USER'S MANUAL

BC-0928

COM Express CPU Module
powered by Intel® 4th Gen.
Core™ i7/i5/i3
features VGA/LAN/3DP/2COM

BC-0928 M1

BC-0928
COM Express CPU Module
With Intel® 4th Gen. Core ™

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DISCLAIMER

This operation manual is meant to assist both Embedded Computer manufacturers and end users in installing and setting up the system. The information contained in this document is subject to change without any notice.

CE NOTICE

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 NOTICE

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.

You are cautioned that any change or modifications to the equipment not expressly approve by the party responsible for compliance could void your authority to operate such equipment.

CAUTION! Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

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APPENDIX A EXPANSION BUS

APPENDIX B TECHNICAL SUMMARY

INTRODUCTION

CHAPTER

1

This chapter gives you the information for BC-0928. It also outlines the system specifications.

Sections included:

- About This Manual
- System Specifications
- Safety Precautions

Experienced users can jump to chapter 2 on page 2-1 for a quick start.

1-1. ABOUT THIS MANUAL

Thank you for purchasing our BC-0928 COM Express CPU Motherboard, powered by Intel® 4th Gen. Core™, enhanced with VGA, LAN, 3DP & 2COM, which is fully PC/AT compatible. The BC-0928 provides faster processing speed, greater expandability and can handle more tasks than before. This manual is designed to assist you how to install and set up the system. It contains four chapters. The user can apply this manual for configuration according to the following chapters:

Chapter 1 Introduction

This chapter introduces you to the background of this manual, and the specifications for this system. The final page of this chapter will indicate how to avoid damaging this board.

Chapter 2 Hardware Configuration

This chapter outlines the component locations and their functions. In the end of this chapter, you will learn how to set jumper and how to configure this card to meet your own needs.

Chapter 3 Software Utilities

This chapter contains helpful information for proper installations of the VGA utility, LAN utility, Sound utility, and Flash BIOS Update. It also describes the Watchdog-timer configuration.

Chapter 4 BIOS Setup

This chapter indicates you how to set up the BIOS configurations.

Appendix A Expansion Bus

This appendix introduces you the expansion bus for PCIe connectors.

Appendix B Technical Summary

This appendix gives you the information about the Technical maps.

1-2. SYSTEM SPECIFICATIONS

System

CPU	Intel® 4th Gen. Core™ Processor (LGA1150) ▪ i7-4700EQ, 47W (4C), 2.4 GHz (Turbo 3.4GHz) ▪ i5-4400E, 37W (2C), 2.7 GHz (Turbo 3GHz) ▪ i3-4102E, 25W (2C), 1.6 GHz (no turbo)
OS Support	Windows 7/8, WEC7/8, Linux
Chipset	Intel® QM87
Memory	Dual channel DDR3L SO-DIMM (204 pins), 1333/1600 MHz, up to 16GB
BIOS	AMI
Watchdog	1~255 seconds
Power Supply	ATX
Power Request	12V, 5V
Dimension	95 x 125 mm (3.74" x 4.92")
Certificate	CE/FCC

I/O Ports (providing signal for connectors on carrier board.)

Serial Port	2 ports (TX/RX)
USB Port	▪ 4 x USB 3.0 ▪ 8 x USB 2.0
SATA Interface	▪ 2 x SATA III ▪ 2 x SATA II
TPM	TPM 1.2 (from carrier board via Protech external TPM module BR-4010)
GPIO	▪ 4 x GPO ▪ 4 x GPI
VGA	1 x VGA
LAN	1 x Intel® I217-LM 1000 GB, support Wake-on-LAN
Audio	Intel® High Definition audio on carrier board
Expansion Bus	▪ 1 x PCIe (x16) ▪ 7 x PCIe (1x) ▪ 1 x LPC bus ▪ 1 x Smbus ▪ 1 x I^2C

Display

Graphics	Built-in processor to share the system memory. ▪ 1 x CRT (2048 x 1536) ▪ 1 x LVDS (2CH, 24 bit) ▪ 3 x Display ports (Signal is from connectors on carrier board.)

Environment

Temperature	▪ Operation: 0 ~ 60°C (32 ~ 140°F) ▪ Storage: -40 ~ 80°C (-40 ~ 176°F)
Humidity	▪ Operation: 20~90% ▪ Storage: 20~95%

1-3. SAFETY PRECAUTIONS

Follow the messages below to avoid your systems from damage:

1. Keep your system away from static electricity on all occasions.

2. Prevent electric shock. Don‘t touch any components of this card when the card is power-on. Always disconnect power when the system is not in use.

3. Disconnect power when you change any hardware devices.
   For instance, when you connect a jumper or install any cards, a surge of power may damage the electronic components or the whole system.

CHAPTER

2

HARDWARE CONFIGURATION

*** QUICK START ***

Helpful information describes the jumper & connector settings, and component locations.

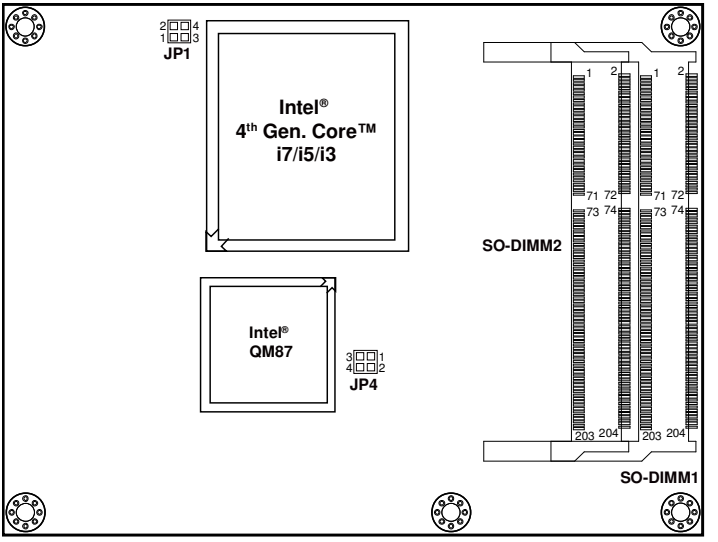
Sections included:

- Jumper & Connector Quick Reference Table
- Component Locations
- Configuration and Jumper settings
- Connector's Pin Assignments

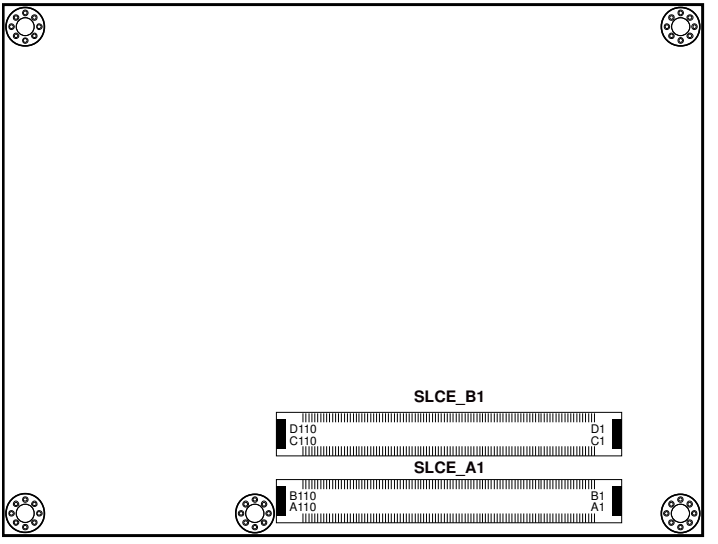
2-1. JUMPER & CONNECTOR QUICK REFERENCE TABLE

JUMPER/CONNECTOR	NAME
PCI Express x16 Selection	JP1
Flash Descriptor & Clear CMOS Selection	JP4
COM Express Connectors	SLCE_A1, SLCE_B1

2-2. COMPONENT LOCATIONS



BC-0928 Top Connector, Jumper and Component locations



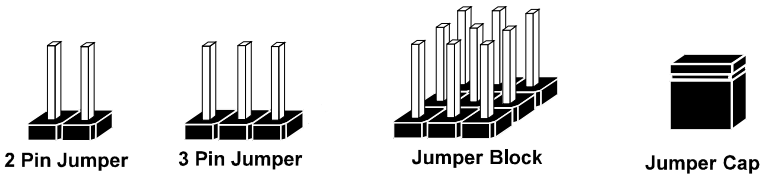
BC-0928 Bottom Connector and Component locations

2-3. HOW TO SET JUMPERS

You can configure your board by setting jumpers. Jumper is consists of two or three metal pins with a plastic base mounted on the card, and by using a small plastic "cap", Also known as the jumper cap (with a metal contact inside), you are able to connect the pins. So you can set-up your hardware configuration by "open" or "close" pins.

The jumper can be combined into sets that called jumper blocks. When the jumpers are all in the block, you have to put them together to set up the hardware configuration. The figure below shows how this looks like.

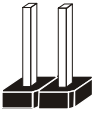
JUMPERS AND CAPS



If a jumper has three pins (for examples, labelled PIN1, PIN2, and PIN3), You can connect PIN1 & PIN2 to create one setting by shorting. You can either connect PIN2 & PIN3 to create another setting. The same jumper diagrams are applied all through this manual. The figure below shows what the manual diagrams look and what they represent.

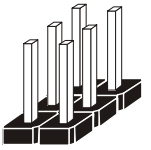
JUMPER DIAGRAMS

Jumper Cap looks like this

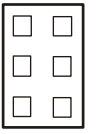


2 pin Jumper looks like this

3 pin Jumper looks like this

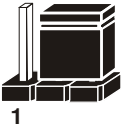


Jumper Block looks like this

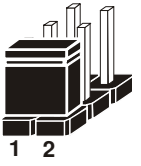


JUMPER SETTINGS

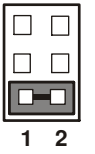
2 pin Jumper close(enabled) Looks like this



3 pin Jumper 2-3 pin close(enabled) Looks like this

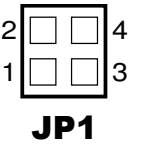
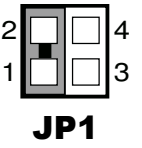
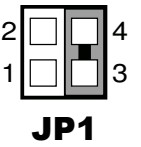
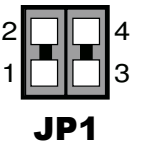


Jumper Block 1-2 pin close(enabled) Looks like this



2-4. PCI EXPRESS X16 SELECTION

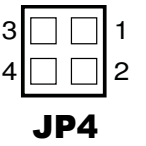
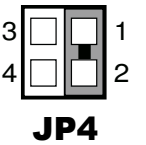
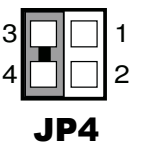
JP1: PCI Express x16 Selection
The pin assignments are as follows:

SELECTION	JUMPTER SETTING	JUMPER ILLUSTRATION
1 x 16	All open	
2 x 8	1-2	
Reserve	3-4	
1 x 8 2 x 4	1-2 3-4	

Note: Manufacturing default is 1 x 16.

2-5. FLASH DESCRIPTOR & CLEAR CMOS SELECTION

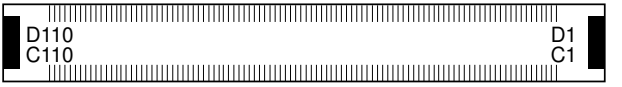
JP4: Flash Descriptor & Clear CMOS Selection
The pin assignments are as follows:

SELECTION	JUMPTER SETTING	JUMPER ILLUSTRATION
Descriptor Disabled & CMOS Normal	All open	
Descriptor Enabled	1-2	
Clear CMOS*	3-4	

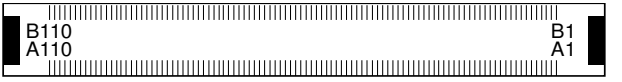
Note: Manufacturing default is Descriptor Disabled & CMOS Normal.

*To clear CMOS data, user must power-off the computer and set the jumper to "Clear CMOS" as illustrated above. After five to six seconds, set the jumper back to "Normal" and power-on the computer.

2-6. COM EXPRESS CONNECTOR



SLCE_B1



SLCE_A1

SLCE_A1, SLCE_B1: COM Express connectors
The pin assignments are as follows:

	A	B	C	D
PIN	**ASSIGNMENT**	**ASSIGNMENT**	**ASSIGNMENT**	**ASSIGNMENT**
1	GND (FIXED)	GND (FIXED)	GND (FIXED)	GND (FIXED)
2	GBE0_MDI3-	GBE0_ACT#	GND	GND
3	GBE0_MDI3+	LPC_FRAME#	USB_SSRX0-	USB_SSTX0-
4	GBE0_LINK100#	LPC_AD0	USB_SSRX0+	USB_SSTX0+
5	GBE0_LINK1000 #	LPC_AD1	GND	GND
6	GBE0_MDI2-	LPC_AD2	USB_SSRX1-	USB_SSTX1-
7	GBE0_MDI2+	LPC_AD3	USB_SSRX1+	USB_SSTX1+
8	GBE0_LINK#	LPC_DRQ0#	GND	GND
9	GBE0_MDI1-	LPC_DRQ1#	USB_SSRX2-	USB_SSTX2-
10	GBE0_MDI1+	LPC_CLK	USB_SSRX2+	USB_SSTX2+
11	GND (FIXED)	GND (FIXED)	GND (FIXED)	GND (FIXED)
12	GBE0_MDI0-	PRWBTN#	USB_SSRX3-	USB_SSTX3-
13	GBE0_MDI0+	SMB_CK	USB_SSRX3+	USB_SSTX3+
14	GBE0_CTREF	SMB_DAT	GND	GND
15	SUS_S3#	SMB_ALERT#	DDI1_PAIR6+	DDI1_CTRLCLK _AUX+

	A	B	C	D
PIN	**ASSIGNMENT**	**ASSIGNMENT**	**ASSIGNMENT**	**ASSIGNMENT**
16	SATA0_TX+	SATA1_TX+	DDI1_PAIR6-	DDI1_CTRLCLK _AUX-
17	SATA0_TX-	SATA1_TX-	RSVD	RSVD
18	SUS_S4#	SUS_STAT#	RSVD	RSVD
19	SATA0_RX+	SATA1_RX+	PCIE_RX6+	PCIE_TX6+
20	SATA0_RX-	SATA1_RX-	PCIE_RX6-	PCIE_RX6-
21	GND (FIXED)	GND (FIXED)	GND (FIXED)	GND (FIXED)
22	SATA2_TX+	SATA3_TX+	PCIE_RX7+	PCIE_TX7+
23	SATA2_TX-	SATA3_TX-	PCIE_RX7-	PCIE_TX7-
24	SUS_S5#	PWR_OK	DDI1_HPD	RSVD
25	SATA2_RX+	SATA3_RX+	DDI1_PAIR4+	RSVD
26	SATA2_RX-	SATA3_RX-	DDI1_PAIR4-	DDI1_PAIR0+
27	BATLOW#	WDT	RSVD	DDI1_PAIR0-
28	(S)ATA ACT#	AC/HDA_SDIN2	RSVD	RSVD
29	AC/HDA SYNC	AC/HDA_SDIN1	DDI1_PAIR5+	DDI1_PAIR1+
30	AC/HDA RST#	AC/HDA_SDIN0	DDI1_PAIR5-	DDI1_PAIR1-
31	GND (FIXED)	GND (FIXED)	GND (FIXED)	GND (FIXED)
32	AC/HDA BITCLK	SPKR	DDI2_CTRLCLK _AUX+	DDI1_PAIR2+
33	AC/HDA SDOUT	I2C_CK	DDI2_CTRLCLK _AUX-	DDI1_PAIR2-
34	BIOS DIS0#	I2C_DAT	DDI2_DDC_AUX _SEL	DDI1_DDC_AUX _SEL
35	THRMTRIP#	THRM#	RSVD	RSVD
36	USB6-	USB7-	DDI3_CTRLCLK _AUX+	DDI1_PAIR3+
37	USB6+	USB7+	DDI3_CTRLCLK _AUX-	DDI1_PAIR3-
38	USB6_7_OC#	USB_4_5_OC#	DDI3_DDC_AUX _SEL	RSVD
39	USB4-	USB5-	DDI3_PAIR0+	DDI2_PAIR0+
40	USB4+	USB5+	DDI3_PAIR0-	DDI2_PAIR0-
41	GND (FIXED)	GND (FIXED)	GND (FIXED)	GND (FIXED)
42	USB2-	USB3-	DDI3_PAIR1+	DDI2_PAIR1+

	A	B	C	D
PIN	**ASSIGNMENT**	**ASSIGNMENT**	**ASSIGNMENT**	**ASSIGNMENT**
43	USB2+	USB3+	DDI3_PAIR1-	DDI2_PAIR1-
44	USB_2_3_OC#	USB_0_1_OC#	DDI3_HPD	DDI2_HPD
45	USB0-	USB1-	RSVD	RSVD
46	USB0+	USB1+	DDI3_PAIR2+	DDI2_PAIR2+
47	VCC_RTC	EXCD1_PERST#	DDI3_PAIR2-	DDI2_PAIR2-
48	EXCD0_PERST#	EXCD1_CPPE#	RSVD	RSVD
49	EXCD0_CPPE#	SYS_RESET#	DDI3_PAIR3+	DDI2_PAIR3+
50	LPC_SERIRQ	CB_RESET#	DDI3_PAIR3-	DDI2_PAIR3-
51	GND (FIXED)	GND (FIXED)	GND (FIXED)	GND (FIXED)
52	PCIE_TX5+	PCIE_RX5+	PEG_RX0+	PEG_TX0+
53	PCIE_TX5-	PCIE_RX5-	PEG_RX0-	PEG_TX0-
54	GPI0	GPO1	TYPE0#	PEG_LANE_RV#
55	PCIE_TX4+	PCIE_RX4+	PEG_RX1+	PEG_TX1+
56	PCIE_TX4-	PCIE_RX4-	PEG_RX1-	PEG_TX1-
57	GND	GPO2	TYPE1#	TYPE2#
58	PCIE_TX3+	PCIE_RX3+	PEG_RX2+	PEG_TX2+
59	PCIE_TX3-	PCIE_RX3-	PEG_RX2-	PEG_TX2-
60	GND (FIXED)	GND (FIXED)	GND (FIXED)	GND (FIXED)
61	PCIE_TX2+	PCIE_RX2+	PEG_RX3+	PEG_TX3+
62	PCIE_TX2-	PCIE_RX2-	PEG_RX3-	PEG_TX3-
63	GPI1	GPO3	RSVD	RSVD
64	PCIE_TX1+	PCIE_RX1+	RSVD	RSVD
65	PCIE_TX1-	PCIE_RX1-	PEG_RX4+	PEG_TX4+
66	GND	WAKE0#	PEG_RX4-	PEG_TX4-
67	GPI2	WAKE1#	RSVD	RSVD
68	PCIE_TX0+	PCIE_RX0+	PEG_RX5+	PEG_TX5+
69	PCIE_TX0-	PCIE_RX0-	PEG_RX5-	PEG_TX5-
70	GND (FIXED)	GND (FIXED)	GND (FIXED)	GND (FIXED)
71	LVDS_A0+	LVDS_B0+	PEG_RX6+	PEG_TX6+
72	LVDS_A0-	LVDS_B0-	PEG_RX6-	PEG_TX6-
73	LVDS_A1+	LVDS_B1+	GND	GND
74	LVDS_A1-	LVDS_B1-	PEG_RX7+	PEG_TX7+
75	LVDS_A2+	LVDS_B2+	PEG_RX7-	PEG_TX7-

