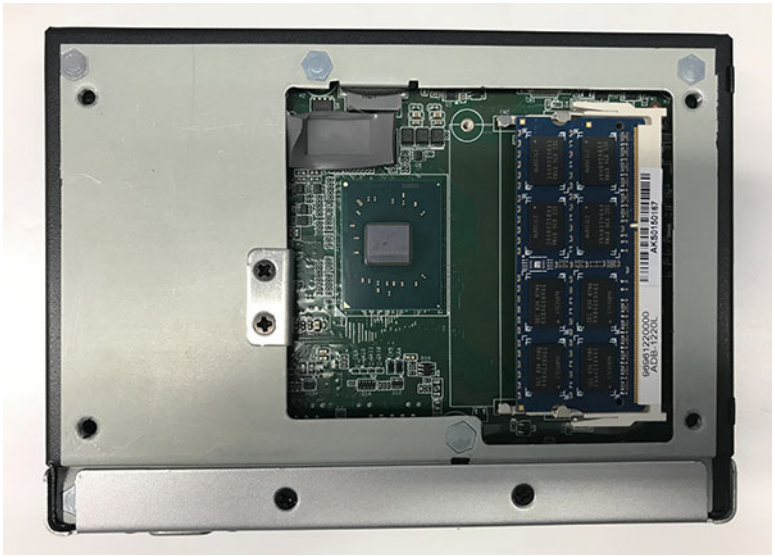
2. Attach the 2.5” SATA HDD/SSD to the rear cover and connect one end of the SATA cable to the HDD/SSD

3. Replace the rear cover and affix it in place with screws.

2.5.2 Memory Installation

1. Remove the top cover

2. Install RAM memory into the memory slot

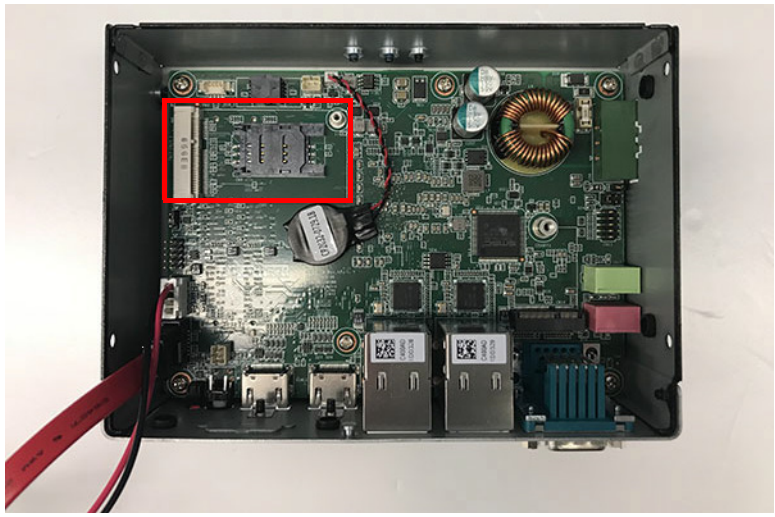


3. Replace the top cover and affix in place using screws

2.5.3 mPCIe/mSATA Installation

1. Loosen the 4 screws affixing screws and remove the rear cover

2. Install the mPCIe/mSATA module. The J2 jumper must be set to enable the mSATA module (refer to Section 2.2.2).

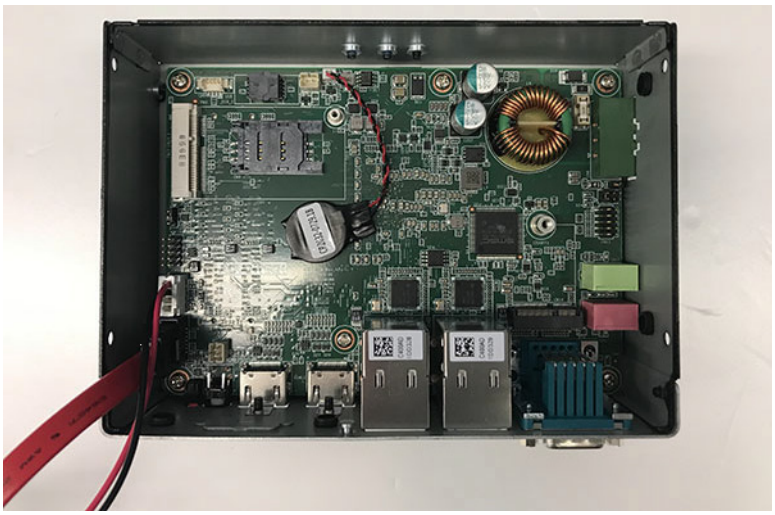


3. Replace the rear cover and affix in place with screws

2.5.4 M.2 Installation

1. Loosen the 4 screws affixing screws and remove the rear cover

2. Install the M.2 2230 E key module



3. Replace the rear cover and affix in place with screws

2.5.5 Optional Adaptor Installation

1. To install an optional adaptor, connect the adaptor wires to the 3-pin phoenix connector provided in the accessory box. Connect the wires to the correct +, -, and GND pins and fix in place using a screwdriver.

2. Connect the 3-pin phoenix connector to the DC In port

Chapter 3

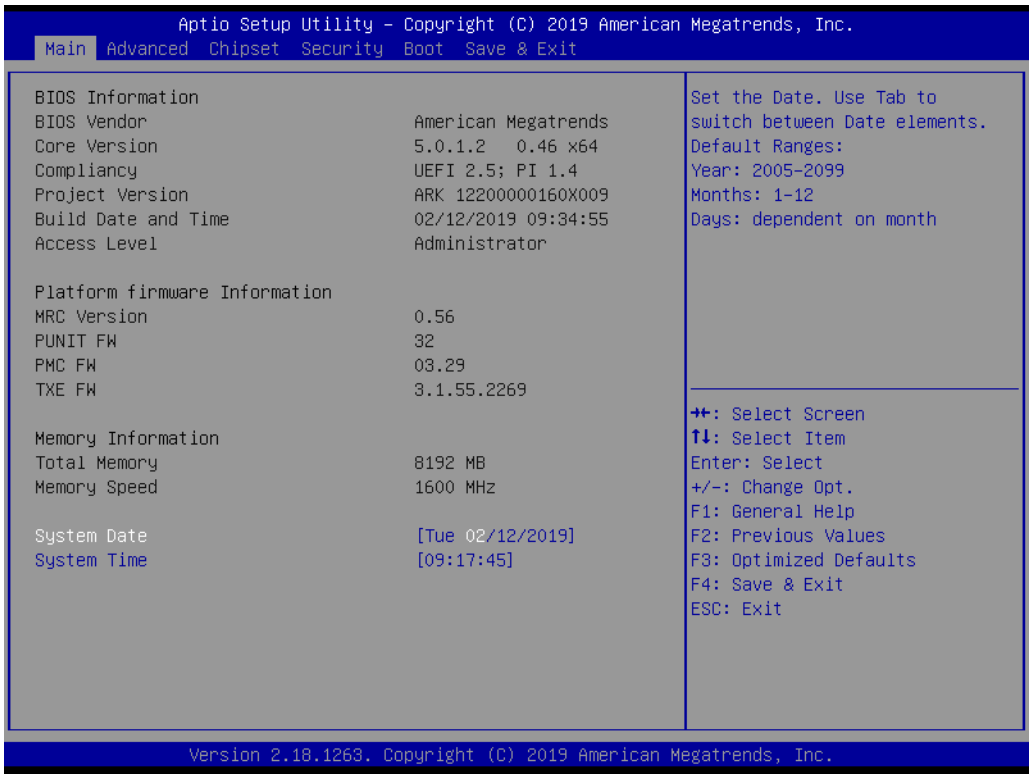
BIOS Settings

This chapter explains how to set the BIOS configuration data

3.1 Introduction

The AMI BIOS ROM has a built-in setup program - the BIOS Setup Utility - that allows users to modify the basic system configuration. All configuration data is stored in battery-backed CMOS to ensure the setup information is retained when the power is turned off.

This chapter describes the basic navigation of the ARK-1220 BIOS setup screens

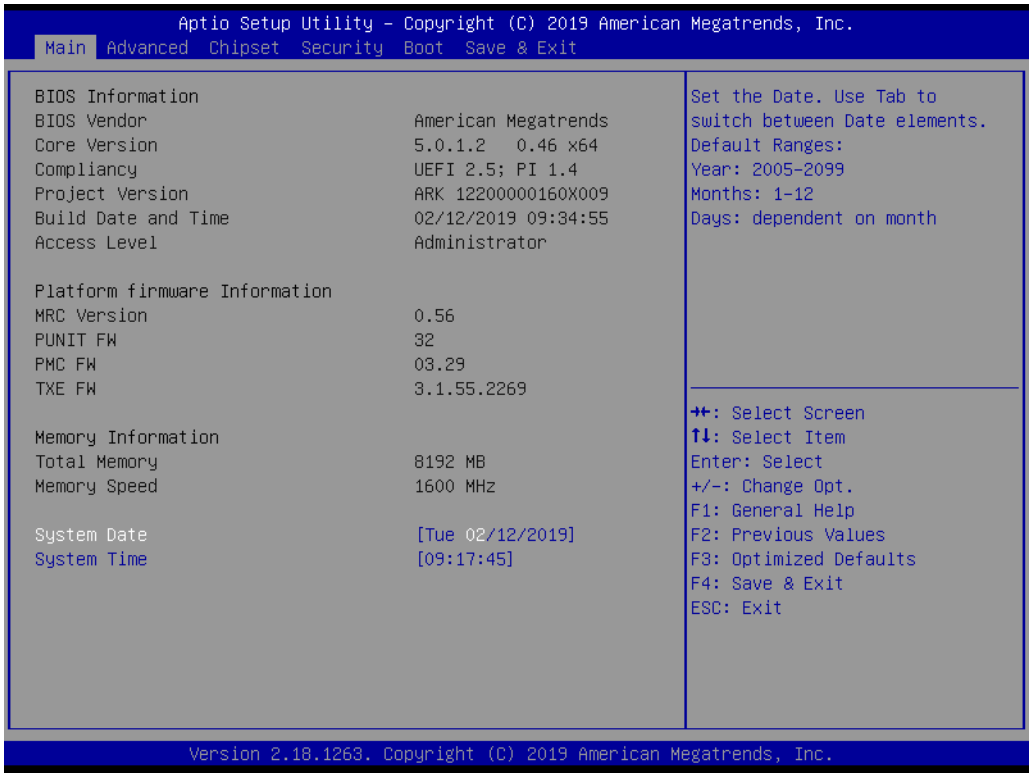


3.2 Entering BIOS Setup

Turn on the computer and then press <F2> or <DEL> to enter the BIOS Setup menu

3.2.1 Main Setup

Upon accessing the BIOS Setup Utility, users are presented with the Main setup page. Users can always return to the Main setup page by selecting the Main tab. The Main BIOS Setup page is shown below.



The Main BIOS setup page has two main frames. The left frame displays all the items accessible on the Main page. Items that are grayed out cannot be configured, whereas items presented in blue text can be configured. The right frame displays the key legend.

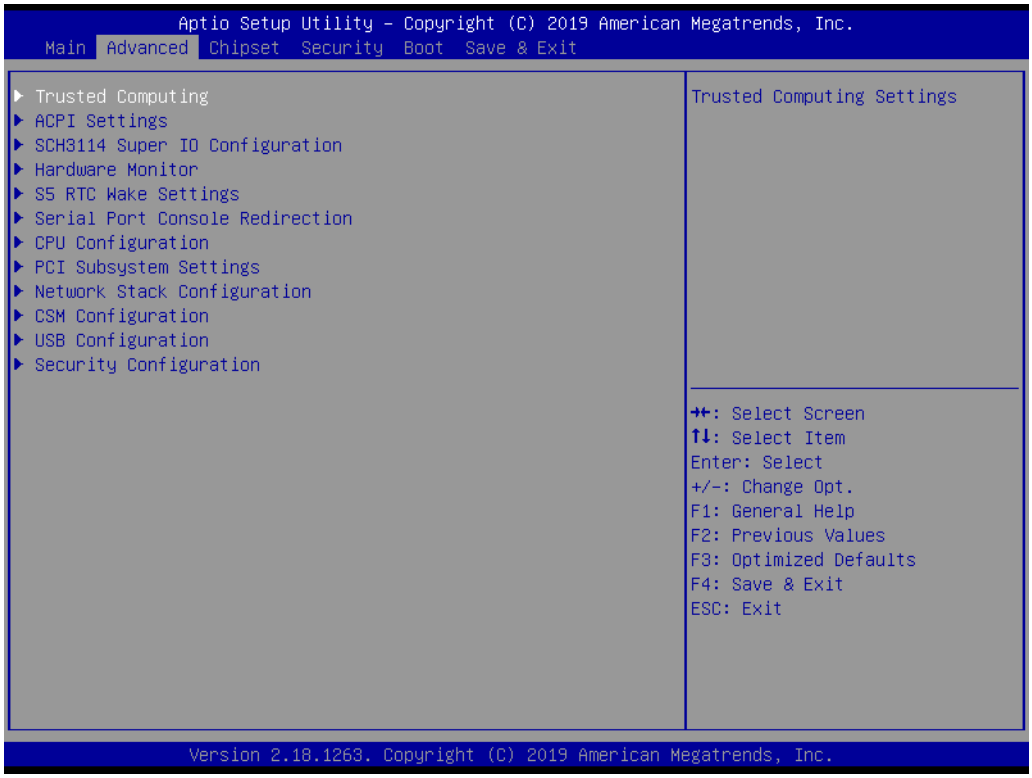
Located above the key legend is an area reserved for a text message. When an item is selected in the left frame, the item is presented in white text and often accompanied by a text message.

- **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 via the keyboard. Press the <Tab> key or the <Arrow> keys to move between fields. The date must be entered in MM/DD/YY format, and the time must be entered in HH:MM:SS format.

