EmETXe-i90M3

COM Express® Basic
Type 6 CPU Module

User's Manual

Version 1.0

2019.07

Revision History

Version	Date	Description
1.0	2019.07	Initial release

Preface iii
- Copyright Notice....iii
- Declaration of Conformity....iii
  - CE....iii
  - FCC Class B....iii
  - RoHS....iv
  - SVHC / REACH....iv
- Warning....v
- Replacing the Lithium Battery....v
- Technical Support....v
- Warranty....vi

Chapter 1 - Introduction 1
- 1.1 The Product....2
- 1.2 About This Manual....2
- 1.3 Specifications....3
- 1.4 Inside the Package....4
- 1.5 Ordering Information....4
  - 1.5.1 Optional Accessories....5
- 1.6 Driver(6.8A) Installation....5

Chapter 2 - Board Overview 7
- 2.1 What Is “COM Express®”?....8
- 2.2 Board Dimensions....9
- 2.3 Block Diagram....10
- 2.4 Connector Pin Definition....11

Chapter 3 - Installation & Maintenance 15
- 3.1 Installing the CPU Module to Carrier Board....16

Chapter 4 - BIOS 19

4.1 Main 20
4.2 Advanced.....22
4.2.1 CPU Configuration 23
4.2.2 PCI Subsystem Settings 24
4.2.3 ACPI Settings.....25
4.2.4 USB Configuration 26
4.2.5 Hardware Monitor.....28
4.2.6 Super IO Configuration.....29
4.2.7 S5 RTC Wake Settings 31
4.2.8 CSM Configuration.....32
4.2.9 NVMe Configuration.....33
4.3 Chipset 34
4.3.1 Graphics Configuration 36
4.3.2 PCI Express Configuration.....37
4.3.3 SATA and RST Configuration 37
4.4 Security 38
4.5 Boot 39
4.6 Save & Exit.....40
Appendix 42
Appendix A: I/O Port Address Map 43
Appendix B: BIOS Memory Mapping 44
Appendix C: Interrupt Request Lines (IRQ) 46
Appendix D: Watchdog Timer (WDT) Setting.....47
Appendix E: DIO Sample Code 49

Copyright Notice

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

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Declaration of Conformity

CE

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

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

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

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

FCC Class B

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1)This device may not cause harmful interference, and

(2)This device must accept any interference received, including interference that may cause undesired operation.

NOTE:

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

RoHS

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

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

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

SVHC / REACH

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

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

Warning

Single Board Computers and their components contain very delicate Integrated Circuits (IC). To protect the Single Board Computer and its components against damage from static electricity, you should always follow the following precautions when handling it :

1. Disconnect your Single Board Computer from the power source when you want to work on the inside.

2. Hold the board by the edges and try not to touch the IC chips, leads or circuitry.

3. Use a grounded wrist strap when handling computer components.

4. Place components on a grounded antistatic pad or on the bag that comes with the Single Board Computer, whenever components are separated from the system.

Replacing the Lithium Battery

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

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

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

Technical Support

If you have any technical difficulties, please contact our website at:

https://www.arbor-technology.com

Warranty

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

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

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

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

Chapter 1

Introduction

1.1 The Product

The EmETXe-i90M3 is a space-conscious CPU board of 125 mm x 95 mm to take up only small footprint in your system. By the architecture of Type 6, the board has two high-performance connectors to promise stable data passing rate. The soldered onboard 7th Generation Intel® Core™ processor, along with integrated Intel® Graphics chipset, bring LVDS, and DDI solution for most monitors or LCD video panels.

For system configuration, the board is supported by AMI UEFI BIOS. EmETXe-i90M3 is an ideal choice for some demanding industrial control and data communications by its significant processing performance, low power consumption and these features:

- Soldered onboard 7th Generation Intel® Core™ i7-7820EQ/i5-7442EQ/Xeon E3-1505L v6
- Intel I219LM PCIe GbE PHY w/ iAMT
- Dual Channels 24-bit LVDS and 2 x DDI ports,Analog RGB
- Support 2 independent displays
- 8.5V~20V Wide Range Voltage Input
- Wide Range Operating Temp.: -40 ~ 85°C

1.2 About This Manual

This user's manual provides general information and installation instructions about the product. This user's manual is intended for experienced users and integrators with hardware knowledge of personal computers. If you are not sure about any description in this booklet. Please consult your vendor before further handling.

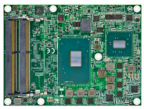
1.3 Specifications

System	
CPU	Soldered onboard 7th Generation Intel® Core™ i7-7820EQ 2.8GHz/i5-7442EQ 2.7GHz/Xeon E3-1505L v6 3.0GHz
Chipset	Intel QM175 PCH/CM238
Memory	2 x DDR4 SO-DIMM sockets
BIOS	AMI UEFI BIOS
Watchdog Timer	1~255 levels reset
I/O	
USB Port	12 x USB ports: - 8 x USB 2.0 ports - 4 x USB 3.0 ports
Serial Port	2 x UART ports (RX/TX only)
Expansion Bus	8 x PCIe x1 lanes, 1 x PCIe x16 lane, I2C Interface, GPIO
Storage	4 x Serial ATA ports with 600MB/s HDD transfer rate
Ethernet Chipset	1 x Intel® i219LM PCIe GbE PHY w/ iAMT
Audio	HD audio link
TPM	Supports TPM (OEM Request)
Display	
Graphic Chipset	Integrated Intel® HD Graphics 630/P630
Graphic Interface	LCD: Dual Channels 24-bit LVDS
	Analog RGB
	2 x DDI ports
OS support	
Windows 10 64-bit Linux: Ubuntu	
Mechanical & Environmental	

Power Requirement	8.5V~20V +/- 5% wide range voltage input, +5VSB
Power Consumption	4.31A@12V(i7-7820EQ Typical)
Operating Temp.	-40 ~ 85°C (-40 ~ 185°F)
Operating Humidity	10 ~ 95% @ 85°C (non-condensing)
Dimensions (L x W)	125 x 95 mm (4.9” x 3.7”)

1.4 Inside the Package

Before you begin installing your single board, please make sure that the following materials have been shipped:



1 x EmETXe-i90M3 COM Express CPU Module

1 x Quick Installation Guide

If any of the above items is damaged or missing, contact your vendor immediately.

1.5 Ordering Information

EmETXe-i90M3-WT-7820EQ	WT COMe Type 6 Basic CPU Module,Kabylake-H, i7-7820EQ,w/VGA, -40 ~ 85°C
EmETXe-i90M3-WT-7442EQ	WT COMe Type 6 Basic CPU Module,Kabylake-H, i5-7442EQ,w/VGA,-40 ~ 85°C
EmETXe-i90M3-WT-1505LV6	WT COMe Type 6 Basic CPU Module,Kabylake-H, Xeon, E3-1505L v6,w/VGA,-40 ~ 85°C

1.5.1 Optional Accessories

HS-90M0-C1	Heat sink with Fan (125x95x35mm)
PBE-1705-F1	COM Express® Type 6 evaluation carrier board with SIO F71869ED module in ATX form factor
CBK-03-1705-00	Cable kit 1 x SATA cable 2 x COM Flat cables

1.6 Driver(6.8A) Installation

The CPU module supports Windows 10. To install the drivers, please go to our website at **www.arbor-technology.com** and download the driver pack from the product page. If you need driver DVD, please contact your ARBOR sales representative.

Windows 10 64-bit

Driver	Path
Chipset	\EmETXe-i90x0\Chipset
Graphic	\EmETXe-i90x0\Graphic\win64
Audio	\EmETXe-i90x0\Audio\Win10_Win8.1_Win8_Win7_WHQLx64
Ethernet	\EmETXe-i90x0\Ethernet
ME	\EmETXe-i90x0\ME
RST	\EmETXe-i90x0\RST\SetupRST

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Chapter 2

Board Overview

2.1 What Is "COM Express®"?

With more and more demands on small and embedded industrial boards, a multi-functional COM (Computer-on-Module) surfaces as a great solution.

COM Express® supports seven pin-out types applying to Basic and Extended form factors:

Module Type 1 and 10 support single connector with two rows (220 pins).

Module Type 2, 3, 4, 5 and 6 support two connectors with four rows (440 pins).

EmETXe-i90M3 is a Type-6 module.

Difference between Standard Type 6 and EmETXe-i90M3 is listed as below:

Module Type	Standard Type 6	EmETXe-i90M3
Connectors	2	2
Connector Rows	A, B, C, D	A, B, C, D
PCIe Lanes (Max)	24	24
LAN (Max)	1	1
Serial Ports (Max)	2	2
Digital Display I/F (Max)	3	3
USB 3.0 Ports (Max)	4	4

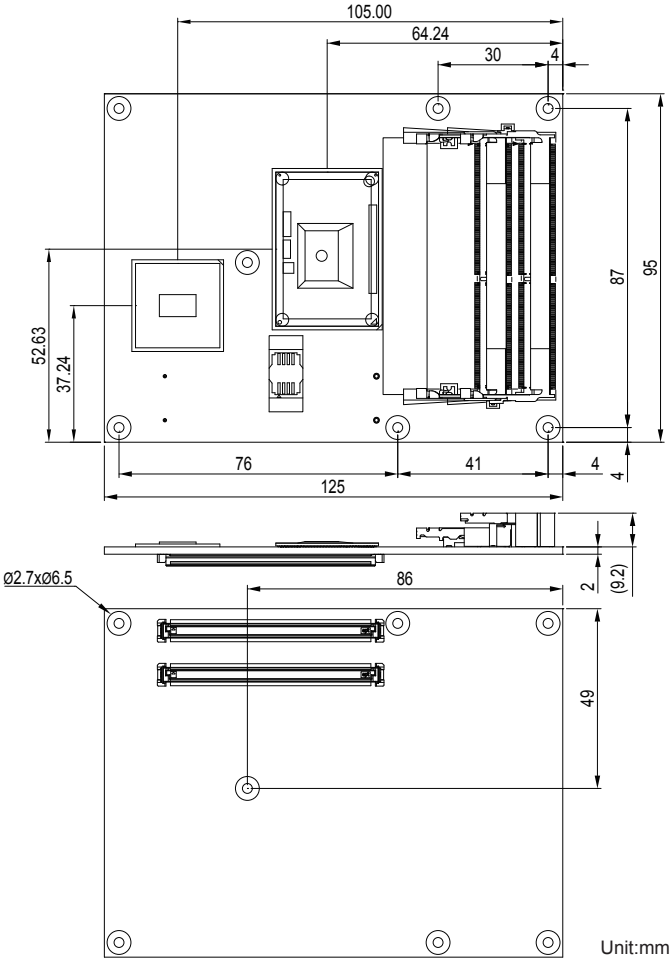
Row AB provides pins for PCI Express, SATA, LVDS, LCD channel, LPC bus, system and power management, VGA, LAN, and power and ground interfaces.