	A	B	C	D
PIN	**ASSIGNMENT**	**ASSIGNMENT**	**ASSIGNMENT**	**ASSIGNMENT**
76	LVDS_A2-	LVDS_B2-	GND	GND
77	LVDS_VDD_EN	LVDS_B3+	RSVD	RSVD
78	LVDS_A3+	LVDS_B3-	PEG_RX8+	PEG_TX8+
79	LVDS_A3-	LVDS_BKLT_EN	PEG_RX8-	PEG_TX8-
80	GND (FIXED)	GND (FIXED)	GND (FIXED)	GND (FIXED)
81	LVDS_A_CLK+	LVDS_B_CK+	PEG_RX9+	PEG_TX9+
82	LVDS_A_CLK-	LVDS_B_CK-	PEG_RX9-	PEG_TX9-
83	LVDS_I2C_CK	LVDS_BKLT_CTRL	RSVD	RSVD
84	LVDS_I2C_DAT	VCC_5V_SBY	GND	GND
85	GPI3	VCC_5V_SBY	PEG_RX10+	PEG_TX10+
86	RSVD	VCC_5V_SBY	PEG_RX10-	PEG_TX10-
87	eDP_HPD	VCC_5V_SBY	GND	GND
88	PCIE_CLK_REF+	BIOS_DIS1#	PEG_RX11+	PEG_TX11+
89	PCIE_CLK_REF-	VGA_RED	PEG_RX11-	PEG_TX11-
90	GND (FIXED)	GND (FIXED)	GND (FIXED)	GND (FIXED)
91	SPI_POWER	VGA_GRN	PEG_RX12+	PEG_TX12+
92	SPI_MISO	VGA_BLU	PEG_RX12-	PEG_TX12-
93	GPO0	VGA_HSYNC	GND	GND
94	SPI_CLK	VGA_VSYNC	PEG_RX13+	PEG_TX13+
95	SPI_MOSI	VGA_I2C_CK	PEG_RX13-	PEG_TX13-
96	TMP_PP	VGA_I2C_DAT	GND	GND
97	TYPE_10#	SPI_CS#	RSVD	RSVD
98	SER0_TX	RSVD	PEG_RX14+	PEG_TX14+
99	SER0_RX	RSVD	PEG_RX14-	PEG_TX14-
100	GND (FIXED)	GND (FIXED)	GND (FIXED)	GND (FIXED)
101	SER1_TX	FAN_PWNOUT	PEG_RX15+	PEG_TX15+
102	SER1_RX	FAN_TACHIN	PEG_RX15-	PEG_TX15-
103	LID#	SLEEP#	GND	GND
104	VCC12	VCC12	VCC12	VCC12
105	VCC12	VCC12	VCC12	VCC12
106	VCC12	VCC12	VCC12	VCC12
107	VCC12	VCC12	VCC12	VCC12

	A	B	C	D
PIN	**ASSIGNMENT**	**ASSIGNMENT**	**ASSIGNMENT**	**ASSIGNMENT**
108	VCC12	VCC12	VCC12	VCC12
109	VCC12	VCC12	VCC12	VCC12
110	GND (FIXED)	GND (FIXED)	GND (FIXED)	GND (FIXED)

SOFTWARE UTILITIES

CHAPTER

3

This chapter comprises the detailed information of VGA driver, LAN driver, and Sound driver.

Sections included:

- Introduction.
- Intel® Chipset Software Installation Utility
- Intel® Rapid Storage Technology Utility
- Intel® USB3.0 eXtensible Host Controller Utility
- Intel® Management Engine Components Utility
- VGA Driver Utility
- LAN Driver Utility

3-1. INTRODUCTION

Enclosed with our BC-0928 package are the driver utilities, which come in a format of CD ROM. Refer to the following table for driver locations:

FILENAME (Assume that CD ROM drive is D:)	PURPOSE
▪ D:\Driver\Plaform\Win7(32-bit)\Main Chip ▪ D:\Driver\Platform\Win7(64-bit)\Main Chip ▪ D:\Driver\Platform\Win8.1(32-bit)\Main Chip	Intel® chipset device software installation utility
▪ D:\Driver\Plaform\Win7(32-bit)\RAID ▪ D:\Driver\Platform\Win7(64-bit)\RAID ▪ D:\Driver\Platform\Win8.1(32-bit)\RAID	Intel® Rapid Storage Technology (RAID) AHCI driver installation
▪ D:\Driver\Plaform\Win7(32-bit)\USB 3.0 ▪ D:\Driver\Platform\Win7(64-bit)\USB 3.0	Intel® USB3.0 eXtensible host controller
▪ D:\Driver\Plaform\Win7(32-bit)\ME ▪ D:\Driver\Platform\Win7(64-bit)\ME ▪ D:\Driver\Platform\Win8.1(32-bit)\ME	Intel® Management Engine Interface
▪ D:\Driver\Plaform\Win7(32-bit)\VGA ▪ D:\Driver\Platform\Win7(64-bit)\VGA ▪ D:\Driver\Platform\Win8.1(32-bit)\VGA	Intel® HD Graphics Media Accelerator 3600 for VGA driver installation
▪ D:\Driver\Plaform\Win7(32-bit)\LAN ▪ D:\Driver\Platform\Win7(64-bit)\ LAN ▪ D:\Driver\Platform\Win8.1(32-bit)\ LAN	Intel® I217-LM for LAN driver installation
D:\Driver\FLASH	AMI BIOS update utility

Note: Be sure to install the Utility right after the OS fully installed.

3-2. INTEL® CHIPSET SOFTWARE INSTALLATION UTILITY

3-2-1. Introduction

The Intel® Chipset Device Software installs Windows INF files to the target system. These files outline to the operating system how to configure the Intel® chipset components in order to ensure that the following features function properly:

- Core PCI and ISAPNP Services
- PCIe Support
- IDE/ATA33/ATA66/ATA100 Storage Support
- SATA Storage Support
- USB Support
- Identification of Intel® Chipset Components in the Device Manager

3-2-2. Installation of Utility for Windows 7/8

The Utility Pack is to be installed only for Windows 7/8 series, and it should be installed right after the OS installation. Please follow the steps below:

1. Insert the driver disk into a CD ROM device.
2. Under Windows system, go to the directory where the Utility driver is located.
3. Run the application with administrative privileges.

3-3. INTEL® RAPID STORAGE TECHNOLOGY UTILITY

3-3-1. Introduction

The Intel® RST driver utility supports RAID 0, 1, 5 and 10 and fully compatible with Windows 7/8, and it should be installed after the operating system is installed completely. Perform F6 and RAID BIOS configurations prior to installation of this driver for proper operation.

3-3-2. Installation of RST Driver for Windows 7/8

1. Insert the driver disk into a CD ROM device.
2. Under Windows system, go to the directory where the RST driver is located.
3. Run the application with administrative privileges.

3-4. INTEL® USB3.0 EXTENSIBLE HOST CONTROLLER UTILITY

3-4-1. Introduction

Intel® USB 3.0 eXtensible Host Controller Driver supports the following Intel® Chipsets/Processors:

- Intel® 4th Generation Core™ Processor Family
- Intel® 8 Series/C220 Series Chipset Family
- Intel® 4th Generation U-Series Platform I/O

3-4-2. Installation Instructions for Windows 7

1. Insert the driver disk into a CD ROM device.
2. Under Windows system, go to the directory where the driver is located.
3. Run the application with administrative privileges.

3-5. INTEL® MANAGEMENT ENGINE COMPONENTS UTILITY

3-5-1. Introduction

The Intel® ME software components that need to be installed depend on the system's specific hardware and firmware features. The installer, compatible with Windows 7/8, detects the system's capabilities and installs the relevant drivers and applications.

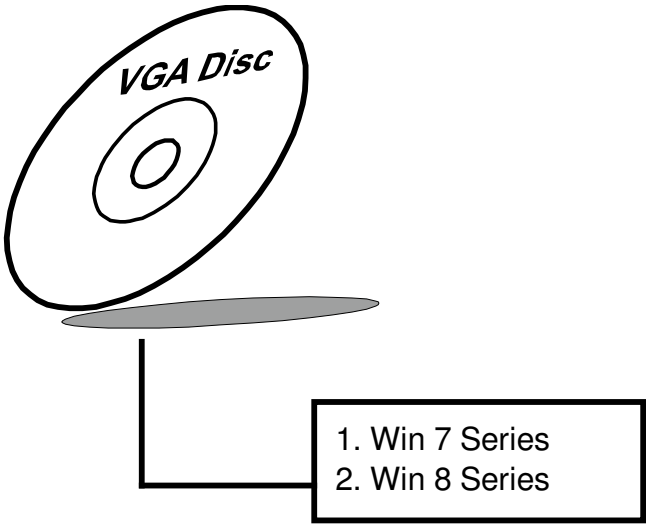
3-5-2. Installation Instructions for Windows 7/8

1. Insert the driver disk into a CD ROM device.
2. Under Windows system, go to the directory where the driver is located.
3. Run the application with administrative privileges.

3-6. VGA DRIVER UTILITY

3-6-1. Introduction

The VGA interface embedded with our BC-0928 can support a wide range of display. You can display CRT/LVDS simultaneously with the same mode.



3-6-2. Installation of VGA Driver

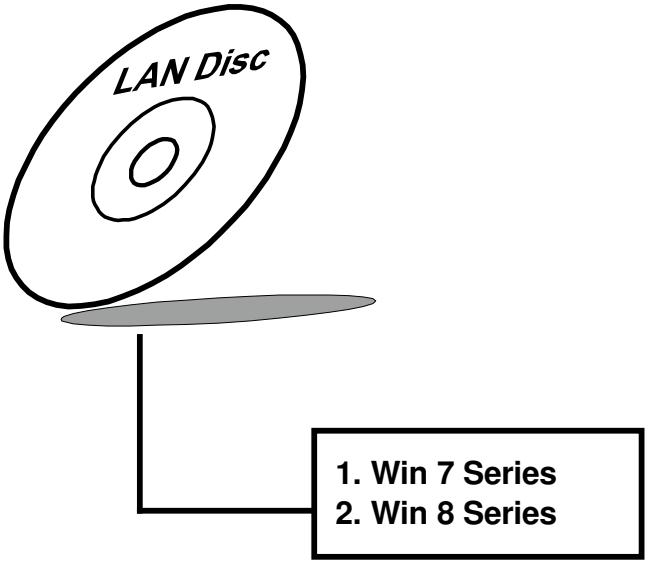
To install the VGA Driver, simply follow the following steps:

1. Insert the driver disk into a CD ROM device.
2. Under Windows system, go to the directory where the VGA driver is located.
3. Run the application with administrative privileges..

3-7. LAN DRIVER UTILITY

3-7-1. Introduction

BC-0928 is enhanced with LAN function that can support various network adapters. Installation programs for LAN drivers are listed as follows:



For more details on Installation procedure, please refer to Readme.txt file found on LAN Driver Utility.

CHAPTER

4

BIOS SETUP

This chapter shows how to set up the BIOS.

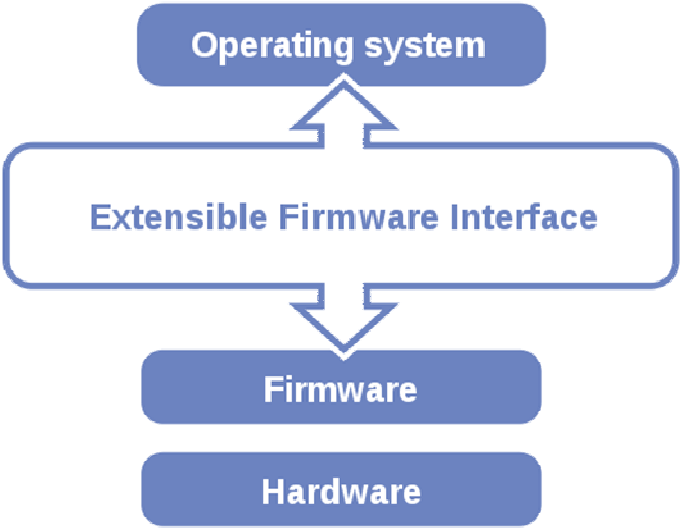
Sections included:

- Introduction
- Entering Setup
- Main
- Advanced
- Chipset
- Boot
- Security
- Save & Exit

4-1. INTRODUCTION

The board BC-0928 uses an AMI Aptio BIOS that is stored in the Serial Peripheral Interface Flash Memory (SPI Flash) and can be updated. The SPI Flash contains the BIOS Setup program, Power-on Self-Test (POST), the PCI auto-configuration utility, LAN EEPROM information, and Plug and Play support.

Aptio is AMI's BIOS firmware based on the UEFI (Unified Extensible Firmware Interface) Specifications and the Intel Platform Innovation Framework for EFI. The UEFI specification defines an interface between an operating system and platform firmware. The interface consists of data tables that contain platform-related information, boot service calls, and runtime service calls that are available to the operating system and its loader. These provide standard environment for booting an operating system and running pre-boot applications. Following illustration shows Extensible Firmware Interface's position in the software stack.



EFI BIOS provides an user interface allow users the ability to modify hardware configuration, e.g. change system date and time, enable or disable a system component, decide bootable device priorities, setup personal password, etc., which is convenient for modifications and customization of the computer system and allows technicians another method for finding solutions if hardware has any problems.

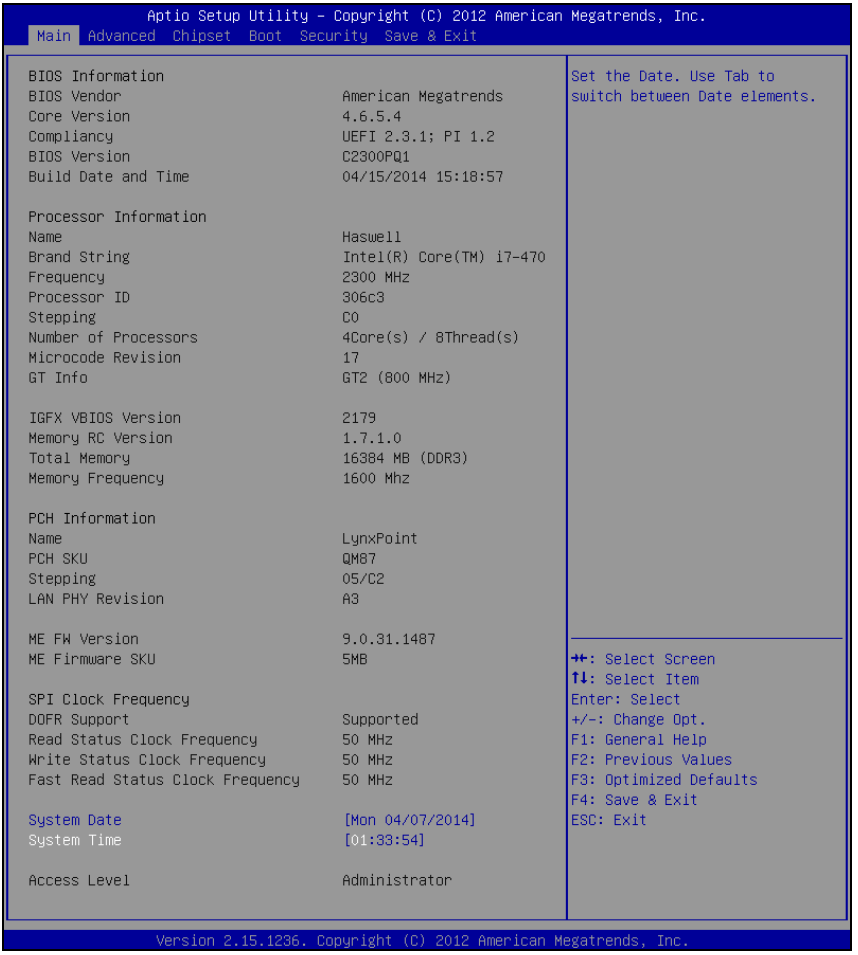
The BIOS Setup program can be used to view and change the BIOS settings for the computer. The BIOS Setup program is accessed by pressing the <Del> or <ESC> key after the POST memory test begins and before the operating system boot begins. The settings are shown below.

4-2. ENTERING SETUP

When the system is powered on, the BIOS will enter the Power-On Self Test (POST) routines and the following message will appear on the lower screen:

POST screen

As long as this message is present on the screen you may press the <Del> key (the one that shares the decimal point at the bottom of the number keypad) to access the Setup program. In a moment, the main menu of the Aptio Setup Utility will appear on the screen:



BIOS setup program initial screen

You may move the cursor by up/down keys to highlight the individual menu items. As you highlight each item, a brief description of the highlighted selection will appear at the bottom of the screen.

4-2-1. BIOS Setup Menu Keys

The following table provides list of keys available for BIOS setup menu.

