SCH300

IEC-61850-3 , IEEE-1613

Substation Fanless Computer

User's Manual

Revision Date: July. 06. 2020

Safety Information

Electrical safety

- To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
- When adding or removing devices to or from the system, ensure that the power cables for the devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you add a device.
- Before connecting or removing signal cables from the motherboard, ensure that all power cables are unplugged.
- Seek professional assistance before using an adapter or extension cord. These devices could interrupt the grounding circuit.
- Make sure that your power supply is set to the correct voltage in your area.
- If you are not sure about the voltage of the electrical outlet you are using, contact your local power company.
- If the power supply is broken, do not try to fix it by yourself. Contact a qualified service technician or your local distributor.

Operation safety

- Before installing the motherboard and adding devices on it, carefully read all the manuals that came with the package.
- Before using the product, make sure all cables are correctly connected and the power cables are not damaged. If you detect any damage, contact your dealer immediately.
- To avoid short circuits, keep paper clips, screws, and staples away from connectors, slots, sockets and circuitry.
- Avoid dust, humidity, and temperature extremes. Do not place the product in any area where it may become wet.
- Place the product on a stable surface.
- If you encounter any technical problems with the product, contact your local distributor

Statement

Revision History

Revision	Date (yyyy/mm/dd)	Changes
V1.0	2020/07/06	First release

Packing List

Item	Description	Q'ty
1	SCH300 Embedded System	1
2	Driver CD	1

Ordering information

SCH300
IEC-61850-3 , IEEE-1613 Substation Fanless Computer with Intel® Core™ i7-9700TE
2 x 2.5" Easy swap SSD Tray
4 x POE , 2 x RJ45 LAN , 4 x USB 3.0 , 2 x USB 2.0 , 1 x DP , 1 x HDMI , 6 x COM(RS232/422/485)
9V to 48V DC-in, Extend Temp -40 to 60°C

Ordering Number	**LAN Port**	**POE**	**COM Port**
S301	2 x RJ45	4 x RJ45	6 x RS232 / 422 / 485, 8-bit Isolated DIDO (4 x DI, 4 x DO)
S302	6 x RJ45	N/A	6 x RS232 / 422 / 485, 8-bit Isolated DIDO (4 x DI, 4 x DO)
S303	2 x RJ45	4 x RJ45 + 4 x M12	2 x RS232 / 422 / 485
S304	2 x RJ45	8 x M12	2 x RS232 / 422 / 485
S305	2 x RJ45	8 x RJ45	2 x RS232 / 422 / 485
S306	10 x RJ45	N/A	2 x RS232 / 422 / 485
S307	2 x RJ45	N/A	10 x RS232 / 422 / 485, 8-bit Isolated DIDO (4 x DI, 4 x DO)
S308	2 x RJ45	4 x M12	6 x RS232 / 422 / 485, 8-bit Isolated DIDO (4 x DI, 4 x DO)

RoHS Compliance

Perfectron RoHS Environmental Policy and Status Update

Perfectron is a global citizen for building the digital infrastructure. We are committed to providing green products and services, which are compliant with

European Union RoHS (Restriction on Use of Hazardous Substance in Electronic Equipment) directive 2011/65/EU, to be your trusted green partner and to protect our environment.

In order to meet the RoHS compliant directives, Perfectron has established an engineering and manufacturing task force to implement the introduction of green products. The task force will ensure that we follow the standard Perfectron development procedure and that all the new RoHS components and new manufacturing processes maintain the highest industry quality levels for which Perfectron are renowned.

The model selection criteria will be based on market demand. Vendors and suppliers will ensure that all designed components will be RoHS compliant

Table Contents

Chapter 1: Product Introduction

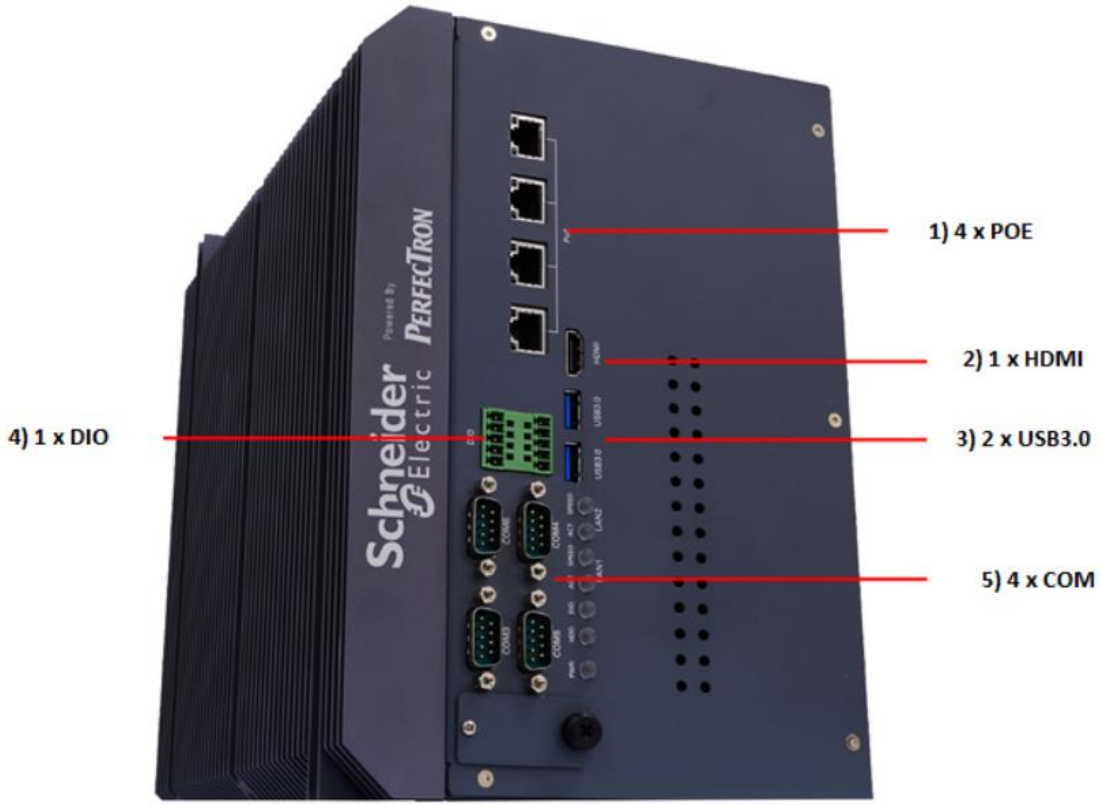
1.1 Key Features

System	
CPU Type	Intel® Core i7-9700TE
Chipset	Intel® C246
Memory Type	DDR4 2666MHz, 2 x 260-pin SO-DIMM, Max. 64GB
Expansion Slot	2 x I/O Expansion Slots(Default : 4 x POE + 4 x COM) 2 x PCIe 3.0 x 8
Storage Device	2 x 2.5" SATAIII HDD / SSD tray
Front I/O	
Power Button	1 x (with LED indicator)
HDMI	1 x 19Pin HDMI1.4 connector, resolution up to 3840x2160@30Hz
USB	2 x USB 3.0
Serial Port	4 x COM(ES232/422/485),with 8-bit Isolated DIDO
POE	4 x RJ45
HSR/PRP	HSR/PRP Dual LAN Card
Rear I/O	
Power Input	DC9V~48V
COM	2 x RS232 / 422 / 485 (Support Power 5V / 12V)
Ethernet	2 x RJ45
USB	4 x USB 3.1, 2 x USB 2.0
PS/2	1
DisplayPort	1 x 20Pin DisplayPort connector, resolution up to 4096x2160@60Hz
DVI-I	1 x 20Pin DVI-I connector, resolution up to 2560x1600@60Hz
Terminal Block	1 x 2Pin Terminal Block Remote Power ON/OFF 1 x 2Pin Terminal Block Remote Reset 1 x 4Pin Terminal Block External FAN Connector 1 x 3Pin Terminal Block Power Input
Audio	1 x Mic-in, 1 x Line-out
Graphic External Power	1 x 12V
DC-in	1 x 9~48V
Mechanical & Environment	
Dimension (W x H x D)	170 x 264 x 250 mm(W x D x H)
System Design	Fanless
Mounting	Rackmount Cube
Operating Temp. (ambient with air flow)	-40°C to 60°C (35W CPU)

Storage Temp.	-40°C to +85°C
Relative Humidity	5% to 95%, non-condensing
OS Support List	
Windows	Windows 10 64 Bit
Linux	Ubuntu14.04 , Fedora 20/23 , RedHat Linux EL 7.1/7.2
Certification	
EMC	CE , FCC compliant
Green Product	RoHS , WEEE compliance

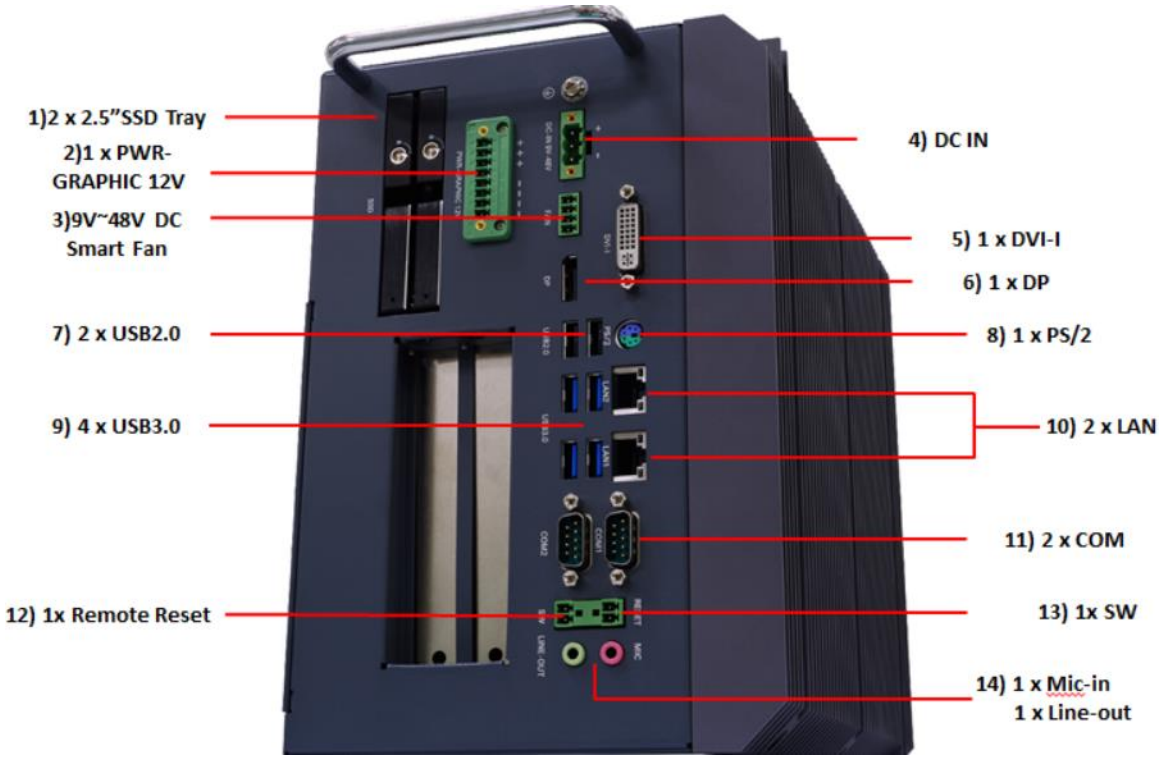
MIL-STD-810G Test		
Operating Tests		
Low temperature	Method 502.5 Procedure 2	Exposure(24h x 3 cycle) at -40°C min
High temperature	Method 501.5 Procedure 2	60°C for 2 hours after temperature stabilization
Humidity	Method 507.5 Procedure 2	RH -95%. Test cycles ; ten 24-hours , functional test after 5th and 10th cycles
Vibration	Method 514.6 Category 20	10-500Hz 1.04 Grms Test duration : 1 hour x 3 axis (total 3 hours)
Shock	Method 516.6 Category 20	20G, 11mSec, 3 per axis
Non-Operating Tests		
Low temperature Storage	Method 502.5 Procedure 1	Exposure(24h x 7 cycle) at -40°C min
High temperature Storage	Method 501.5	71°C for 2 hours after temperature stabilization
Vibration	Method 514.6 Category 24	200 to 2000Hz Test duration : 1 hour x 1 axis Rms = 7.7 gs
Shock	Method 516.6 Category V	40G, 11ms, 3 pluse