Row CD provides SDVO and legacy PCI signals next to additional PCI Express, LAN and power and ground signals. The COM are targeted at following applications:

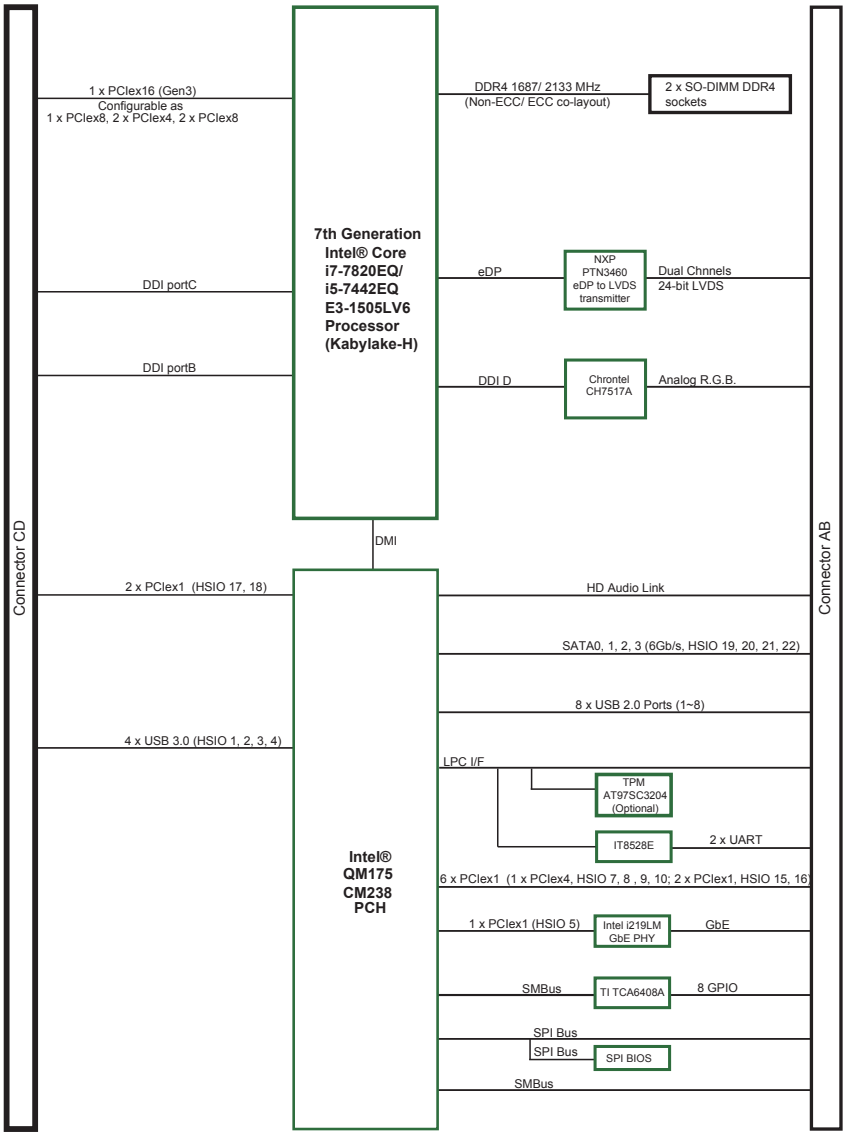
- Retail & Advertising
- Medical
- Test & Measurement
- Gaming & Entertainment
- Industrial & Automation
- Military & Government
- Security

2.2 Board Dimensions

The following illustration shows the dimension of EmETXe-i90M3, with the measurements in width, depth, and height called out.



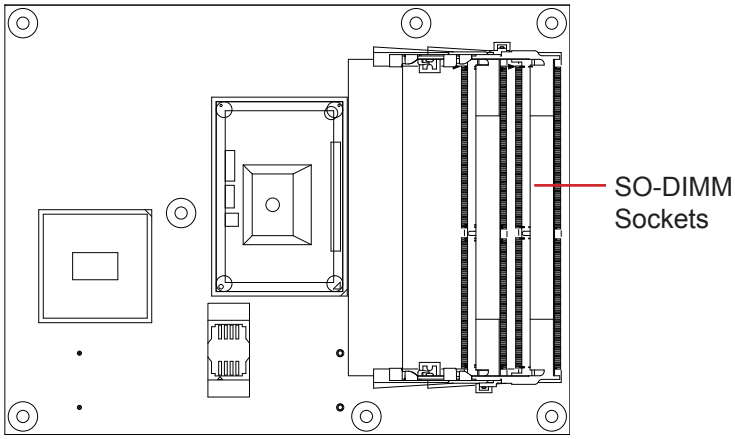
2.3 Block Diagram



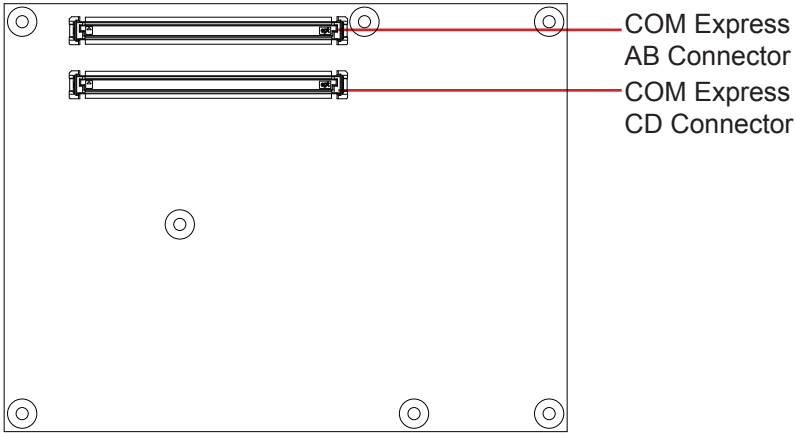
2.4 Connector Pin Definition

Being a most commonly-used Type 6, the EmETXe-i90M3 features two board-to-board connectors on bottom side.

Top Side



Bottom Side



COM Express AB Connector (bottom side)

B1	GND (FIXED)	GND (FIXED)	A1
B2	GBE0_ACT#	GBE0_MDI3-	A2
B3	LPC_FRAME#	GBE0_MDI3+	A3
B4	LPC_AD0	GBE0_LINK100#	A4
B5	LPC_AD1	GBE0_LINK1000#	A5
B6	LPC_AD2	GBE0_MDI2-	A6
B7	LPC_AD3	GBE0_MDI2+	A7
B8	LPC_DRQ0#	GBE0_LINK#	A8
B9	LPC_DRQ1#	GBE0_MDI1-	A9
B10	LPC_CLK	GBE0_MDI1+	A10
B11	GND (FIXED)	GND (FIXED)	A11
B12	CB_PWRBTN#	GBE0_MDI0-	A12
B13	CB_SMB_CLK	GBE0_MDI0+	A13
B14	CB_SMB_DAT	N/C	A14
B15	CB_SMB_ALERT#	SLP_S3#	A15
B16	SATA1_TX+	SATA0_TX+	A16
B17	SATA1_TX-	SATA0_TX-	A17
B18	SUS_STAT#	SLP_S4#	A18
B19	SATA1_RX+	SATA0_RX+	A19
B20	SATA1_RX-	SATA0_RX-	A20
B21	GND (FIXED)	GND (FIXED)	A21
B22	SATA3_TX+	SATA2_TX+	A22
B23	SATA3_TX-	SATA2_TX-	A23
B24	CB_PWROK	SLP_S5#	A24
B25	SATA3_RX+	SATA2_RX+	A25
B26	SATA3_RX-	SATA2_RX-	A26
B27	WDT	PM_BATLOW#	A27
B28	N/C	SATALED-	A28
B29	HDA_SDIN1	HDA_SYNC	A29
B30	HDA_SDIN0	HDA_RST#	A30
B31	GND	GND	A31
B32	SPKR	HDA_BITCLK	A32
B33	I2C_CK	HDA_SDOUT	A33
B34	I2C_DAT	BIOS_DISABLE0#	A34
B35	THRM#	CB_TRIP#	A35
B36	USB7-	USB6-	A36
B37	USB7+	USB6+	A37
B38	USB_4_5_OC#	USB_6_7_OC#	A38
B39	USB5-	USB4-	A39
B40	USB5+	USB4+	A40
B41	GND	GND	A41
B42	USB3-	USB2-	A42
B43	USB3+	USB2+	A43
B44	USB_0_1_OC#	USB_2_3_OC#	A44
B45	USB1-	USB0-	A45
B46	USB1+	USB0+	A46
B47	PLTRST#_BUFF	VRTC_BTB	A47
B48	EXCD1_CCPE#	PLTRST#_BUFF	A48
B49	SYS_RESET#	EXCD0_CCPE#	A49
B50	CB_RESET#	LPC_SERIRQ	A50
B51	GND	GND	A51
B52	PCIE_RX10+	PCIE_TX10+	A52
B53	PCIE_RX10-	PCIE_TX10-	A53
B54	DIO_5	DIO_0	A54
B55	PCIE_RX9+	PCIE_TX9+	A55