3.2.2 Advanced BIOS Setup

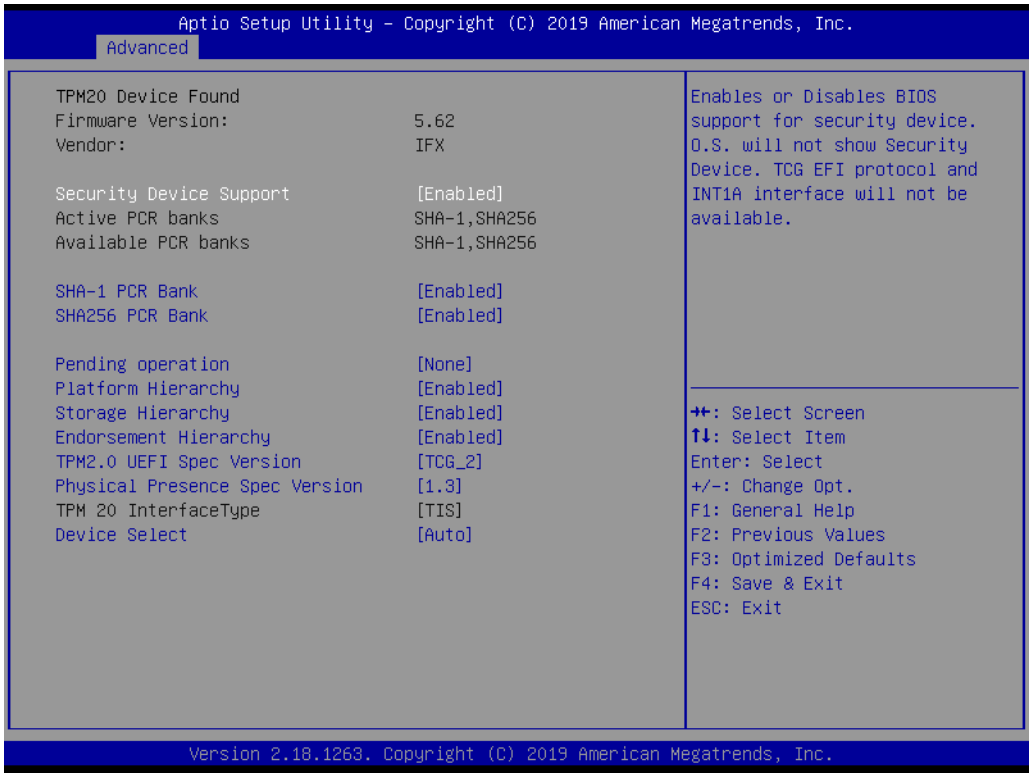
Select the Advanced tab from the BIOS Setup Utility to enter the Advanced BIOS Setup page. Select any of the items in the left frame of the screen, such as CPU Configuration, to access the sub menu for that item. The options for any of the Advanced BIOS Setup items can be displayed by highlighting the item using the <Arrow> keys.

The Advanced BIOS Setup page is shown below



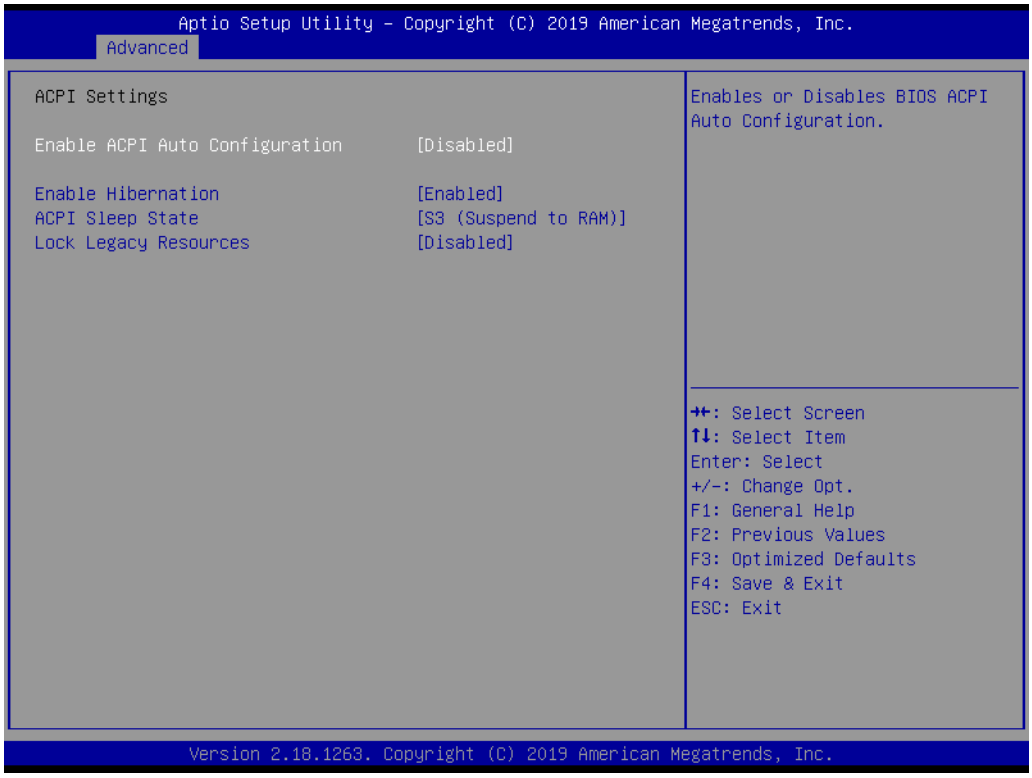
3.2.2.1 Trusted Computing

Provides security support for the device



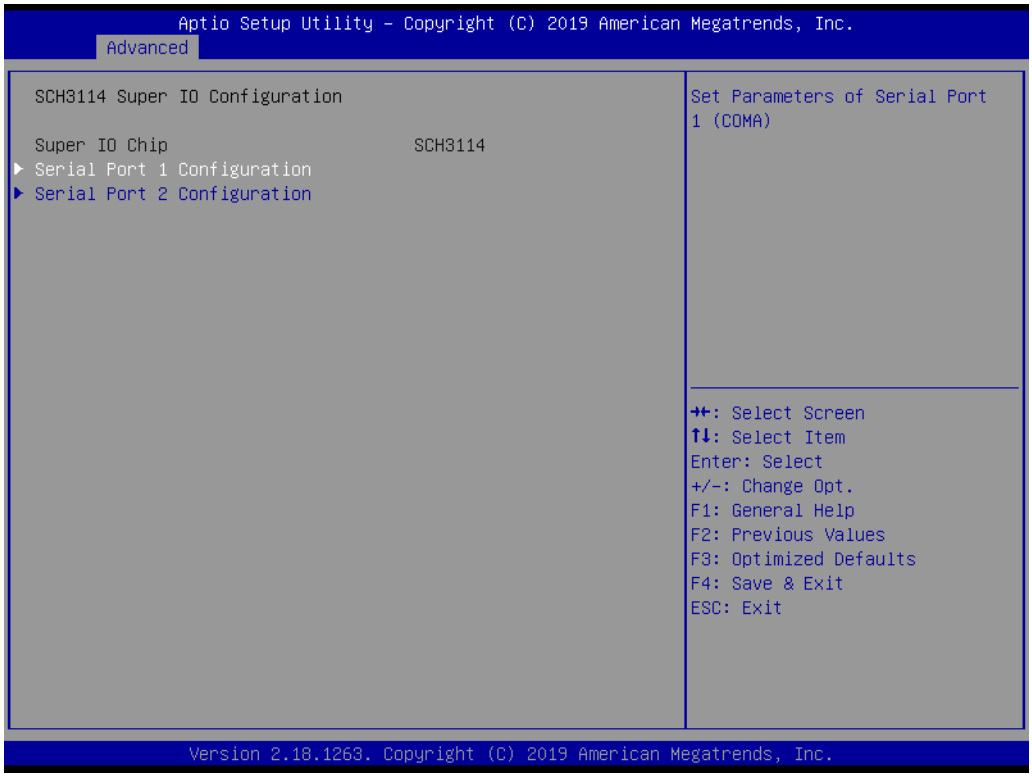
3.2.2.2 ACPI Settings

- **Enable ACPI Auto Configuration**
  This item allows users to enable or disable BIOS ACPI auto configuration
- **Enable Hibernation**
  This item allows users to enable or disable hibernation
- **ACPI Sleep State**
  This item allows users to set the ACPI sleep state
- **Lock Legacy Resources**
  This item allows users to lock legacy device resources



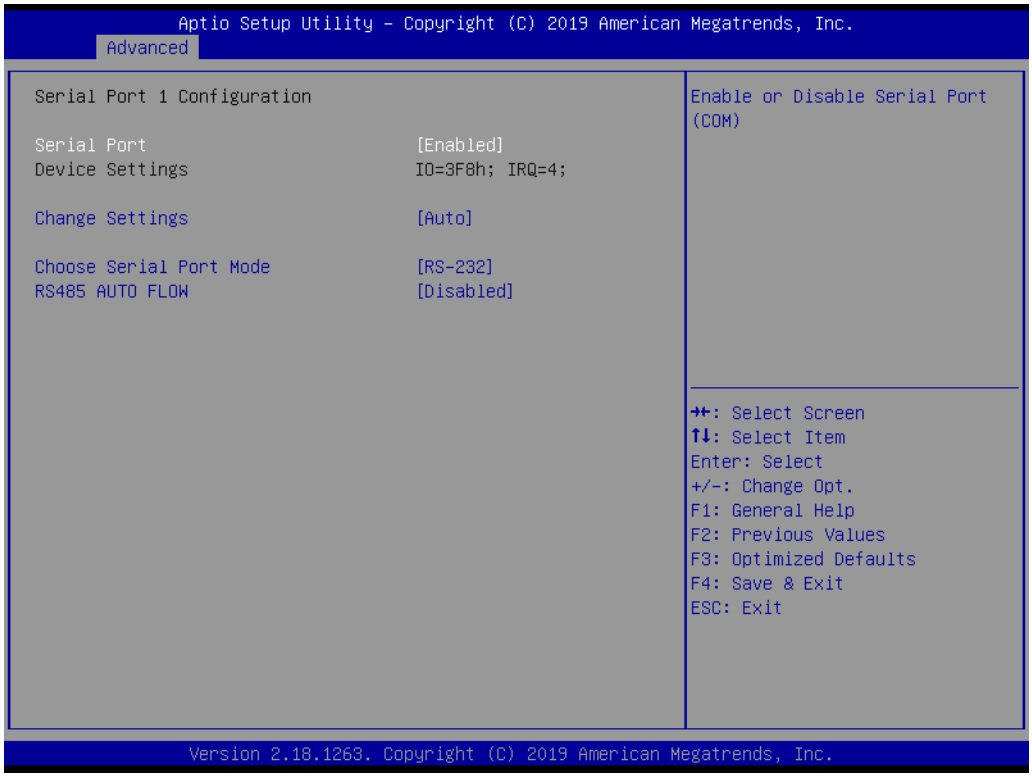
3.2.2.3 Super I/O Configuration

- **Super I/O Configuration (SCH3114)**
- **Set Parameters of Serial Port 1 (COM 1)**
  This item allows users to configure Serial Port 1
- **Set Parameters of Serial Port 2 (COM 2)**
  This item allows users to configure Serial Port 2