1.2 Front Panel I/O Placement



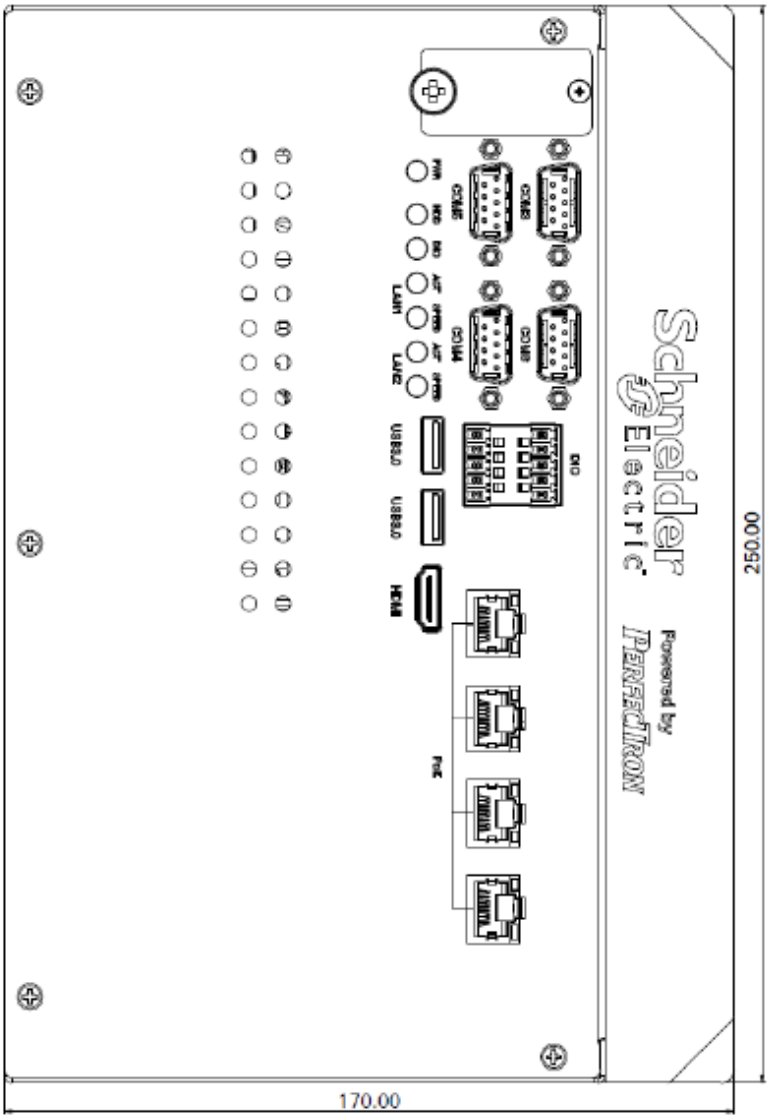
1	4 x POE
2	1 x HDMI
3	2 x USB3.0
4	1 x DIO
5	4 x COM

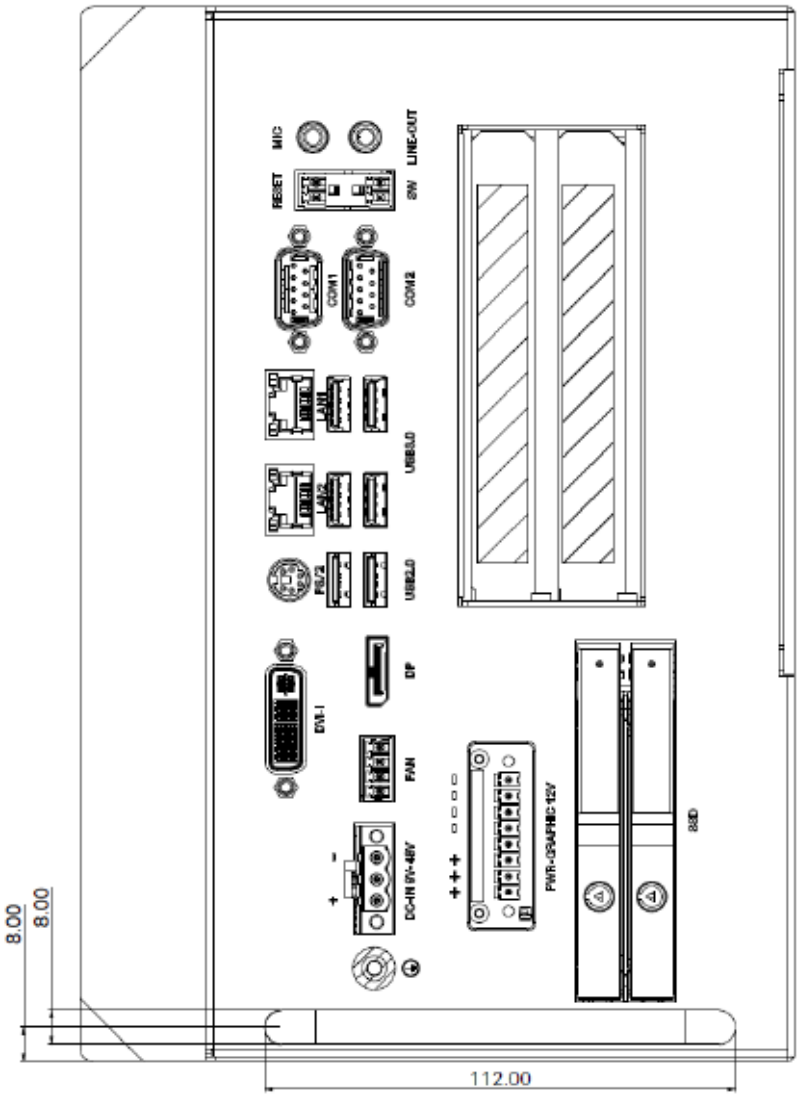
1.3 Rear Panel I/O Placement

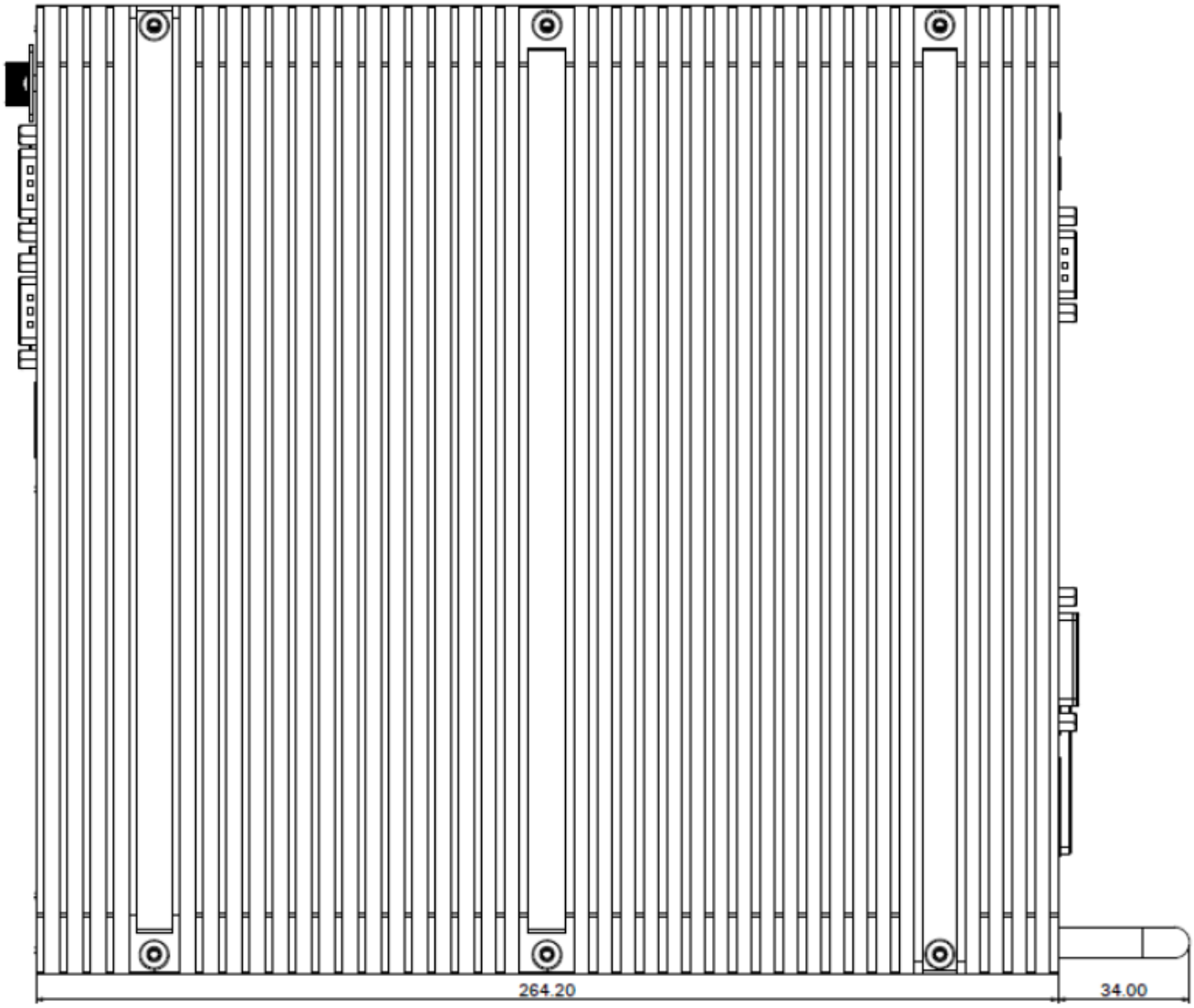


1	2 x 2.5" SSD Tray
2	1 x PWR-GRAPHIC 12V
3	9V~48V DC Smart Fan
4	DC IN
5	1 x DVI-I
6	1 x DP
7	2 x USB2.0
8	1 x PS/2
9	4 x USB3.0
10	2 x LAN
11	2 x COM
12	1 x Remote Reset
13	1 x SW
14	1 x Mic-in ; 1 x Line out

1.4 Mechanical Dimensions




MIC
LINE-OUT
RESET
SW
COM1
COM2
LAN1
LAN2
USB3.0
USB3.0
PS/2
DP
DVI-I
FAN
DC-IN 9V-48V
PWR-GRAPHIC 12V
SSD
8.00
8.00
112.00


264.20
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Chapter 2: Connectors Pin Define

2.1 External Connector Pin Definition

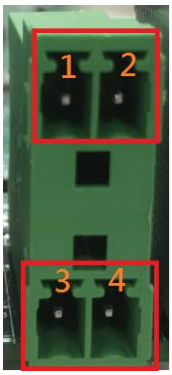
3-pin terminal block for DC Input

Pin	Signal
1	DC IN +9~48VIN
2	Ignition (IGN)
3	GND

4-pin Terminal Block for PWM Fan

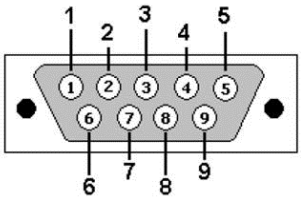
Pin	Signal
1	Ground
2	+12V
3	System_FAN_TACH
4	SYSTEM_FAN_CTRL

2-pin Terminal Block for Remote Power ON/OFF and Reset



Pin	Signal
1	Ground
2	EXT Reset
3	Ground
4	EXT_PWRBT_ON/OFF

COM Pin definition



Pin No	RS-232	RS-422	RS-485
1	DCD	TX-	DATA-
2	RX	TX+	DATA+
3	RTX	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

Chapter 3: AMI BIOS UTILITY

This chapter provides users with detailed descriptions on how to set up a basic system configuration through the AMI BIOS setup utility.