B56	PCIE_RX9-	PCIE_TX9-	A56
B57	DIO_6	GND	A57
B58	PCIE_RX4+	PCIE_TX4+	A58
B59	PCIE_RX4-	PCIE_TX4-	A59
B60	GND	GND	A60
B61	PCIE_RX3+	PCIE_TX3+	A61
B62	PCIE_RX3-	PCIE_TX3-	A62
B63	DIO_7	DIO_1	A63
B64	PCIE_RX2+	PCIE_TX2+	A64
B65	PCIE_RX2-	PCIE_TX2-	A65
B66	PCH_WAKE#	GND	A66
B67	EC_WAKE_IN#	DIO_2	A67
B68	PCIE_RX1+	PCIE_TX1+	A68
B69	PCIE_RX1-	PCIE_TX1-	A69
B70	GND	GND	A70
B71	LVDSB_DATA0+	LVDSA_DATA0+	A71
B72	LVDSB_DATA0-	LVDSA_DATA0-	A72
B73	LVDSB_DATA1+	LVDSA_DATA1+	A73
B74	LVDSB_DATA1-	LVDSA_DATA1-	A74
B75	LVDSB_DATA2+	LVDSA_DATA2+	A75
B76	LVDSB_DATA2-	LVDSA_DATA2-	A76
B77	LVDSB_DATA3+	LVDS_VDD_EN	A77
B78	LVDSB_DATA3-	LVDSA_DATA3+	A78
B79	LVDSBKLTEN	LVDSA_DATA3-	A79
B80	GND	GND	A80
B81	LVDSB_CLK+	LVDSA_CLK+	A81
B82	LVDSB_CLK-	LVDSA_CLK-	A82
B83	COM_BKLT_CTRL	LVDS_CK_EDP_AUXP	A83
B84	VCC_5V_SBY	LVDS_DAT_EDP_AUXN	A84
B85	VCC_5V_SBY	DIO_3	A85
B86	VCC_5V_SBY	H_RCIN	A86
B87	VCC_5V_SBY	EDP_HPD(Optional)	A87
B88	BIOS_DISABLE1#	COM_CLK+	A88
B89	CRT_RED	COM_CLK-	A89
B90	GND	GND	A90
B91	CRT_GREEN	SPI_POWER	A91
B92	CRT_BLUE	SPI_MISO	A92
B93	CRT_HSYNC	DIO_4	A93
B94	CRT_VSYNC	SPI_CK	A94
B95	CRT_DDC_CLK	SPI_MOSI	A95
B96	CRT_DDC_DATA	COM_TPM_PP	A96
B97	SPI_CS1#	N/C	A97
B98	N/C	UART_TX0	A98
B99	N/C	UART_RX0	A99
B100	GND	GND	A100
B101	FAN_PWMOUT	UART_TX1	A101
B102	FAN_TACHIN	UART_RX1	A102
B103	SLEEP#	LID#	A103
B104	VCC_12V	VCC_12V	A104
B105	VCC_12V	VCC_12V	A105
B106	VCC_12V	VCC_12V	A106
B107	VCC_12V	VCC_12V	A107
B108	VCC_12V	VCC_12V	A108
B109	VCC_12V	VCC_12V	A109
B110	GND	GND	A110

COM Express CD Connector (bottom side)

D1	GND (FIXED)	GND (FIXED)	C1
D2	GND	GND	C2
D3	USB3_TX1-	USB3_RX1-	C3
D4	USB3_TX1+	USB3_RX1+	C4
D5	GND	GND	C5
D6	USB3_TX2-	USB3_RX2-	C6
D7	USB3_TX2+	USB3_RX2+	C7
D8	GND	GND	C8
D9	USB3_TX3-	USB3_RX3-	C9
D10	USB3_TX3+	USB3_RX3+	C10
D11	GND (FIXED)	GND (FIXED)	C11
D12	USB3_TX4-	USB3_RX4-	C12
D13	USB3_TX4+	USB3_RX4+	C13
D14	GND	GND	C14
D15	DDI2_CTRLCLK_AUX+	N/C	C15
D16	DDI2_CTRLCLK_AUX-	N/C	C16
D17	N/C	N/C	C17
D18	N/C	N/C	C18
D19	PCIE_TX11+	PCIE_RX11+	C19
D20	PCIE_TX11-	PCIE_RX11-	C20
D21	GND(FIXED)	GND(FIXED)	C21
D22	PCIE_TX12+	PCIE_RX12+	C22
D23	PCIE_TX12-	PCIE_RX12-	C23
D24	N/C	DPB_HPD	C24
D25	N/C	N/C	C25
D26	DDI2_PAIR0+	N/C	C26
D27	DDI2_PAIR0-	N/C	C27
D28	N/C	N/C	C28
D29	DDI2_PAIR1+	N/C	C29
D30	DDI2_PAIR1-	N/C	C30
D31	GND(FIXED)	GND (FIXED)	C31
D32	DDI2_PAIR2+	DDI3_CLK_AUX+	C32
D33	DDI2_PAIR2-	DDI3_DATA_AUX-	C33
D34	DDI2_DDC_AUX_SEL	DDI3_DDC_AUX_SEL	C34
D35	N/C	N/C	C35
D36	DDI2_PAIR3+	N/C	C36
D37	DDI2_PAIR3-	N/C	C37
D38	N/C	N/C	C38
D39	DDI3_PAIR0+	N/C	C39
D40	DDI3_PAIR0-	N/C	C40
D41	GND(FIXED)	GND(FIXED)	C41
D42	DDI3_PAIR1+	N/C	C42
D43	DDI3_PAIR1-	N/C	C43
D44	DPC_HPD	N/C	C44
D45	N/C	N/C	C45
D46	DDI3_PAIR2+	N/C	C46
D47	DDI3_PAIR2-	N/C	C47
D48	N/C	N/C	C48
D49	DDI3_PAIR3+	N/C	C49
D50	DDI3_PAIR3-	N/C	C50
D51	GND (FIXED)	GND (FIXED)	C51
D52	PEG_TX0+	PEG_RX0+	C52
D53	PEG_TX0-	PEG_RX0-	C53
D54	PEG_LANE_RV#	N/C	C54
D55	PEG_TX1+	PEG_RX1+	C55

D56	PEG_TX1-	PEG_RX1-	C56
D57	TYPE2#	N/C	C57
D58	PEG_TX2+	PEG_RX2+	C58
D59	PEG_TX2-	PEG_RX2-	C59
D60	GND (FIXED)	GND (FIXED)	C60
D61	PEG_TX3+	PEG_RX3+	C61
D62	PEG_TX3-	PEG_RX3-	C62
D63	N/C	N/C	C63
D64	N/C	N/C	C64
D65	PEG_TX4+	PEG_RX4+	C65
D66	PEG_TX4-	PEG_RX4-	C66
D67	GND	N/C	C67
D68	PEG_TX5+	PEG_RX5+	C68
D69	PEG_TX5-	PEG_RX5-	C69
D70	GND (FIXED)	GND (FIXED)	C70
D71	PEG_TX6+	PEG_RX6+	C71
D72	PEG_TX6-	PEG_RX6-	C72
D73	GND	GND	C73
D74	PEG_TX7+	PEG_RX7+	C74
D75	PEG_TX7-	PEG_RX7-	C75
D76	GND	GND	C76
D77	N/C	N/C	C77
D78	PEG_TX8+	PEG_RX8+	C78
D79	PEG_TX8-	PEG_RX8-	C79
D80	GND (FIXED)	GND (FIXED)	C80
D81	PEG_TX9+	PEG_RX9+	C81
D82	PEG_TX9-	PEG_RX9-	C82
D83	N/C	N/C	C83
D84	GND	GND	C84
D85	PEG_TX10+	PEG_RX10+	C85
D86	PEG_TX10-	PEG_RX10-	C86
D87	GND	GND	C87
D88	PEG_TX11+	PEG_RX11+	C88
D89	PEG_TX11-	PEG_RX11-	C89
D90	GND (FIXED)	GND (FIXED)	C90
D91	PEG_TX12+	PEG_RX12+	C91
D92	PEG_TX12-	PEG_RX12-	C92
D93	GND	GND	C93
D94	PEG_TX13+	PEG_RX13+	C94
D95	PEG_TX13-	PEG_RX13-	C95
D96	GND	GND	C96
D97	N/C	N/C	C97
D98	PEG_TX14+	PEG_RX14+	C98
D99	PEG_TX14-	PEG_RX14-	C99
D100	GND (FIXED)	GND (FIXED)	C100
D101	PEG_TX15+	PEG_RX15+	C101
D102	PEG_TX15-	PEG_RX15-	C102
D103	GND	GND	C103
D104	VCC_12V	VCC_12V	C104
D105	VCC_12V	VCC_12V	C105
D106	VCC_12V	VCC_12V	C106
D107	VCC_12V	VCC_12V	C107
D108	VCC_12V	VCC_12V	C108
D109	VCC_12V	VCC_12V	C109
D110	GND (FIXED)	GND (FIXED)	C110

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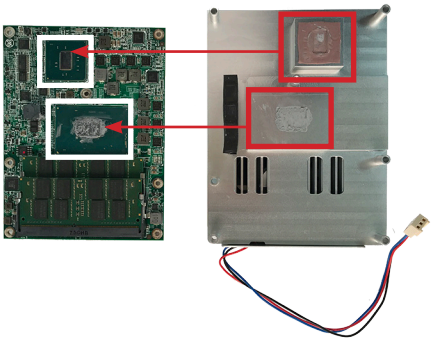
Chapter 3

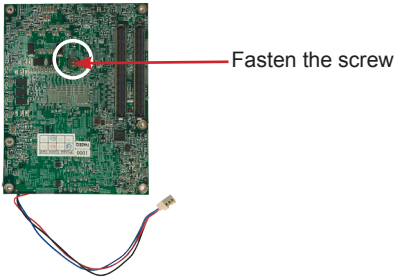
Installation & Maintenance

3.1 Installing the CPU Module to Carrier Board

1. Find the heat sink included in optional accessories. (See section 1.5.1 Optional Accessories on page 5) Apply thermal grease to be in contact with CPU and chipset on CPU module.