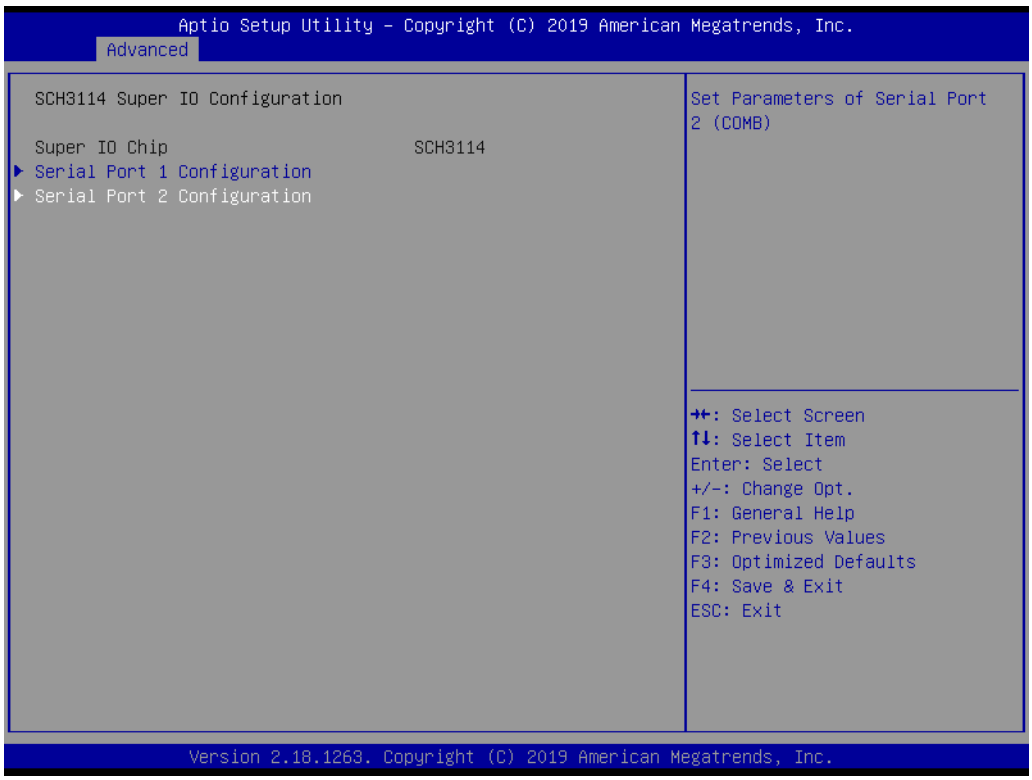


3.2.2.4 Serial Port 1 Configuration

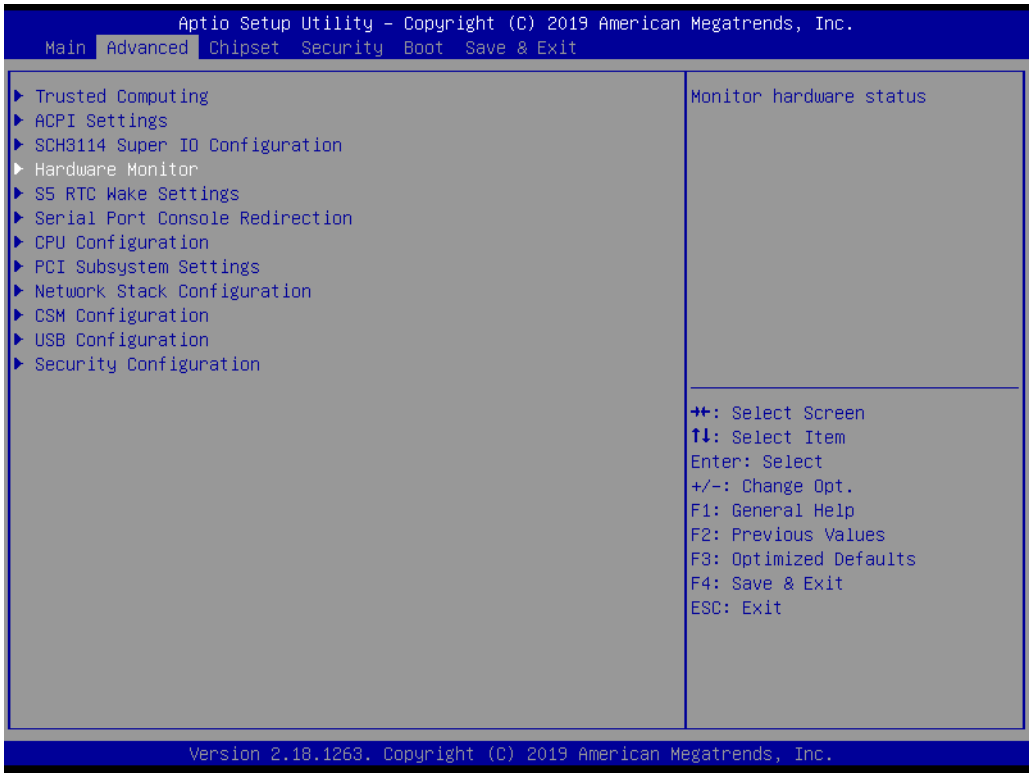
- **Serial Port**
  This item allows users to enable or disable Serial Port 1 (COM)
- **Change Settings**
  This item allows users to specify the settings for a super I/O device
- **Choose Serial Port Mode**
  This item allows users to change the serial port mode
- **RS485 Auto Flow**
  This item allows users to enable or disable RS485 auto flow



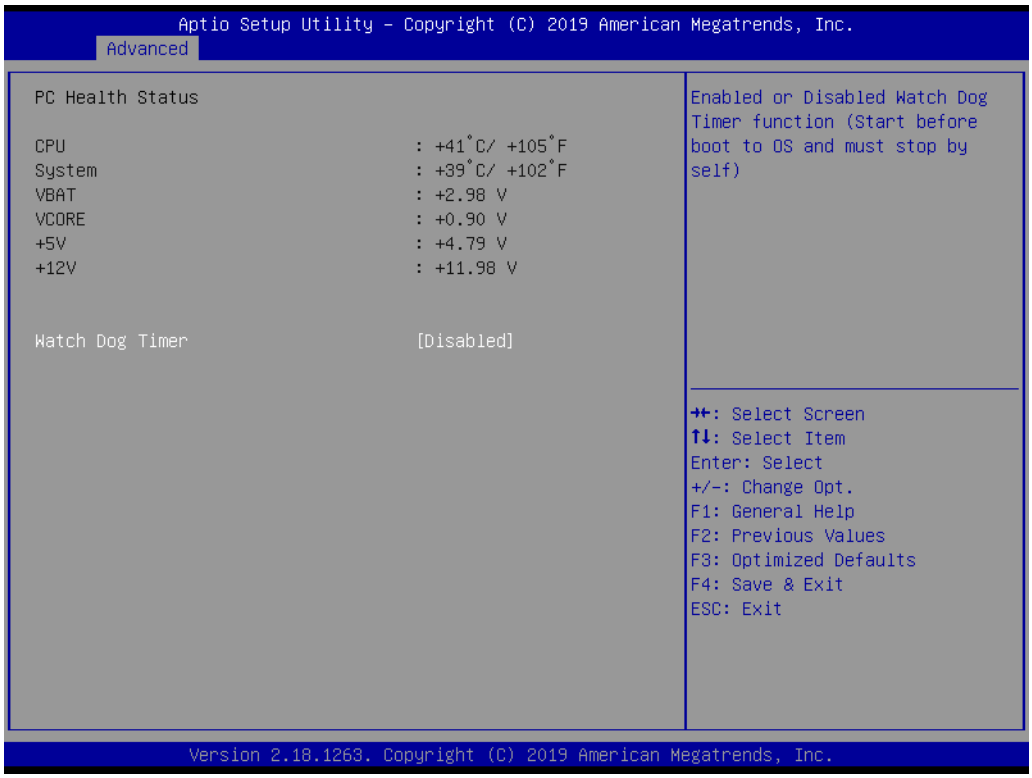
The items and options for configuring Serial Port 2 are the same as that for Serial Port 1



3.2.2.5 Hardware Monitor

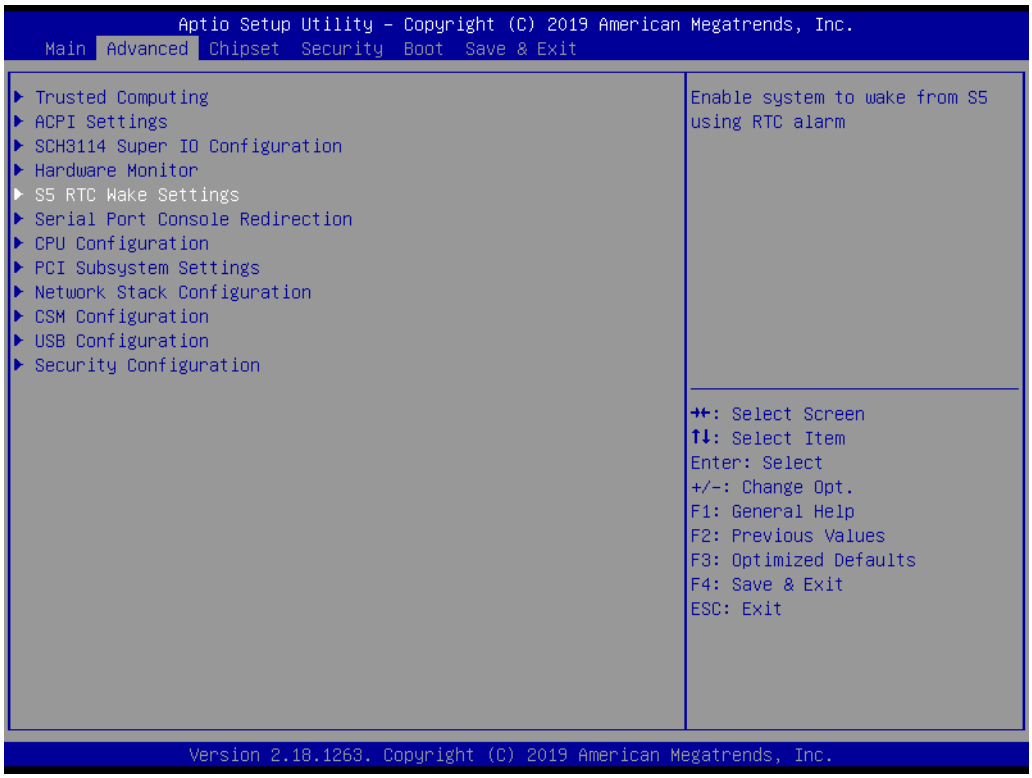


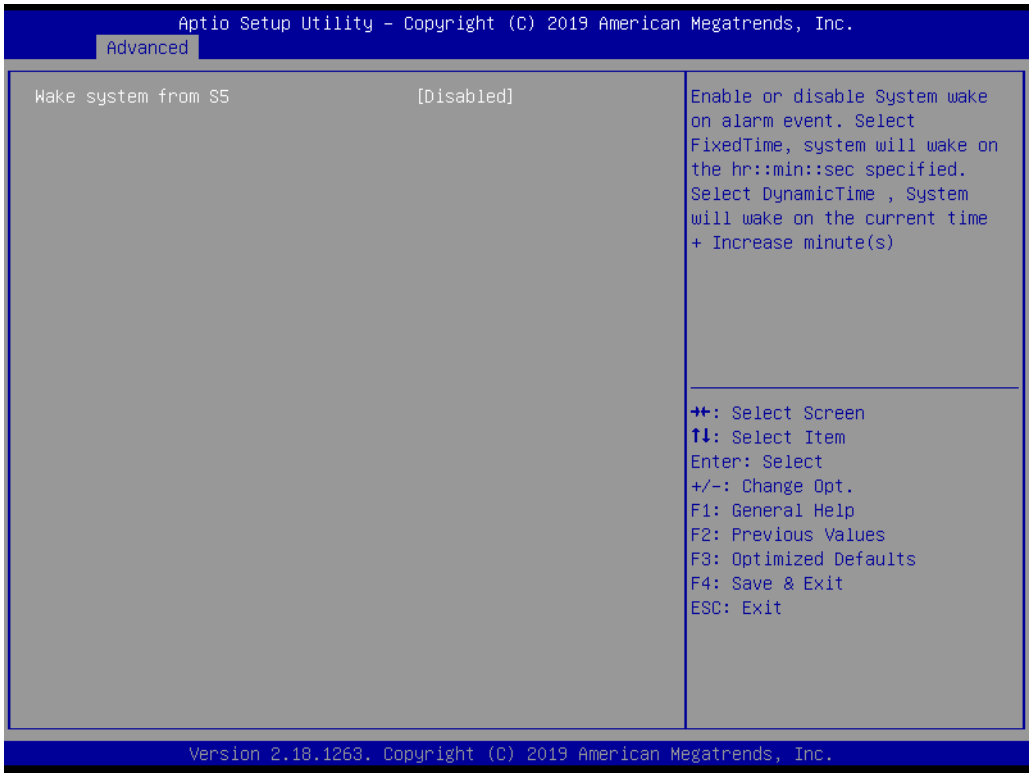
- **Pc Health Status**
  This shows all system information including the CPU/system temperature and voltage
- **Watchdog Timer**
  This item allows users to enable or disable the watchdog timer function (before booting to OS)



3.2.2.6 S5 RTC Wake Settings

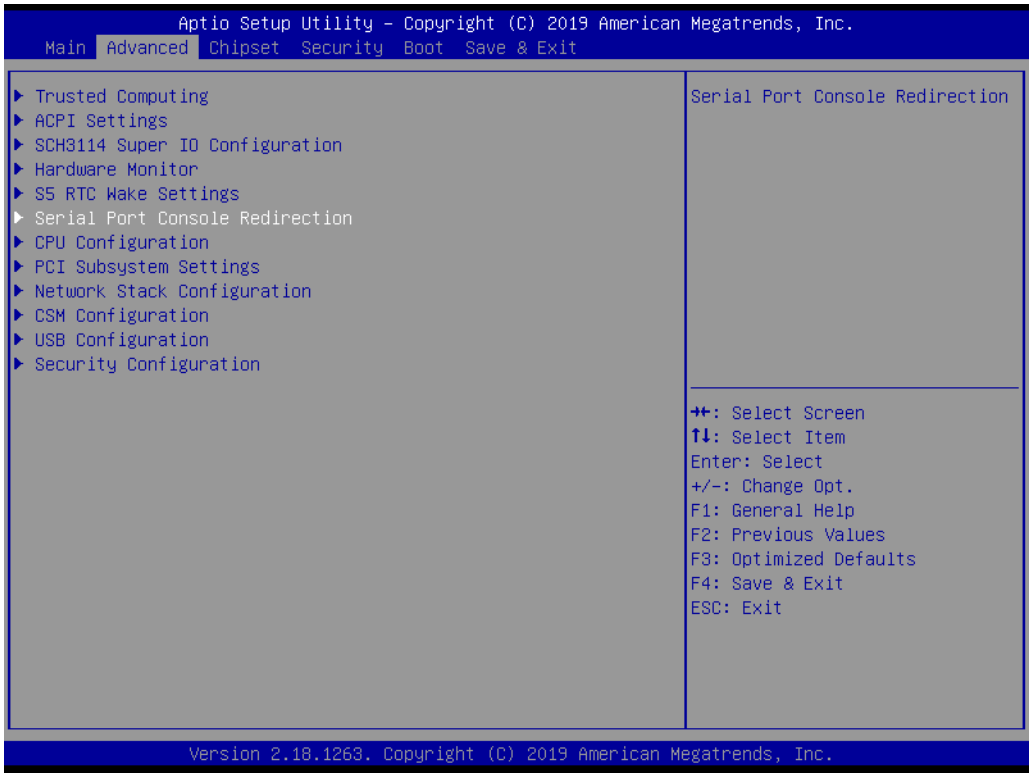
- **Wake System at Fixed Time**
  This item allows users to enable or disable Wake On Alarm Event. If the Fixed-Time option is selected for this item, the system will wake at the hr:min:sec specified. If the DynamicTime option is selected, the system will wake at the current time + specified minute(s).