3.1 Starting

To enter the setup screens, perform the following steps:

- Turn on the computer and press the <Del> key immediately.
- After the <Del> key is pressed, the main BIOS setup menu displays. Other setup screens can be accessed from the main BIOS setup menu, such as the Chipset and Power menus.

3.2 Navigation Keys

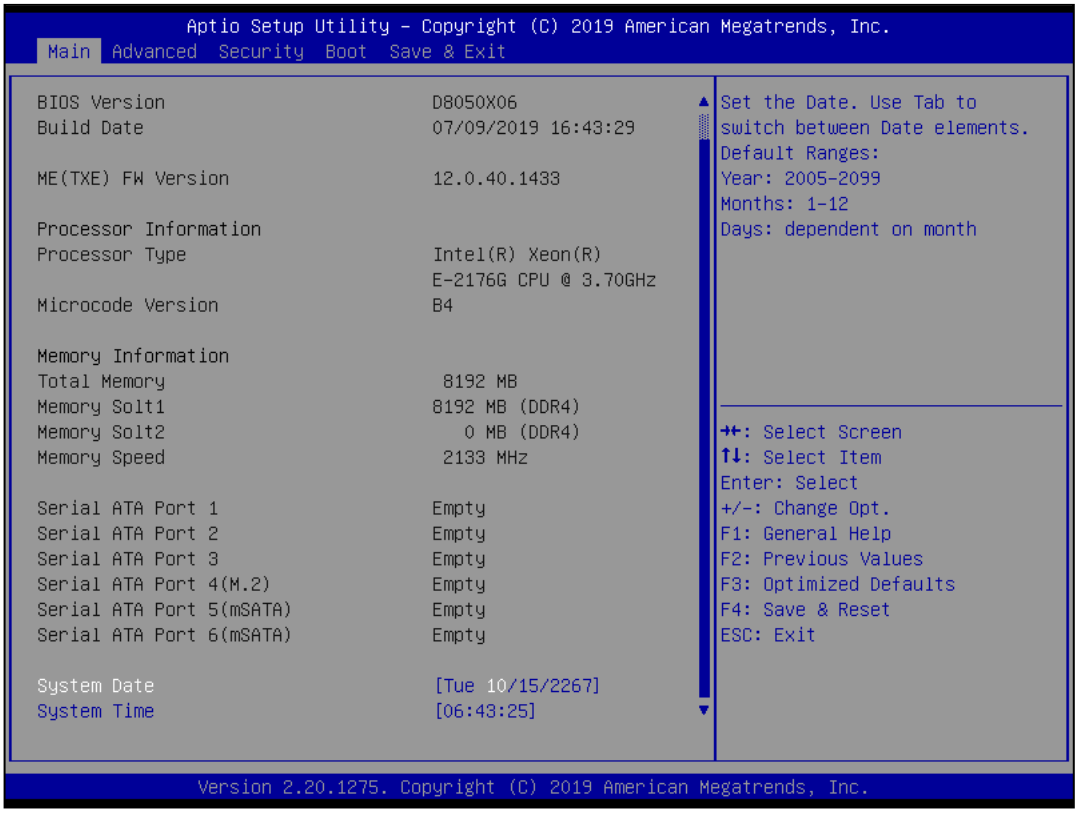
The BIOS setup/utility uses a key-based navigation system called hot keys. Most of the BIOS setup utility hot keys can be used at any time during the setup navigation process.
Some of the hot keys are <F1>, <F10>, <Enter>, <ESC>, and <Arrow> keys.

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

Left/Right	The Left and Right <Arrow> keys moves the cursor to select a menu.
Up/Down	The Up and Down <Arrow> keys moves the cursor to select a setup screen or sub-screen.
+– Plus/Minus	The Plus and Minus <Arrow> keys changes the field value of a particular setup setting.
Tab	The <Tab> key selects the setup fields.
F1	The <F1> key displays the General Help screen.
F10	The <F10> key saves any changes made and exits the BIOS setup utility.
Esc	The <Esc> key discards any changes made and exits the BIOS setup utility.
Enter	The <Enter> key displays a sub-screen or changes a selected or highlighted option in each menu.

3.3 Main Page

The Main menu is the first screen that you will see when you enter the BIOS Setup Utility.



System Date

Use this function to change the system date.

Select System Date using the Up and Down <Arrow> keys. Enter the new values through the keyboard. Press the Left and Right <Arrow> keys to move between fields.

The date setting must be entered in MM/DD/YY format.

System Time

Use this function to change the system time.

Select System Time using the Up and Down <Arrow> keys. Enter the new values through the keyboard. Press the Left and Right <Arrow> keys to move between fields.

The time setting is entered in HH:MM:SS format.

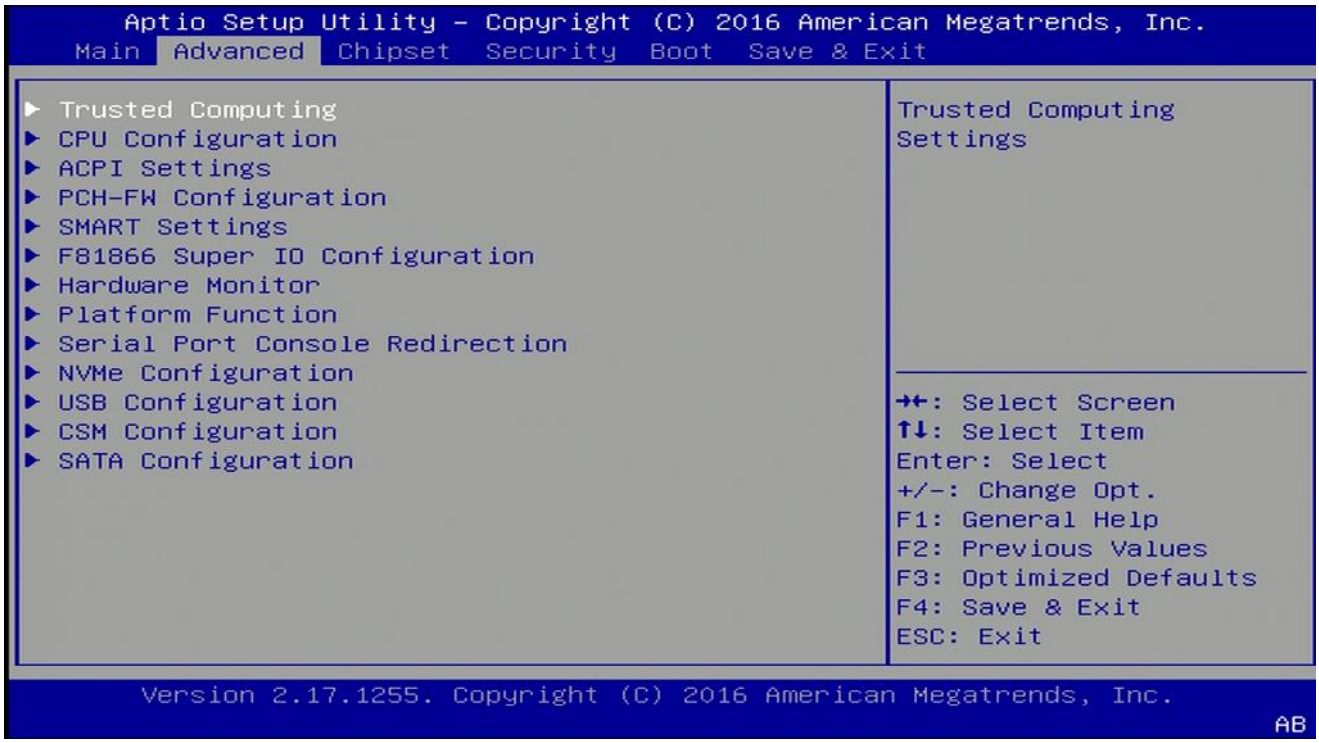
Note: The time is in 24-hour format. For example, 5:30 A.M. appears as 05:30:00, and 5:30 P.M. as 17:30:00.

Access Level

Display the access level of the current user in the BIOS.