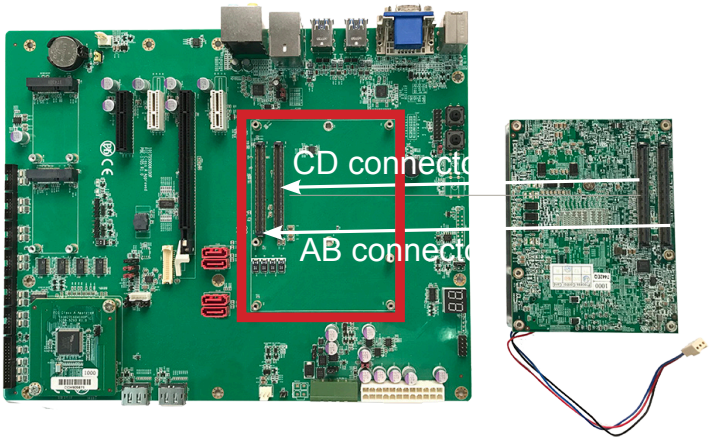


2. Place the heat sink over the CPU module and fasten the screw to secure it in place.

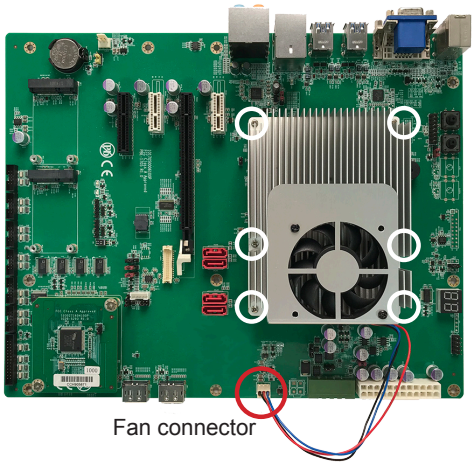


3. Find the COM Express connectors on carrier board PBE-1705, which is available in Section 1.5.1 Optional Accessories on page 5.

4. Mount the EmETXe-i90M3 into PBE-1705 via COM Express connectors as below; that is, COM Express AB to AB and CD to CD.



5. Secure the CPU module to the carrier board by fastening the 6 screws included in the heat sink accessory pack. Then plug the fan cable to the fan connector on the carrier board.



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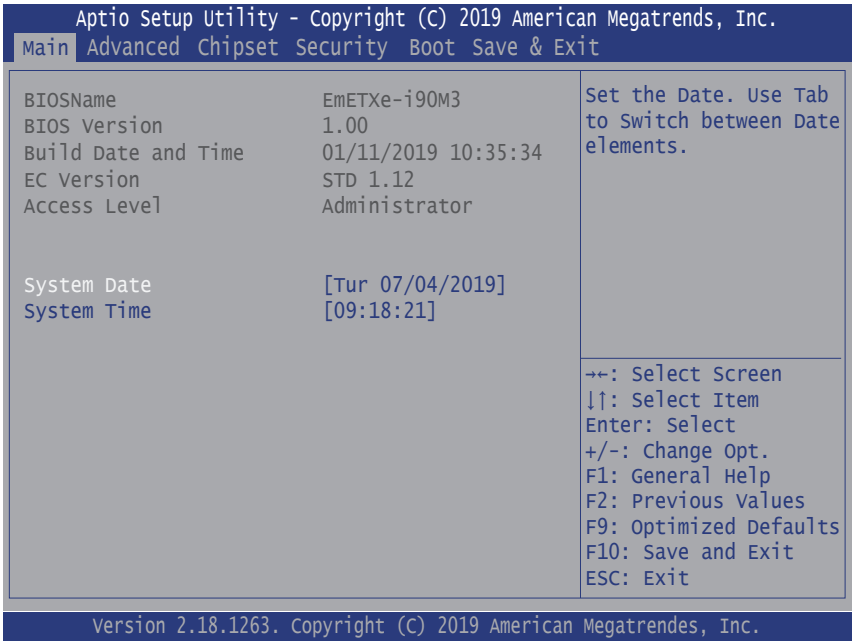
Chapter 4

BIOS

4.1 Main

The AMI BIOS provides a Setup utility program for specifying the system configurations and settings. The BIOS RAM of the system stores the Setup utility and configurations. When you turn on the computer, the AMI BIOS is immediately activated. To enter the BIOS SETUP UTILITY, press **"Delete"** once the power is turned on.

The **Main Setup** screen lists the following information:



Setting	Description
System Language	Choose the system default language.
System Date	Set the system date. Use Tab to switch between Data elements. Note that the 'Day' automatically changes when you set the date. ► The date format is: **Day:** Sun to Sat **Month:** 1 to 12 **Date:** 1 to 31 **Year:** 1998 to 2099

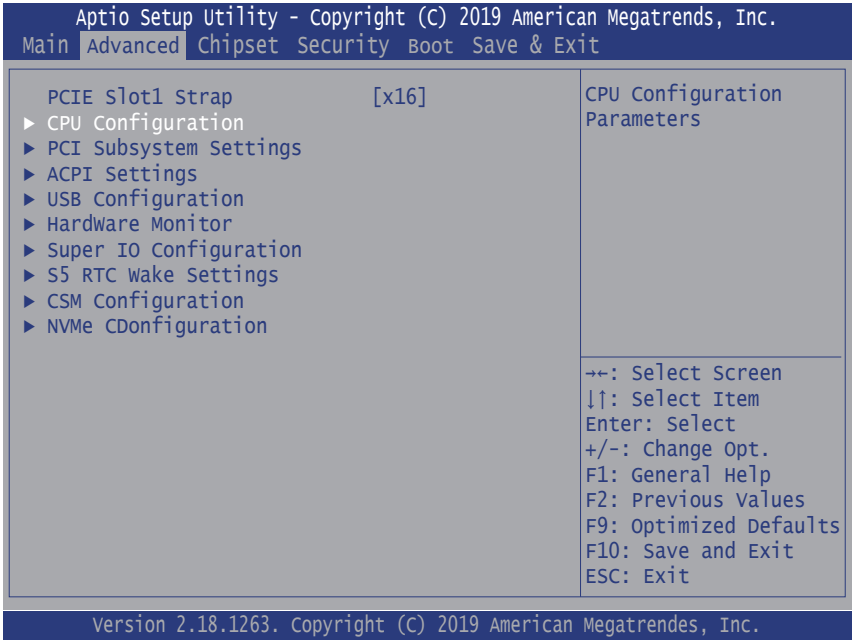
System Time	Set the system time. Use Tab to switch between Time elements. ► The time format is: **Hour:** 00 to 23 **Minute:** 00 to 59 **Second:** 00 to 59

Key Commands

BIOS Setup Utility is mainly a key-based navigation interface. Please refer to the following key command instructions for navigation process.

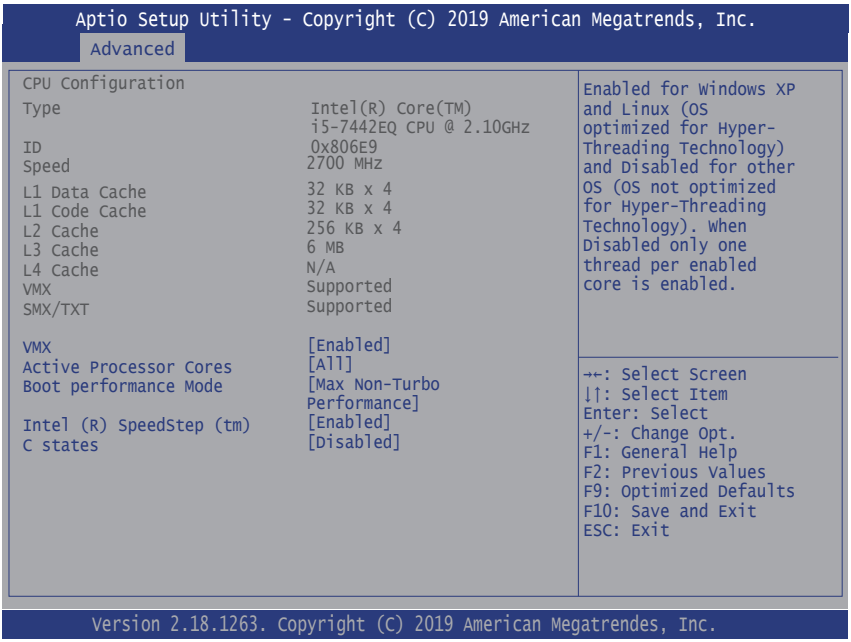
Keystroke	Function
◄ ►	Move to highlight a particular configuration screen from the top menu bar / Move to highlight items on the screen
▼ ▲	Move to highlight previous/next item
Enter	Select and access a setup item/field
Esc	On the Main Menu – Quit the setup and not save changes into CMOS (a message screen will display and ask you to select “OK” or “Cancel” for exiting and discarding changes. Use “←” and “→” to select and press “Enter” to confirm) On the Sub Menu – Exit current page and return to main menu
Page Up / +	Increase the numeric value on a selected setup item / make change
Page Down / -	Decrease the numeric value on a selected setup item / make change
F1	Activate “General Help” screen
F2	Load previous values
F9	Load optimized defaults
F10	Save the changes that have been made in the setup and exit. (a message screen will display and ask you to select “OK” or “Cancel” for exiting and saving changes. Use “←” and “→” to select and press “Enter” to confirm)