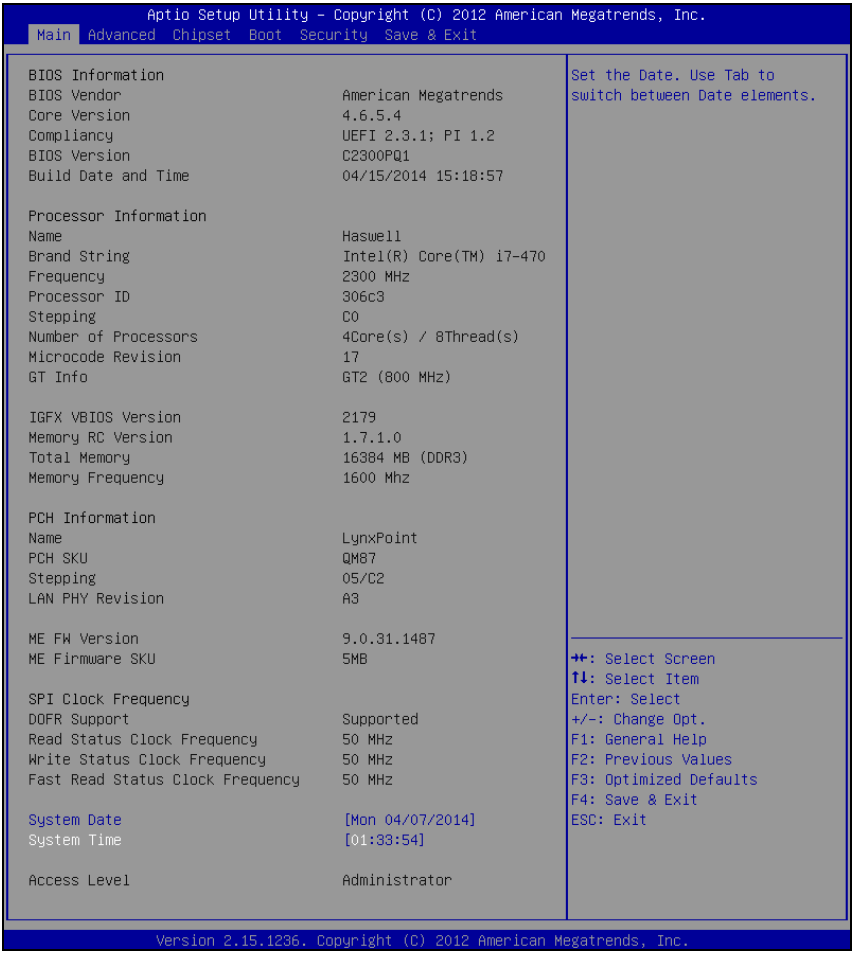
BIOS Setup menu key	Description
<←> and <→>	Selects a different menu screen (moves the selection left or right).
< ↑ > and < ↓ >	Selects an item (moves the selection up or down).
<Enter>	Executes command or selects the sub-menu.
<F2>	Load the previous configuration values.
<F3>	Load the default configuration values.
<F4>	Save the current values and exits the BIOS setup menu.
<Esc>	Leaves the sub-menu. Triggers confirmation to exit BIOS setup menu.

4-2-2. BIOS Messages

This section describes error messages generated by the board's BIOS. These messages would be displayed on the monitor when certain recoverable error/event occurs during POST stage. The table bellow gives an explanation of the BIOS messages.

BIOS Setup menu key	Explanation
A first boot or NVRAM reset condition has been detected.	BIOS has been updated or the battery was replaced.
The CMOS defaults were loaded.	Default values have been loaded after the BIOS was updated or the battery was replaced.
The CMOS battery is bad or was recently replaced.	The battery may be losing power, replace the battery soon. Also, this message is displayed once the new battery was placed.

4-3. MAIN



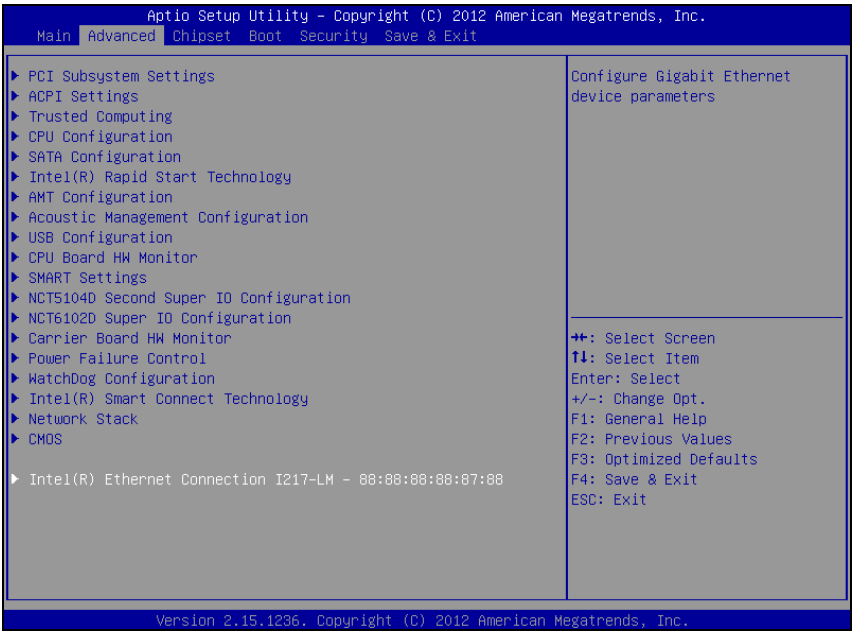
Main screen

BIOS Setting	Options	Description/Purpose
BIOS Vendor	No changeable options	Displays the BIOS vendor.
Core Version	No changeable options	Displays the current BIOS core version.

BIOS Setting	Options	Description/Purpose
Compliancy	No changeable options	Displays the current UEFI version.
BIOS Version	No changeable options	Displays the version of the board and its BIOS.
Build Date and Time	No changeable options	Displays the date of current BIOS version.
Name	No changeable options	Intel processor codename.
Brand String	No changeable options	Intel processor model designation.
Frequency	No changeable options	Processor clock speed.
Processor ID	No changeable options	Processor ID.
Stepping	No changeable options	Processor stepping information.
Number of processors	No changeable options	Total number of processor physical cores and logical threads available.
Microcode Revision	No changeable options	Information about current microcode version.
GT Info	No changeable options	Integrated graphics processor type (its clock speed).
IGFX VBIOS Version	No changeable options	Intel VBIOS (Video BIOS) version.
Memory RC Version	No changeable options	Intel MRC (Memory Reference Code) version.
Total Memory	No changeable options	Total RAM installed in SO-DIMM slots (and its type).
Memory Frequency	No changeable options	Memory module(s) frequency.
Name	No changeable options	Intel chipset codename.
PCH SKU	No changeable options	Intel chipset model designation.
Stepping	No changeable options	Chipset stepping information.
LAN PHY Revision	No changeable options	Chipset integrated LAN card revision information.
ME FW Version	No changeable options	Intel Management Engine firmware version.
ME Firmware SKU	No changeable options	Intel Management Engine edition (either 1.5 or 5MB).

BIOS Setting	Options	Description/Purpose
DOFR Support	No changeable options	SPI (Serial Peripheral Interface) chip supports Fast Read Dual Output feature.
Read Status Clock Frequency	No changeable options	Reading speed of Winbond SPI chip.
Write Status Clock Frequency	No changeable options	Writing speed of Winbond SPI chip.
Fast Read Status Clock Frequency	No changeable options	Reading speed of SPI chip in fast mode.
System Date	Month, day, year	Specifies the current date.
System Time	Hour, minute, second	Specifies the current time.
Access Level	No changeable options	Displays security levels currently in use.

4-4. ADVANCED



Advanced screen

BIOS Setting	Options	Description/Purpose
PCI Subsystem Settings	Sub-Menu	Accesses settings for PCI subsystem.
ACPI Settings	Sub-Menu	Enters menu to set ACPI option.
Trusted Computing	Sub-Menu	Controls TPM related configuration.
CPU Configuration	Sub-Menu	All processor basic options menu.
SATA Configuration	Sub-Menu	SATA device(s) configuration section.
Intel(R) Rapid Start Technology	Sub-Menu	Menu which deals with control for Intel Rapid Start Technology.
AMT Configuration	Sub-Menu	Controls AMT related options.

BIOS Setting	Options	Description/Purpose
Acoustic Management Configuration	Sub-Menu	Enters menu to set Acoustic Management feature.
USB Configuration	Sub-Menu	Enters menu to configure USB options.
CPU Board HW Monitor	Sub-Menu	Exposes values gathered by hardware monitor.
SMART Settings	Sub-Menu	Section allows controlling SATA HDD/SSD S.M.A.R.T. capability.
NCT5104D Second Super IO Configuration	Sub-Menu	Serial ports on Secondary Super IO configuration section.
NCT6102D Super IO Configuration	Sub-Menu	Serial ports on Primary Super IO configuration section.
Carrier Board HW Monitor	Sub-Menu	Exposes values gathered by hardware monitor.
Power Failure Control	Sub-Menu	Enters menu to set behavior configuration in case of power loss event.
WatchDog Configuration	Sub-Menu	Section to configure Watchdog timer.
Intel(R) Smart Connect Technology	Sub-Menu	Menu which deals with control for Intel Smart Connect Technology.
Network Stack	Sub-Menu	Enters menu to enable network during DXE stage and UEFI shell environment.
CMOS	Sub-Menu	Options for CMOS battery.
Intel(R) Ethernet Connection I217-LM	Sub-Menu	Additional settings and information regarding Intel I217 GbE device.

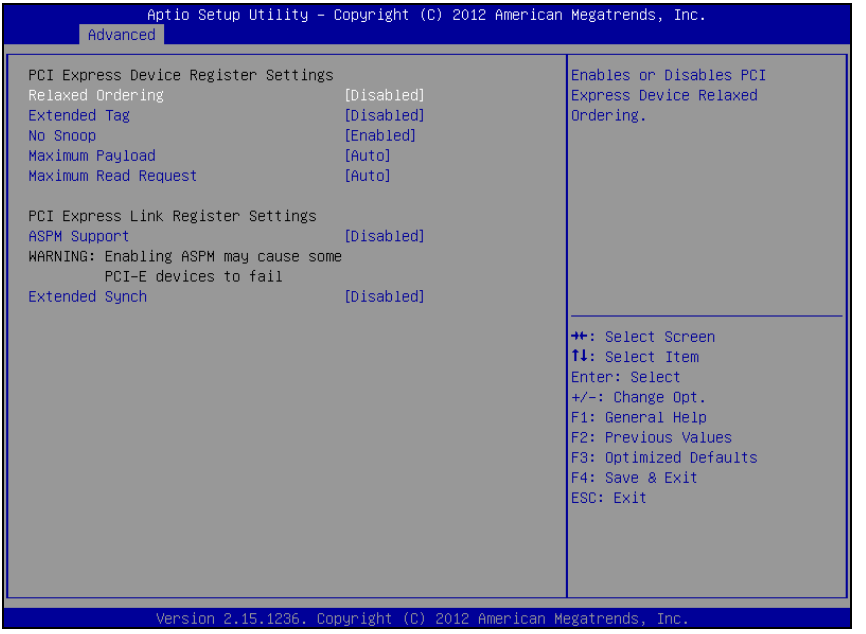
4-4-1. PCI Subsystem Settings

PCI subsystem settings screen

BIOS Setting	Options	Description/Purpose
PCI Bus Driver Version	No changeable options	Displays PCI UEFI driver version.
PCI Latency Timer	-32 PCI Bus Clocks -64 PCI Bus Clocks -96 PCI Bus Clocks -128 PCI Bus Clocks -160 PCI Bus Clocks -192 PCI Bus Clocks -224 PCI Bus Clocks -248 PCI Bus Clocks	Sets PCI latency time.

BIOS Setting	Options	Description/Purpose
VGA Palette Snoop	-Disabled -Enabled	Enabling this feature turns on this palette "snoop." Some special VGA cards need to be able to look at the video card's VGA palette to determine what colors are currently in use.
PERR# Generation	-Disabled -Enabled	Enables or disables generation of PERR# signals (data parity errors) used to signal the detection of a parity error related to a data phase.
SERR# Generation	-Disabled -Enabled	Enables or disables generation of SERR# signals (unrecoverable errors) which are reported to the system and handled by system software.
PCI Express Settings	Sub-menu	Enters menu to configure PCI Express Settings.

4-4-1-1. PCI Subsystem Settings – PCI Express Settings

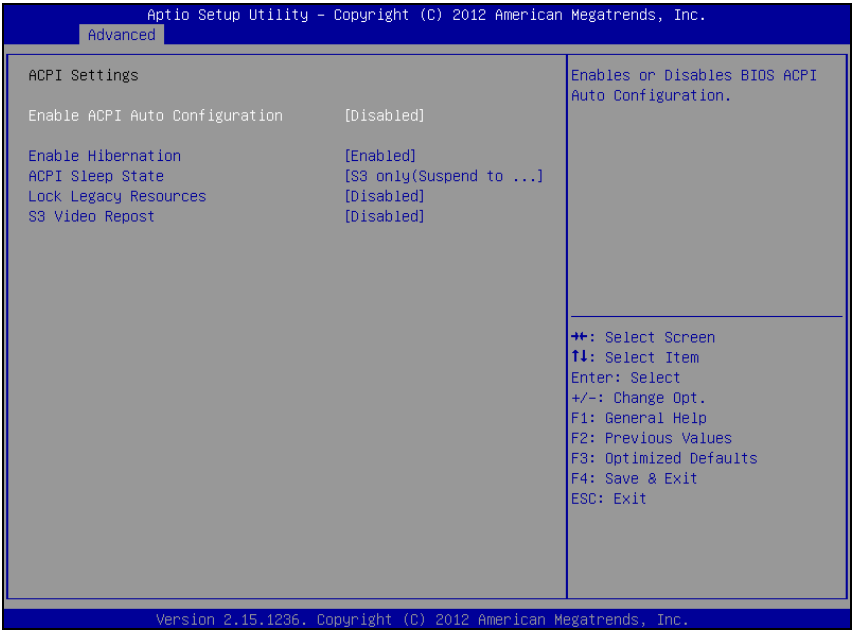


PCI express settings screen

BIOS Setting	Options	Description/Purpose
Relaxed Ordering	-Disabled -Enabled	Enables or disables relaxed ordering feature which allows transactions that do not have any order of completion requirements to complete more efficiently.
Extended Tag	-Disabled -Enabled	Enables or disables extended tag support for maximum value of outstanding requests possible per components from 32 to 2048.
No Snoop	-Disabled -Enabled	Control No Snoop option on PCIe devices.

BIOS Setting	Options	Description/Purpose
Maximum Read Request	-Auto -128 Bytes -256 Bytes -512 Bytes -1024 Bytes -2048 Bytes -4096 Bytes	Maximum read request size specifies the size for the device when acting as the requestor. The device must not generate read requests with a size larger this value.
Maximum Payload	-Auto -128 Bytes -256 Bytes -512 Bytes -1024 Bytes -2048 Bytes -4096 Bytes	Maximum payload size supported specifies the size that the function supports for TLPs (Transaction Layer Packets).
Automatic ASPM	-Disabled -Auto -Force L0	Specifies mode for Active State Power Management (ASPM), hardware-based link power conservation mechanism. Force L0 standby mode applies to a single direction on the link.
Extended Synch	-Disabled -Enabled	Enabling extended synch feature forces the transmission of additional ordered sets when exiting the L0 state and when in the recovery state. This mode provides external devices monitoring the link time to achieve bit symbol lock before the link enters L0 state and resumes communication.

4-4-2. ACPI Settings

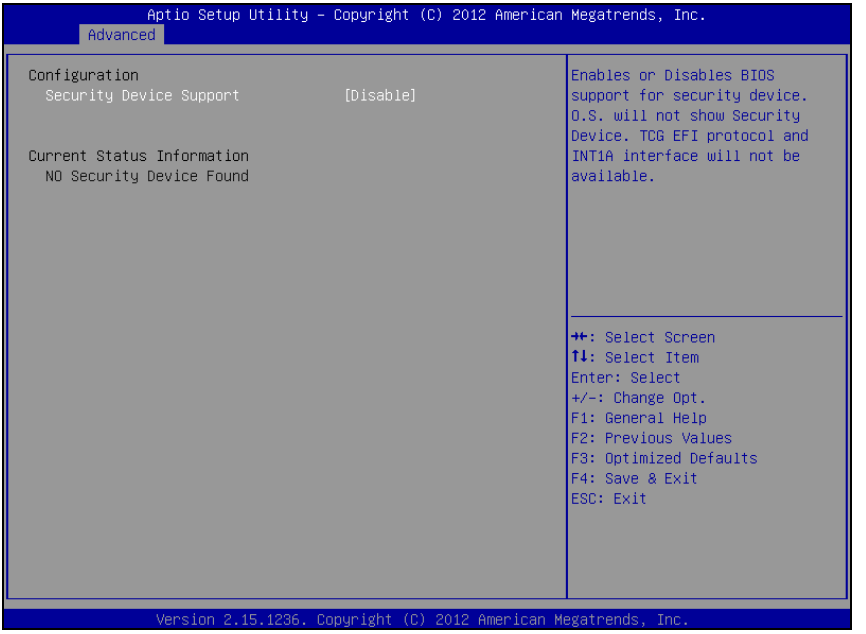


ACPI settings screen

BIOS Setting	Options	Description/Purpose
Enable ACPI Auto Configuration	-Disabled -Enabled	Allows deciding whether ACPI settings are configured by operating system or manually (option disabled).
Enable Hibernation	-Disabled -Enabled	Enables ability to enter S4 state (to be able to hibernate in Windows operating system).
ACPI Sleep State	-Suspend Disabled -S1 only -S3 only -Both S1 and S3 available for OS	Specifies the ACPI sleep state. ▪ **Disabled** option disables ACPI sleep feature. ▪ **S3** allows the platform to enter Sleep mode (also known as Standby or Suspend to RAM).

BIOS Setting	Options	Description/Purpose
		▪ **S1** is less common state in which the CPU is stopped.
Lock Legacy Resources	-Disabled -Enabled	Prevents the operating system from changing resources to serial or parallel controller.
S3 Video Repost	-Disabled -Enabled	If enabled re-initialises the VBIOS after waking up from an S3 sleep.

4-4-3. Trusted Computing



Trusted Conputing screen

BIOS Setting	Options	Description/Purpose
Security Device Support	- Disable - Enable	Enables Trusted Platform Module feature (if TPM hardware is inserted on carrier board).