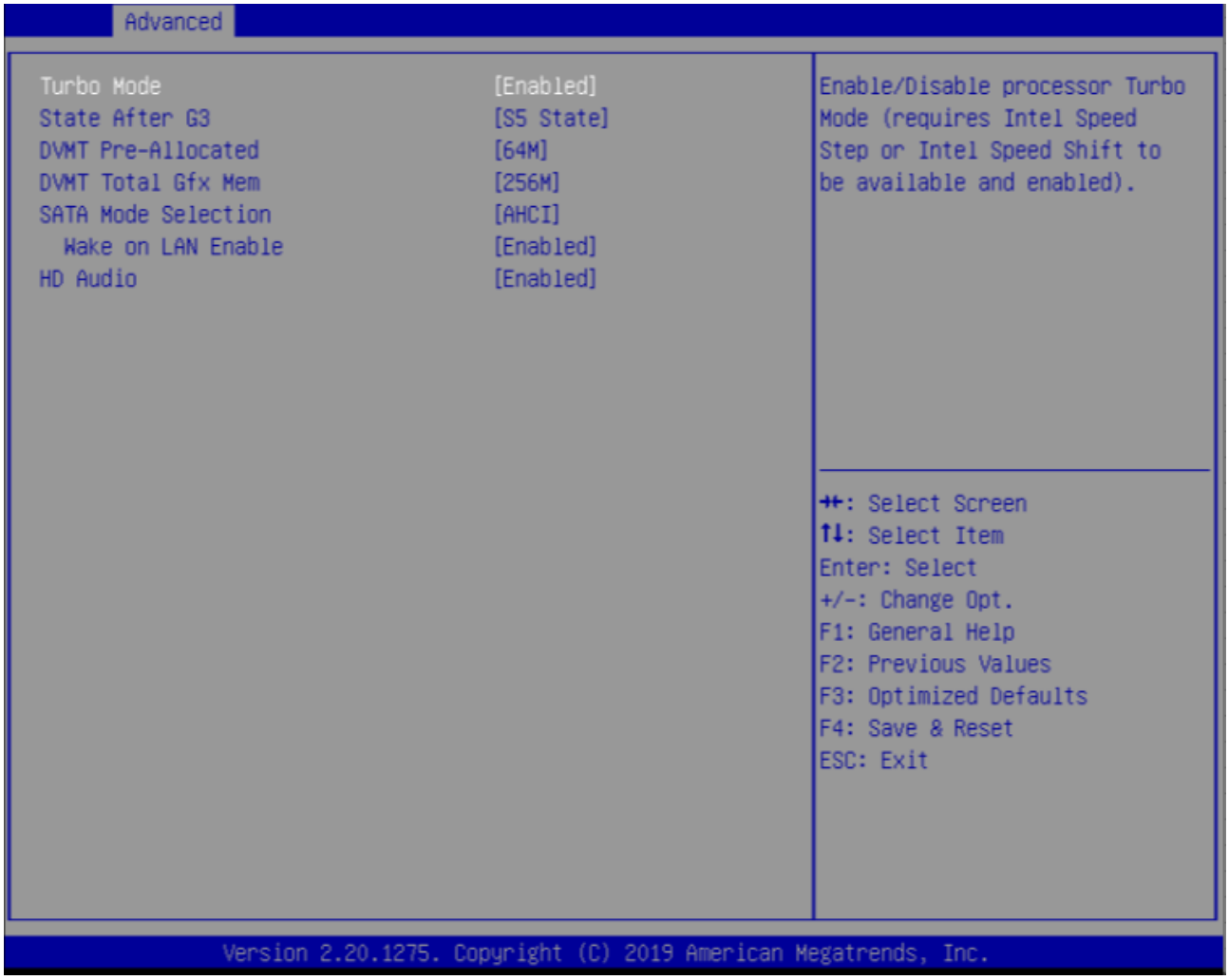
3.4 Advanced Page

The Advanced Menu allows you to configure your system for basic operation. Some entries are defaults required by the system board, while others, if enabled, will improve the performance of your system or let you set some features according to your preference. ***Setting incorrect field values may cause the system to malfunction.***



Advanced	Description
▶ Onboard Devices	Onboard Device Configuration
▶ CPU Configuration	CPU Configuration Parameters
▶ Trusted Computing	Trusted Computing Settings
▶ WatchDog	WatchDog Configuration
▶ Super IO Configuration	System Super IO Chip Parameters.
▶ NCT6116D HW Monitor	Monitor hardware status
▶ S5 RTC Wake Setting	Enable System to wake from S5 using RTC alarm
▶ Network Stack Configuration	Network Stack Settings
▶ NVMe Configuration	NVMe Device Options Settings

3.4.1 Onboard Device



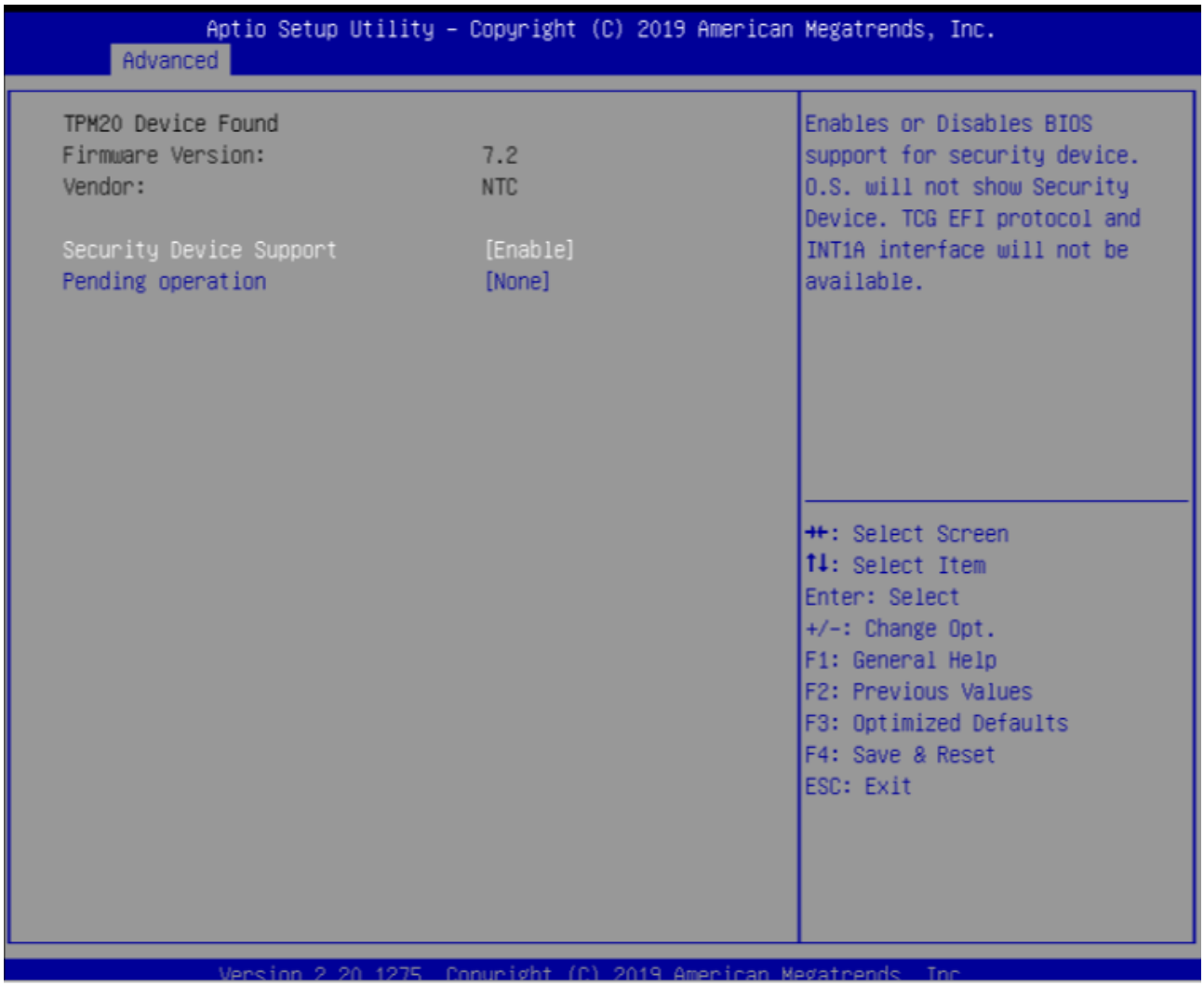
► Onboard Devices	Value	Onboard Device Configuration
Turbo Mode	Disabled / [Enabled]	Enable/Disable processor Turbo Mode (requires Intel Speed Step or Intel Speed Shift to be available and enabled).
State After G3	S0 State / [S5 State]	Specify what state to go to when power is re-applied after a power failure (G3 state).
DVMT Pre-Allocated	[64M] / 32M/F7 / 36M / 40M / 44M / 48M / 52M / 56M / 60M	Select DVMT 5.0 Pre-Allocated(Fixed) Graphics Memory size used by the Internal Graphics Device.
DVMT Total Gfx	128MB / [256MB] /Max	Select DVMT5.0 Total Graphic Menory size used by

Mem		the Internal Graphics Device.
SATA Mode Selection	[AHCI] / Intel RST Premium With Intel Optane System Acceleration	Determines how SATA controller(s) operate.
Wake on LAN Enable	[Enabled] / Disabled	Enable/Disable integrated LAN to wake the system.
HD Audio	Disabled / [Enabled]	Control Detection of the HD-Audio device. Disable = HAD will be unconditionally disabled Enabled = HAD will be unconditionally enabled.

3.4.2 CPU Configuration

▶ CPU Configuration	Value	CPU Configuration Parameters
CPU Configuration		
Type	Intel® xxxx® xxxxxx xxxxxxx	
ID	0xXXXX	
Speed	XXXX MHz	
L1 Data Cache	EX. 32KB x 2	
L1 Instruction Cache	EX. 32KB x 2	
L2 Cache	EX. 256KB x 2	
L3 Cache	EX. 3MB	
L4 Cache		
VMX	Supported	
SMX/TXT	Supported	
Intel Trusted Execution Technology	[Enabled] / Disabled	Enables utilization of additional hardware capabilities provided by Intel® Trusted Execution Technology. Changes require a full power cycle to take effect.

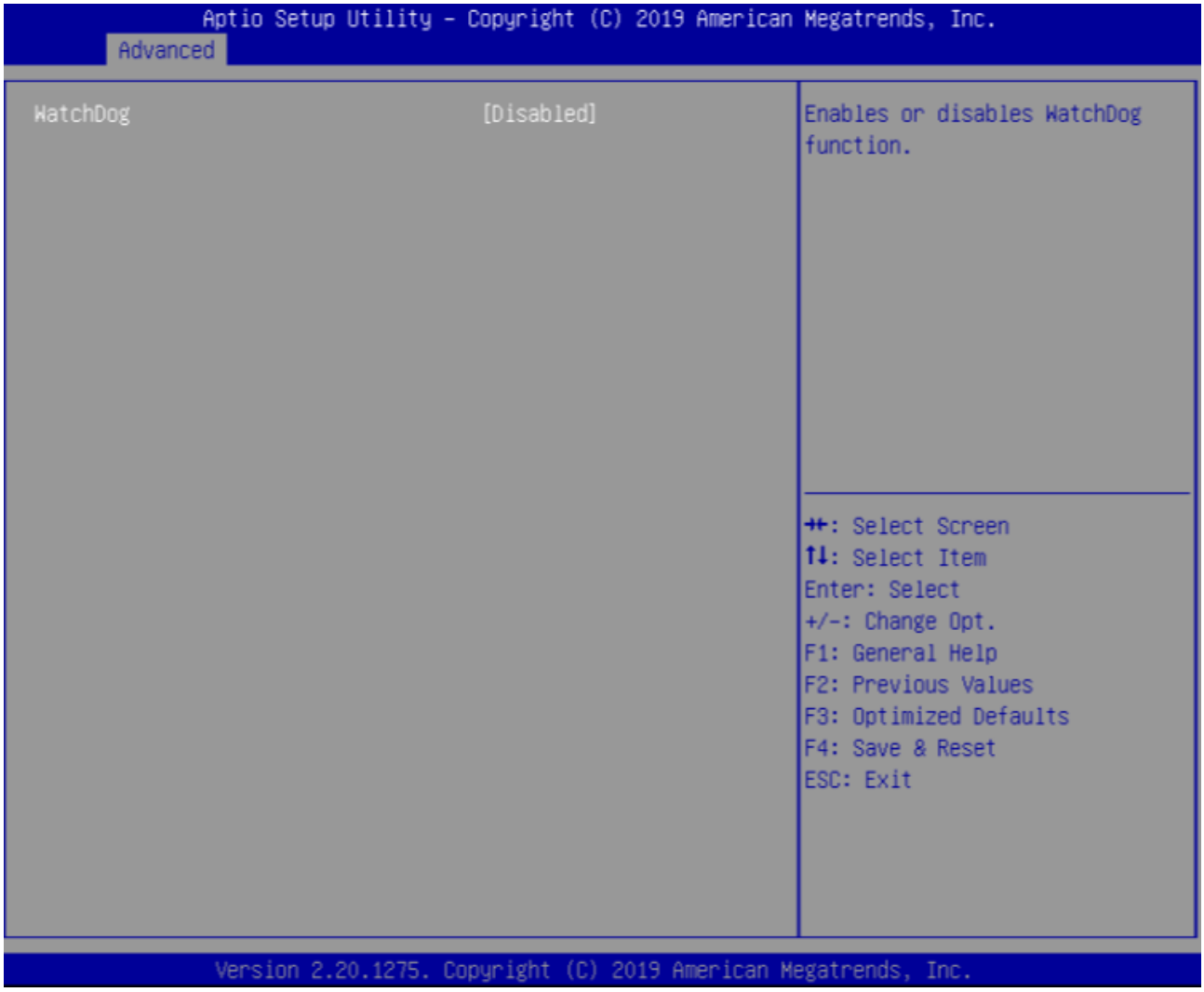
3.4.3 Trusted Computing



▶ Trusted Computing	Value	Trusted Computing Settings
TPM20 Device Found		
Firmware Version:	x.x	
Vendor:	xxxxxx	
Security Device Support	[Disabled] / Enabled	Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
Pending operation	[None] / TPM Clear	Schedule an Operation for the