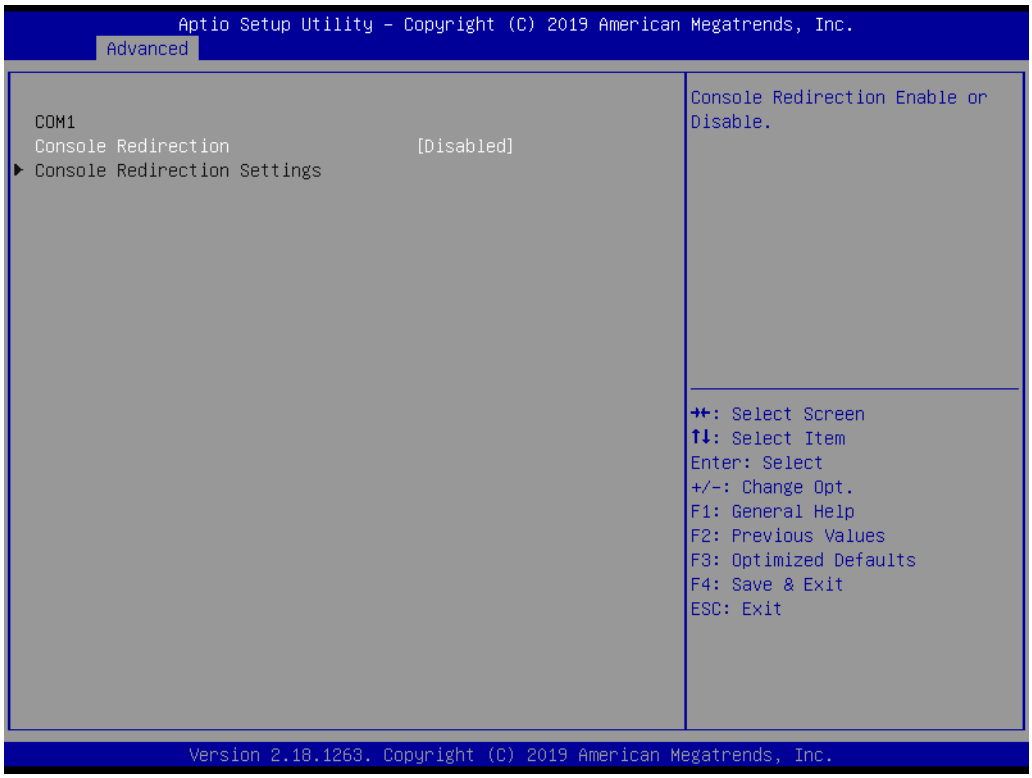




3.2.2.7 Serial Port Console Redirection

- **Console Redirection**
  This item allows users to enable or disable console redirection for Microsoft Windows Emergency Management Services (EMS)
- **Legacy Console Redirection**
  This item allows users to configure the legacy console redirection serial port
- **Console Redirection**
  This item allows users to configure the console redirection settings

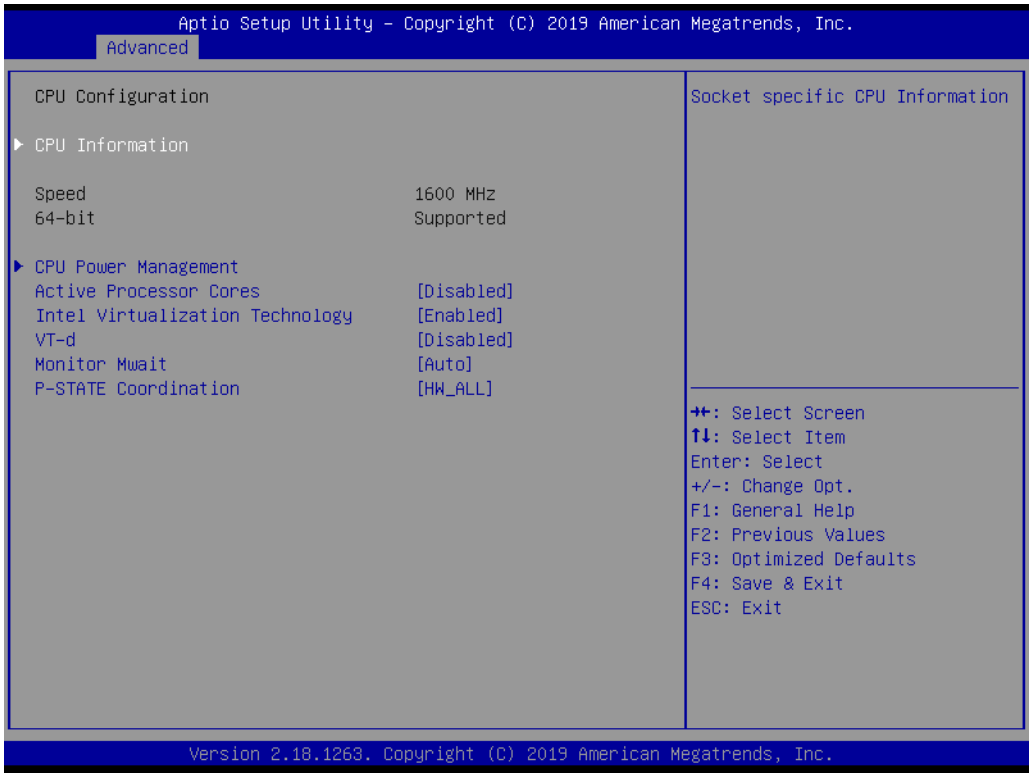


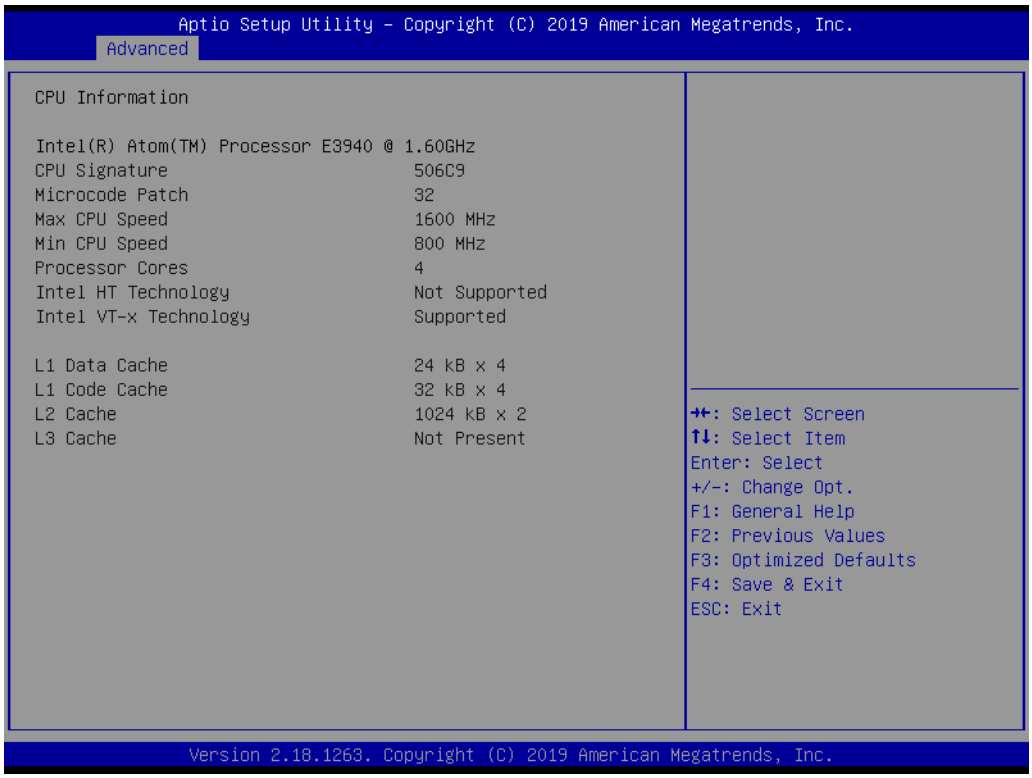


3.2.2.8 CPU Configuration

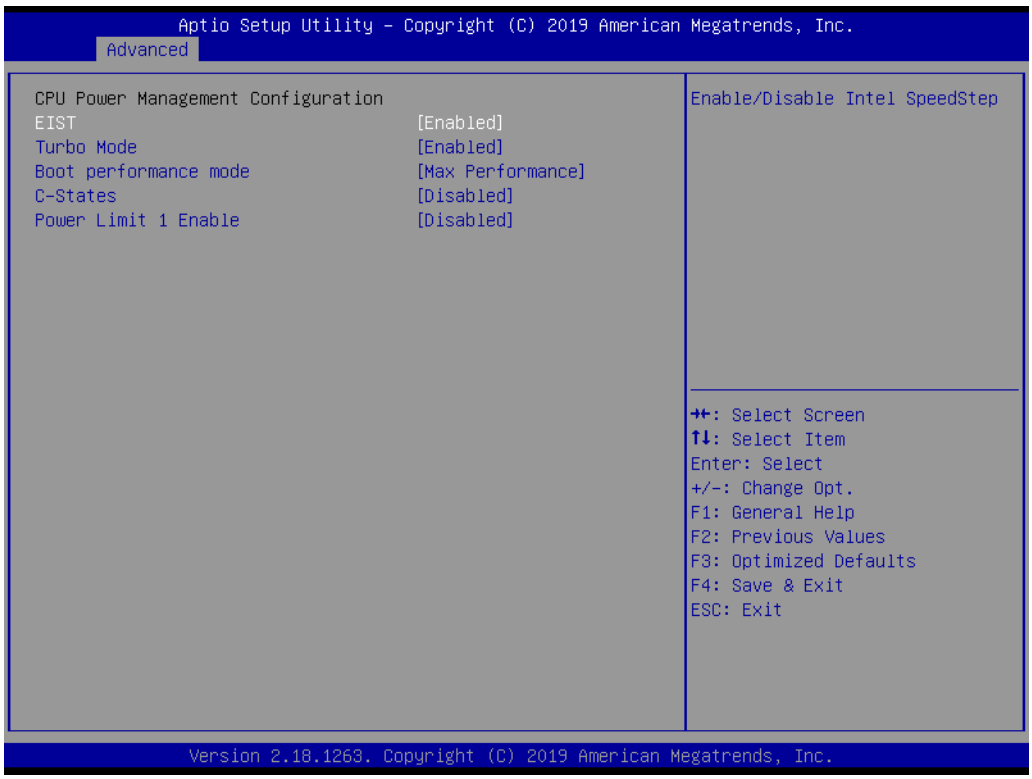
- **CPU Information**

  This item allows users to view the CPU, speed, and core information



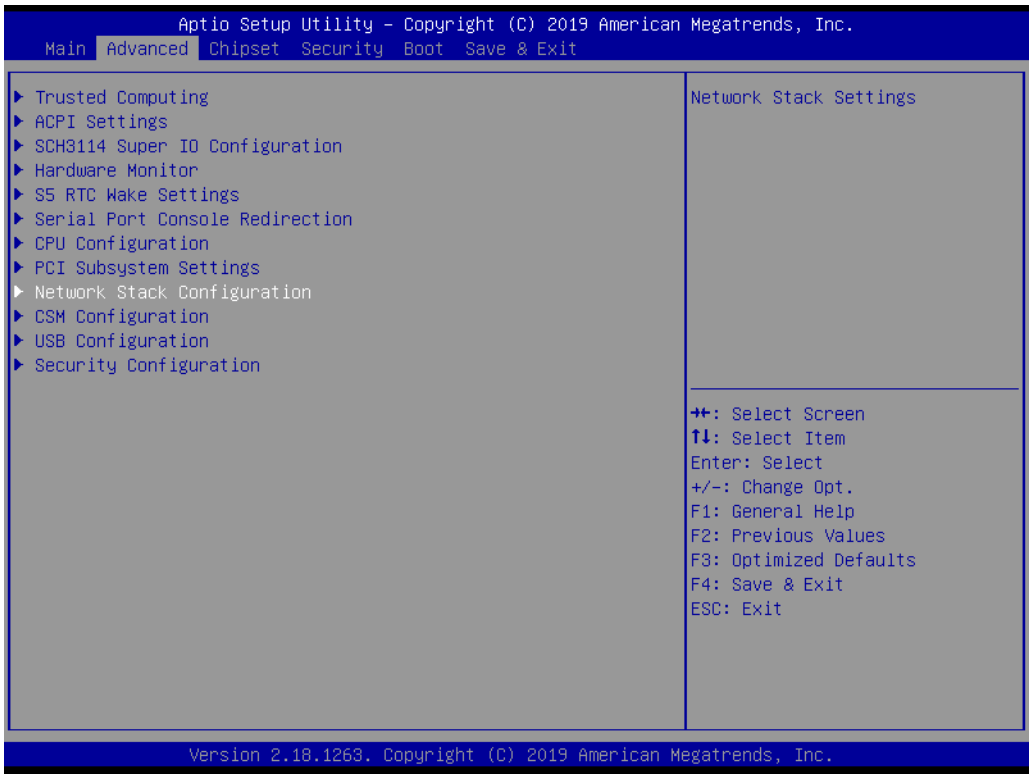


- **CPU Power Management**
  This item allows users to configure the CPU Power Management options
- **Active Processor Cores**
  This item allows users to configure the number of cores enabled for each processor package
- **Intel Virtualization Technology**
  This item allows users to enable or disable VMM. When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology
- **Monitor Mwait**
  This item allows users to enable or disable Monitor Mwait function