4-4-4. CPU Configuration

CPU configuration screen

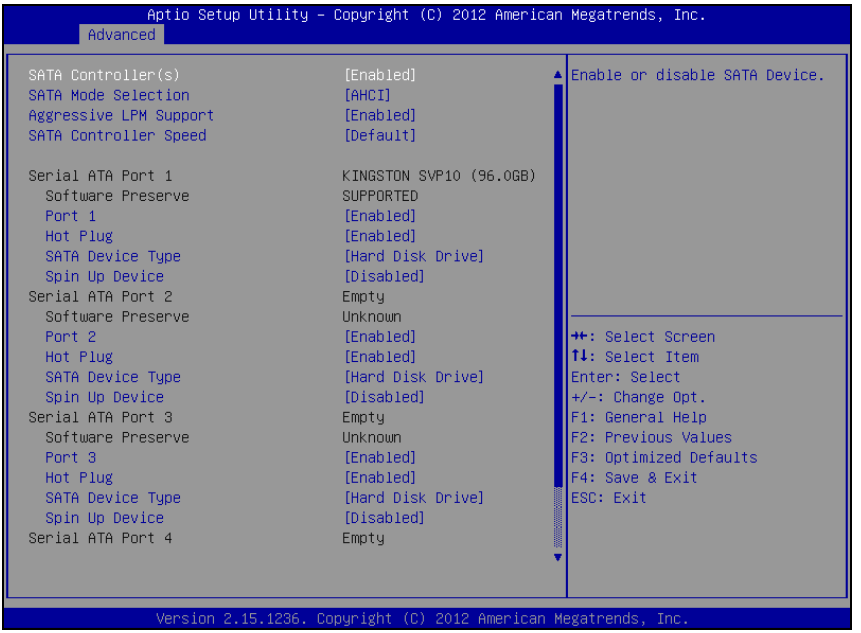
BIOS Setting	Options	Description/Purpose
Processor Type	No changeable options	Displays the current processor model number and its frequency.
CPU Signature	No changeable options	Displays processor's stepping.
Processor Family	No changeable options	Displays processor's family model.

BIOS Setting	Options	Description/Purpose
Microcode Patch	No changeable options	Displays processor's microcode update revision.
FSB Speed	No changeable options	Displays FSB frequency.
Max CPU Speed	No changeable options	Shows maximal supported processor frequency with Turbo mode enabled.
Min CPU Speed	No changeable options	Shows minimal supported processor frequency.
CPU Speed	No changeable options	Displays the current processor frequency.
Processor Cores	No changeable options	Displays information about number of physical cores in processor.
Intel HT Technology	No changeable options	Reports if Intel Hyper-Threading Technology is supported by processor.
Intel VT-x Technology	No changeable options	Displays hardware support for virtualization Intel Virtualization Technology (VT-x) status.
Intel SMX Technology	No changeable options	Shows processor ability for Safer Mode Extensions (SMX), enhanced version of Intel (Trusted Execution Technology) TXT.
64-bit	No changeable options	Reports if processor supports Intel x86-64 (amd64) implementation.
EIST Technology	No changeable options	Checks Intel Enhanced SpeedStep feature status.
CPU C3 State	No changeable options	Reports processor support for C3 state.
CPU C6 State	No changeable options	Reports processor support for C6 state.
CPU C7 State	No changeable options	Reports processor support for C7 state.
L1 Data Cache	No changeable options	Displays amount of Level 1 cache for data.

BIOS Setting	Options	Description/Purpose
L1 Code Cache	No changeable options	Displays amount of Level 1 cache for instructions.
L2 Cache	No changeable options	Displays amount of Level 2 cache.
L3 Cache	No changeable options	Displays amount of Level 3 cache.
Intel HT Technology	No changeable options	Reports if Intel Hyper-Threading Technology is supported by processor.
Hyper-threading	-Disabled -Enabled	When disabled, only one thread per active core will operate.
Active Processor Cores	-All -1	Controls number of active physical cores in processor.
Limit CPUID Maximum	-Disabled -Enabled	Enables for legacy operating systems to boot processors with extended CPUID (CPU Identification) functions.
Execute Disable Bit	-Disabled -Enabled	Enables the NX bit (No eXecute) security feature (if supported by operating system).
Intel Virtualization Technology	-Disabled -Enabled	Enables or disables Intel Virtualization Technology (VT-x). Takes affect only after power cycling.
Hardware Prefetcher	-Disabled -Enabled	Enables capability for bringing data or instructions from memory into the cache before they are needed.
Adjacent Cache Line Prefetch	-Disabled -Enabled	Ability for hardware prefetcher to fetch adjacent 64-byte cache line.
Boot performance mode	-Max Non-Turbo -Turbo Performance	Allows to pick which performance mode is used during boot stage.
EIST	-Disabled -Enabled	Enables Intel Enhanced SpeedStep feature for dynamic scaling processor frequency.

BIOS Setting	Options	Description/Purpose
CPU C states	-Disabled -Enabled	Enables or disables idle C states in processor.
Package C State limit	-C0/C1 -C2 -C3 -C6 -C7 -C7s -AUTO	Controls C state limit on package level.

4-4-5. SATA Configuration – [Enabled]



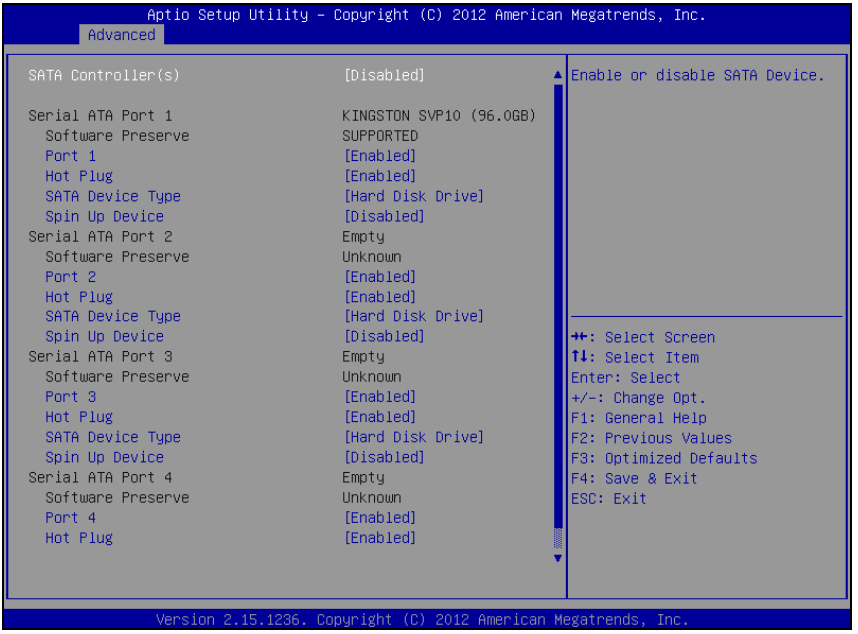
SATA [Enabled] configuration screen

BIOS Setting	Options	Description/Purpose
SATA Controller(s)	- Disabled - Enabled	Enables SATA controller.
SATA Mode Selection	-AHCI -RAID -IDE	Configures SATA devices for AHCI, RAID and IDE modes respectively. It is not advised to change this option once the operating system is installed.
Aggressive LPM Support	- Disabled - Enabled	Aggressive Link Power Management (LPM) feature adds ability to enter low-power states during inactivity periods (with a drawback in form of increased latency).

BIOS Setting	Options	Description/Purpose
SATA Controller Speed	-Default -Gen1 -Gen2 -Gen3	Configures SATA (only when set as AHCI) interface: ▪ **Gen1** mode sets the device to 1.5 Gbit/s speed. ▪ **Gen2** mode sets the device to 3 Gbit/s speed (in case it is compatible). ▪ **Gen3** mode sets the device to 6 Gbit/s speed (in case it is compatible).
Serial ATA Port 1	No changeable options	Displays device ID plugged in SATA port 1 (if any).
Software Preserve	No changeable options	Indicates whether SATA device supports SSP (Software Settings Preservation) or not.
Port 1	- Disabled - Enabled	Allows controlling specific SATA port.
Hot Plug	- Disabled - Enabled	Enables Hot Plug feature on SATA port 1 (if supported by the device).
SATA Device Type	-Hard Disk Drive -Solid State Drive	Option to select appropriate type of SATA device.
Spin Up Device	- Disabled - Enabled	For hard disk SATA devices, it is possible to enable to spin up the drive in advance.
Serial ATA Port 2	No changeable options	Displays device ID plugged in SATA port 2 (if any).
Software Preserve	No changeable options	Indicates whether SATA device supports SSP (Software Settings Preservation) or not.
Port 2	- Disabled - Enabled	Allows controlling specific SATA port.
Hot Plug	- Disabled - Enabled	Enables Hot Plug feature on SATA port 2 (if supported by the device).
SATA Device Type	-Hard Disk Drive -Solid State Drive	Option to select appropriate type of SATA device.

BIOS Setting	Options	Description/Purpose
Spin Up Device	- Disabled - Enabled	For hard disk SATA devices, it is possible to enable to spin up the drive in advance.
Serial ATA Port 3	No changeable options	Displays device ID plugged in SATA port 3 (if any).
Software Preserve	No changeable options	Indicates whether SATA device supports SSP (Software Settings Preservation) or not.
Port 3	- Disabled - Enabled	Allows controlling specific SATA port.
Hot Plug	- Disabled - Enabled	Enables Hot Plug feature on SATA port 3 (if supported by the device).
SATA Device Type	-Hard Disk Drive -Solid State Drive	Option to select appropriate type of SATA device.
Spin Up Device	- Disabled - Enabled	For hard disk SATA devices, it is possible to enable to spin up the drive in advance.
Serial ATA Port 4	--	Identical behaviour and settings as with previous SATA ports 1, 2 and 3.

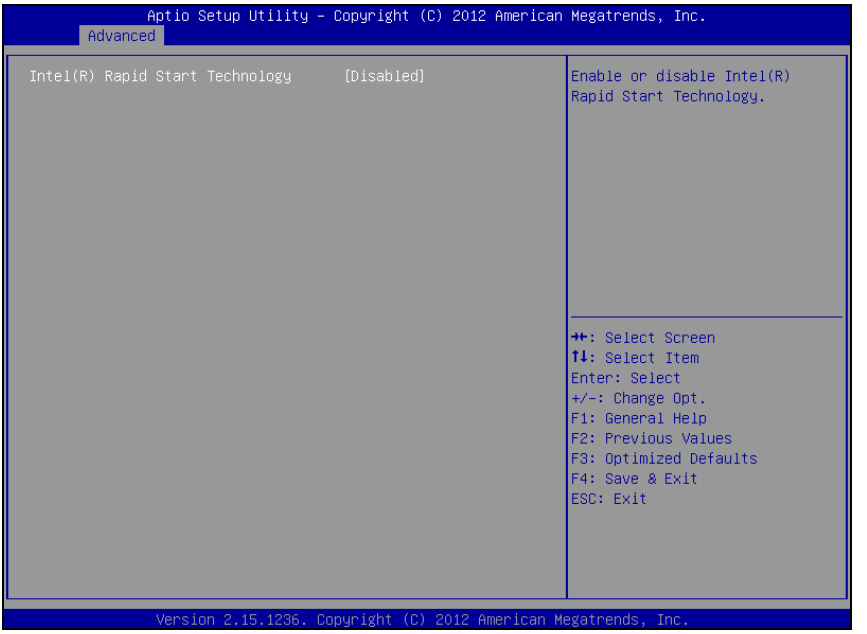
4-4-6. SATA Configuration – [Disabled]



SATA [Disabled] configuration screen

BIOS Setting	Options	Description/Purpose
SATA Controller(s)	-Disabled -Enabled	Enables SATA controller.
Serial ATA Port 1	no changeable options	Displays device ID plugged in SATA port 1 (if any).
Serial ATA Port 2	no changeable options	Displays device ID plugged in SATA port 2 (if any).
Serial ATA Port 3	no changeable options	Displays device ID plugged in SATA port 3 (if any).
Serial ATA Port 4	no changeable options	Displays device ID plugged in SATA port 4 (if any).

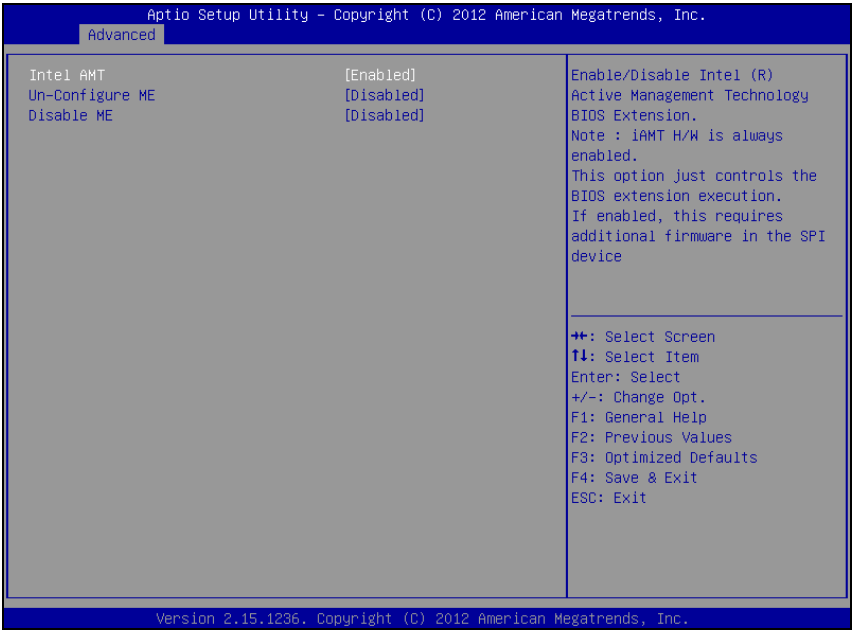
4-4-7. Intel® Rapid Start Technology



Intel Rapid Start Technology screen

BIOS Setting	Options	Description/Purpose
Intel(R) Rapid Start Technology	-Disabled -Enabled	Enables Intel Rapid Start Technology feature (additional steps involving partitioning the solid state drive are required).

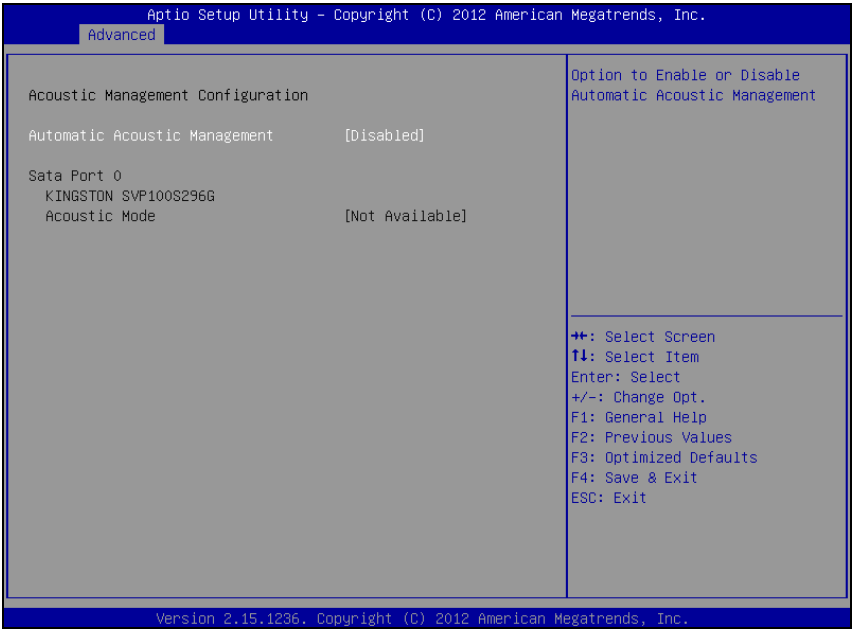
4-4-8. AMT Configuration



AMT configuration screen

BIOS Setting	Options	Description/Purpose
Intel AMT	- Disabled - Enabled	Enables Intel Active Management Technology feature (its BIOS extension, AMT is always enabled on hardware layer).
Un-Configure ME	- Disabled - Enabled	Allows to un-configure Intel Management Engine to factory values.
Disable ME	- Disabled - Enabled	If enabled, temporary disables Intel Management Engine (hardware debugging, for instance).

4-4-9. Acoustic Management Configuration



Acoustic Management configuration screen

BIOS Setting	Options	Description/Purpose
Automatic Acoustic Management	- Disabled - Enabled	Enables Acoustic Management feature which could be found on many modern HDD.

4-4-10. USB Configuration

USB configuration screen

BIOS Setting	Options	Description/Purpose
USB Module Version	No changeable options	Indicates USB module version number.
USB Devices	No changeable options	Reports number and type of connected USB device(s) (if any).
Legacy USB Support	- Disabled - Enabled - Auto	Enables support for USB in legacy operating systems (e.g. MS-DOS, Windows NT).
EHCI Hand-off	- Disabled - Enabled	When enabled it allows BIOS support control of the EHCI controller and the OS hand-off synchronization capability.

BIOS Setting	Options	Description/Purpose
USB transfer time-out	-1 sec -5 sec -10 sec -20 sec	Specifies time-out value for Control, Bulk and Interrupt transfers.
Device reset time-out	-10 sec -20 sec -30 sec -40 sec	Specifies the value for device reset timeout.
Device power-up delay	-Auto -Manual	Specifies maximum time it would take for USB device to report itself to the controller. If set to auto, it would use default values (100 ms for root port) and value read from hub descriptor in case of hub port.
Mass Storage Devices: [drive(s)]	-Auto -Floppy -Forced FDD -Hard Disk -CD-ROM	Appears only when USB flash drive is plugged in. Allows selecting which emulation to use on available drive(s). Please note that the sector size of your USB drive should be emulated device native sector size.

4-4-11. CPU Board Hardware Monitor

CPU Board Hardware Monitor screen

BIOS Setting	Options	Description/Purpose
CPU Fan Mode	- Auto Mode - Manual Mode	Selects mode in which CPU fan operates. For manual option, legal input values are ranging from 0 to 255.
CPU Temperature	No changeable options	Monitors CPU temperature via PECI interface.
CPU Board System Temperature	No changeable options	Shows CPU board temperature in degree Celsius.
HW Monitor Chip On-die Temperature	No changeable options	Displays temperature from sensor placed inside NCT7802Y HW monitor chip.
CPU Fan Speed	No changeable options	Monitors processor fan's RPM (if connected).

4-4-12. SMART Settings

SMART Settings screen

BIOS Setting	Options	Description/Purpose
SMART Self Test	-Disabled -Enabled	Enables S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) feature to be found on most modern HDD/SSD.