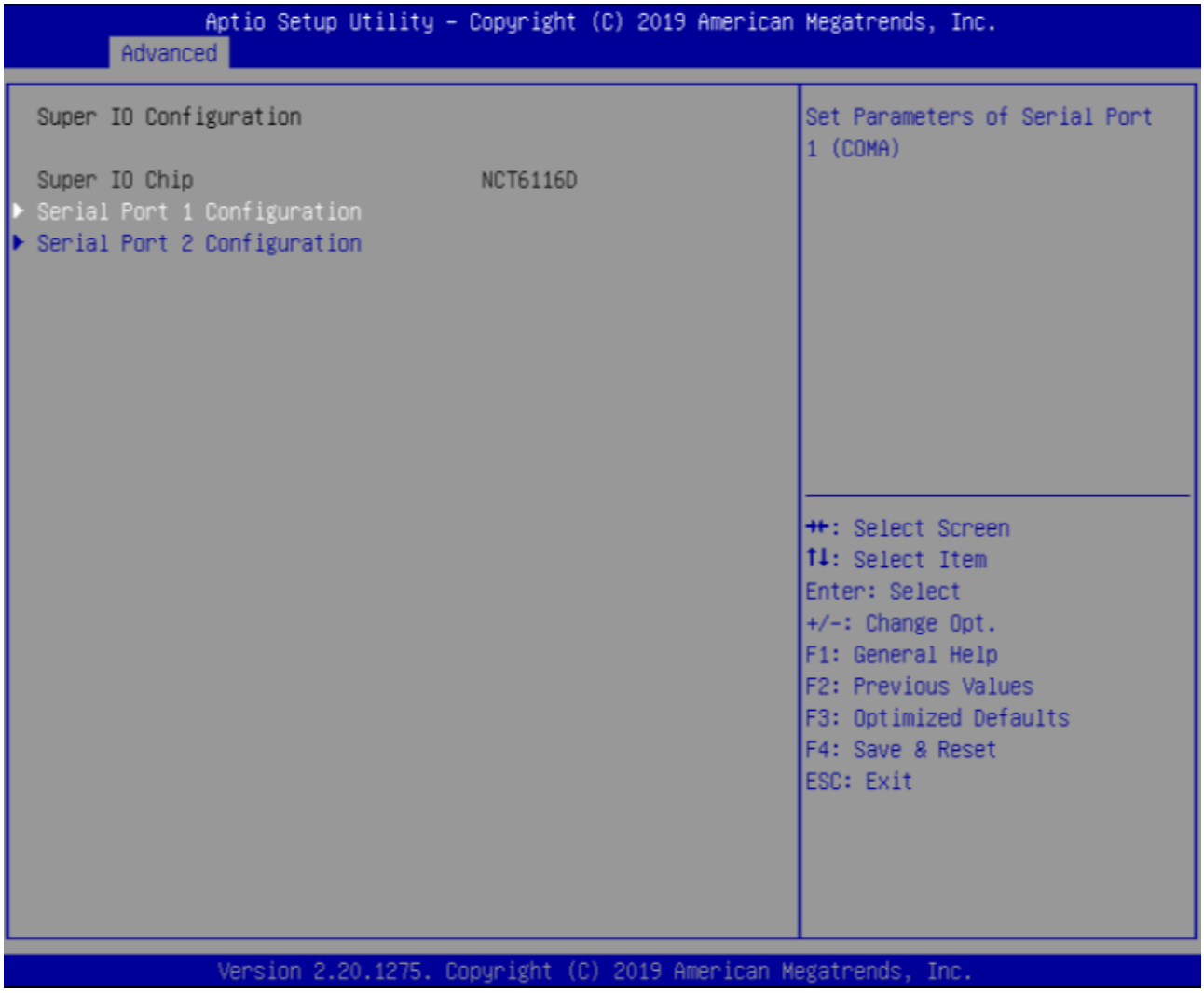
		Security Device. NOTE: Your Computer will reboot during restart in order to change State of Security Device.

3.4.4 WatchDog



▶ WatchDog	Value	WatchDog Configuration
WatchDog	[Disabled] / Enabled	Enables or Ddisables WatchDog function.

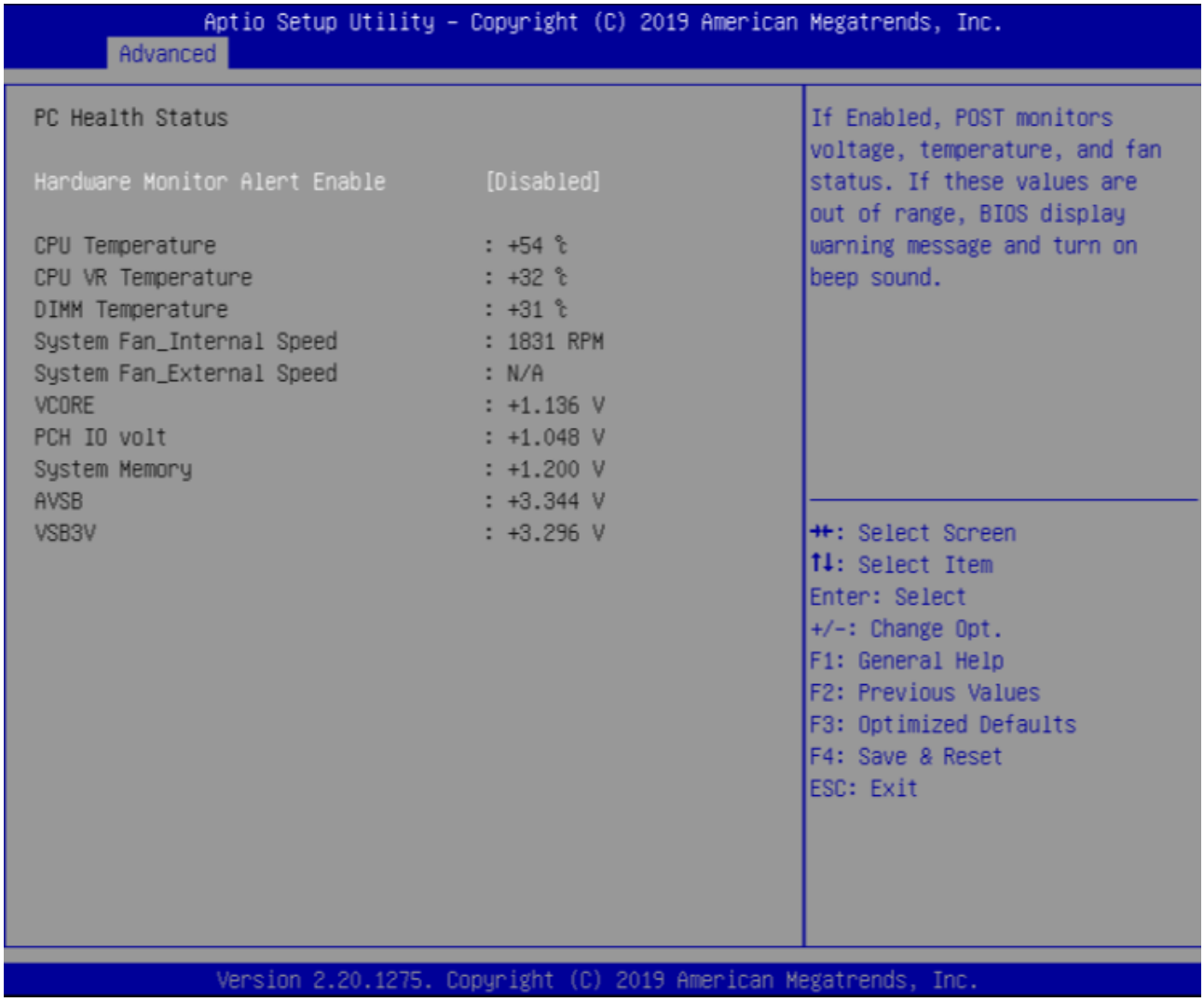
3.4.5 Super IO Configuration



▶ Super IO Configuration	Value	System Super IO Chip Parameters.
Super IO Configuration		
Super IO Chip	NCT6116D	
▶ Serial Port 1 Configuration	Value	Set Parameters of Serial Port 1 (COMA)
Serial Port 1 Configuration		
Serial Port	Disabled / [Enabled]	Enable or Disable Serial Port (COM)

Device Settings	IO=3F8h; IRQ=4	
Change settings	[Auto] / IO=3F8h; IRQ=4 / IO=3F8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12 / IO=2F8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12 / IO=3E8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12 / IO=2E8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12	Select an optimal settings for Super IO Device
Mode Configuration	[RS232] / RS485 / RS422	Configure serial port as RS232/RS422/RS485.
► Serial Port 2 Configuration	**Value**	**Set Parameters of Serial Port 2 (COMB)**
Serial Port 2 Configuration		
Serial Port	Disabled / [Enabled]	Enable or Disable Serial Port (COM)
Device Settings	IO=2E8h; IRQ=4	
Change settings	[Auto] / IO=2E8h; IRQ=7 / IO=3E8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12 / IO=2E8h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12 / IO=2F0h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12 / IO=2E0h; IRQ=3, 4, 5, 6, 7, 9, 10, 11, 12	Select an optimal settings for Super IO Device
Mode Configuration	[RS232] / RS485 / RS422	Configure serial port as RS232/RS422/RS485.