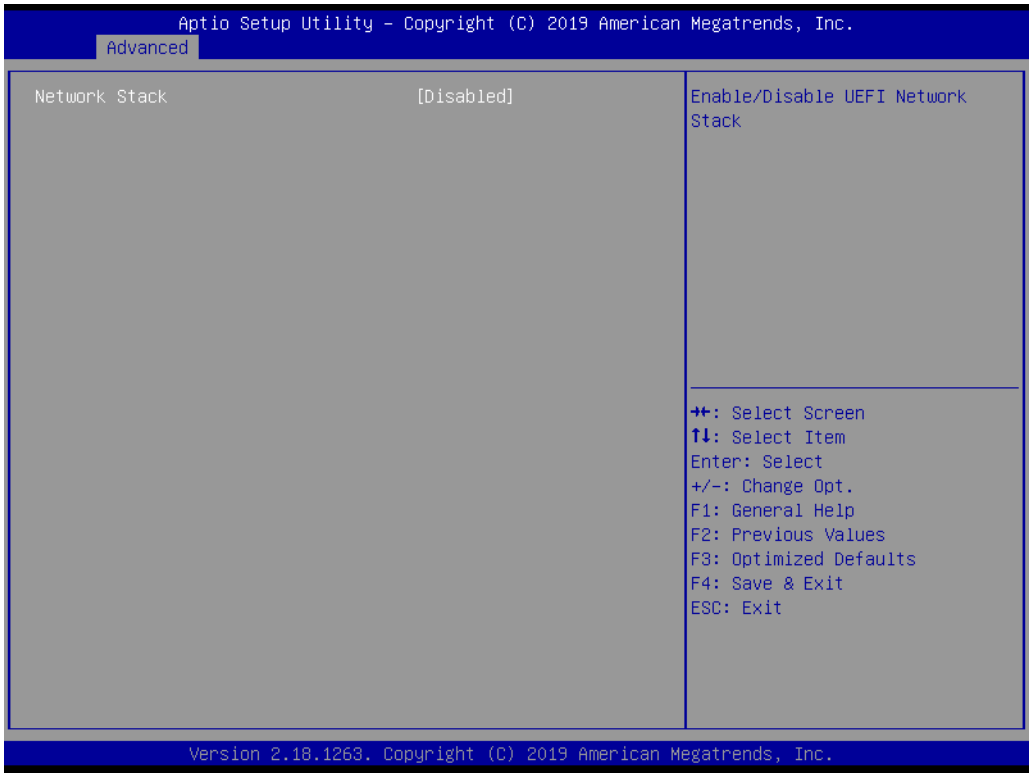


- **EIST**
  This item allows users to enable or disable Intel SpeedStep
- **Turbo Mode**
  This item allows users to enable or disable turbo mode
- **Boot Performance Mode**
  This item allows users to configure the boot performance mode for optimum performance
- **C-States**
  This item allows users to enable or disable C states

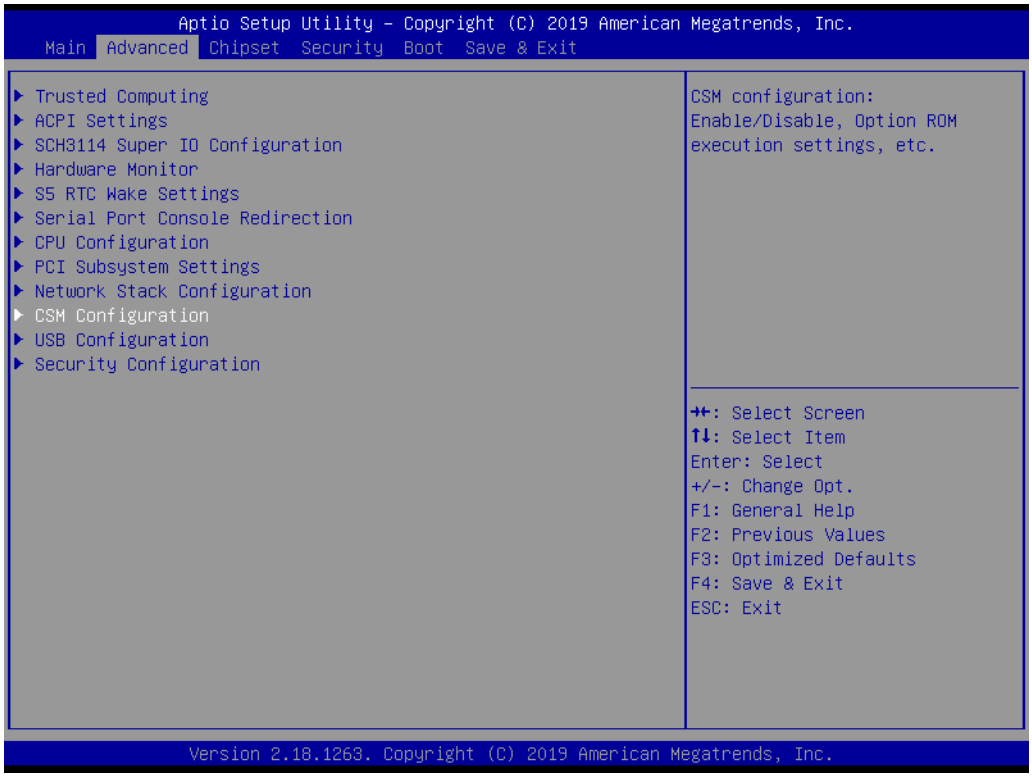
3.2.2.9 Network Stack Configuration



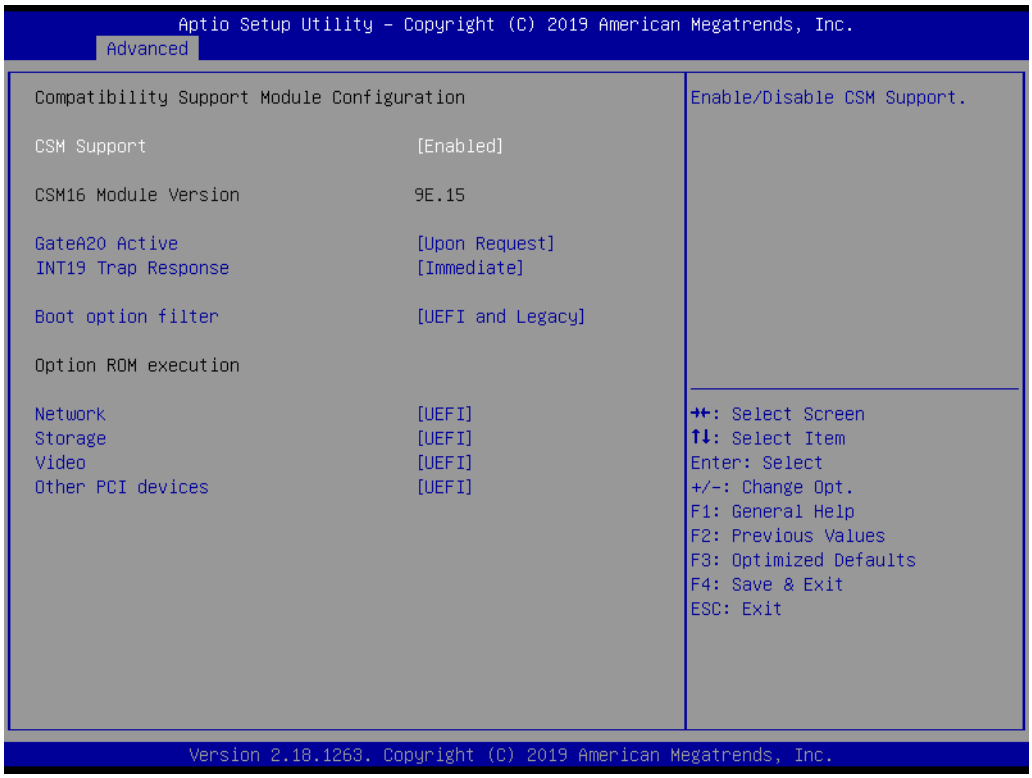
- **Network Stack**
  This item allows users to enable or disable UEFI network stack
- **Ipv4 PXE Support**
  This item allows users to enable or disable Ipv4 PXE boot support. If disabled, the IPV4 PXE boot option will not be available.
- **Ipv4 HTTP Support**
  This item allows users to enable or disable Ipv4 HTTP boot support. If disabled, the IPV4 HTTP boot option will not be available
- **PXE Boot Wait Time**
  This item allows users to configure the time the system waits before PXE boot up
- **Media Detect Count**
  This item allows users to configure the number of times the system checks for the presence of media



3.2.2.10 CSM Configuration



- **CSM Support**
  This item allows users to enable or disable CSM support
- **GateA20 Active**
  This item allows users to enable or disable GA20 function. The Always option does not allow GA20 disabling and is useful when executing an RT code above 1 MB.
- **INT19 Trap Response**
  This item allows users to configure the BIOS reaction to INT19 trapping. The Immediate option instructs the BIOS to execute the trap immediately. The Postponed option instructs the BIOS to execute the trap during legacy boot.
- **Boot Option Filter**
  This item allows users to configure the legacy/UEFI ROM priority
- **Network**
  This item allows users to configure the execution of UEFI and Legacy PXE OpROM
- **Storage**
  This item allows users to configure the execution of UEFI and Legacy Storage OpROM
- **Video**
  This item allows users to configure the execution of UEFI and Legacy Video OpROM
- **Other PCI Devices**
  This item allows users to configure the OpROM execution policy for other devices

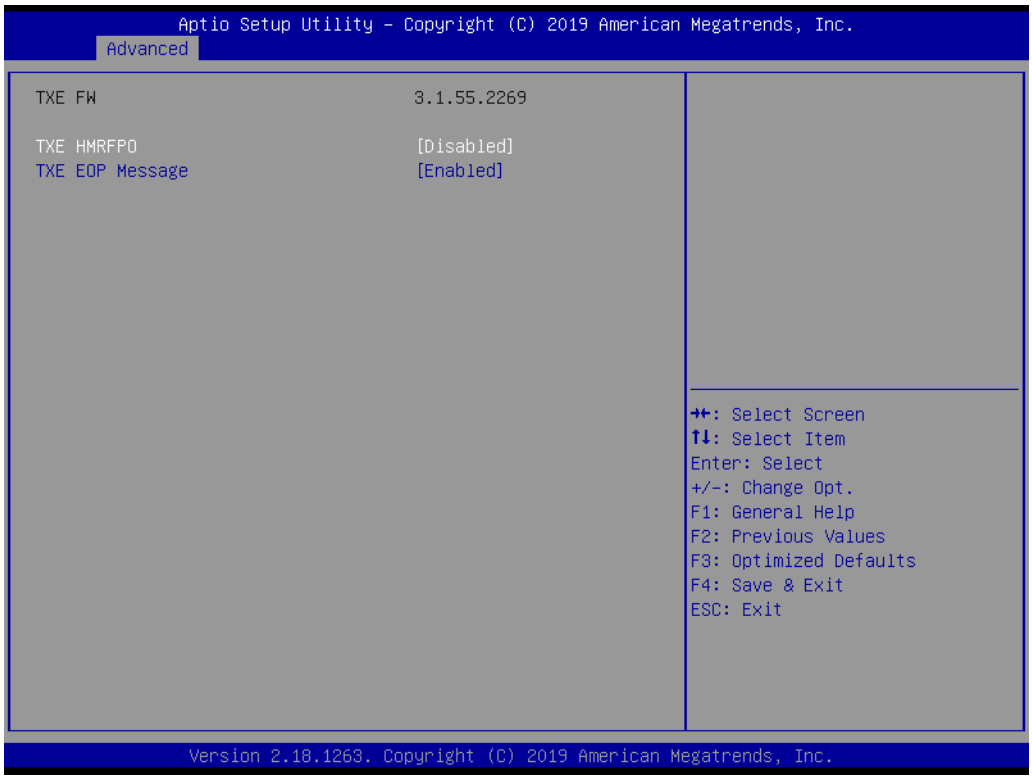


3.2.2.11 USB Configuration

- **Legacy USB Support**
  This item allows users to enable or disable legacy USB support. The Auto option disables legacy support if no USB devices are connected. The Disabled option keeps USB devices available only for EFI applications.
- **XHCI Hand-Off**
  This item is a workaround for operating systems without XHCI hand-off support. The XHCI ownership change should be claimed by an XHCI driver.
- **EHCI Hand-Off**
  This item is a workaround for operating systems without EHCI hand-off support. The EHCI ownership change should be claimed by EHCI driver.
- **USB Mass Storage Driver Support**
  This item allows users to enable or disable USB driver support
- **Device Reset Timeout**
  This item allows users to configure the USB start unit command timeout
- **Device Power-Up Delay**
  This item allows users to configure the maximum time the device will wait before reporting itself to the host controller. The Auto option uses the default value, which is 100 ms for a root port. For a hub port, the default delay time is determined by the hub descriptor.

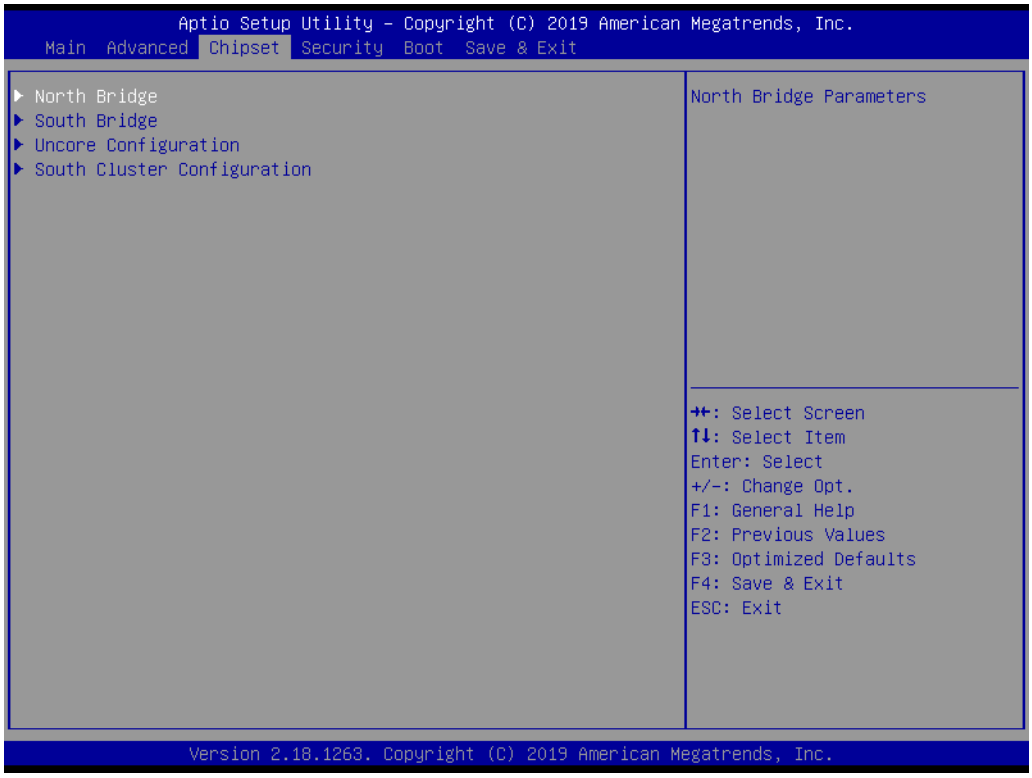
3.2.2.12 Security Configuration

- **TXE EOP Message**
  This item allows users to enable or disable the sending of an EOP message before entering OS