4-4-13. NCT5104D Second Super IO Configuration

NCT5104D Second Super IO Configuration screen

BIOS Setting	Options	Description/Purpose
NCT5104D Super IO Chip	No changeable options	Shows Second Super IO manufacturer and model.
Serial Port 3 Configuration	Sub-menu	Enters menu to configure serial port 3.
Serial Port 4 Configuration	Sub-menu	Enters menu to configure serial port 4.
I2C NXT SC18IM700 via Serial Port 5 Configuration	Sub-menu	Enters menu to control I2C NXT SC18IM700 chip on serial port 5.

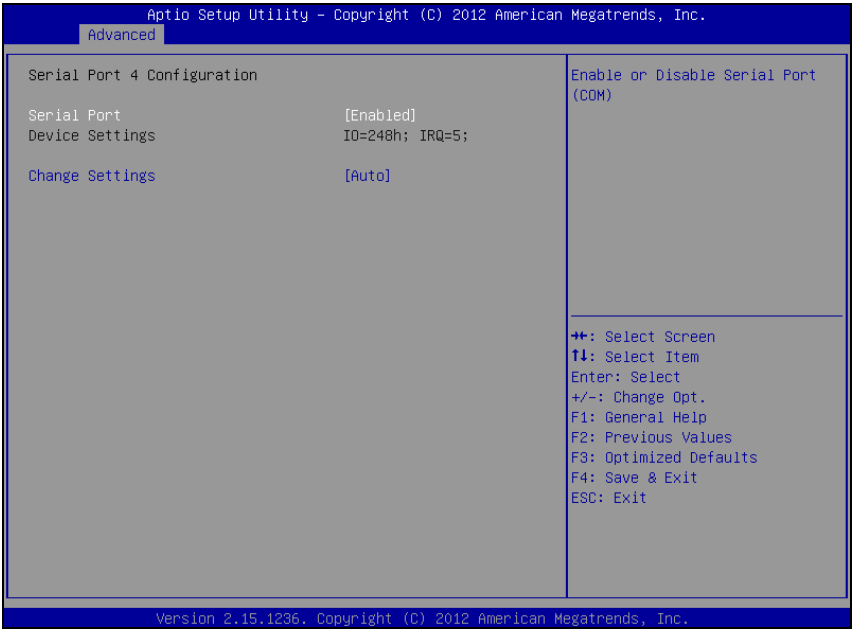
4-4-14. NCT5104D Super IO Configuration

4-4-14-1. Serial Port 3 Configuration

Serial Port 3 Configuration screen

BIOS Setting	Options	Description/Purpose
Serial Port	-Disabled -Enabled	Configures the serial port 3.
Device Settings	No changeable options	Shows current settings applied to the serial port.
Change Settings	-Auto -IO=3F8h; IRQ=4; -IO=3F8h; IRQ=3,4,5,6,7,10,11,12; -IO=2F8h; IRQ=3,4,5,6,7,10,11,12; -IO=3E8h; IRQ=3,4,5,6,7,10,11,12; -IO=2E8h; IRQ=3,4,5,6,7,10,11,12;	Specifies the base I/O address and interrupt request for the serial port 3 if enabled.

4-4-14-2. Serial Port 4 Configuration



Serial Port 4 Configuration screen

BIOS Setting	Options	Description/Purpose
Serial Port	-Disabled -Enabled	Configures the serial port 4.
Device Settings	No changeable options	Shows current settings applied to the serial port.
Change Settings	-Auto -IO=3F8h; IRQ=4; -IO=3F8h; IRQ=3,4,5,6,7,10,11,12; -IO=2F8h; IRQ=3,4,5,6,7,10,11,12; -IO=3E8h; IRQ=3,4,5,6,7,10,11,12; -IO=2E8h; IRQ=3,4,5,6,7,10,11,12;	Specifies the base I/O address and interrupt request for the serial port 4 if enabled.

4-4-14-3. I²C NXT on Serial Port 5 Configuration

I²C NXT on Serial Port 5 Configuration screen

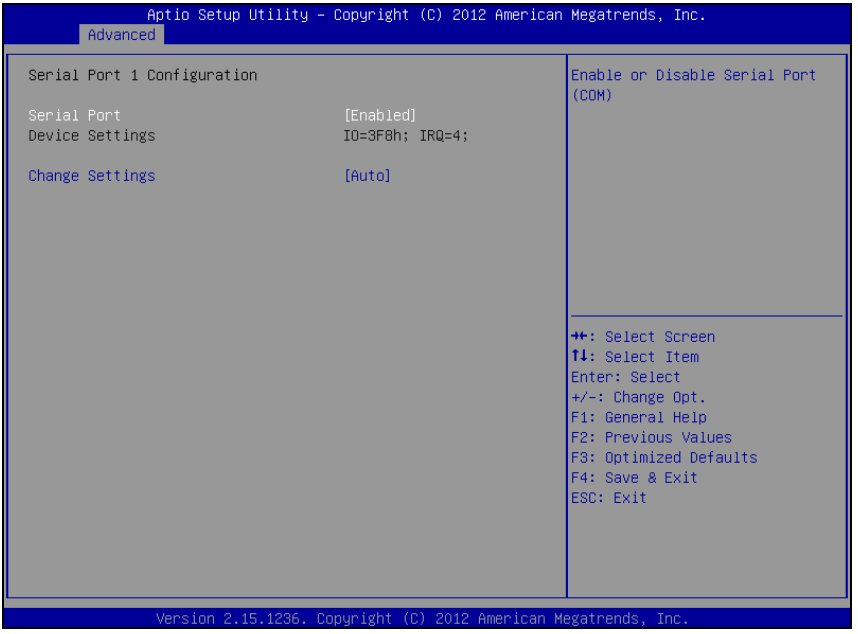
BIOS Setting	Options	Description/Purpose
Serial Port	-Disabled -Enabled	Enables/disables I2C NXT SC18IM700 chip on serial port 5.

4-4-15. NCT6102D Super IO Configuration

NCT6102D Super IO Configuration screen

BIOS Setting	Options	Description/Purpose
NCT6102D Super IO Chip	No changeable options	Shows Super IO manufacturer and model.
Serial Port 1 Configuration	Sub-menu	Enters menu to configure serial port 1.
Serial Port 2 Configuration	Sub-menu	Enters menu to configure serial port 2.

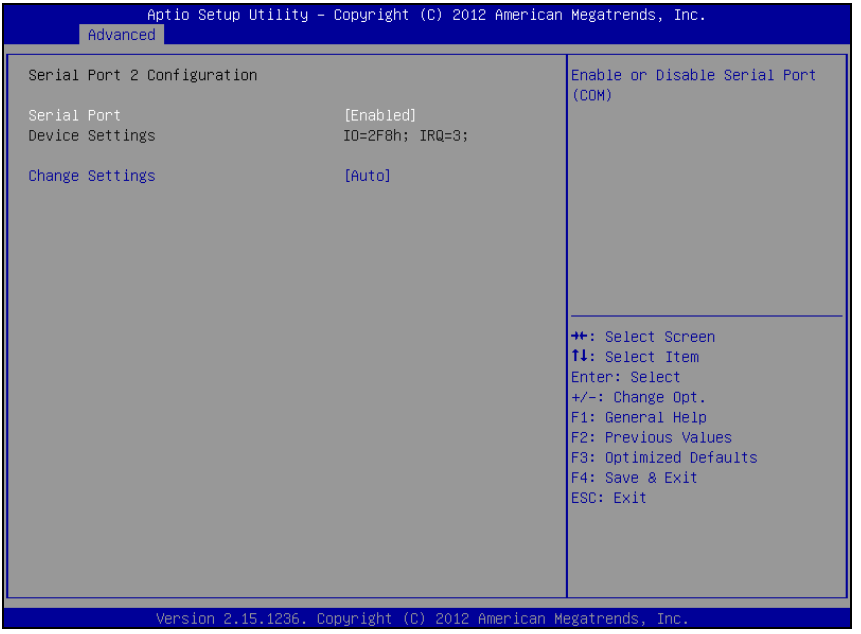
4-4-15-1. Serial Port 1 Configuration



Serial Port 1 Configuration screen

BIOS Setting	Options	Description/Purpose
Serial Port	-Disabled -Enabled	Configures the serial port 1.
Device Settings	No changeable options	Shows current settings applied to the serial port.
Change Settings	-Auto -IO=3F8h; IRQ=4; -IO=3F8h; IRQ=3,4,5,6,7,10,11,12; -IO=2F8h; IRQ=3,4,5,6,7,10,11,12; -IO=3E8h; IRQ=3,4,5,6,7,10,11,12; -IO=2E8h; IRQ=3,4,5,6,7,10,11,12;	Specifies the base I/O address and interrupt request for the serial port 1 if enabled.

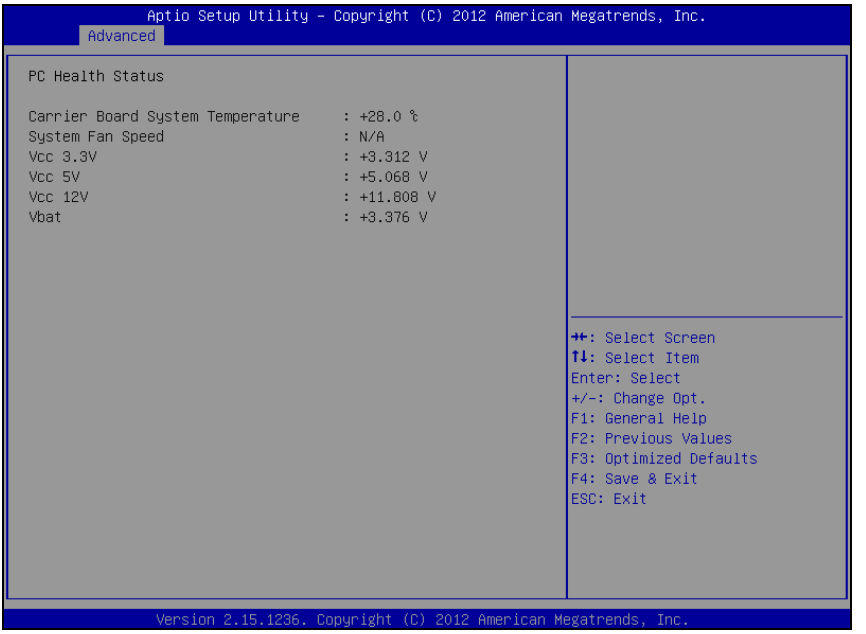
4-4-15-2. Serial Port 2 Configuration



Serial Port 2 Configuration screen

BIOS Setting	Options	Description/Purpose
Serial Port	-Disabled -Enabled	Configures the serial port 2.
Device Settings	No changeable options	Shows current settings applied to the serial port.
Change Settings	-Auto -IO=3F8h; IRQ=4; -IO=3F8h; IRQ=3,4,5,6,7,10,11,12; -IO=2F8h; IRQ=3,4,5,6,7,10,11,12; -IO=3E8h; IRQ=3,4,5,6,7,10,11,12; -IO=2E8h; IRQ=3,4,5,6,7,10,11,12;	Specifies the base I/O address and interrupt request for the serial port 2 if enabled.

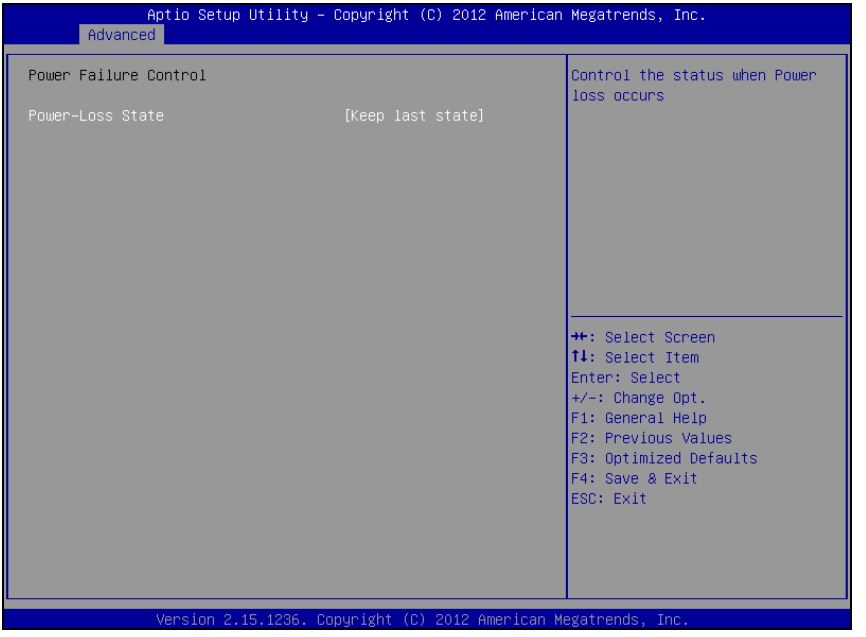
4-4-16. Carrier Board HW Monitor



Carrier Board HW Monitor screen

BIOS Setting	Options	Description/Purpose
Carrier Board System Temperature	No changeable options	Monitors system temperature in degree Celsius.
System Fan Speed	No changeable options	Monitors system fan's RPM (if connected).
Vcc 3.3V	No changeable options	Monitors 3.3V voltage rail (in volt).
Vcc 5V	No changeable options	Monitors 5V section (in volt).
Vcc 12V	No changeable options	Reports on 12V section (in volt).
Vbat	No changeable options	Monitors CMOS memory battery voltage (in volt).

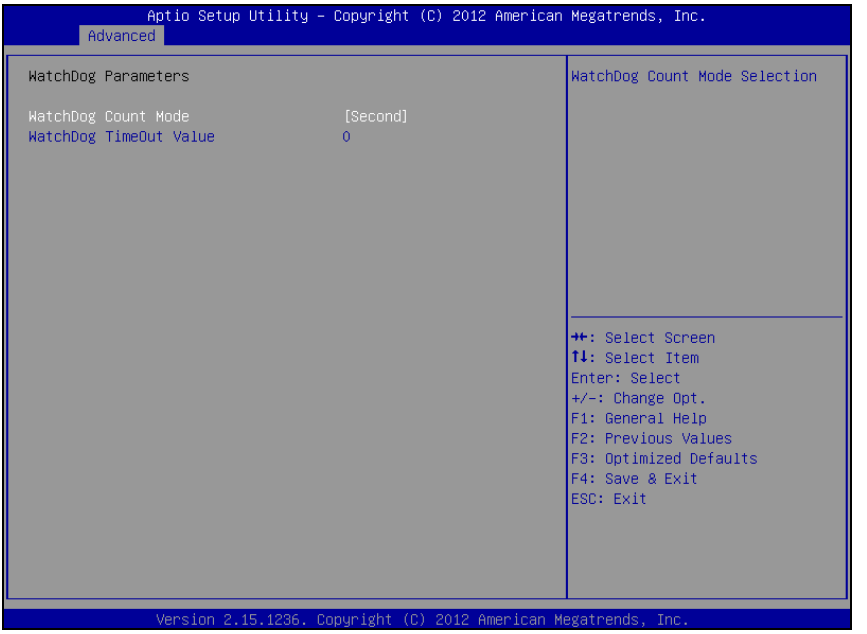
4-4-17. Power Failure Control



Power Failure Control screen

BIOS Setting	Options	Description/Purpose
Power-Loss State	-Power Off -Power On -Keep Last State	Section to configure the board behavior if sudden loss of power should occur.

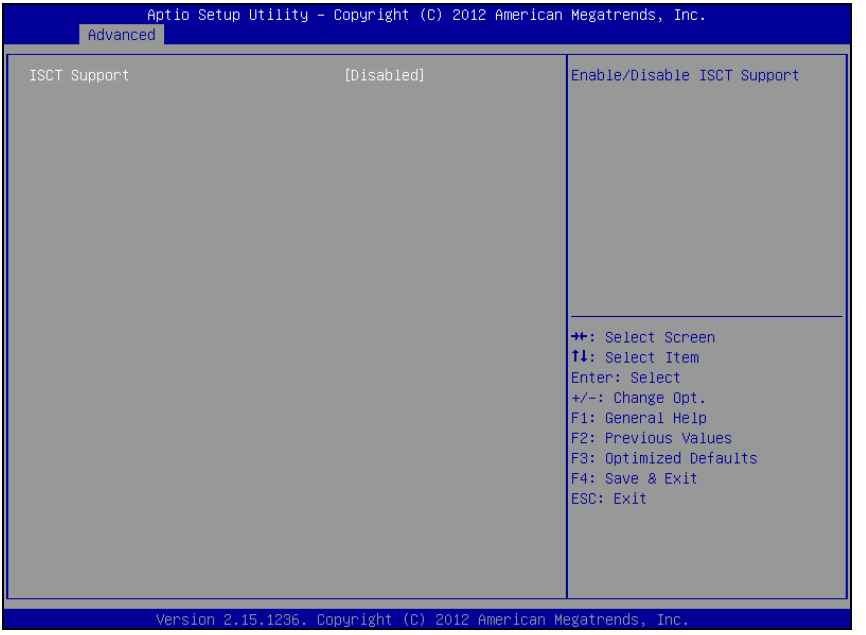
4-4-18. Watchdog Configuration



Watchdog Configuration screen

BIOS Setting	Options	Description/Purpose
Watchdog Timer	-Second -Minute	Selects time unit for watchdog timer feature.
WatchDog TimeOut Value	Multiple options ranging from 0 to 255	Sets the desired value (in seconds) for watchdog timeout. Setting value '0' means the watchdog is disabled.