4.2 Advanced



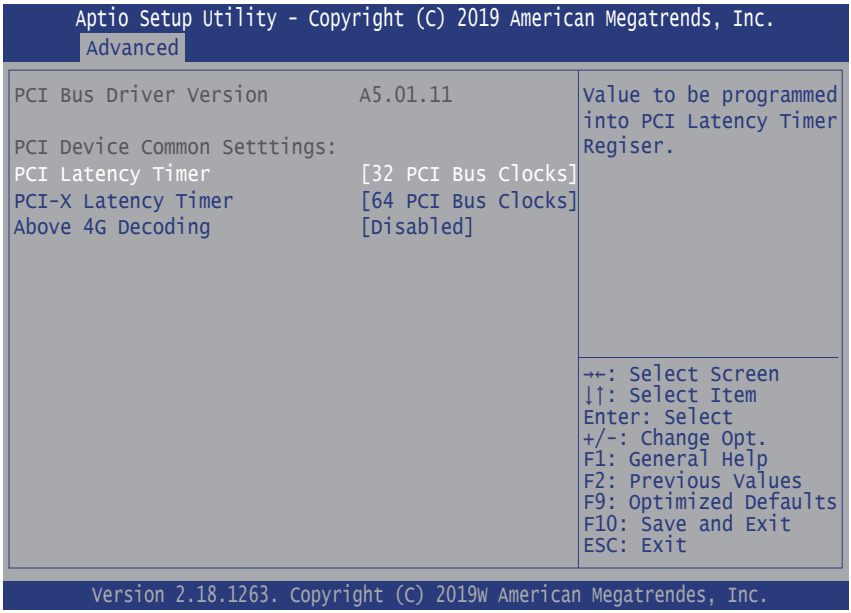
Setting	Description
PCIE Slot1 Strap	Select PCIE Slot1 strap. Options: **x16** (default) and **x8x8**
CPU Configuration	See section 4.2.1 CPU Configuration on page 23
PCI Subsystem Settings	See section 4.2.2 PCI Subsystem Settings on page 24
ACPI Settings	See section 4.2.3 ACPI Settings on page 25
USB Configuration	See section 4.2.4 USB Configuration on page 26
Hardware Monitor	See section 4.2.5 Hardware Monitor on page 28
Super IO Configuration	See section 4.2.6 Super IO Configuration on page 29
S5 RTC Wake Settings	See section 4.2.7 S5 RTC Wake Settings on page 31
CSM Configuration	See section 4.2.8 CSM Configuration on page 32
NVMe Configuration	See section 4.2.9 NVMe Configuration on page 33

4.2.1 CPU Configuration



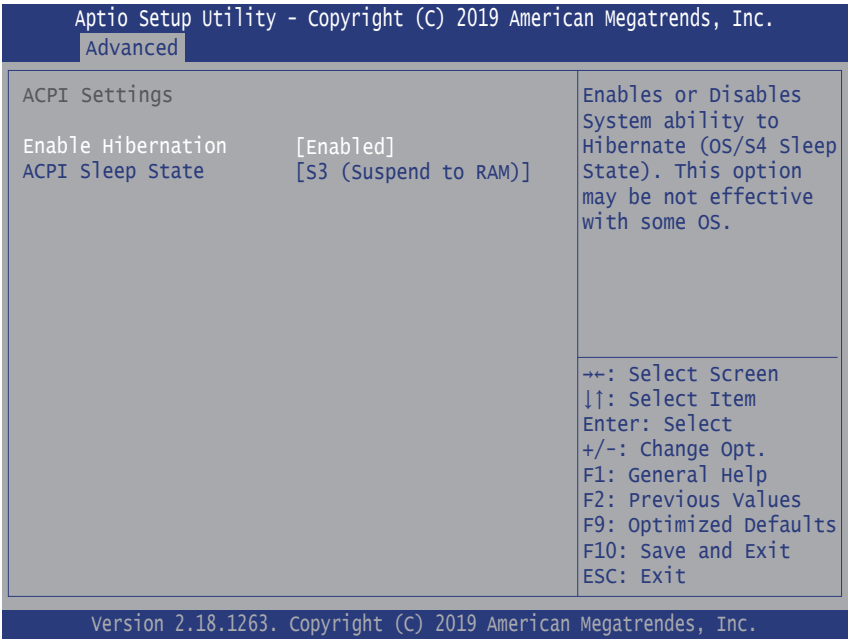
Setting	Description
VMX	Enable or disable Intel virtualization technology. ► Options: **Enabled** (default) or **Disabled**
Active Processor Cores	Number of cores to enable in each processor package. ► Options: **All** (default) **1, 2** and **3**
Boot performance Mode	Set the performance state that the BIOS will set before the OS handoff. ► Options: **Max Non-Turbo Performance** (default), **Max Power Saving** and **Turbo Performance**
Intel (R) Speed Step (tm)	**Enable** (default)/**Disable** Intel SpeedStep. Allows more than two frequency ranges to be supported.
C States	**Enable** /**Disable** (default) CPU C States

4.2.2 PCI Subsystem Settings



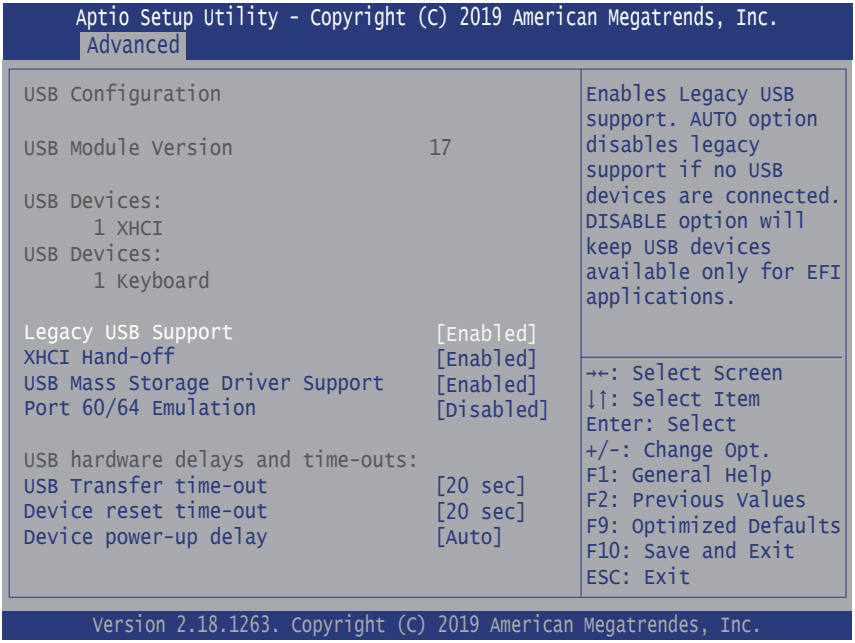
Setting	Description
PCI Latency Timer	Value to be programmed into PCI Latency timer Register. ► Default: **32 PCI Bus Clocks**
PCI-X Latency Timer	Value to be programmed into PCI Latency timer Register. ► Default: **64 PCI Bus Clocks**
Above 4G Decoding	**Enable**/**Disable**(default) 64bit capable Devices to be Decoded in Above 4G Address Space (Only if System Supports 64 bit PCI Decoding).

4.2.3 ACPI Settings



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

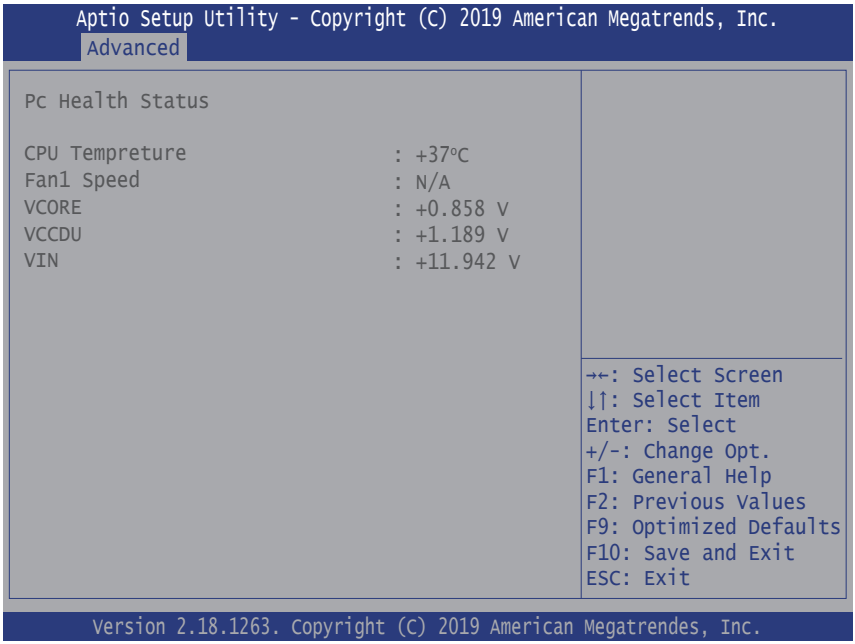
4.2.4 USB Configuration



Setting	Description
Legacy USB Support	Sets legacy USB support. ► Options: **Enabled** (default), **Disabled** and **Auto**. **AUTO** option disables legacy support if no USB devices are connected. **Disable** option will keep USB devices available only for EFI applications.
XHCI Hand-off	**Enable** (default) or **Disable** XHCI Hand-off This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
USB Mass Storage Driver Support	**Enable** (default) or **Disable** USB Mass Storage Driver Support.