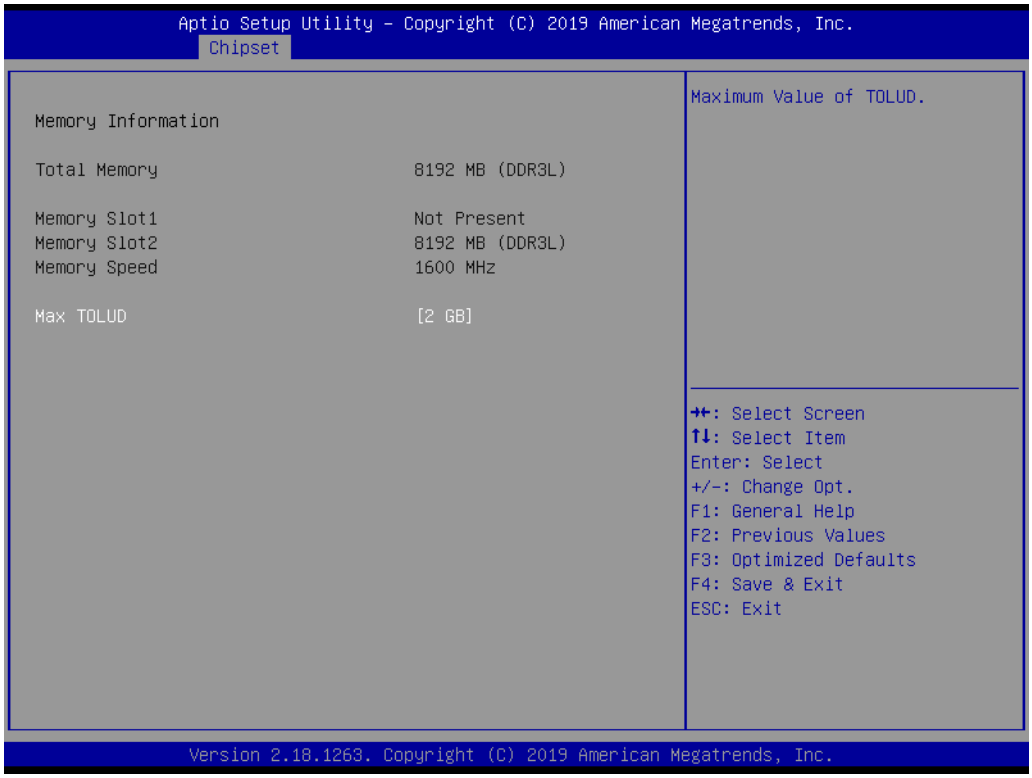
3.2.3 Chipset Configuration

- **North Bridge**
  This item allows users to access and configure North Bridge items
- **South Bridge**
  This item allows users to access and configure South Bridge items
- **Uncore Configuration**
  This item allows users to access and configure Uncore items
- **South Cluster Configuration**
  This item allows users to access and configure South Cluster items



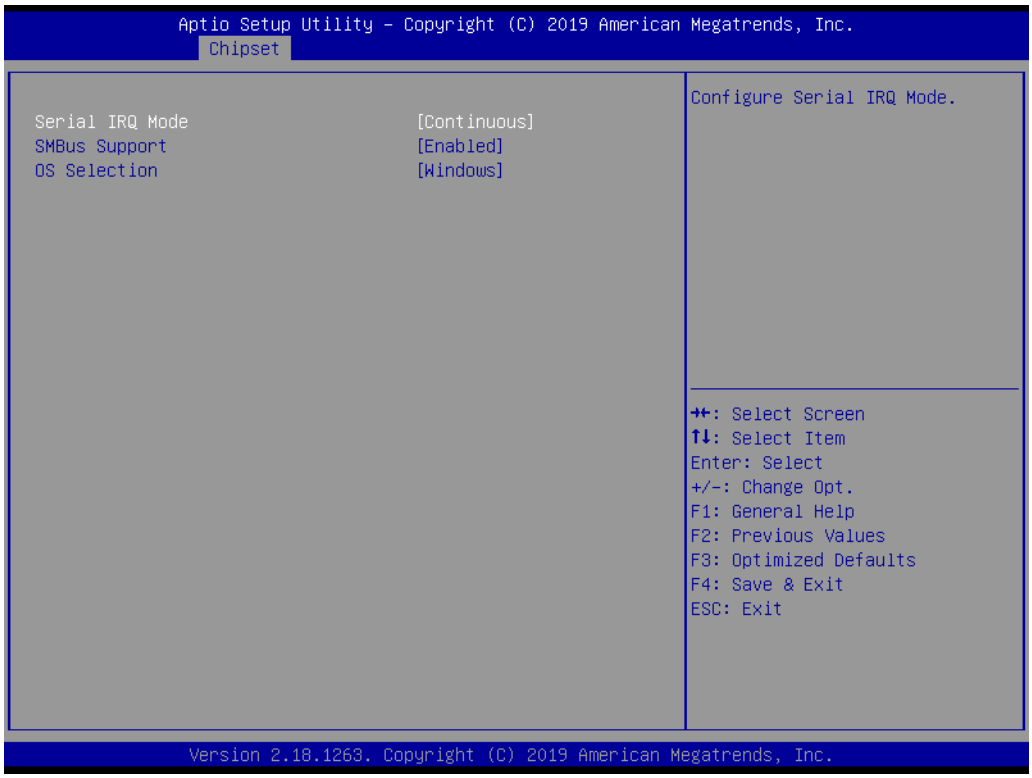
3.2.3.1 North Bridge

- **Max TOLUD**
  This item allows users to configure the maximum value of TOLUD



3.2.3.2 South Bridge

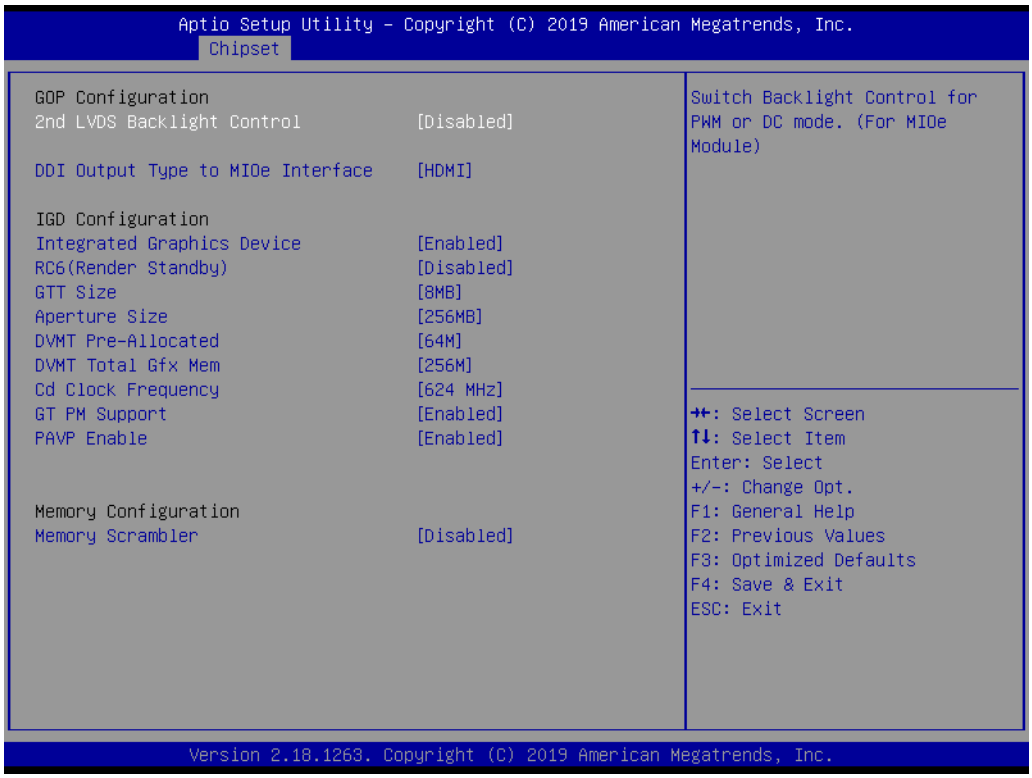
- **Serial IRQ Mode**
  This item allows users to configure the serial IRQ mode
- **SMBus Support**
  This item allows users to enable or disable SMBus support
- **OS Selection**
  This item allows users to select the target OS



3.2.3.3 Uncore Configuration

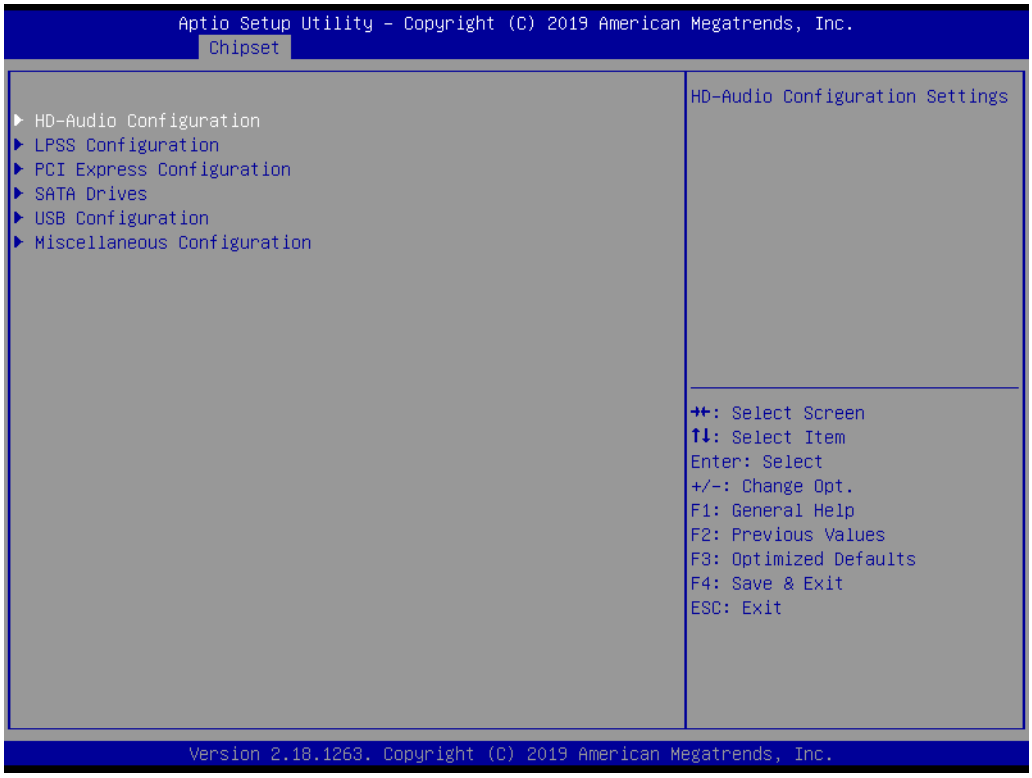
- **Integrated Graphics Device**
  This item allows users to enable or disable integrated graphics devices when selected as the primary video adaptor
- **Primary Display**
  This item allows users to select which IGD/PCI graphics device is used as the primary display
- **RC6 (Render Standby)**
  This item allows users to enable or disable render standby support
- **GTT Size**
  This item allows users to select the GTT size
- **Aperture Size**
  This item allows users to select the aperture size
- **DVMT Pre-Allocated**
  This item allows users to select the DVMT 4.0 pre-allocated (UMA) graphics memory size used by the internal graphics device
- **DVMT Total Gfx Mem**
  This item allows users to select the DVMT5.0 total graphics memory size used by the internal graphics device
- **GT PM Support**
  This item allows users to enable or disable GT PM support