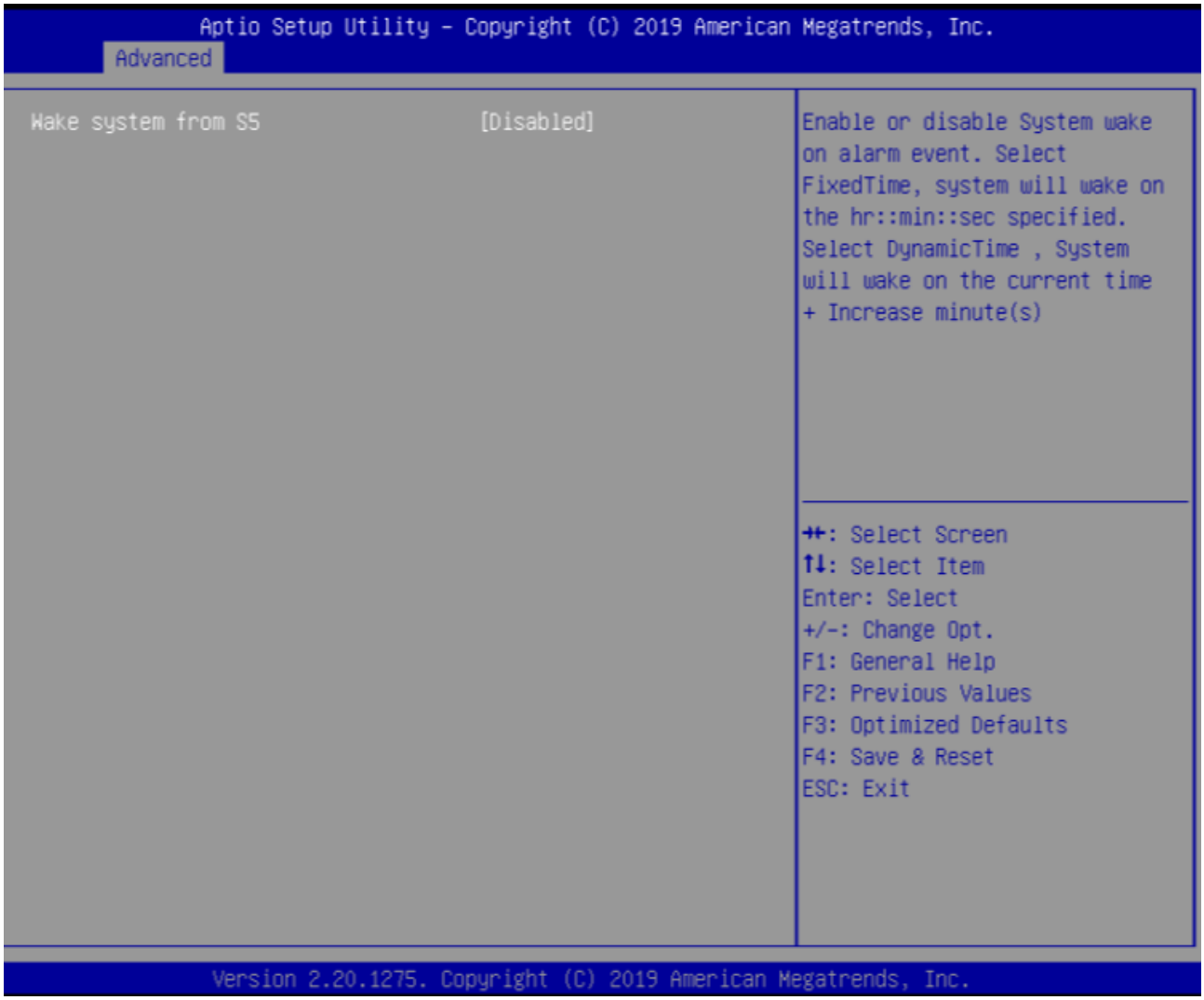
3.4.6 NCT6116D HW Monitor



► NCT6116D HW Monitor	Value	Monitor hardware status
PC Health Status		
Hardware Monitor Alert Enable	[Disabled] / Enabled	If Enabled, POST monitors voltage, temperature, and fan status. If these values are out of range, BIOS display warning message and turn on beep sound.
CPU Temperature	xx ℃	

CPU VR Temperature	xx ℃	
DIMM Temperature	xx ℃	
System Fan_Internal Speed	xx RPM	
System Fan_External Speed	xx RPM	
VCORE	xx V	
PCH IO volt	xx V	
System Memory	xx V	
AVSB	xx V	
VSB3V	xx V	

3.4.7 S5 RTC Wake Setting

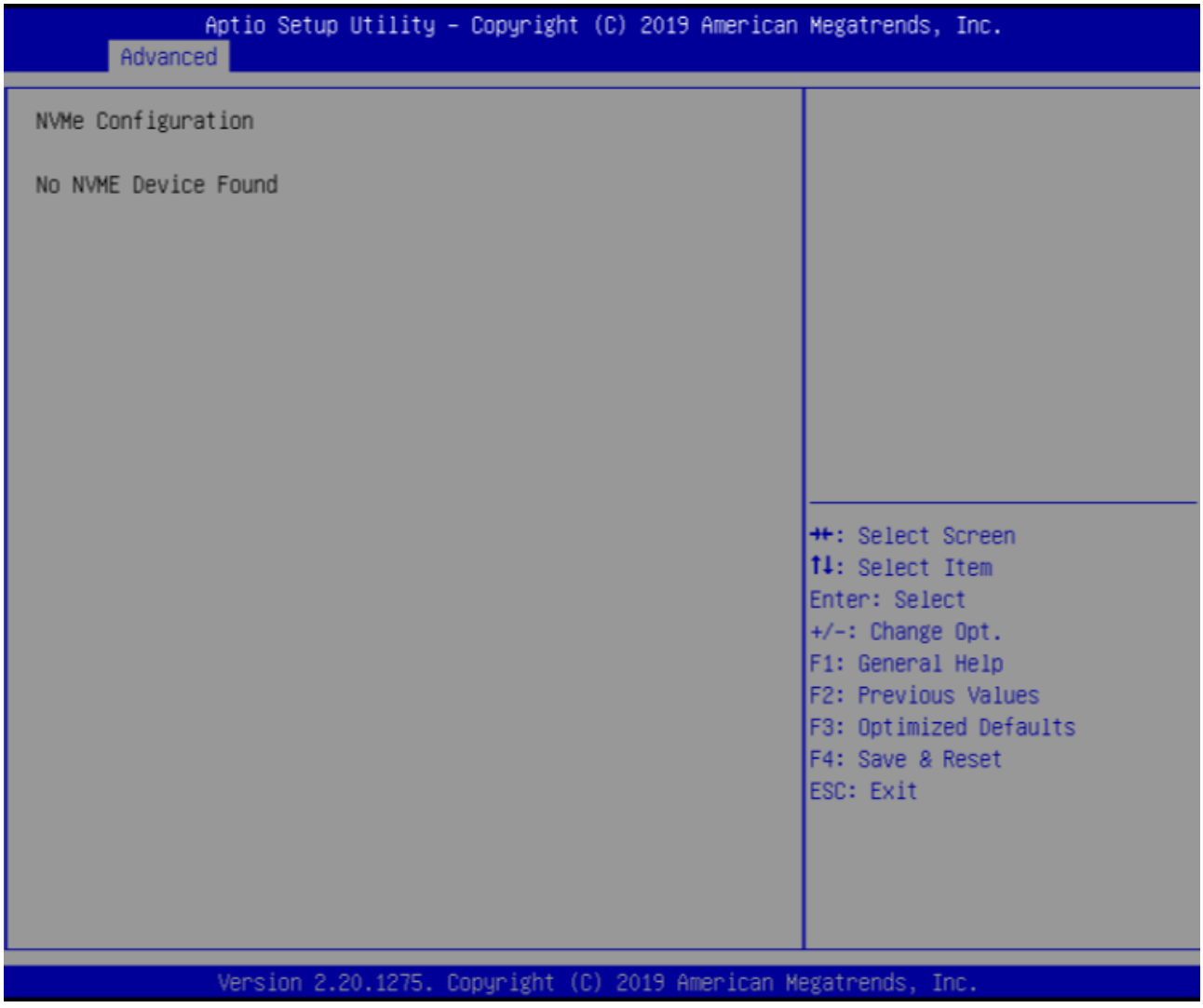


► S5 RTC Wake Setting	Value	Enable System to wake from S5 using RTC alarm
Wake System with Fixed Time from S5	[Disabled] / Fixed Time / Dynamic Time	Enable or disable System wake on alarm event. Select FixedTime, system will wake on the hr::min::sec specified. Select DynamicTime , System will wake on the current time + Increase minute(s)

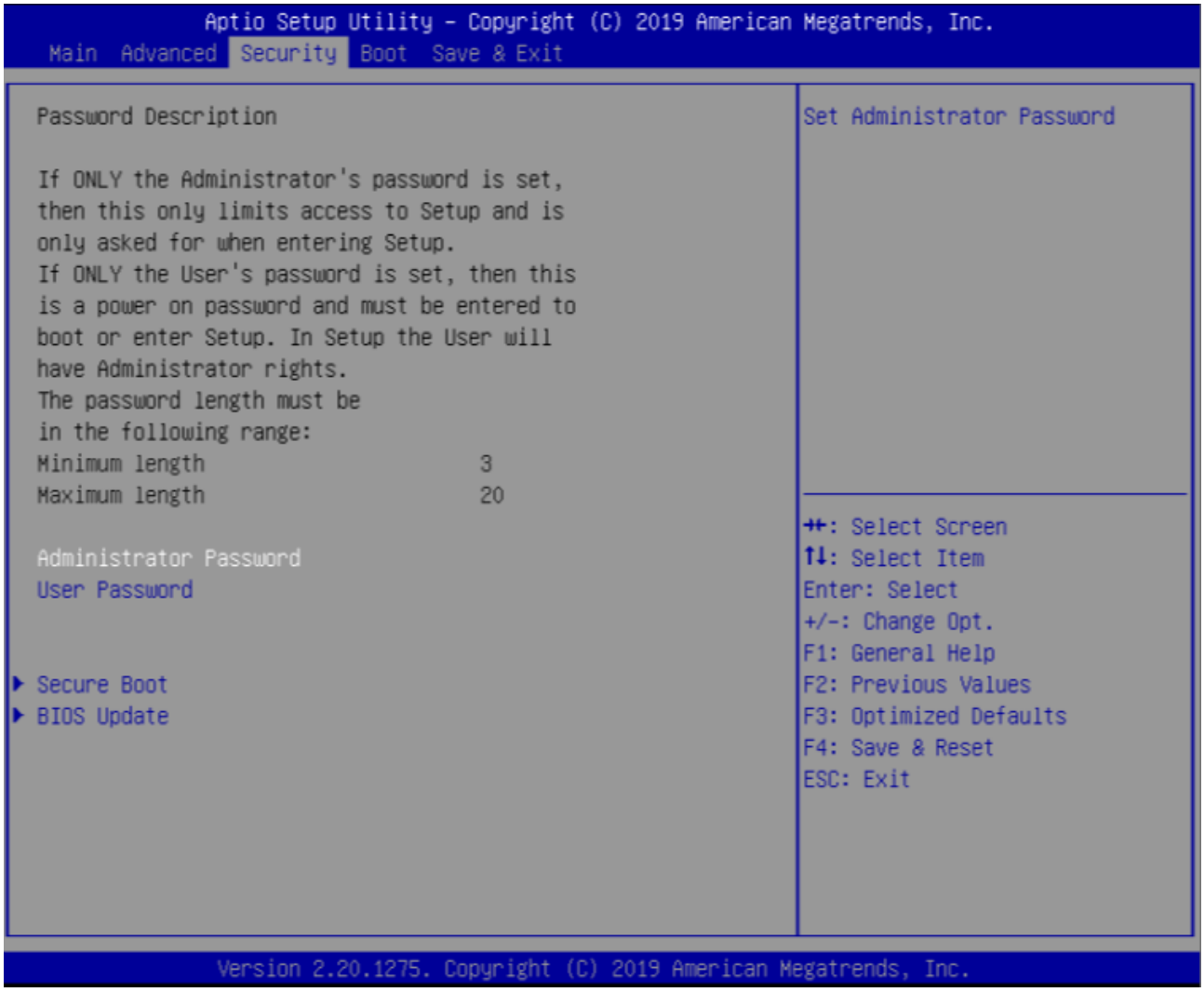
3.4.8 Network Stack Configuration

► Network Stack Configuration	Value	Network Stack Settings
Network Stack	[Disabled] / Enabled	Enable/Disable UEFI Network Stack