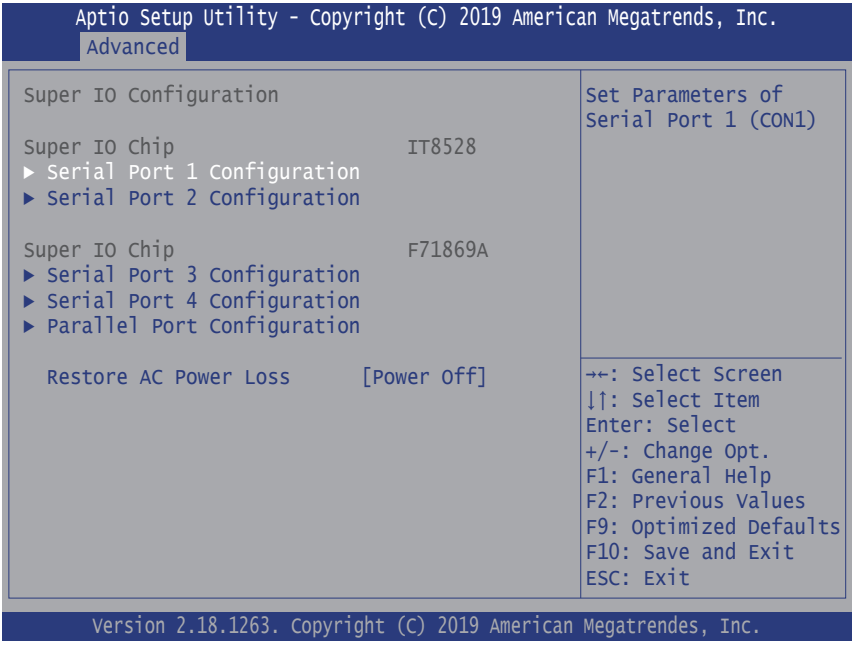
Port 60/64 Emulation	Enables/Disables (default) I/O port 60h/64h emulation support. This should be enabled for the complete USB keyboard legacy support. USB keyboard legacy support for non-USB aware OSes. ► Options: **Enabled** and **Disabled** (default).
USB hardware delay and time-out	
USB Transfer time-out	Use this item to set the time-out value for control, bulk, and interrupt transfers. ‣ Options available are: **1 sec, 5 sec, 10 sec, 20 sec** (default)
Device reset time-out	Use this item to set USB mass storage device start unit command time-out. ‣ Options available are: **10 sec, 20 sec** (default)**, 30 sec, 40 sec**
Device power-up delay	Use this item to set maximum time the device will take before it properly reports itself to the host controller. ‣ Options available are: **Auto** (Default): 'Auto' uses default value: for a root port it is 100 ms, for a hub port the delay is taken from hub descriptor. **Manual**: Select **Manual** you can set value for the following sub-item: '**Device Power-up delay in seconds**', the delay range in from 1 to 40 seconds, in one second increments.

4.2.5 Hardware Monitor



Access this submenu to monitor the hardware status.

4.2.6 Super IO Configuration



Setting	Description
Serial Port 1/2/3/4 & Parallel Port Configuration	See next page.
Restore AC Power Loss	Specify what state to go to when power is re-applied after a power failure. ► Options: **Last State**, **Power On** and **Power Off** (default)

Serial Port 1/2/3/4 Configuration

Setting	Description
Serial Port	**Enable** (default) or **Disable** Serial Port (COM).
Change Settings	Select an optimal setting for Super IO device. ► Options for Serial Port 1: **Auto**; **IO=3F8h; IRQ=4** (default) ; **IO=3F8h; IRQ=3, 4, 7, 12**; **IO=2F8h; IRQ=3, 4, 7, 12**; ► Options for Serial Port 2: **Auto** **IO=2F8h; IRQ=3** (default) **IO=3F8h; IRQ=3, 4, 7, 12** **IO=2F8h; IRQ=3, 4, 7, 12** ► Options for Serial Port 3: **Auto** **IO=3E8h; IRQ=11** (default) **IO=3E8h; IRQ=7, 10, 11, 12** **IO=2E8h; IRQ=7, 10, 11, 12** **IO=2F0h; IRQ=7, 10, 11, 12** **IO=2E0h; IRQ=7, 10, 11, 12** ► Options for Serial Port 4: **Auto** **IO=2E8h; IRQ=10** (default) **IO=3E8h; IRQ=7, 10, 11, 12** **IO=2E8h; IRQ=7, 10, 11, 12** **IO=2F0h; IRQ=7, 10, 11, 12** **IO=2E0h; IRQ=7, 10, 11, 12**

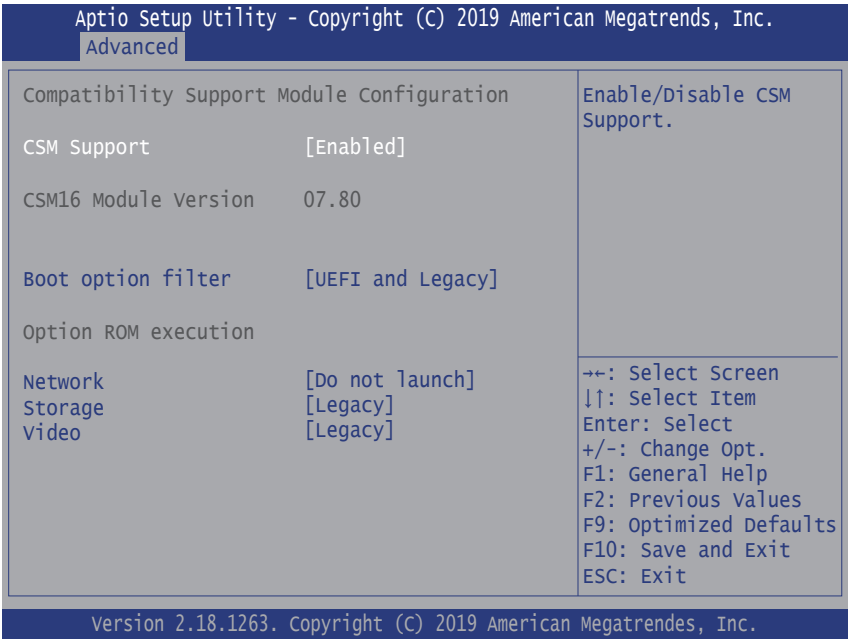
Parallel Port Configuration

Setting	Description
Parallel Port	**Enable** (default) or **Disable** Parallel Port (LPT/LPTE).
Change Settings	Select an optimal setting for Super IO device. ► Options: **Auto** **IO=378h; IRQ=7** (default) **IO=378h; IRQ=7, 10, 11, 12** **IO=278h; IRQ=7, 10, 11, 12** **IO=3BCh; IRQ=7, 10, 11, 12**
Device Mode (only for Parallel Port Configuration)	Change the Printer Port mode. ► Options: **STD Printer Mode** (default) **SPP Mode** **EPP-1.9 and SPP Mode** **EPP-1.7 and SPP Mode** **ECP Mode** **ECP and EPP 1.9 Mode** **ECP and EPP 1.7 Mode**.

4.2.7 S5 RTC Wake Settings

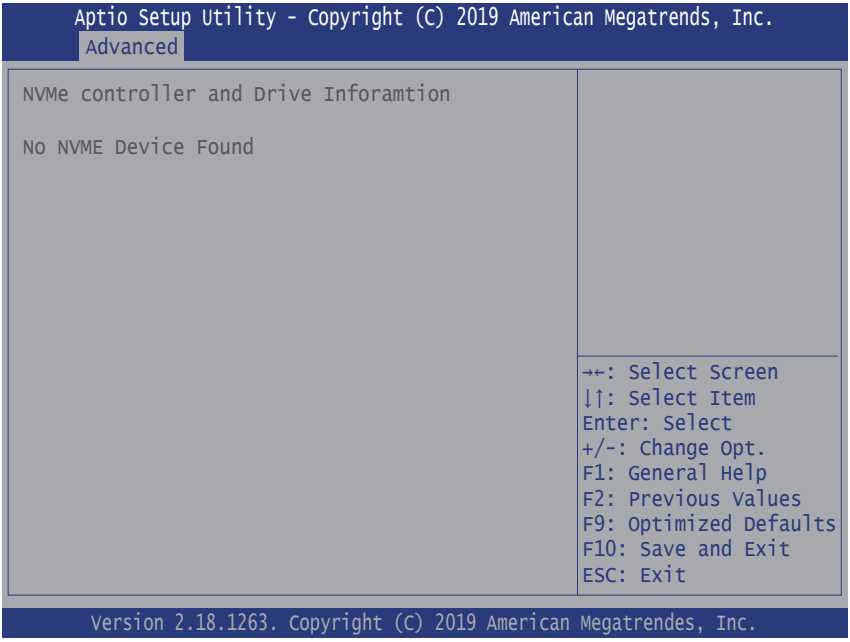
Setting	Description
Wake System from S5	**Enable** or **Disable** (default) system wake on alarm event. ► Options available are: **Disabled** (default): **Fixed Time:** System will wake on the hr::min::sec specifiedc. **DynamicTime:** If selected, you need to set **Wake up minute increase** from 1 - 5. System will wake on the current time + increase minute(s).