- **PAVP Enable**
  This item allows users to enable or disable PAVP

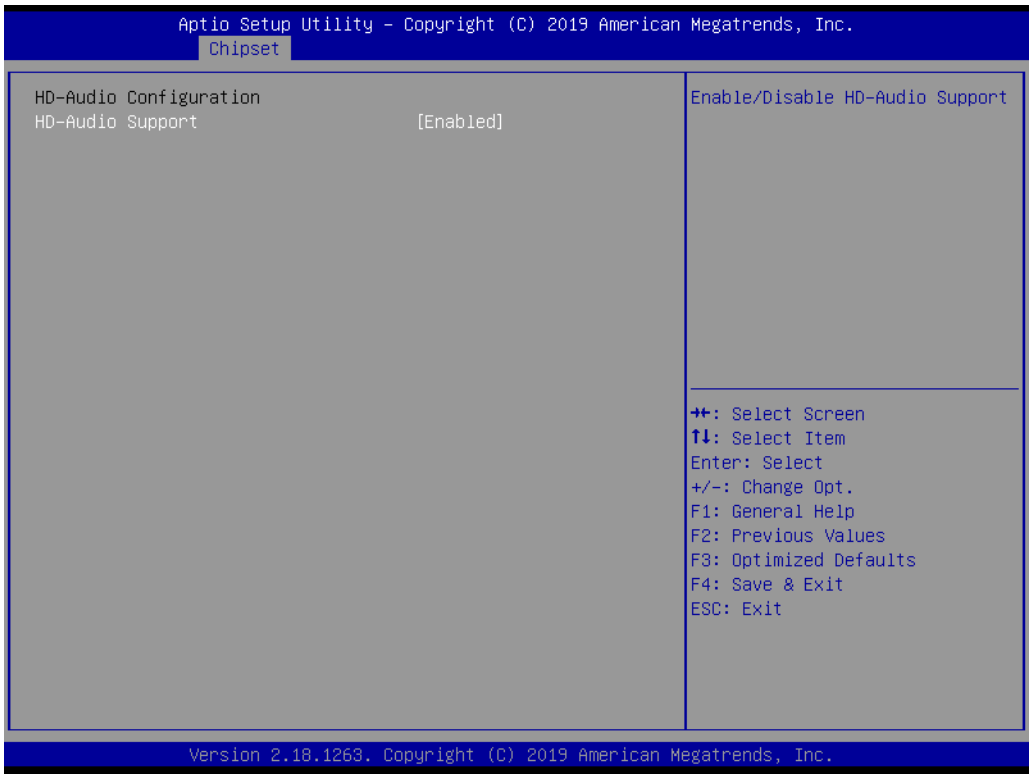


3.2.3.4 South Cluster Configuration

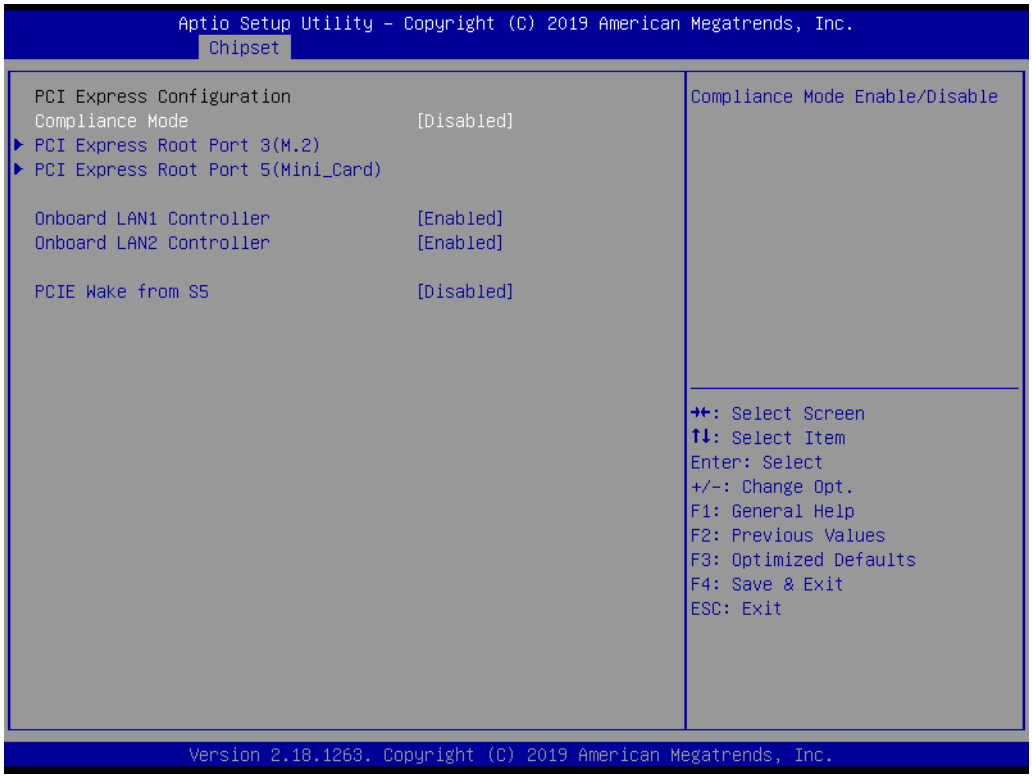
- **HD-Audio Configuration**
  This item allows users to access and configure the HD audio settings
- **PCI Express Configuration**
  This item allows users to access and configure the PCI Express settings
- **SATA Drives**
  This item allows users to access and configure the SATA device settings
- **USB Configuration**
  This item allows users to access and configure the USB configuration settings
- **Miscellaneous Configuration**
  This item allows users to enable or disable miscellaneous functions/features



- **HD-Audio Configuration Settings**
- **HD-Audio Support**
  This item allows users to enable or disable HD audio support

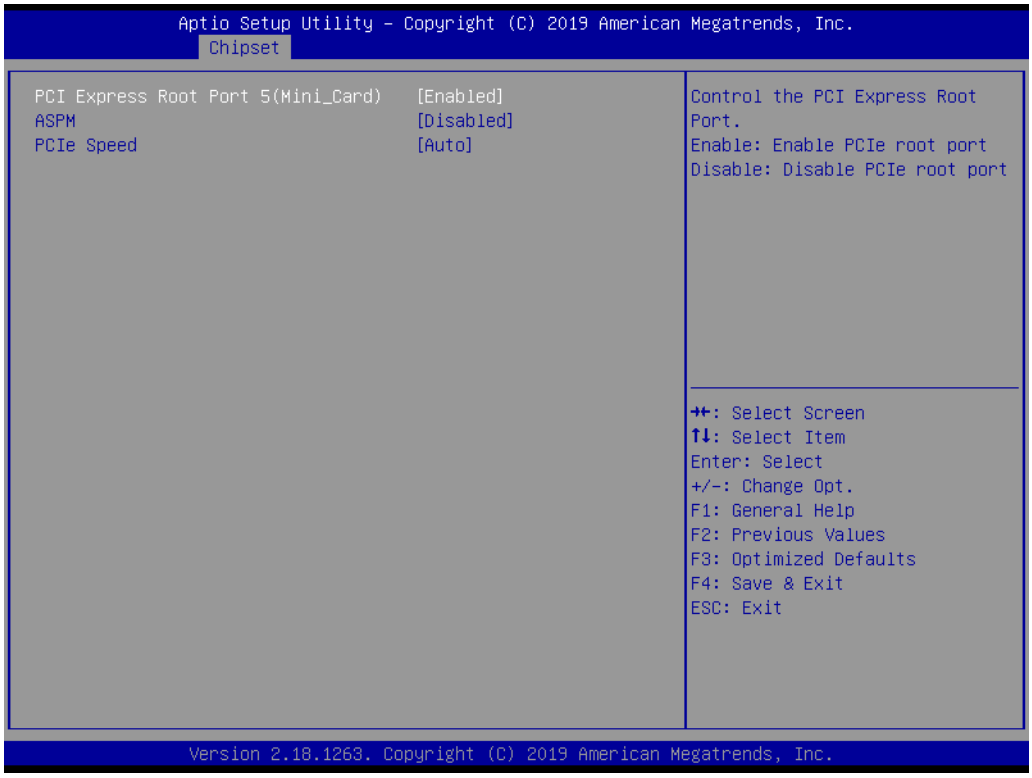


- **PCI Express Configuration**
- **Compliance Mode**
  This item allows users to enable or disable compliance mode
- **PCIE Wake**
  This item allows users to enable or disable Wake from PCIE
- **Onboard LAN1 Controller**
  This item allows users to enable or disable the onboard LAN1 controller
- **Onboard LAN2 Controller**
  This item allows users to enable or disable the onboard LAN2 controller
- **PCIE Wake from S5**
  This item allows users to enable or disable Wake from S5 via PCIE

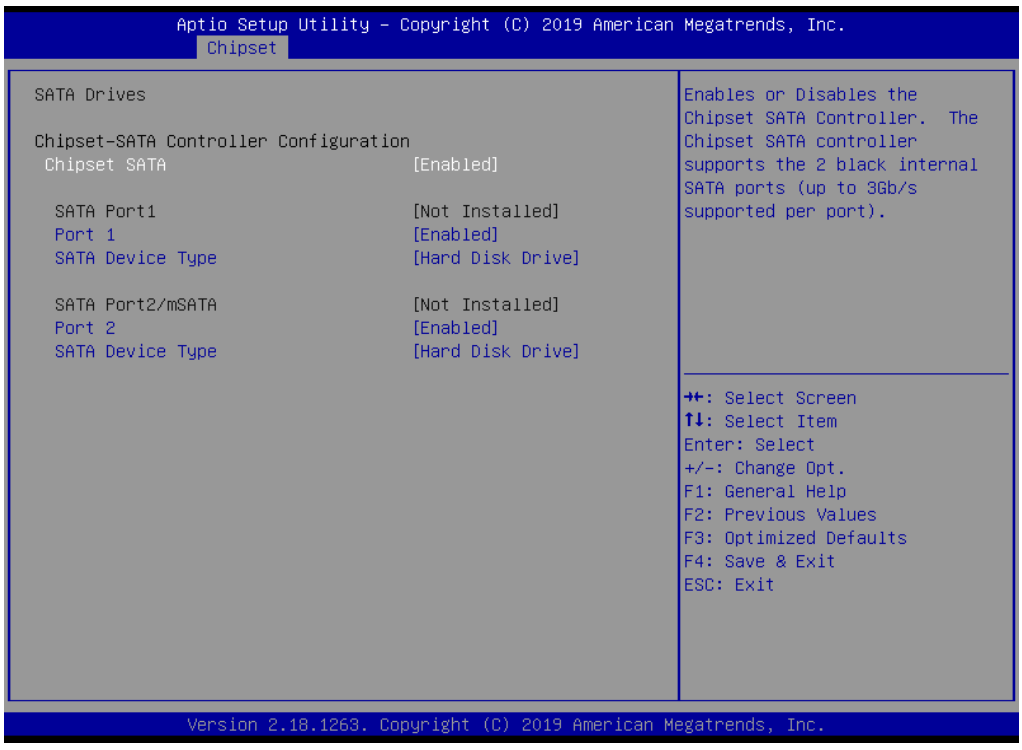


3.2.3.5 PCI Express Configuration Settings

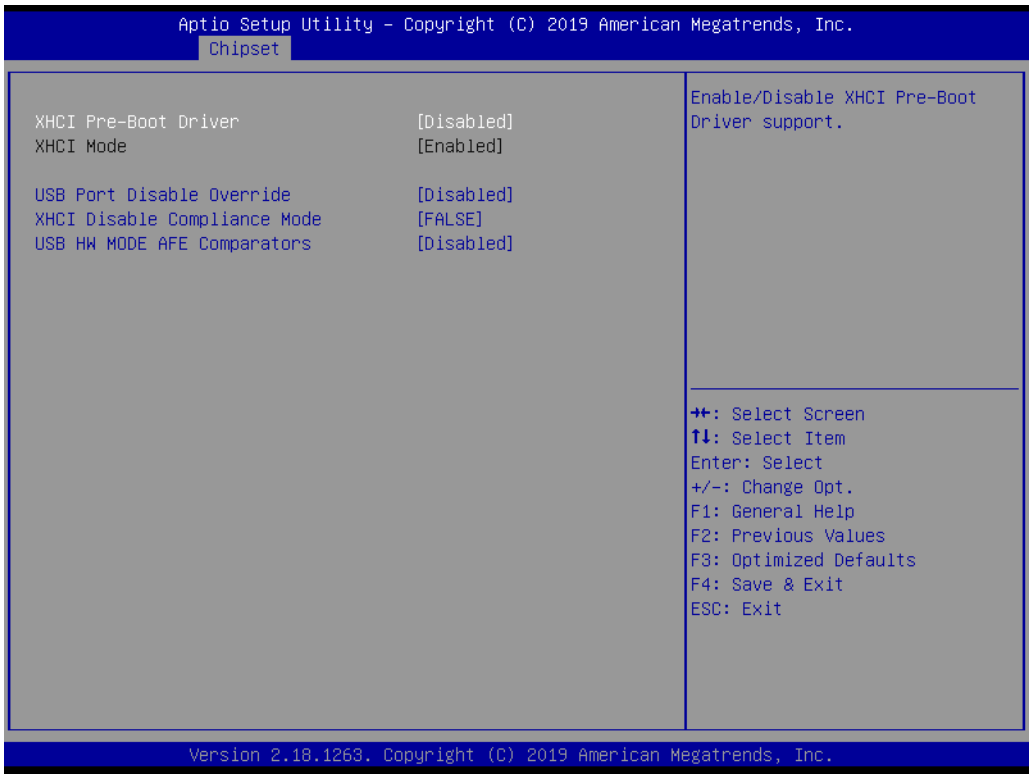
- **PCI Express Root Port 5**
  This item allows users to control the PCI Express root port. The Auto option disables the unused root port automatically for optimum power savings.
- **ASPM**
  This item allows users to configure the PCI Express Active State Power Management (ASPM) settings
- **PCIe Speed**
  This item allows users to configure PCIe speed



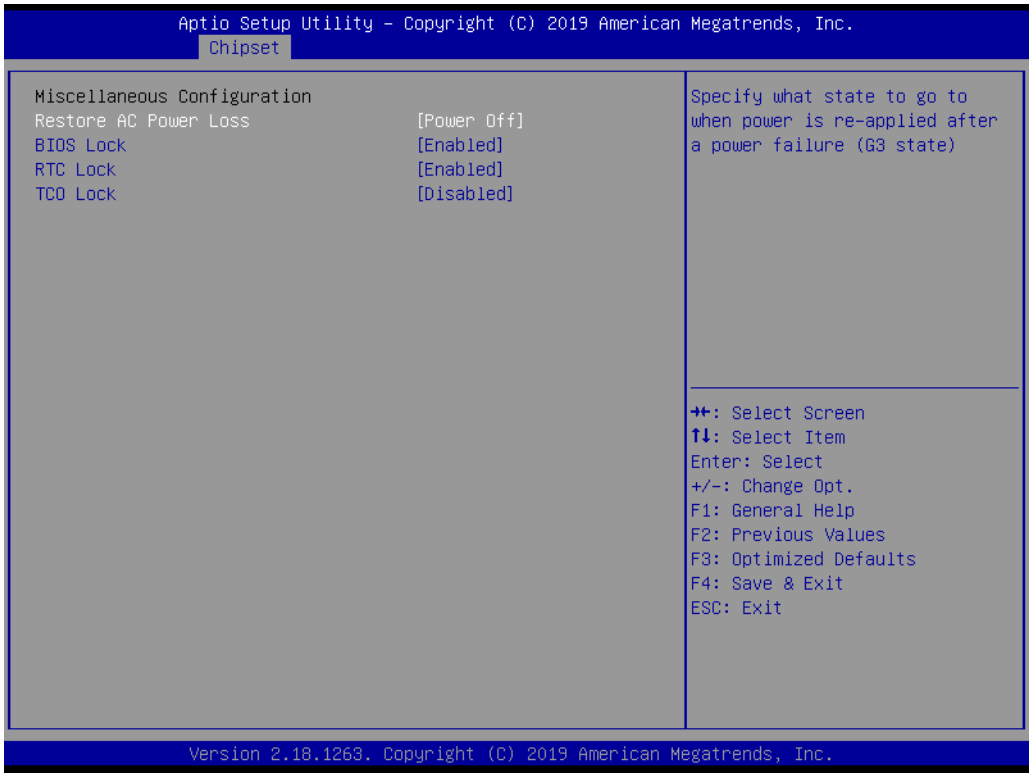
- **SATA Drives**
- **Chipset SATA**
  This item allows users to enable or disable the chipset SATA controller. The chipset SATA controller supports two internal SATA ports (up to 3Gb/s per port).
- **Port 1**
  This item allows users to enable or disable the SATA port
- **SATA Device Type**
  This item allows users to identify the SATA port connected to an SSD or HDD



- **USB Configuration**
- **XHCI Mode**
  This item allows users to configure the XHCI mode. If disabled, none of the USB devices will be detectable or usable during boot up. Only disable this function for debugging purposes.
- **USB Port Disable Override**
  This item allows users to enable or disable the corresponding USB port from reporting a device connection to the controller.
- **XHCI Disable Compliance Mode**
  This item allows users to enable or disable XHCI compliance mode. The default setting is disabled.