3.4.9 NVMe Configuration

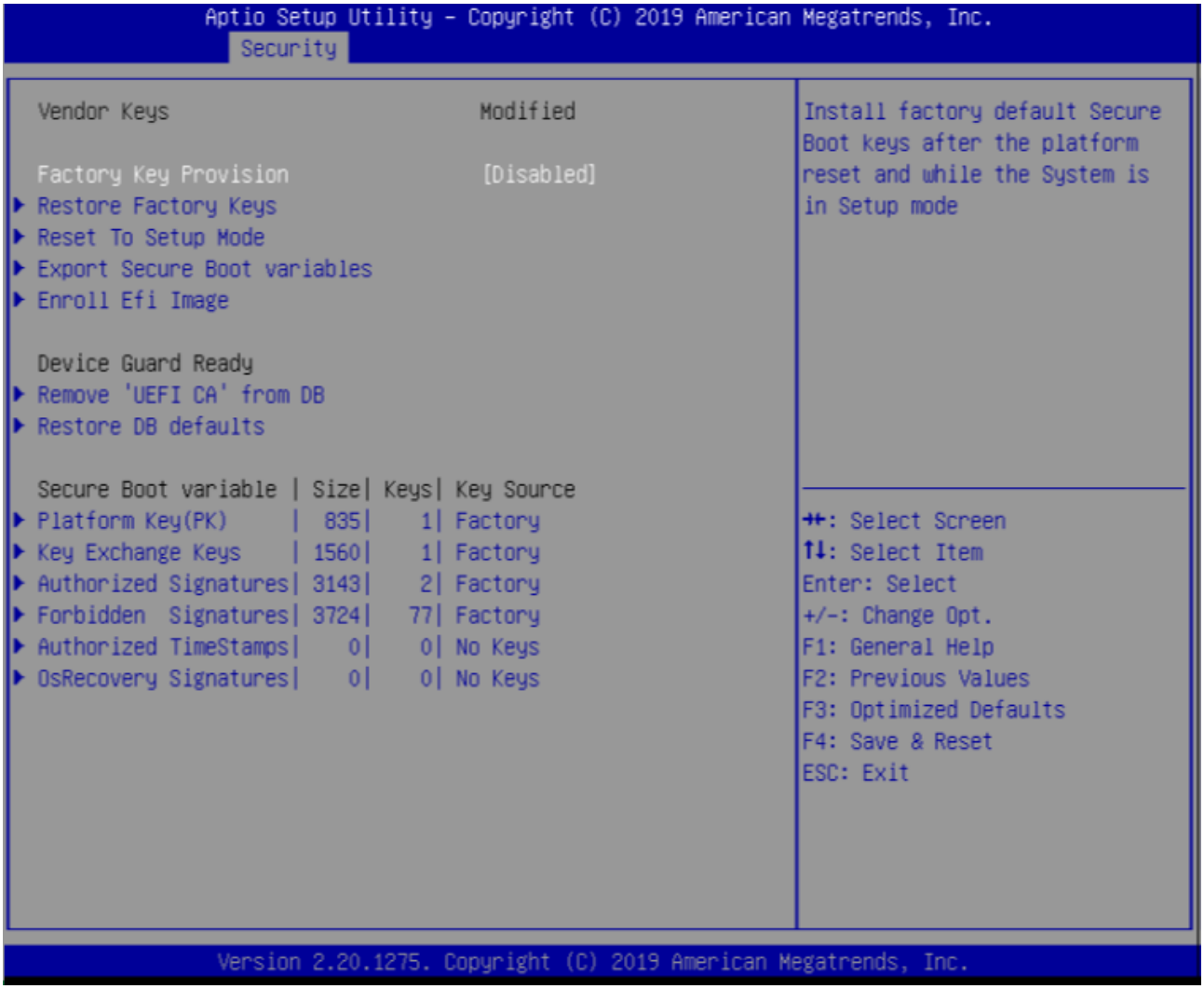


3.5 Security Page



Security	Value	Description
Password Description		
Administrator Password	xxxx	Set Administrator Password
User Password	xxxx	Set User Password
► HDD Security drive(EX: xxxxxxxxxxxx)		HDD Security Configuration for selected drive
► Secure Boot		Secure Boot configuration
► BIOS Update		BIOS Update support

3.5.1 Secure Boot



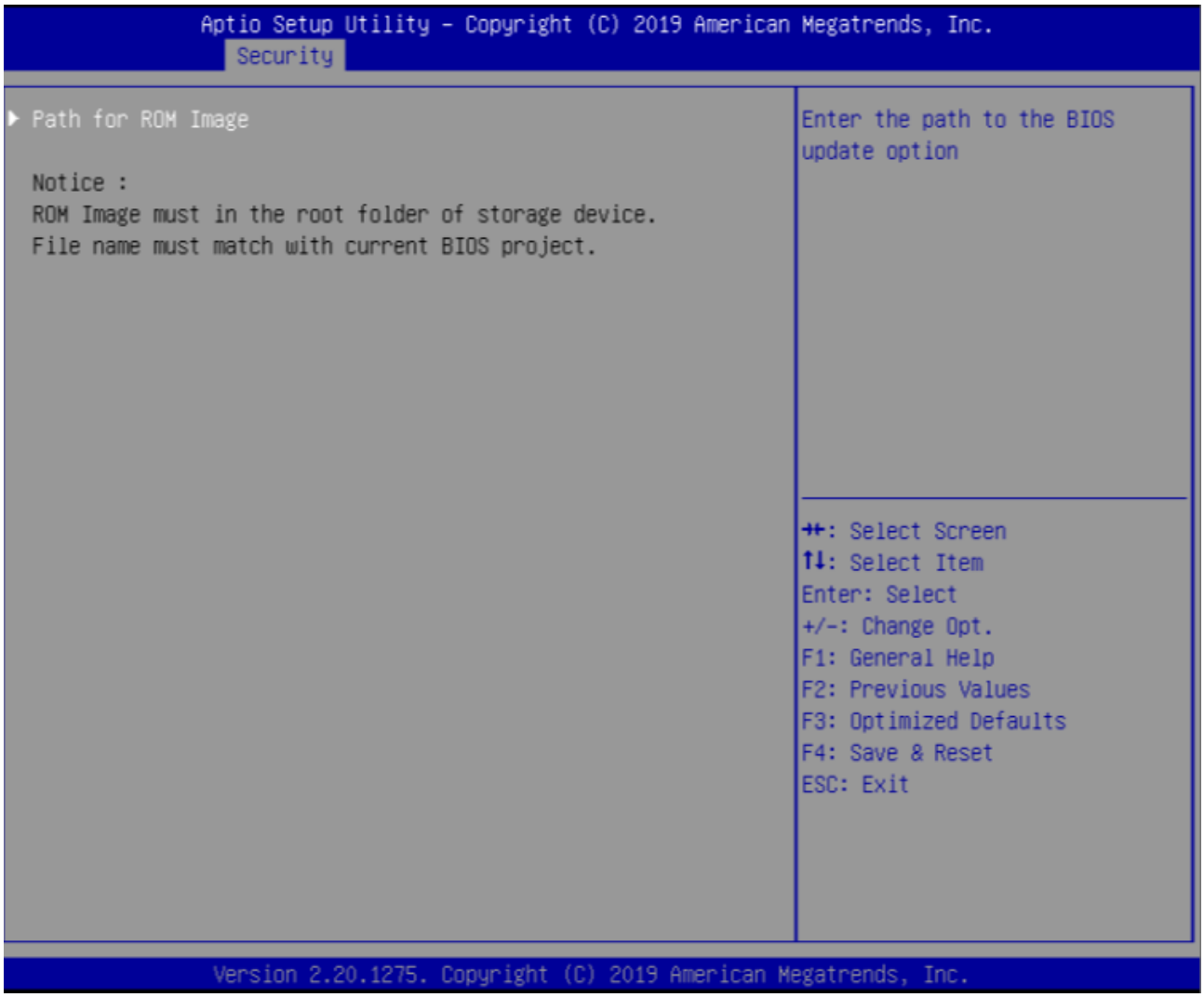
► Secure Boot	Value	Secure Boot configuration
System Mode	xxxx	
Secure Boot	[Disabled] / Enabled	Secure Boot feature is Active if Secure Boot is Enable, Platform Key(PK) is enrolled and the System is in User mode. The mode change requires platform reset
Secure Boot Mode	Standard / [Customer]	Secure Boot mode options: Standard or Custom. In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full aythentication
► Restore Factory Keys	[Yes] / No	Force System to User Mode. Install factory default Secure Boot key database
► Reset To Setup Mode	[Yes] / No	Delete all Secure Boot key databases from NVRAM

► Key Management		Enables expert users to modify Secure Boot Policy variables without full authentication
Vendor Keys	Invalid / Valid	
Factory Key Provision	[Disabled] / Enabled	Install factory default Secure Boot keys after the platform reset and while the System is in Setup mode
► Restore Factory Keys	[Yes] / No	Force System to User Mode. Install factory default Secure Boot key database
► Reset To Setup Mode	[Yes] / No	Delete all Secure Boot key databases from NVRAM
► Export Secure Boot variables	Drive: \Path	Copy NVRAM content of Secure Boot variables to files in a root folder on a file system device
► Enroll Efi Image	xxxxxxxxxxxxxxxxxxx	Allow the image to run in Secure Boot mode. Enroll SHA256 Hash certificate of a PE image into Authorized Signature Database (db)
Device Guard ready		
► Remove 'UEFI CA' from DB		Device Guard ready system must not list 'Microsoft UEFI CA' Certificate in Authorized Signature database (db)
► Remove DB defaults	[Yes] / No	Restore DB variable to factory defaults
Secure Boot variables | Size | Keys | Key Source		
► Platform Key(PK)	[Details] / Export / Update / Delete	Enroll Factory Defaults or load certificates from a file: 1.Public Key Certificate: a)EFI_SIGNATURE_LIST b)EFI_CERT_X509 (DER) c)EFI_CERT_RSA2048 (bin) d)EFI_CERT_SHAXXX 2.Authenticated UEFI Variable 3. EFI PE/COFF Image(SHA256) Key Source: Factory, External,Mixed
► Key Exchange Keys	[Details] / Export / Update / Append / Delete	Enroll Factory Defaults or load certificates from a file: 1.Public Key Certificate:

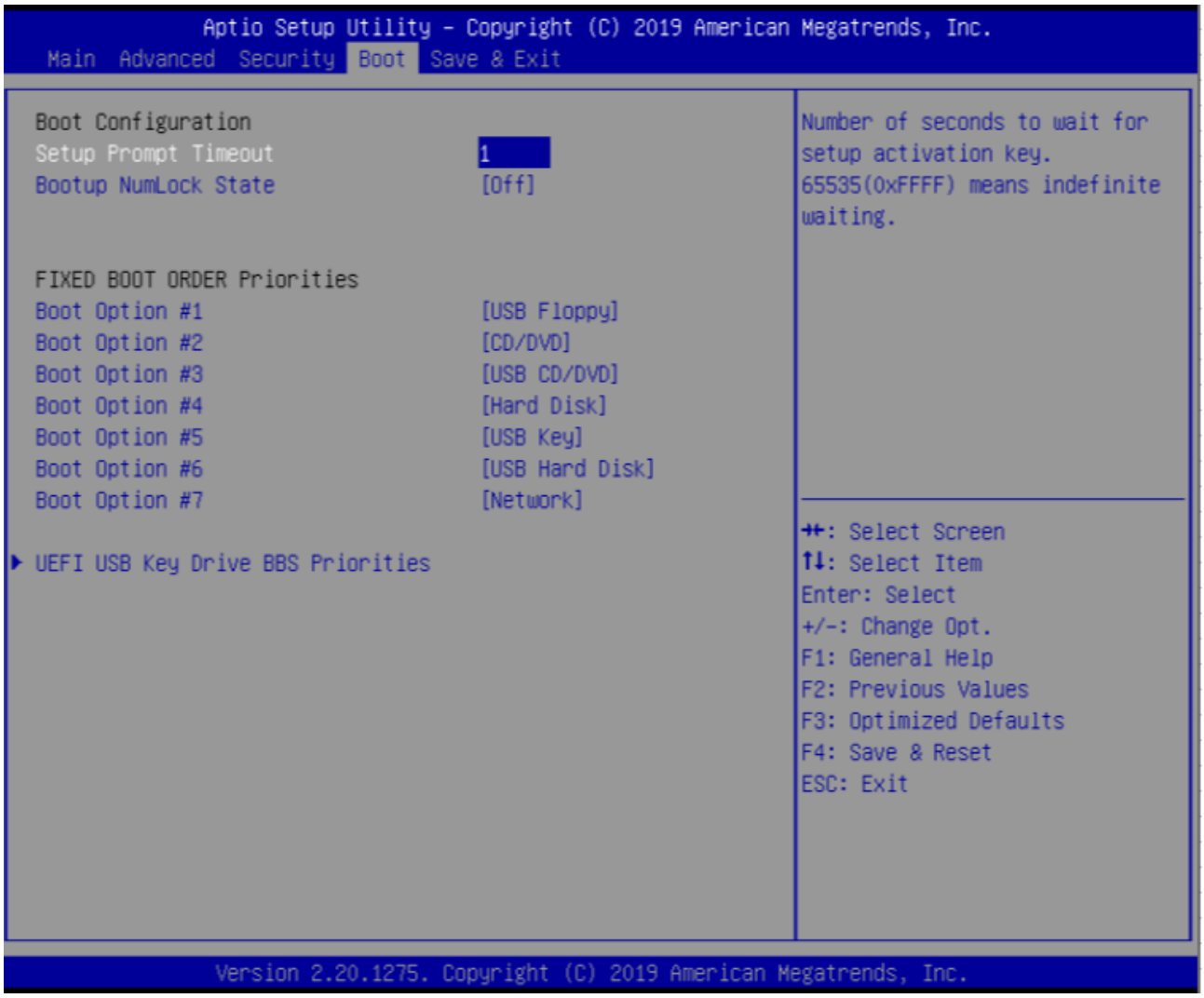
		a)EFI_SIGNATURE_LIST b)EFI_CERT_X509 (DER) c)EFI_CERT_RSA2048 (bin) d)EFI_CERT_SHAXXX 2.Authenticated UEFI Variable 3. EFI PE/COFF Image(SHA256) Key Source: Factory, External,Mixed
► Authorized Signatures	[Details] / Export / Update / Append / Delete	Enroll Factory Defaults or load certificates from a file: 1.Public Key Certificate: a)EFI_SIGNATURE_LIST b)EFI_CERT_X509 (DER) c)EFI_CERT_RSA2048 (bin) d)EFI_CERT_SHAXXX 2.Authenticated UEFI Variable 3. EFI PE/COFF Image(SHA256) Key Source: Factory, External,Mixed
► Forbidden Signatures	[Details] / Export / Update / Append / Delete	Enroll Factory Defaults or load certificates from a file: 1.Public Key Certificate: a)EFI_SIGNATURE_LIST b)EFI_CERT_X509 (DER) c)EFI_CERT_RSA2048 (bin) d)EFI_CERT_SHAXXX 2.Authenticated UEFI Variable 3. EFI PE/COFF Image(SHA256) Key Source: Factory, External,Mixed
► Authorized TimeStamps	[Details] / Export / Update / Append / Delete	Enroll Factory Defaults or load certificates from a file: 1.Public Key Certificate: a)EFI_SIGNATURE_LIST b)EFI_CERT_X509 (DER) c)EFI_CERT_RSA2048 (bin) d)EFI_CERT_SHAXXX

		2.Authenticated UEFI Variable 3. EFI PE/COFF Image(SHA256) Key Source: Factory, External,Mixed
► OsRecovery Signatures	[Details] / Export / Update / Append / Delete	Enroll Factory Defaults or load certificates from a file: 1.Public Key Certificate: a)EFI_SIGNATURE_LIST b)EFI_CERT_X509 (DER) c)EFI_CERT_RSA2048 (bin) d)EFI_CERT_SHAXXX 2.Authenticated UEFI Variable 3. EFI PE/COFF Image(SHA256) Key Source: Factory, External,Mixed

3.5.2 BIOS Update



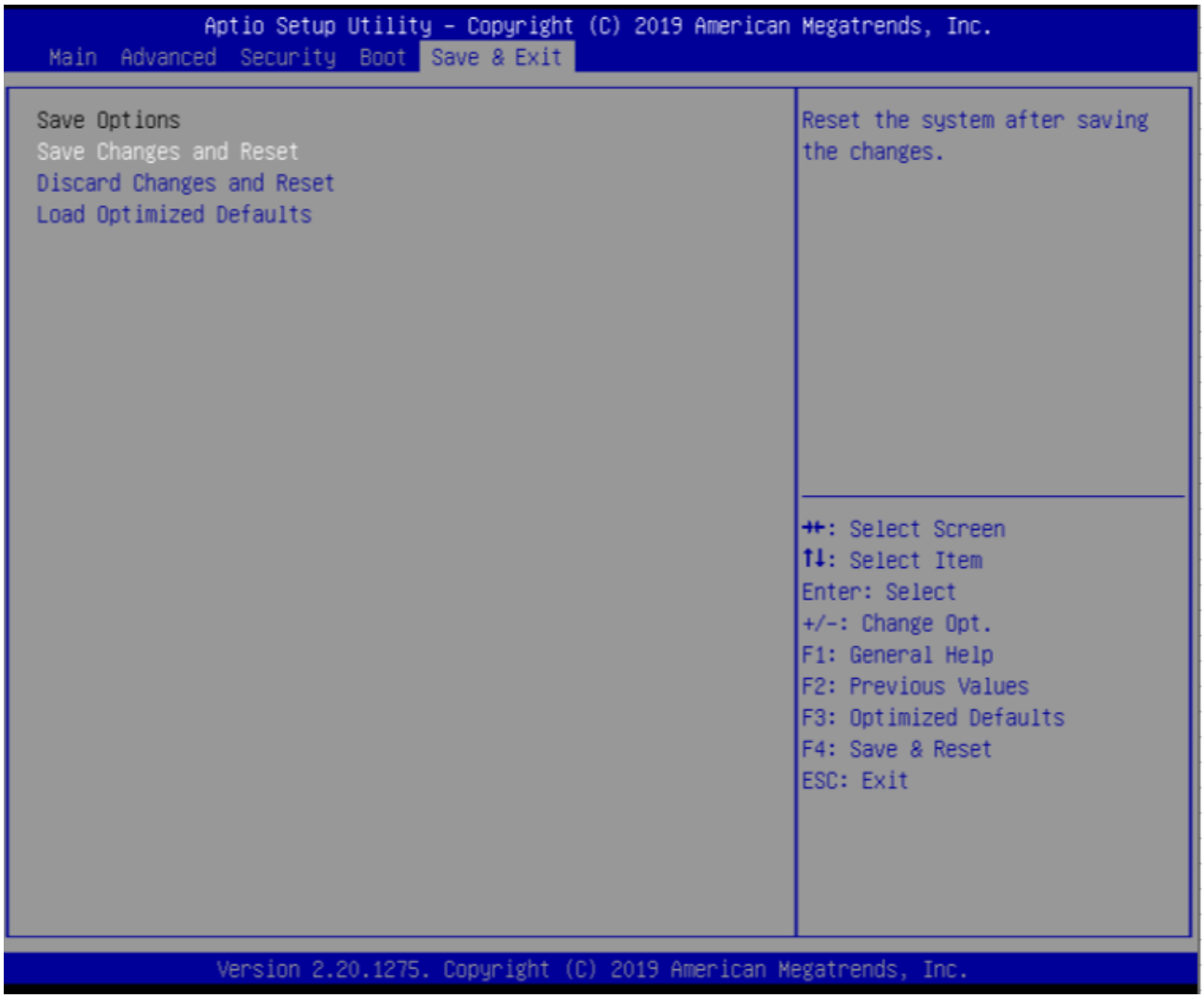
3.6 Boot Page



Boot	Value	Description
Setup Prompt Timeout	1	Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
Bootup NumLock State	On / [Off]	Select the keyboard NumLock state
FIXED BOOT ORDER Priorities		
Boot Optoin #1	[USB Floppy] / CD/DVD / USB	Sets the system boot orfer

	CD/DVD / Hard Disk / USB Key / USB Hard Disk / Network / Disable	
Boot Optoin #2	USB Floppy / [CD/DVD] / USB CD/DVD / Hard Disk / USB Key / USB Hard Disk / Network / Disable	Sets the system boot orfer
Boot Optoin #3	USB Floppy / CD/DVD / [USB CD/DVD] / Hard Disk / USB Key / USB Hard Disk / Network / Disable	Sets the system boot orfer
Boot Optoin #4	USB Floppy / CD/DVD / USB CD/DVD / [Hard Disk] / USB Key / USB Hard Disk / Network / Disable	Sets the system boot orfer
Boot Optoin #5	USB Floppy / CD/DVD / USB CD/DVD / Hard Disk / [USB Key] / USB Hard Disk / Network / Disable	Sets the system boot orfer
Boot Optoin #6	USB Floppy / CD/DVD / USB CD/DVD / Hard Disk / USB Key / [USB Hard Disk] / Network / Disable	Sets the system boot orfer
Boot Optoin #7	USB Floppy / CD/DVD / USB CD/DVD / Hard Disk / USB Key / USB Hard Disk / [Network] / Disable	Sets the system boot orfer

3.7 Save & Exit Page



Save & Exit	Description
Save Changes and Reset	Reset the system after saving the changes.
Discard Changes and Reset	Reset system setup without saving any changes.
Load Optimized Defaults	Restore/Load Default values for all the setup options.