4.2.8 CSM Configuration



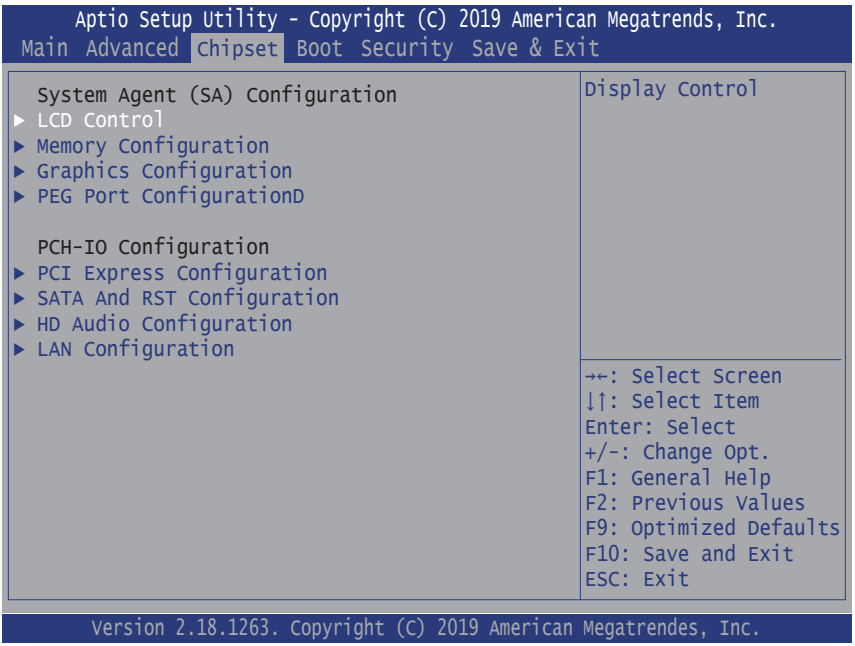
Setting	Description
CSM Support	**Enable** (default) or **Disable** CSM Support.
Boot option filter	Control the Legacy/UEFI ROMs priority. ► Options: **UEFI and Legacy** (default), **Legacy only** and **UEFI only**
Network	Control the execution of UEFI and Legacy PXE OpROM ► Options: **Do not lauch** (default) and **Legacy**
Storage	Control the execution of UEFI and Legacy Storage OpROM ► Options: **Do not lauch** and **Legacy** (default)
Video	Control the execution of UEFI and Legacy Video OpROM ► Options: **Do not lauch** and **Legacy** (default)

4.2.9 NVMe Configuration



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

4.3 Chipset



Setting	Description
System Agent (SA) Configuration	
LCD Control	
Boot Display	Select the Video Device which will be activated during POST. This has no effect if external graphics present. Secondary boot display selection will appear based on your selection. VGA modes will be supported only on primary display. ► Options: **VBIOS Default** (default), **CRT**, **LVDS**, **DVI** and **DP1**.
Active LFP	Configuring LFP usage ► Options: **No eDP** (default), and **eDP Port-A**
Memory Configuration	Access this submenu to view the memory configuration.

Graphic Configuration	See section 4.3.1 Graphics Configuration on page 36
PEG Port Configuration	
Enable Root Port	**Enable** or **Disable** (default) the Root Port. ► Options: **Auto** (default), **Disabled** and **Enabled**.
Max Link Speed	Configures PEG 0:1: 0 Max Speed. ► Options: **Auto** (default), **Gen 1**, **Gen 2** and **Gen 3**.
PCIe Spread Spectrum Clocking	Allows to **Enable** (default) or **Disable** Spread Spectrum Clocking for compliance testing.
PCI-IO Configuration	
PCI Express Configuration	See section 4.3.2 PCI Express Configuration on page 37
SATA And RST Configuration	See section 4.3.3 SATA and RST Configuration on page 37
HD Audio Configuration	Control Detection of the HD-Audio device. ► Options: **Disabled**: HDA will be unconditionally disabled **Enabled**: HDA will be unconditionally Enabled **Auto** (default) = HDA will be enabled if present, disabled otherwise.
LAN Configuration	
PHC LAN Controller	Enables/Disables onboard NIC. ► Options: **Enabled** (default) and **Disabled**
Wake on LAN Enable	Availabe if PCH LAN Controller is enabled: ► Options: **Enable** (default) / **Disable** integrated LAN to wake the system.

4.3.1 Graphics Configuration

Setting	Description
Skip Scaning of External Gfx Card	If enabled, it will not scan for External Gfx Card on PEG and PCH PCIE Ports. ► Options: **Disabled** (default) and **Enabled**.
External Gfx Card Primary Display Configuration	
Primary PEG	Select which of IGFX/PEG/PCI graphics device should be Primay Display or select SG for Switchable Gfx. ► Options: **Auto** (default), **PEG11** and **PEG12**.
Primary PCIE	Select the card used on the platfform ► Options: **Auto** (default) and **PCIE1~18**.
Internal Graphics	Keep IGFX enabled based on the setup options. ► Options: **Auto** (default), **Disabled** and **Enabled**
GTT Size	Select the GTT Size. ► Options: **2MB**, **4MB** and **8MB** (default)**.**
Apeture Size	Select the Apeture Size. Note that above 4GB MMIO BIOS assignment is automatically enabled when selecting 2048MB aperture. To use this feature, please disable CSM support. ► Options: **128MB**, **256MB**(default), **512MB**, **1024MB** and **2048MB**
DVMT Pre-Allocated	Select the DVMT 5.0 Pre-allocated (Fixed) Graphic Memory size used by the Internal Graphic Device. ► Options: **32M** is the default.
DVMT total Gfx Mem	Select the DVMT 5.0 Total Graphic Memory size used by the Internal Graphic Device. ► Options: **256MB** (default), **128MB** and **Max.**

4.3.2 PCI Express Configuration

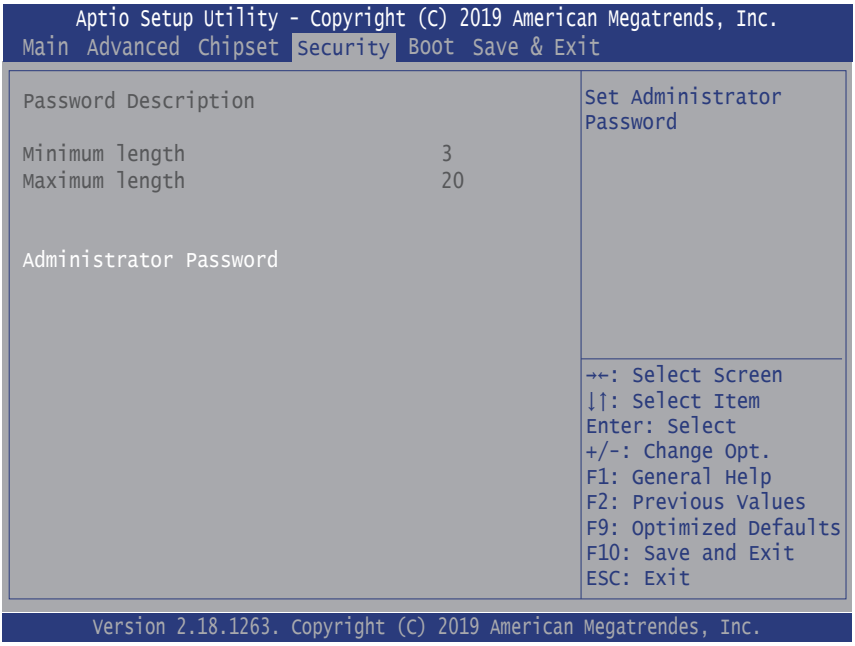
Setting	Description
PCIE1/2/3 & MC1/2	**Enable** (default) or **disable** PCIE1/2/3 and MC1/2.
ASPM Support	Disable or set the ASPM level. Force L0s will force all inks to L0s state. “Auto” will allow BIOS to auto configure.”Disable” will disable ASPM. ► Options: **Disabled** (default), **L0s**, **L1**, **L0sL1** and **Auto**.
PCIe Speed	Select PCI Express port speed. ► Options: **Auto** (default), **Gen1**, **Gen2** and **Gen3**

4.3.3 SATA and RST Configuration

Setting	Description
SATA Controller`(s)	**Enable** (default) or **disable** SATA Device.
SATA Mode Selection	Determines how SATA controller(s) operate. ► Options: **AHCI** (default) and **RAID**
SATA Controller Speed	Indicates the maximum speed the SATA controller can support. ► Options: **Default** (default), **Gen1**, **Gen2** and **Gen3**
Port 0/1/2/3	**Enable** or **disable**(default) SATA Port.

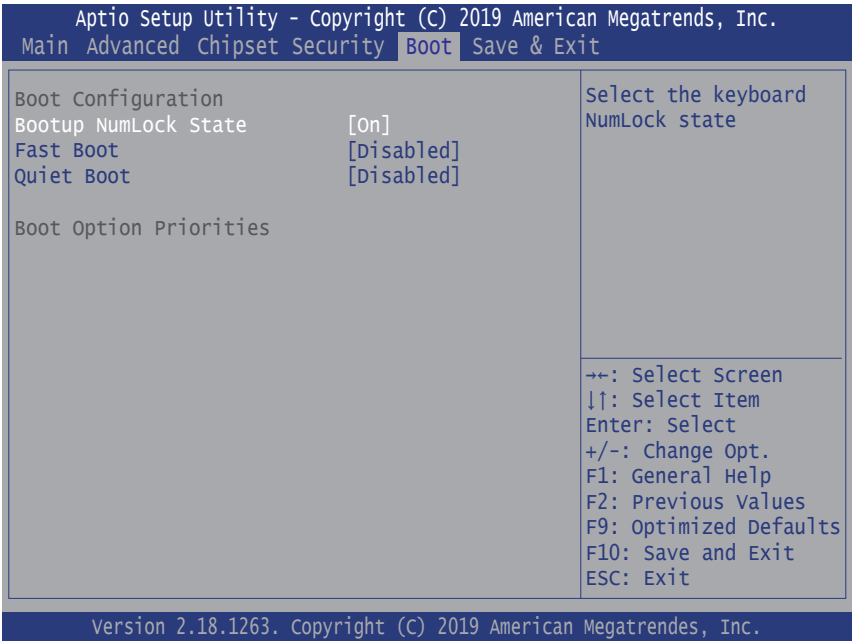
4.4 Security

The **Security** menu sets up the administrator password.