4-4-19. Intel® Smart Connect Technology



Intel Smart Connect Technology screen

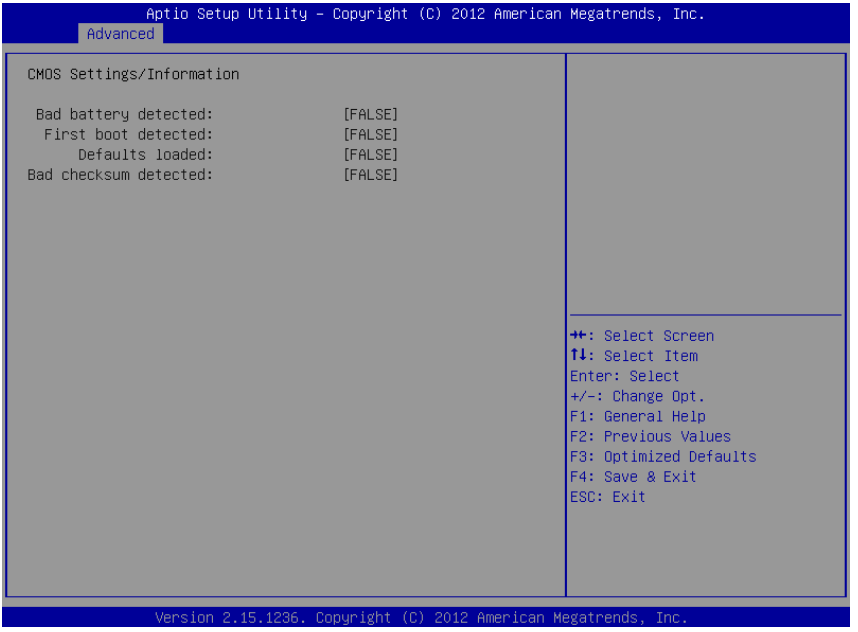
BIOS Setting	Options	Description/Purpose
ISCT Support	-Disabled -Enabled	Enables Intel Smart Connect Technology feature (additional steps involving operating system driver installation might be required).

4-4-20. Network Stack

Network Stack screen

BIOS Setting	Options	Description/Purpose
Network stack	-Disabled -Enabled	Allows for enabling network capability during DXE stage and in UEFI shell.

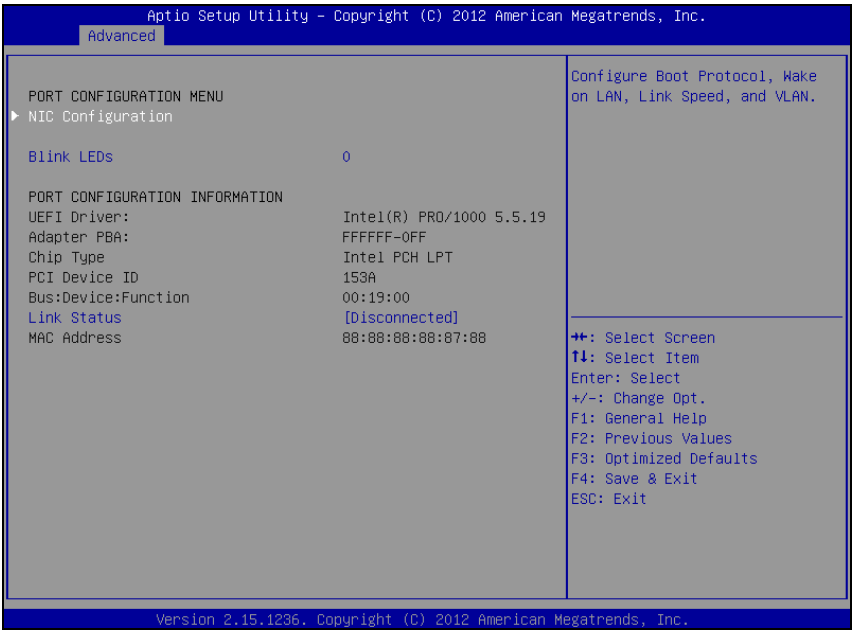
4-4-21. CMOS



CMOS screen

BIOS Setting	Options	Description/Purpose
Bad battery detected	No changeable options	Informs about low voltage on CMOS backup battery. Please replace the battery.
First boot detected	No changeable options	Shows that this is first boot after updating BIOS.
Defaults loaded	No changeable options	Confirms that loaded default values has been selected and loaded.
Bad checksum detected	No changeable options	Informs about CMOS memory bad checksum.

4-4-22. Intel® Ethernet Connection I217-LM



Intel Ethernet Connection I217-LM screen

BIOS Setting	Options	Description/Purpose
NIC Configuration	Sub-menu	Enters further adapter configuration.
Blink LEDs	Multiple options ranging from 0 to 15	To identify port easily, entered value (in seconds) corresponds to period of time its LED would be blinking.
UEFI Driver	No changeable options	Displays UEFI driver version for this device.
Adapter PBA	No changeable options	Displays GbE device serial number.
Chip Type	No changeable options	Indentifies whether GbE is part of chipset or standalone chip.

BIOS Setting	Options	Description/Purpose
PCI Device ID	No changeable options	Displays device's unique identification.
Bus:Device:Function	No changeable options	Displays device's PCI address.
Link Status	No changeable options	Indicates whether link has been established or not.
MAC Address	No changeable options	Shows MAC address for this GbE device.

4-4-22-1. NIC Configuration

NIC Configuration screen

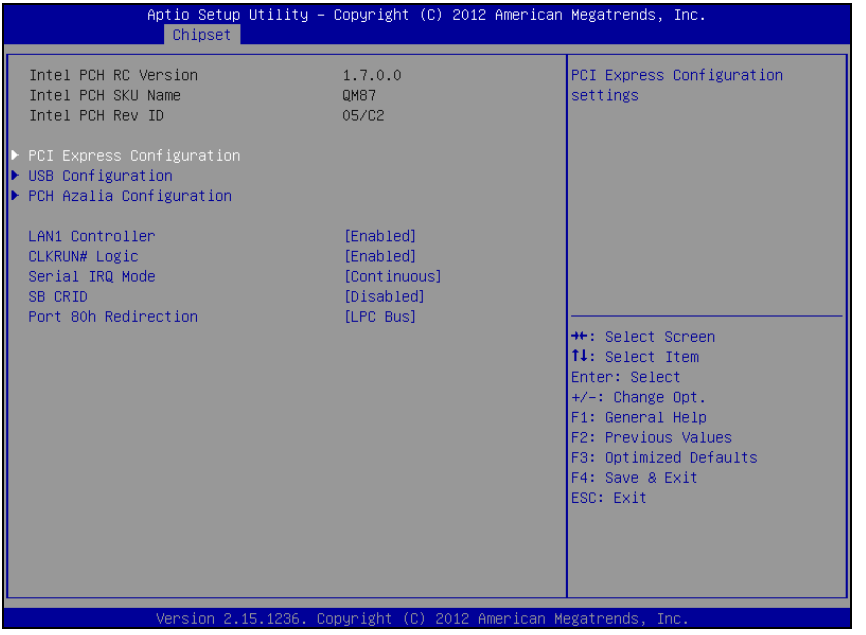
BIOS Setting	Options	Description/Purpose
Link Speed	-Auto Negotiated -10 Mbps Half -10 Mbps Full -100 Mbps Half -100 Mbps Full	Allows configuring link speed on GbE device manually or automatically.
Wake On LAN	-Disabled -Enabled	Option to control Wake on LAN feature for this particular GbE device.

4-5. CHIPSET

Chipset screen

BIOS Setting	Options	Description/Purpose
PCH-IO Configuration	Sub-menu	Enters menu to configure integrated graphics & memory related items.
System Agent (SA) Configuration	Sub-menu	Enters menu to configure audio, USB and other items.

4-5-1. PCH IO Configuration

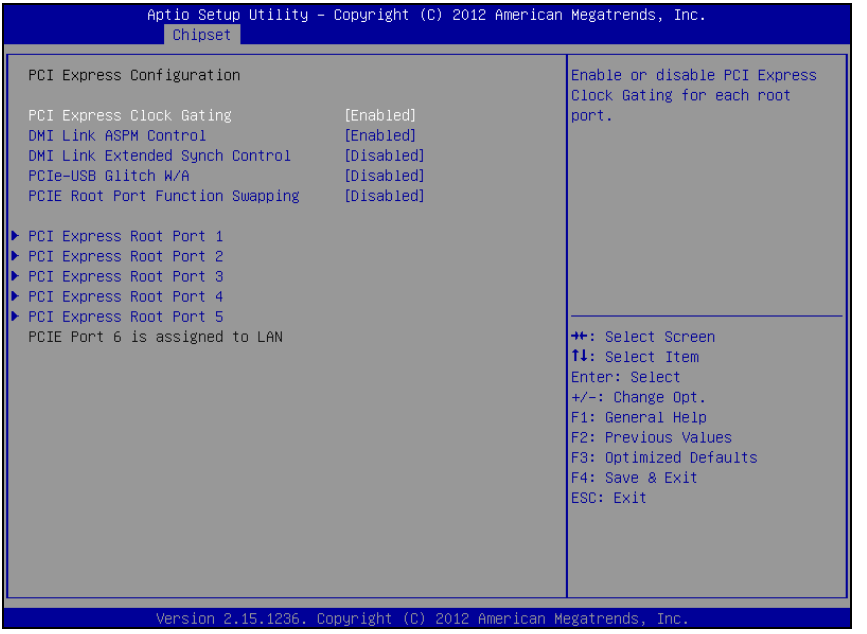


PCH IO Configuration screen

BIOS Setting	Options	Description/Purpose
Intel PCH RC Version	No changeable option	Displays UEFI module version for chipset.
Intel PCH SKU Name	No changeable option	Shows chipset model name.
Intel PCH Rev ID	No changeable option	Displays chipset's stepping version.
PCI Express Configuration	Sub-menu	Controls options for PCIe devices.
USB Configuration	Sub-menu	Enters menu to configure audio and USB devices.
PCH Azalia Configuration	Sub-menu	Enters menu to configure audio and USB devices.

BIOS Setting	Options	Description/Purpose
LAN1 Controller	- Disabled - Enabled	Controls chipset internal PHY GbE device.
CLKRUN# Logic	- Disabled - Enabled	Enables CLKRUN# logic to control the system PCI 33 MHz clock (used by LPC peripherals or other legacy devices).
Serial IRQ Mode	-Continuous -Quiet	Selects which mode to use for IRQ Mode, quiet (every device can start communication) or continuous (only host controller can initiate it).
SB CRID	- Disabled - Enabled	Compatible Revision Identification (CRID) for chipset intended for forward compatibility. OS image built on the earlier stepping to be used on any new stepping(s) (if marked by Intel as compatible).
Port 80h Redirection	-LPC Bus -PCIE Bus	Selects to which location debug port information would be send.

4-5-1-1. PCI Express Configuration

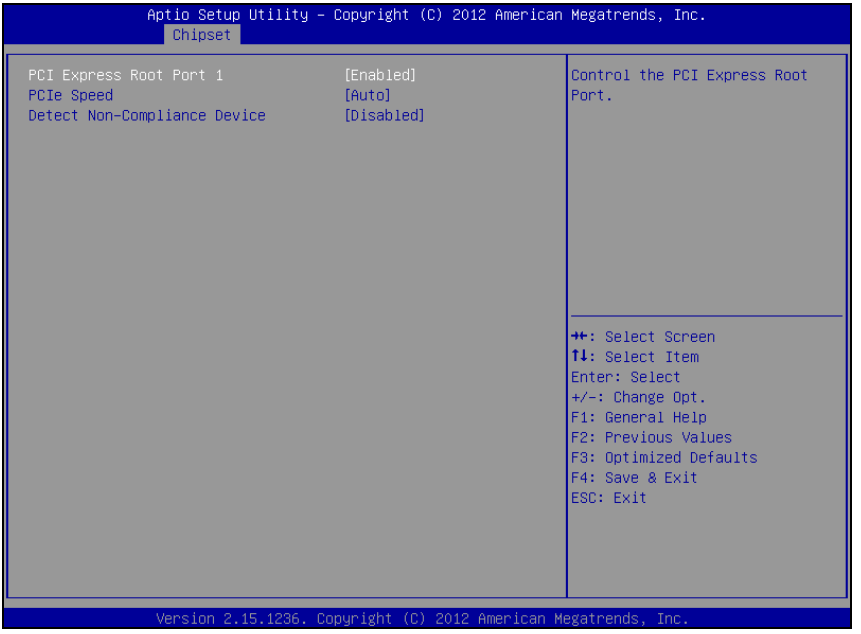


PCI Express Configuration screen

BIOS Setting	Options	Description/Purpose
PCI Express Clock Gating	- Disabled - Enabled	Controls clock gating function on PCIe devices.
DMI Link ASPM Control	- Disabled - Enabled	Option to control ASPM (Active State Power Management) on both sides of the DMI link.
DMI Link Extended Sync Control	- Disabled - Enabled	Enables or disables extended synchronization on DMI link.
PCIe-USB Glitch W/A	- Disabled - Enabled	Allows using PCIe-USB glitch workaround for bad USB devices connected behind the PCIe/PEG ports.

BIOS Setting	Options	Description/Purpose
PCIE Root Port Function Swapping	- Disabled - Enabled	Enables feature for PCIe endpoint to be inserted or removed from a PCIe system gracefully.
PCI Express Root Port 1 [to 6]	Sub-menu	Enters menu to control additional configuration for each PCIe x1 port.
PCIE Port 6 is assigned to LAN	No changeable options	Informs about GbE LAN device location (hardwired by hardware design decision).

PCI Express Root Port 1



PCI Express Root Port 1 creen

BIOS Setting	Options	Description/Purpose
PCI Express Root Port 1	- Disabled - Enabled	Controls PCIe x1 port number 1 (if card inserted).
PCIe Speed	-Auto -Gen1 -Gen2	Options to manually select PCIe card speed according to PCI Express Base 1.1 and PCI Express Base 2.0 specifications.
Detect Non-Compliance Device	- Disabled - Enabled	Enables or disables detection of non-compliance devices. This could resolve potential compatibility issues.

PCI Express Root Port 2

PCI Express Root Port 2 creen

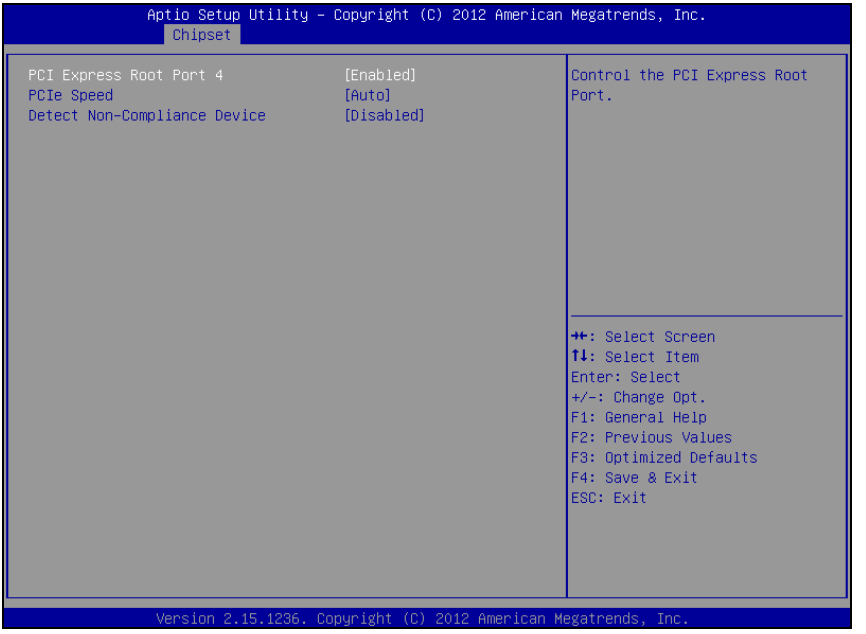
BIOS Setting	Options	Description/Purpose
PCI Express Root Port 2	- Disabled - Enabled	Controls PCIe x1 port number 2 (if card inserted).
PCIe Speed	-Auto -Gen1 -Gen2	Options to manually select PCIe card speed according to PCI Express Base 1.1 and PCI Express Base 2.0 specifications.
Detect Non-Compliance Device	- Disabled - Enabled	Enables or disables detection of non-compliance devices. This could resolve potential compatibility issues.

PCI Express Root Port 3

PCI Express Root Port 3 creen

BIOS Setting	Options	Description/Purpose
PCI Express Root Port 3	- Disabled - Enabled	Controls PCIe x1 port number 3 (if card inserted).
PCIe Speed	-Auto -Gen1 -Gen2	Options to manually select PCIe card speed according to PCI Express Base 1.1 and PCI Express Base 2.0 specifications.
Detect Non-Compliance Device	- Disabled - Enabled	Enables or disables detection of non-compliance devices. This could resolve potential compatibility issues.

PCI Express Root Port 4



PCI Express Root Port 4 creen

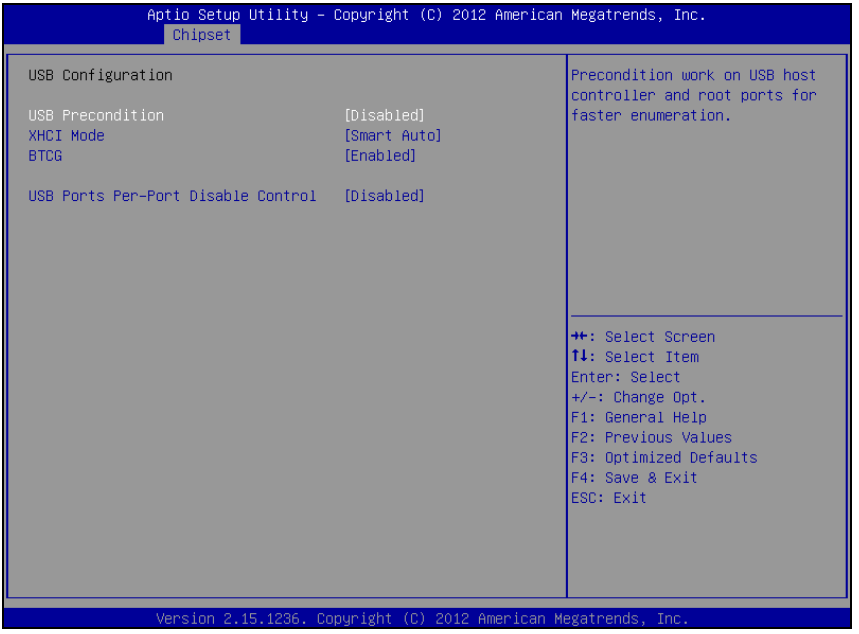
BIOS Setting	Options	Description/Purpose
PCI Express Root Port 4	- Disabled - Enabled	Controls PCIe x1 port number 4 (if card inserted).
PCIe Speed	-Auto -Gen1 -Gen2	Options to manually select PCIe card speed according to PCI Express Base 1.1 and PCI Express Base 2.0 specifications.
Detect Non-Compliance Device	- Disabled - Enabled	Enables or disables detection of non-compliance devices. This could resolve potential compatibility issues.