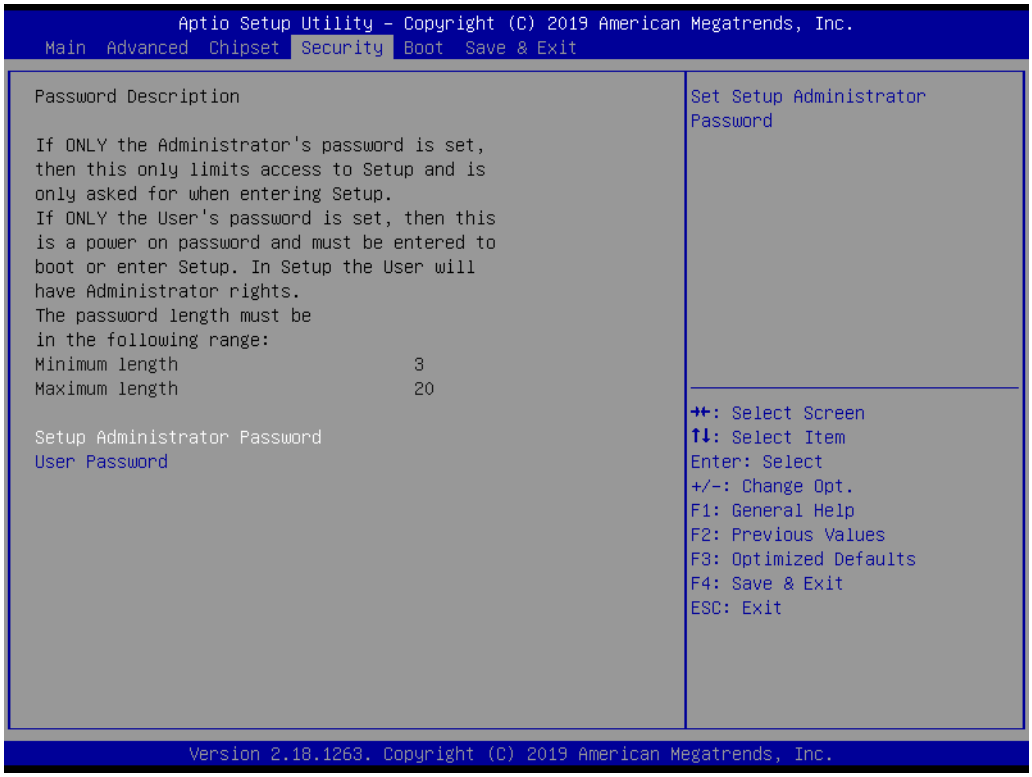
- **Miscellaneous Configuration**
- **Restore AC Power Loss**
  Specify what state to go to when power is re-applied after a power failure (G3 state).
  Power On: System will boot directly as soon as power applied
  Power Off: System keeps in power-off state until power button is pressed
  Last State: System will act as like last power states
- **BIOS Lock**
  This item allows users to enable or disable the BIOS lock feature. This function must be enabled for SMM-based flash protection.
- **RTC Lock**
  This item allows users to enable or disable the RTC lock feature. When enabled, bytes 38h ~ 3Fh in the lower/upper 128-byte bank of RTC RAM will be locked.



3.2.4 Security

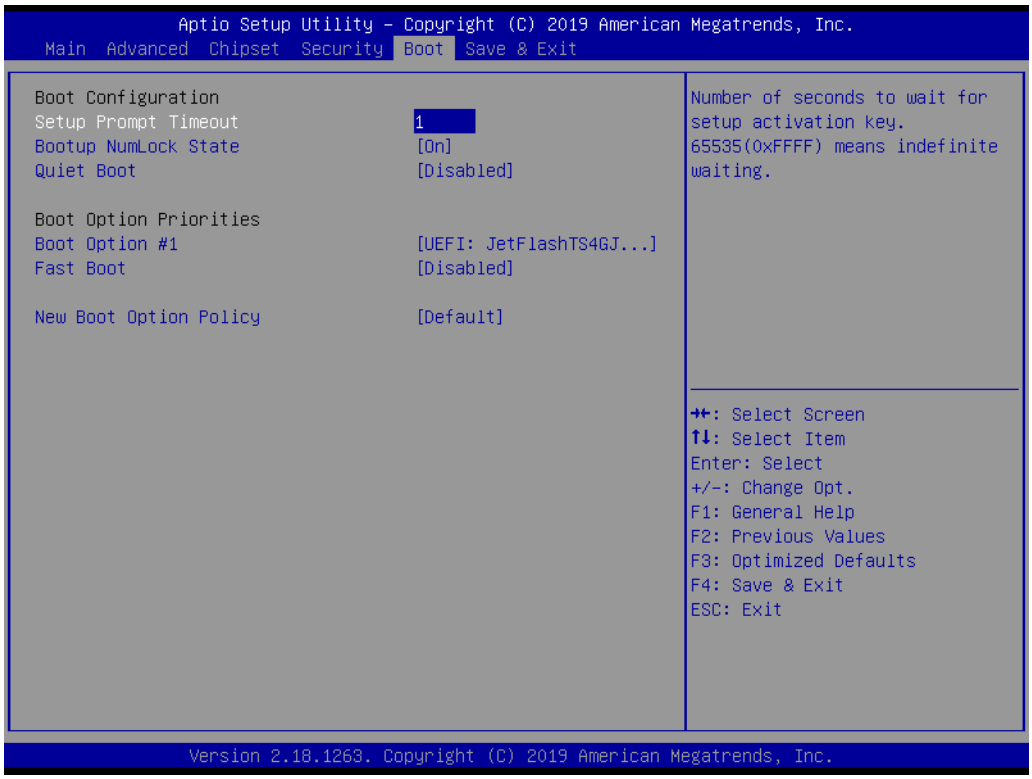
Select the Security tab of the main BIOS Setup Utility menu. To access the sub menu for each item, select the item and press <Enter>.

- **Change Administrator/User Password**
  This item allows users to setup the administrator account and configure the user password settings



3.2.5 Boot

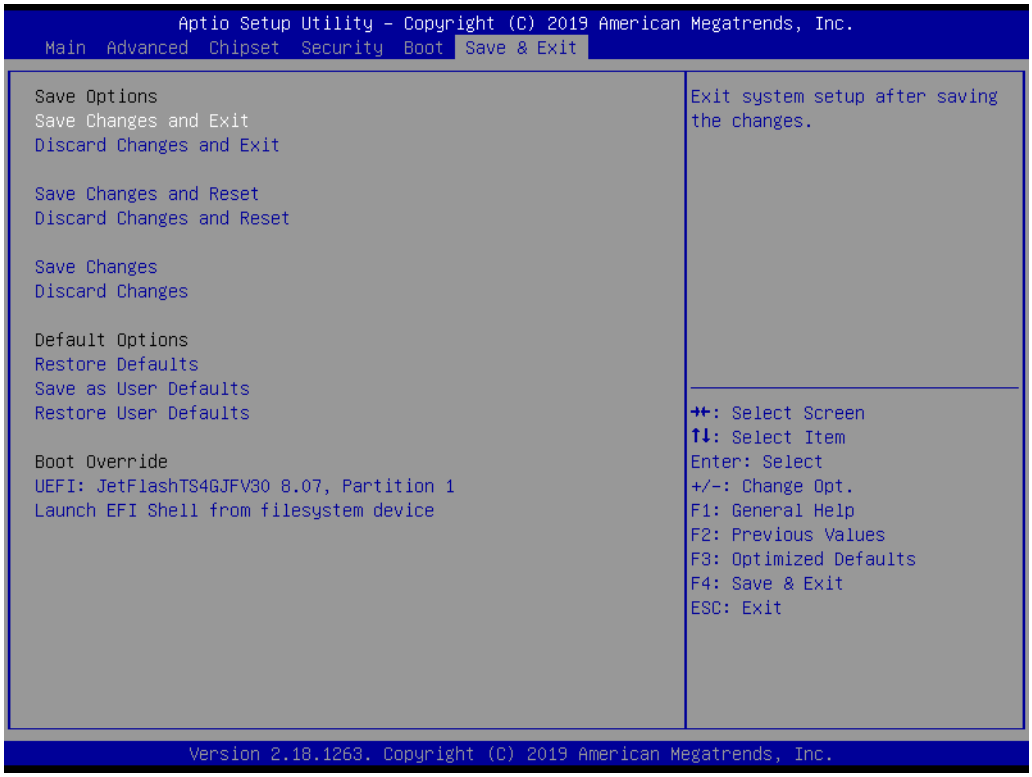
- **Setup Prompt Timeout**
  This item allows users to configure the number of seconds that the system waits for a setup activation key. 65535 (0xFFFF) means indefinite waiting.
- **Bootup NumLock State**
  This item allows users to configure the keyboard NumLock state
- **Quiet Boot**
  This item allows users to enable or disable the quiet boot option
- **Boot Option #1**
  This item allows users to configure the system boot order
- **Fast Boot**
  This item allows users to enable or disable the FastBoot function. When enabled, most probes are skipped to reduce the time required for boot up.
- **New Boot Option Policy**
  This item allows users to configure the policy for newly detected UEFI boot options



3.2.6 Save & Exit

- **Save Changes and Exit**
  This item allows users to exit the BIOS Setup Utility after saving all changes
- **Discard Changes and Exit**
  This item allows users to exit the BIOS Setup Utility without saving changes
- **Save Changes and Reset**
  This item allows users to reset the system after saving changes
- **Discard Changes and Reset**
  This item allows users to rest the system without saving changes

- **Save Changes**
  This item allows users to save all changes to any configuration options
- **Discard Changes**
  This item allows users to discard all changes to any configuration options
- **Restore Defaults**
  This item allows users to restore/load default values for all configuration options
- **Save as User Defaults**
  This item allows users to save all configuration changes as user defaults
- **Restore User Defaults**
  This item allows users to restore the system configuration options to the user default settings
- **Boot Override**
  This item allows users to enable or disable the boot priority override function



Appendix A

Watchdog Sample Code

A.1 Watchdog Function

The SCH3114 Runtime base I/O address is A00h
The watchdog value is offset at 66h
If the value is set at “0”, this means watchdog function is disabled

```
Superio_GPIO_Port = A00h
mov dx,Superio_GPIO_Port + 66h
mov al,00h
out dx,al
.model small
.486p
.stack 256
.data
SCH3114_IO EQU A00h
.code
org 100h
.STARTup
;=====================================================
;47H
;enable WDT function bit [0]=0Ch
;=====================================================
mov dx,SCH3114_IO + 47h
mov al,0Ch
out dx,al
;=====================================================
;65H
;bit [1:0]=Reserved
;bit [6:2]Reserve=00000
;bit [7] WDT time-out Value Units Select
;Minutes=0 (default) Seconds=1
;=====================================================
mov dx,SCH3114_IO + 65h;
mov al,080h
out dx,al
;=====================================================
;66H
;WDT timer time-out value
;bit[7:0]=0~255
;=====================================================
mov dx,SCH3114_IO + 66h
mov al,01h
out dx,al
;=====================================================
;bit[0] status bit R/W
;WD timeout occurred =1;WD timer counting = 0
;=====================================================
mov dx,SCH3114_IO + 68h
```

```
mov al,01h
out dx,al
.exit
END
```

Appendix B

SUSI API Introduction

B.1 SUSI API Introduction

To provide programmers with easier, more convenient access to hardware, Advantech has released a suite of application programming interfaces (APIs) in the form of a program library. This program library is known as the Secured and Unified Smart Interface, or SUSI for short.

SUSI provides a uniform API for application programmers to access the hardware functions in different OS and on different Advantech platforms. Application programmers can invoke the functions exported by SUSI instead of calling the drivers directly. The benefit of using SUSI is portability. The same set of APIs is defined for various Advantech platforms and implemented on different OS.

The hardware functions currently supported by SUSI are grouped into various categories and APIs, such as the Watchdog API and Hardware Monitor API. The most common of the SUSI APIs are briefly described below.

B.1.1 Watchdog API

A watchdog timer (abbreviated as WDT) is a hardware device that triggers an action, e.g., system reboot, if the system does not reset the timer within a specific period of time. The WDT API in SUSI provides developers with functions such as starting the timer, resetting the timer, and setting the timeout value if the hardware requires customized timeout values.

B.1.2 Hardware Monitor API

The hardware monitor (abbreviated as HWM) is a system health supervision capability achieved by placing certain I/O chips along with sensors for inspecting the target of interests for certain condition indexes, such as temperature and voltage.

However, due to the inaccuracy of many commercially available hardware monitoring chips, Advantech has developed a unique scheme for hardware monitoring that uses a dedicated micro-processor with algorithms specifically designed for providing accurate, reliable, real-time data.

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