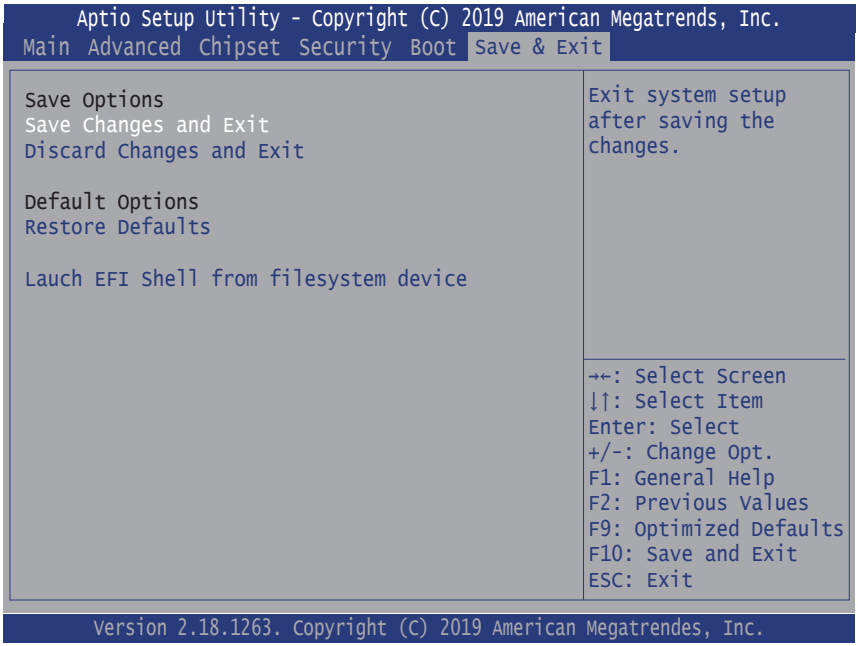
Setting	Description
Administrator Password	To set up an administrator password: 1. Select **Administrator Password**. The screen then pops up an **Create New Password** dialog. 2. Enter your desired password that is no less than 3 characters and no more than 20 characters. 3. Hit [Enter] key to submit.

4.5 Boot



Setting	Description
Boot NumLock State	Select the keyboard NumLock state. ► Options: **On** (default) and **Off**.
Fast Boot	**Enable** or **Disable** (default) boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.
Quiet Boot	**Enable** or **Disable** (default) Quiet Boot option.

4.6 Save & Exit



Setting	Description
Save Changes and Exit	Exit system setup after saving the changes. ► Enter the item and then a dialog box pops up: **Save configuration and exit? (Yes/ No)**
Discard Changes and Exit	Exit system setup without saving the changes. ► Enter the item and then a dialog box pops up: **Quit without saving? (Yes/ No)**
Restore Defaults	Restore/Load Default values for all the setup options. ► Enter the item and then a dialog box pops up: **Load Optimized Defaults? (Yes/ No)**
Launch EFI Shell from fi.lesystem device	Attempts to launch EFI shell application (Shell.efi) from one of the available filesystem devices.

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Appendix

Appendix A: I/O Port Address Map

Each peripheral device in the system is assigned a set of I/O port addresses which also becomes the identity of the device. The following table lists the I/O port addresses used.

Address	Device Description
03F8-03FF	Communications Port (COM1)
02F8-02FF	Communications Port (COM2)
03E8-03EF	Communications Port (COM3)
02E8-02EF	Communications Port (COM4)
002E-002F	Motherboard resources
004E-004F	Motherboard resources
0061-0061	Motherboard resources
0070-0071	Motherboard resources
0080-0080	Motherboard resources
0092-0092	Motherboard resources
00B2-00B3	Motherboard resources
1800-18FE	Motherboard resources
0A00-0A1F	Motherboard resources
0A20-0A2F	Motherboard resources
0A30-0A3F	Motherboard resources
0CF8-0CFF	PCI Express Configuration Access Port
0378-037F	Printer Port (LPT1)
0020-0021	Programmable interrupt controller
00A0-00A1	Programmable interrupt controller
04D0-04D1	Programmable interrupt controller
F040-F05F	SM Bus Controller
F090-F097	Standard SATA AHCI Controller
F080-F083	Standard SATA AHCI Controller
F060-F07F	Standard SATA AHCI Controller
0040-0043	System timer

Appendix B: BIOS Memory Mapping

Address	Device Description
0xDF000000-0xDF01FFFF	Ethernet Controller
0xDF040000-0xDF043FFF	High Definition Audio Controller
0xDF020000-0xDF02FFFF	High Definition Audio Controller
0xFED00000-0xFED003FF	High Precision Event Timer
0xFF000000-0xFFFFFFFF	Intel(R) 82802 Firmware Hub Device
0xDF030000-0xDF03FFFF	Intel(R) USB 3.0 eXtensible Host Controller - 0100 (Microsoft)
0xA0000-0xBFFFF	Microsoft Basic Display Adapter
0xDE000000-0xDEFFFFFF	Microsoft Basic Display Adapter
0xC0000000-0xCFFFFFFF	Microsoft Basic Display Adapter
0xFED10000-0xFED17FFF	Motherboard resources
0xFED18000-0xFED18FFF	Motherboard resources
0xFED19000-0xFED19FFF	Motherboard resources
0xE0000000-0xEFFFFFFF	Motherboard resources
0xFED20000-0xFED3FFFF	Motherboard resources
0xFED90000-0xFED93FFF	Motherboard resources
0xFED45000-0xFED8FFFF	Motherboard resources
0xFF000000-0xFFFFFFFF	Motherboard resources
0xFEE00000-0xFEEFFFFF	Motherboard resources
0xDFFE0000-0xDFFFFFFF	Motherboard resources
0xFE029000-0xFE029FFF	Motherboard resources
0xFE028000-0xFE028FFF	Motherboard resources
0xFDAF0000-0xFDAFFFFF	Motherboard resources
0xFDAE0000-0xFDAEFFFF	Motherboard resources
0xFDAC0000-0xFDACFFFF	Motherboard resources
0xFD000000-0xFDABFFFF	Motherboard resources
0xFDAD0000-0xFDADFFFF	Motherboard resources
0xFDB00000-0xFDFFFFFF	Motherboard resources
0xFE000000-0xFE01FFFF	Motherboard resources

0xFE036000-0xFE03BFFF	Motherboard resources
0xFE03D000-0xFE3FFFFF	Motherboard resources
0xFE410000-0xFE7FFFFF	Motherboard resources
0xDF051000-0xDF051FFF	PCI Data Acquisition and Signal Processing Controller
0xFD000000-0xFDABFFFF	PCI Express Root Complex
0x90000000-0xDFFFFFFF	PCI Express Root Complex
0xDF044000-0xDF047FFF	PCI Memory Controller
0xDF04B000-0xDF04BFFF	SDA Standard Compliant SD Host Controller
0xDF04A000-0xDF04A0FF	SM Bus Controller
0xDF048000-0xDF049FFF	Standard SATA AHCI Controller
0xDF04E000-0xDF04E0FF	Standard SATA AHCI Controller
0xDF04D000-0xDF04D7FF	Standard SATA AHCI Controller
0xFED40000-0xFED40FFF	Trusted Platform Module 1.2

Appendix C: Interrupt Request Lines (IRQ)

Peripheral devices use interrupt request lines to notify CPU for the service required. The following table shows the IRQ used by the devices on board.

Level	Function
IRQ0	System timer
IRQ1	PS/2 Keyboard
IRQ3	Communications Port (COM2)
IRQ4	Communications Port (COM1)
IRQ5	SM Bus Controller
IRQ8	System CMOS/real time clock
IRQ10	Communications Port (COM4)
IRQ11	Communications Port (COM3)
IRQ12	PS/2 Mouse
IRQ16~IRQ23	PCIe Devices

Appendix D: Watchdog Timer (WDT) Setting

WDT is widely used for industry application to monitor the activity of CPU. Application software depends on its requirement to trigger WDT with adequate timer setting. Before WDT time out, the functional normal system will reload the WDT. The WDT never time out for a normal system. The WDT will not be reloaded by an abnormal system, then WDT will time out and reset the system automatically to avoid abnormal operation.

This board supports 255 levels watchdog timer by software programming I/O ports. Below are the source codes written in C, please take them as WDT application example.

```
#include <math.h>
#include <stdio.h>
#include <dos.h>

int WDTCount;

int main(void)
{
         unsigned char     iCount;

         printf("WDT Times ( 1 ~ 255 ) : ");
         scanf("%d",&iCount);
         printf("\n");

         WDT_Start(iCount);

         return 0;
}

void WDT_Start(int iCount)
{
         outportb(0x66,0xBA);                                  /* Enable Watch Dog */
         delay(1000);

         WDTCount = iCount;
         outportb(0x62, WDTCount);      /* Number is Watch Dog Down count number */
         delay(1000);

         outportb(0x62, 0x00);               /* Minute is 1 count unit by minute */
                                             /* Minute is 0 count unit by second */

}

void WDT_Stop(void)
{
         outportb(0x66,0xBB);                          /* Disable Watch Dog */
}

void WDT_Clear(void)
{
```

```
        outportb(0x66,0xBA);                              /* Enable Watch Dog */
        delay(1000);

        outportb(0x62, WDTCount);      /* Number is Watch Dog Down count number */
        delay(1000);

        outportb(0x62, 0x00);              /* Minute is 1 count unit by minute */
                                           /* Minute is 0 count unit by second */
}
```

Appendix E: DIO Sample Code

```
#include "math.h"
#include "stdio.h"
#include "dos.h"

int SMB_PORT_AD    = 0xF040;
int SMB_DEVICE_ADD = 0x42;

void GPIOMode(int iMode);
void GPIOData(int iData);
int  GPIOStatus();

int main(void)
{
    int iInput;

    GPIOMode(0xF);
    delay(2000);

    GPIOData(0x0A);
    delay(2000);
    iInput = GPIOStatus();
    printf(" Data : %2x \n",iInput);

    GPIOData(0x05);
    delay(2000);
    iInput = GPIOStatus();
    printf(" Data : %2x \n",iInput);

    return 0;
}

void GPIOMode(int iMode)
{
    SMB_Byte_WRITE(SMB_PORT_AD,SMB_DEVICE_ADD,0x03,iMode);    /* DIO 0 ~ 7 Mode */
}

void GPIOData(int iData)
{
    SMB_Byte_WRITE(SMB_PORT_AD,SMB_DEVICE_ADD,0x01,iData);    /* DIO 0 ~ 7 Data */
}

int GPIOStatus()
{
    int iStatus;

    iStatus = SMB_Byte_READ(SMB_PORT_AD,SMB_DEVICE_ADD,0x00);/* DIO 0 ~ 7 Status*/

    return iStatus;
}
```