PCI Express Root Port 5

PCI Express Root Port 5 creen

BIOS Setting	Options	Description/Purpose
PCI Express Root Port 5	- Disabled - Enabled	Controls PCIe x1 port number 5 (if card inserted).
PCIe Speed	-Auto -Gen1 -Gen2	Options to manually select PCIe card speed according to PCI Express Base 1.1 and PCI Express Base 2.0 specifications.
Detect Non-Compliance Device	- Disabled - Enabled	Enables or disables detection of non-compliance devices. This could resolve potential compatibility issues.

4-5-1-2. USB Configuration



USB Configuration screen

BIOS Setting	Options	Description/Purpose
USB Precondition	- Disabled - Enabled	By default set as disabled, in which USB initialization happens in DXE stage as usually. When selected enabled USB initialization is forced to take place during PEI stage as part of 2 seconds Fast Boot BIOS optimization.
XHCI Mode	-Auto -Smart Auto -Enabled -Disabled	Various methods to control USB 3.0 controller behavior. When set to enabled USB speed is always set to USB 3.0 as opposed to disabled which forces speed to USB 2.0 at all times.

		Option auto sets USB 2.0 speed during POST & booting to Windows and USB 3.0 speed in Windows itself, while smart auto means speed would be set always USB 3.0 once USB devices is recognized in Windows as USB 3.0 capable.
BTCG	- Disabled - Enabled	Enables or disables trunk clock gating.
USB Ports Per-Port Disable Control	- Disabled - Enabled	Allowing control USB precisely by each port.

4-5-1-3. PCH Azalia Configuration

PCH Azalia Configuration screen

BIOS Setting	Options	Description/Purpose
Azalia	-Auto -Disabled -Enabled	Controls Intel HD Audio controller (Realtek audio chip itself is located on the carrier board).

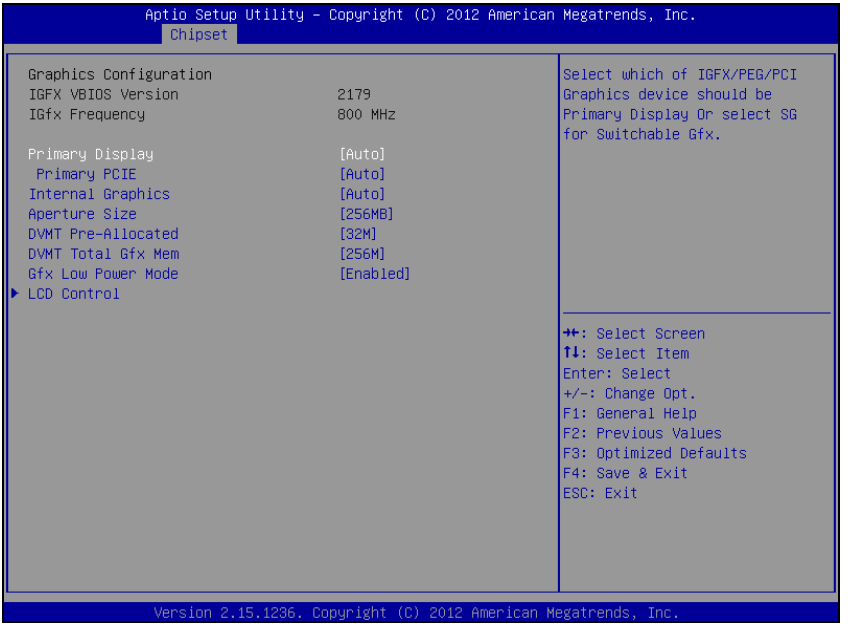
4-5-2. System Agent (SA) Configuration

System Agent (SA) Configuration screen

BIOS Setting	Options	Description/Purpose
System RC Version	No changeable options	Displays current Intel Reference Code version.
VT-d Capability	No changeable options	Displays chipset's support for Intel VT-d.
VT-d	- Disabled - Enabled	Enables Intel Virtualization Technology for Directed I/O (Intel VT-x must be enabled first; in CPU menu).
CPU SA Audio Device (B0:D3:F0)	- Disabled - Enabled	Controls Intel Display Audio feature.
Enable NB CRID	- Disabled - Enabled	Revision Identification (RID) for processor intended for forward compatibility.

BIOS Setting	Options	Description/Purpose
Graphics Configuration	Sub-menu	Enters menu to deal with graphics configuration settings.
NB PCIe Configuration	Sub-menu	Menu to control additional settings for PCIe add-on cards.
Memory Configuration	Sub-menu	Allows controlling memory controller related options.

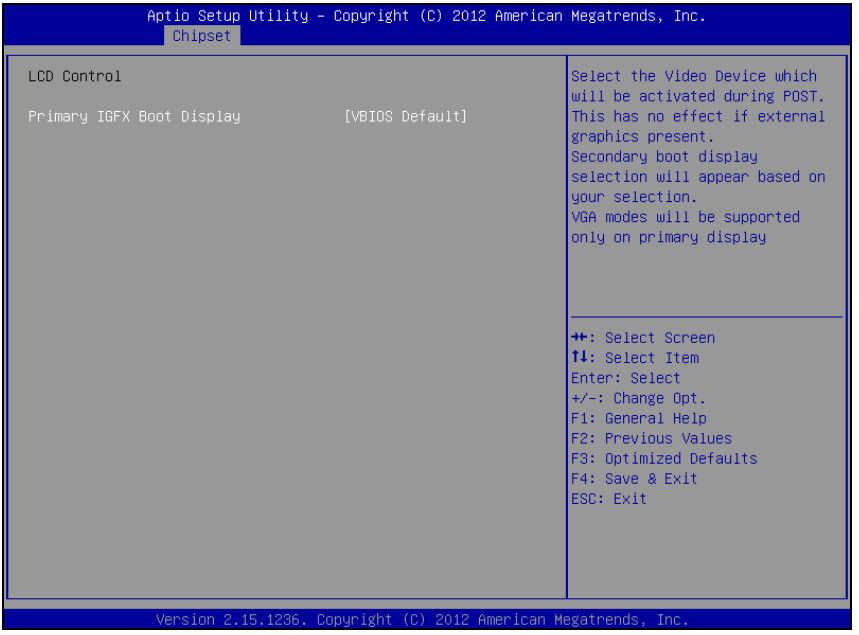
4-5-2-1. Graphics Configuration



Graphics Configuration screen

BIOS Setting	Options	Description/Purpose
IGFX VBIOS Version	No changeable options	Displays Intel VBIOS version.
IGfx Frequency	No changeable options	Reports about graphics engine current frequency.
Primary Display	-Auto -IGFX -PEG -PCIE	Allows controlling which device (if applicable) is going to be used for graphical output initially.
Primary PCIE	-Auto -PCIE1 -PCIE2 -PCIE3 -PCIE4 -PCIE5	Sets used graphics card (if discrete graphical card is inserted in any PCIe slots).

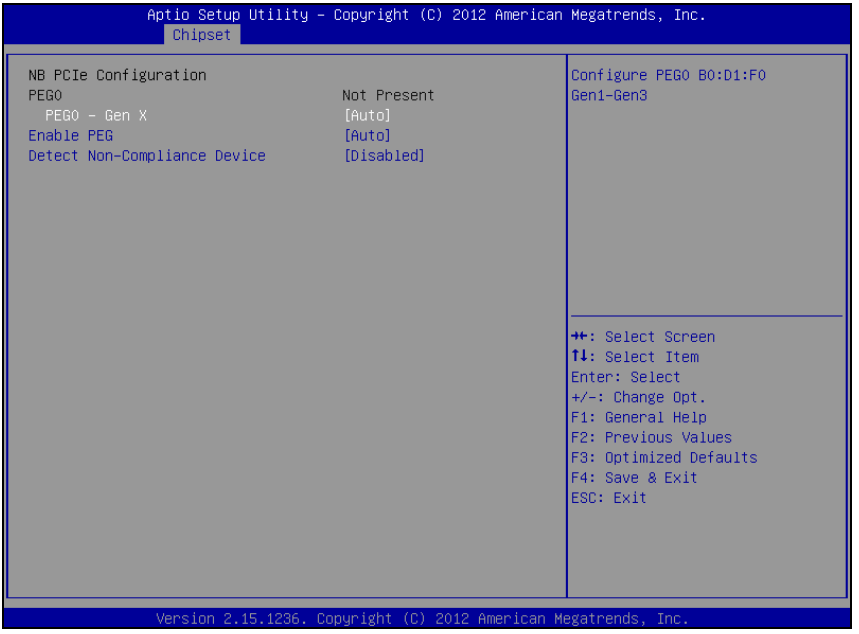
BIOS Setting	Options	Description/Purpose
Internal Graphics	-Auto -Disabled -Enabled	Controls internal graphics engine (which could be disabled if discrete graphical card is being used).
Aperture Size	-128M -256M -512M	Specifies the size of the graphics memory aperture in function.
DVMT Pre-Allocated	-32M -64M … -1024M	Selects how big portion of main memory is going to be allocated for Intel Dynamic Video Memory Technology (DVMT).
DVMT Total Gfx Mem	-128M -256M -MAX	Controls amount of Dynamic Video Memory Technology (DVMT) total memory size for graphics engine.
Gfx Low Power Mode	-Disabled -Enabled	Selects support for graphics engine low power mode.
LCD Control	Sub-menu	Enters menu to configure active graphics output during boot.



LCD Control screen

BIOS Setting	Options	Description/Purpose
IGFX - Boot Type	-VBIOS Default -VGA -LVDS via eDP -DisplayPort 1 -DisplayPort 2 -DisplayPort 3	Selects which screen is going to be active on power on (this option also applies to installed eDP to LVDS chip).

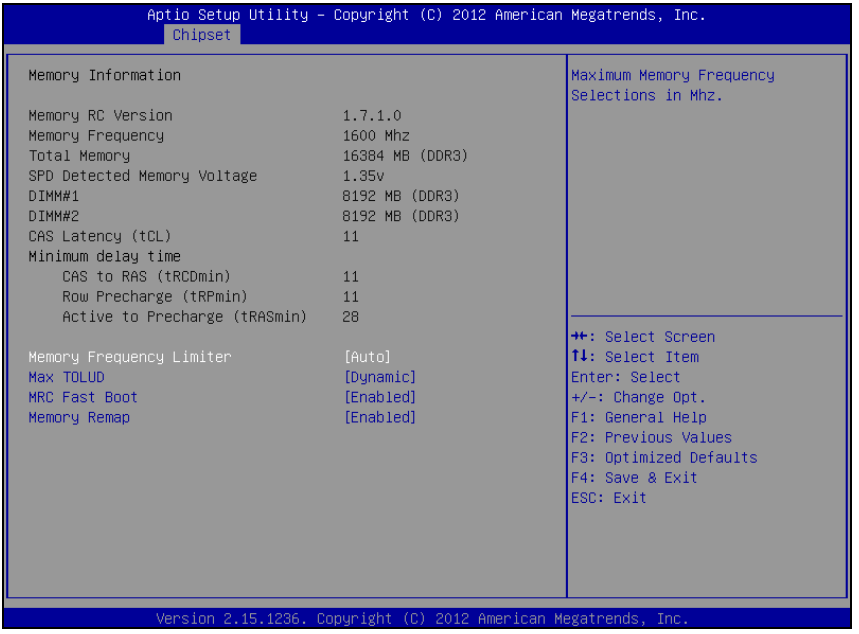
4-5-2-2. NB PCIe Configuration



NB PCIe Configuration screen

BIOS Setting	Options	Description/Purpose
PEG0	No changeable options	Displays detected PCIe graphical card device.
PEG0 - Gen X	-Auto -Gen1 -Gen2 -Gen3	Allows controlling which mode is used for PCIe device (if inserted). This could resolve potential compatibility issues.
Enable PEG	-Auto -Disabled -Enabled	Controls PCIe Graphics port (if graphics card inserted).
Detect Non-Compliance Device	-Disabled -Enabled	Enables or disables detection of non-compliance devices. This could resolve potential compatibility issues.

4-5-2-3. Memory Configuration

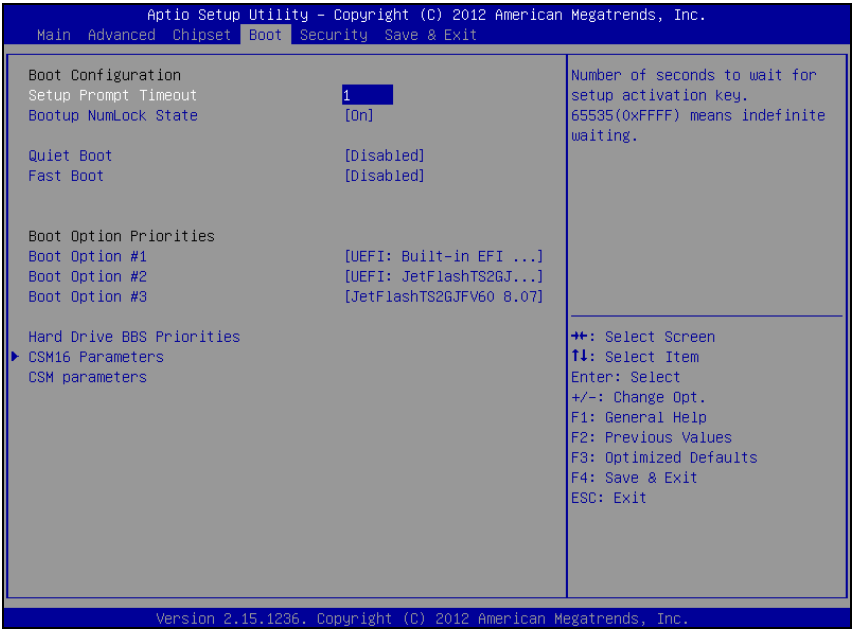


Memory Configuration screen

BIOS Setting	Options	Description/Purpose
Memory RC Version	No changeable options	Reports Intel Memory Reference Code (MRC) version.
Memory Frequency	No changeable options	Displays operating memory current speed in MHz.
Total Memory	No changeable options	Reports current total memory size, e.g. '2048 MB.'
Memory Voltage	No changeable options	Indicates memory modules voltage (in order to distinguish between DDR3 and DDR3L modules).
DIMM#1	No changeable options	Displays current amount of memory in DIMM slot number 1, e.g. '1024 MB.'

BIOS Setting	Options	Description/Purpose
DIMM#2	No changeable options	Displays current amount of memory in DIMM slot number 2, e.g. '1024 MB.'
CAS Latency (tCL)	No changeable options	Displays specific value for memory module.
CAS to RAS (tRCDmin)	No changeable options	Displays specific value for memory module.
Row Precharge (tRPmin)	No changeable options	Displays specific value for memory module.
Active to Precharge (tRASmin)	No changeable options	Displays specific value for memory module.
Memory Frequency Limiter	-Auto -1067 -1333 -1600	Option to set memory module frequency (must be within limits of each module) in MHz.
Max TOLUD	-Dynamic -1 GB -1.25 GB -1.5 GB -1.75 GB -2 GB -2.25 GB -2.5 GB -2.75 GB -3 GB -3.25 GB	Ability to control range which extends from 1 MB to the top of Low Usable physical memory that is permitted to be accessible by the processor (as programmed in the TOLUD register).
MRC Fast Boot	-Disabled -Enabled	Selects MRC (Memory Reference Code) boot setting. Disabled MRC fast boot may help to resolve memory issues if encountered.
Memory Remap	-Disabled -Enabled	Enables memory remapping above 4 GB border (capability to recover addressable memory space).

4-6. BOOT

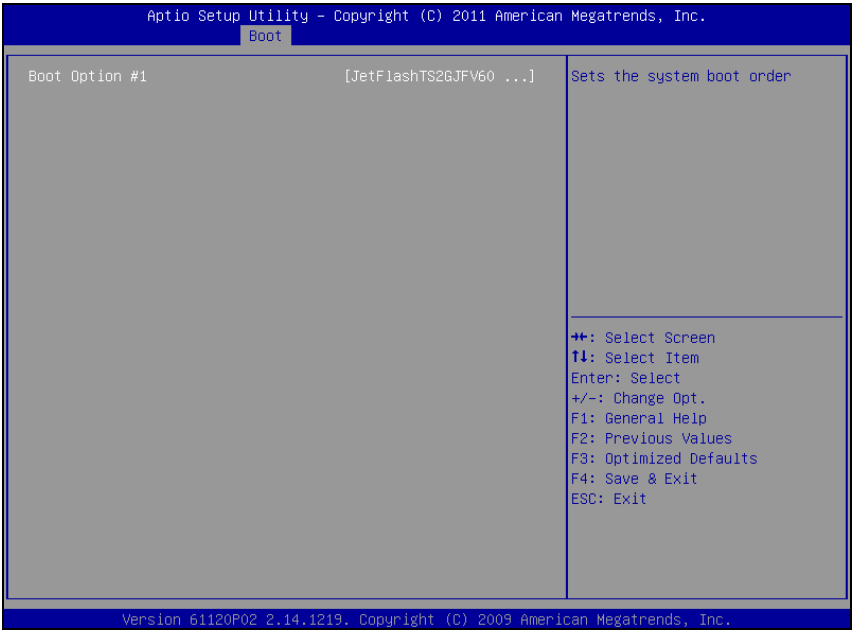


Boot screen

BIOS Setting	Options	Description/Purpose
Setup Prompt Timeout	Multiple options ranging from 1 to 65535	Specifies number of seconds to wait for setup activation key (value 65535 results in indefinite waiting).
Bootup NumLock Status	-On -Off	Specifies the power-on state of the numlock feature on the numeric keypad of keyboard.
Quiet Boot	-Disabled -Enabled	When quiet boot is enabled, it displays AMI or OEM logo (if implemented) instead of POST messages during the boot flow.
Fast Boot	-Disabled -Enabled	When enabled, system would omit several non-critical devices initialization in order to speed up boot up time.

BIOS Setting	Options	Description/Purpose
Boot Option #1	-[USB/DVD/ hard drive(s)] -Built-in EFI shell -Disabled	Allows setting up boot option(s) from menu listed.

4-6-1. Hard Drive BBS Priorities



Hard Drive BBS Priorities screen

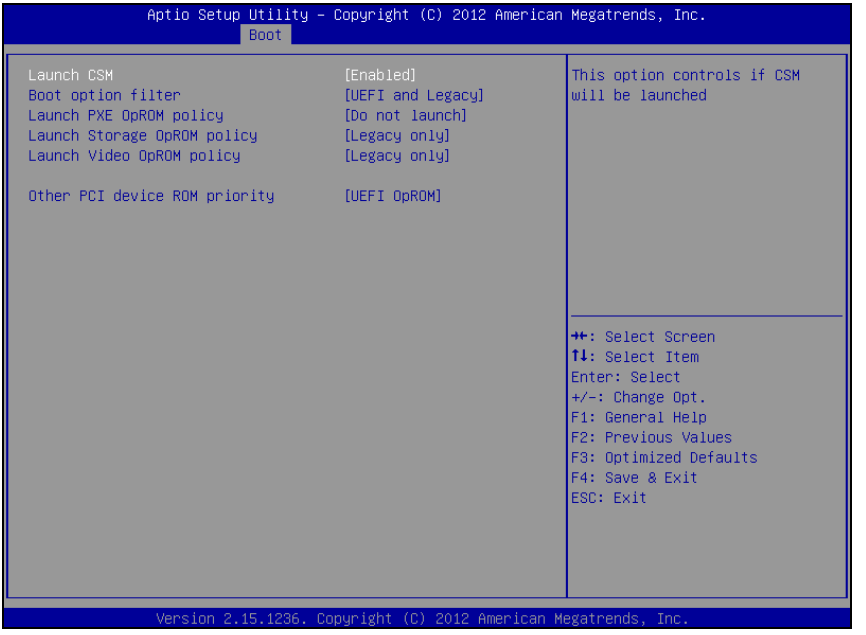
BIOS Setting	Options	Description/Purpose
Boot Option #1	-[drive(s)] -Disabled	Allows setting the boot order of available drive(s).

4-6-2. CSM16 Parameters

CSM16 parameters screen

BIOS Setting	Options	Description/Purpose
Option ROM Messages	-Force BIOS -Keep Current	When set to Force BIOS it allows the POST screen to display Option ROM messages.
INT19 Trap Response	-Immediate -Postponed	When set to immediate the trap is executed right away in contrast to postponed which delays execution to legacy boot.

4-6-3. CSM Parameters

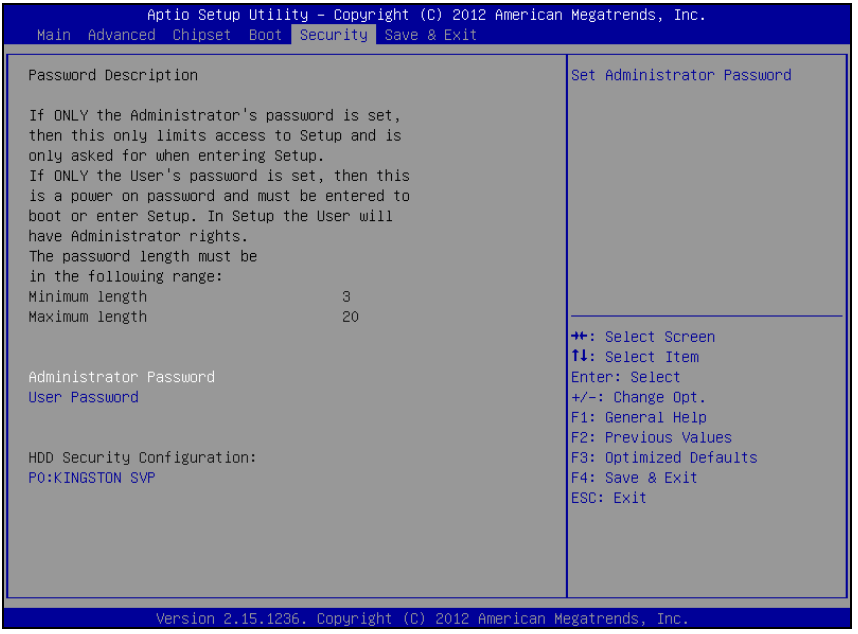


CSM parameters screen

BIOS Setting	Options	Description/Purpose
Launch CSM	-Disabled -Enabled	Enables or disables Compatibility System Module (depends on operating system in use).
Boot option filter	-UEFI and Legacy -Legacy only -UEFI only	Set this option according to your operating systems installed.
Launch PXE OpROM policy	-Do not launch -UEFI only -Legacy only	Selection to control which Option ROM to use for PXE boot method.
Launch Storage OpROM policy	-Do not launch -UEFI only -Legacy only	Selection to control which Option ROM to use for storage system.

BIOS Setting	Options	Description/Purpose
Launch Video OpROM policy	-Do not launch -UEFI only -Legacy only	Allows to select between GOP (UEFI) and VBIOS (legacy) to handle graphics output.
Other PCI device ROM priority	-UEFI OpROM -Legacy OpROM	Selection to control which Option ROM to use on PCI device(s) (if inserted).

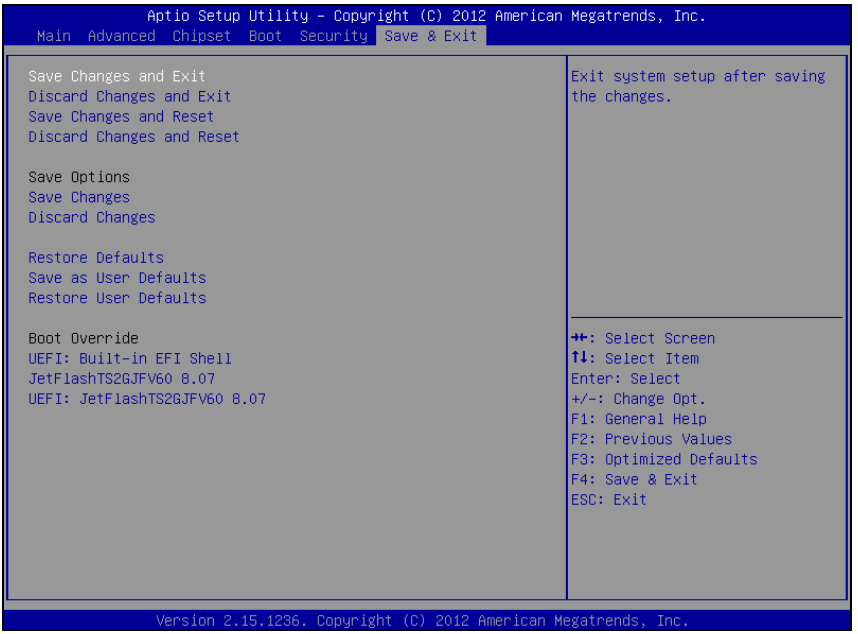
4-7. SECURITY



Security screen

BIOS Setting	Options	Description/Purpose
Administrator Password	Password can be up to 20 alphanumeric characters	Specifies the administrator password.
User Password	Password can be up to 20 alphanumeric characters	Specifies the user password.
HDD Security Configuration	Sub-menu	Enters sub-menu with option to enabled password protected HDD/SSD (if supported by connected SATA device).

4-8. SAVE & EXIT



Save & Exit screen

BIOS Setting	Options	Description/Purpose
Save Changes and Exit	No changeable options	Exits and saves the changes in CMOS memory.
Discard Changes and Exit	No changeable options	Exits without saving any changes made in BIOS settings.
Save Changes and Reset	No changeable options	Saves the changes in CMOS memory and resets.
Discard Changes and Reset	No changeable options	Resets without saving any changes made in BIOS settings.
Save Changes	No changeable options	Saves the changes done in BIOS settings so far.
Discard Changes	No changeable options	Discards the changes done in BIOS settings so far.

BIOS Setting	Options	Description/Purpose
Restore Defaults	No changeable options	Loads the optimized defaults for BIOS settings.
Save as User Defaults	No changeable options	Saves the current values as user defaults.
Restore User Defaults	No changeable options	Loads the user defaults for BIOS settings.
Boot Override	-[drive(s)]	Forces to boot from selected [drive(s)] or UEFI shell

EXPANSION BUS

APPENDIX

A

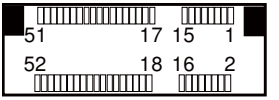
This appendix indicates the pin assignments for reference.

Sections included:

- Mini-PCIe Bus
- PCIe Bus

MINI-PCIE BUS

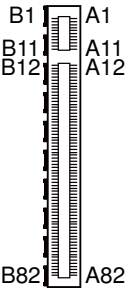
PIN	ASSIGNMENT	PIN	ASSIGNMENT
1	WAKE#	27	GND
2	+3.3V	28	+1.5V
3	Reserved	29	GND
4	GND	30	SMB_CLK
5	Reserved	31	PETn0
6	+1.5V	32	SMB_DATA
7	CLKREQ#	33	PETp0
8	Reserved	34	GND
9	GND	35	GND
10	Reserved	36	USB_D-
11	REFCLK-	37	GND
12	Reserved	38	USB_D+
13	REFCLK+	39	+3.3V
14	Reserved	40	GND
15	GND	41	+3.3V
16	Reserved	42	Reserved
17	Reserved	43	GND
18	GND	44	Reserved
19	Reserved	45	CLINK_CLK
20	Reserved	46	Reserved
21	GND	47	CLINK_DATA
22	PERST#	48	+1.5V
23	PERn0	49	CLINK_RST_N
24	+3.3Vaux	50	GND
25	PERp0	51	Reserved
26	GND	52	+3.3V



M_PCIE

PCIE BUS

PCI_E with 164 pins:



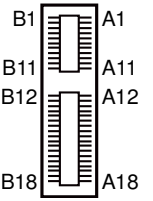
PCI_E

A				B			
PIN	**ASSIGNMENT**	**PIN**	**ASSIGNMENT**	**PIN**	**ASSIGNMENT**	**PIN**	**ASSIGNMENT**
A1	Reserved	A42	GND	B1	+12V	B42	EXP_A_TX_6_DN
A2	+12V	A43	EXP_A_RX_6_DP	B2	+12V	B43	GND
A3	+12V	A44	EXP_A_RX_6_DN	B3	+12V	B44	GND
A4	GND	A45	GND	B4	GND	B45	EXP_A_TX_7_DP
A5	Reserved	A46	GND	B5	SMB_CLK	B46	EXP_A_TX_7_DN
A6	Reserved	A47	EXP_A_RX_7_DP	B6	SMB_DATA_	B47	GND
A7	Reserved	A48	EXP_A_RX_7_DN	B7	GND	B48	Reserved
A8	Reserved	A49	GND	B8	+3.3V	B49	GND
A9	+3.3V	A50	Reserved	B9	Reserved	B50	Reserved
A10	+3.3V	A51	Reserved	B10	+3.3SB	B51	Reserved
A11	PWRGD	A52	Reserved	B11	Wakeup	B52	Reserved
A12	GND	A53	Reserved	B12	Reserved	B53	Reserved
A13	PEG1_CLK_P	A54	Reserved	B13	GND	B54	Reserved
A14	PEG1_CLK_N	A55	Reserved	B14	EXP_A_TX_0_DP	B55	Reserved
A15	GND	A56	Reserved	B15	EXP_A_TX_0_DN	B56	Reserved
A16	EXP_A_RX_0_DP	A57	Reserved	B16	GND	B57	Reserved
A17	EXP_A_RX_0_DN	A58	Reserved	B17	PCIEX16_PRSNT2	B58	Reserved

A				B			
PIN	**ASSIGNMENT**	**PIN**	**ASSIGNMENT**	**PIN**	**ASSIGNMENT**	**PIN**	**ASSIGNMENT**
A18	GND	A59	Reserved	B18	GND	B59	Reserved
A19	Reserved	A60	Reserved	B19	EXP_A_TX_1_DP	B60	Reserved
A20	GND	A61	Reserved	B20	EXP_A_TX_1_DN	B61	Reserved
A21	EXP_A_RX_1_DP	A62	Reserved	B21	GND	B62	Reserved
A22	EXP_A_RX_1_DN	A63	Reserved	B22	GND	B63	Reserved
A23	GND	A64	Reserved	B23	EXP_A_TX_2_DP	B64	Reserved
A24	GND	A65	Reserved	B24	EXP_A_TX_2_DN	B65	Reserved
A25	EXP_A_RX_2_DP	A66	Reserved	B25	GND	B66	Reserved
A26	EXP_A_RX_2_DN	A67	Reserved	B26	GND	B67	Reserved
A27	GND	A68	Reserved	B27	EXP_A_TX_3_DP	B68	Reserved
A28	GND	A69	Reserved	B28	EXP_A_TX_3_DN	B69	Reserved
A29	EXP_A_RX_3_DP	A70	Reserved	B29	GND	B70	Reserved
A30	EXP_A_RX_3_DN	A71	Reserved	B30	Reserved	B71	Reserved
A31	GND	A72	Reserved	B31	Reserved	B72	Reserved
A32	Reserved	A73	Reserved	B32	GND	B73	Reserved
A33	Reserved	A74	Reserved	B33	EXP_A_TX_4_DP	B74	Reserved
A34	GND	A75	Reserved	B34	EXP_A_TX_4_DN	B75	Reserved
A35	EXP_A_RX_4_DP	A76	Reserved	B35	GND	B76	Reserved
A36	EXP_A_RX_4_DN	A77	Reserved	B36	GND	B77	Reserved
A37	GND	A78	Reserved	B37	EXP_A_TX_5_DP	B78	Reserved
A38	GND	A79	Reserved	B38	EXP_A_TX_5_DN	B79	Reserved
A39	EXP_A_RX_5_DP	A80	Reserved	B39	GND	B80	Reserved

A				B			
PIN	**ASSIGNMENT**	**PIN**	**ASSIGNMENT**	**PIN**	**ASSIGNMENT**	**PIN**	**ASSIGNMENT**
A40	EXP_A_RX_5_DN	A81	Reserved	B40	GND	B81	Reserved
A41	GND	A82	Reserved	B41	EXP_A_TX_6_DP	B82	Reserved

PCI_E with 36 pins:



PCI_E

A				B			
PIN	**ASSIGNMENT**	**PIN**	**ASSIGNMENT**	**PIN**	**ASSIGNMENT**	**PIN**	**ASSIGNMENT**
A1	Reserved	A10	+3.3V	B1	+12V	B10	+3.3SB
A2	+12V	A11	PWRGD	B2	+12V	B11	wakeup
A3	+12V	A12	GND	B3	+12V	B12	Reserved
A4	GND	A13	CLK_DP	B4	GND	B13	GND
A5	Reserved	A14	CLK_DN	B5	SMB_CLK	B14	PCH_PE_TXP_5
A6	Reserved	A15	GND	B6	SMB_DATA	B15	PCH_PE_TXN_5
A7	Reserved	A16	PCH_PE_RXP_5	B7	GND	B16	GND
A8	Reserved	A17	PCH_PE_RXN_5	B8	+3.3V	B17	SLOT1_PRSNT2_N
A9	+3.3V	A18	GND	B9	Reserved	B18	GND

TECHNICAL SUMMARY

APPENDIX

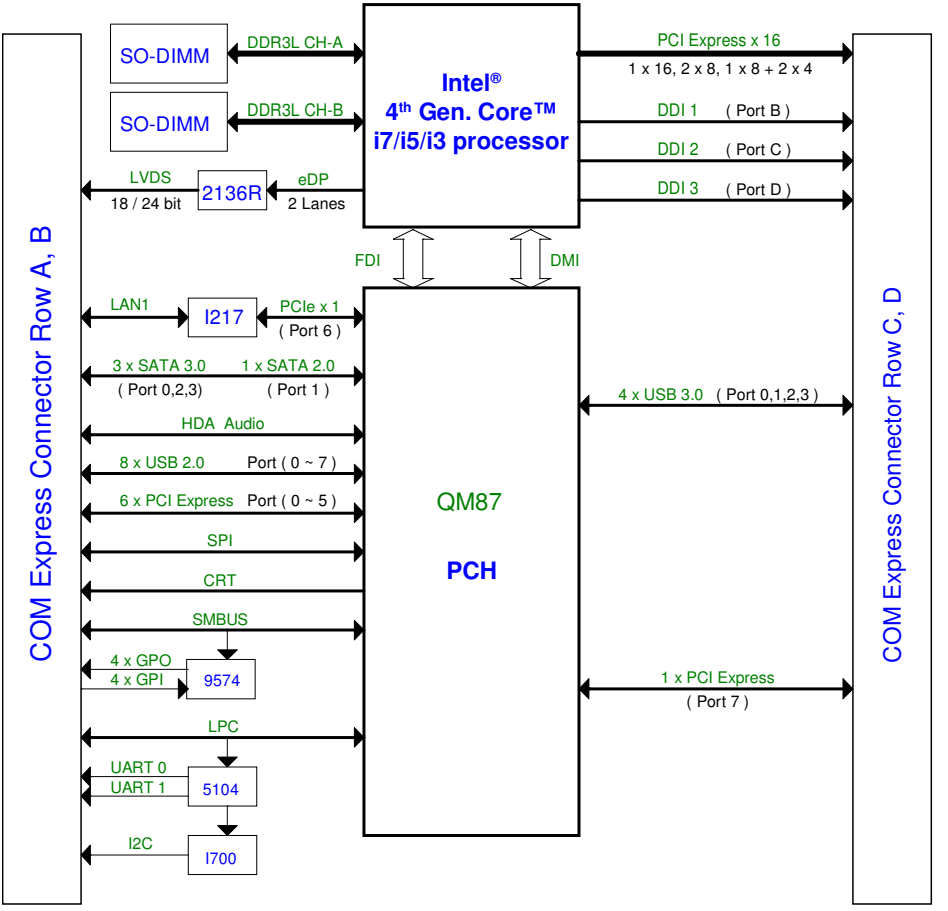
B

This section introduce you the maps concisely.

Sections included:

- Block Diagram
- Interrupt Map
- DMA Channel Map
- I/O Map
- Watchdog Timer Configuration
- Flash BIOS Update

BLOCK DIAGRAM



INTERRUPT MAP

IRQ	ASSIGNMENT
0	System timer
1	Standard PS/2 Keyboard
3	Communications Port (COM2)
4	Communications Port (COM1)
8	System CMOS/real time clock
10	Intel(R) 8 Series/C220 Series SMBus Controller
10	PCI Serial Port
11	Ethernet Controller
11	PCI Simple Communications Controller
12	Microsoft PS/2 Mouse
13	Numeric data processor
16	Intel(R) 8 Series/C220 Series USB Enhanced Host Controller #2
16	High Definition Audio Controller
19	Intel(R) 8 Series SATA AHCI Controller
23	Intel(R) 8 Series/C220 Series USB Enhanced Host Controller #1
81 - 190	Microsoft ACPI-Compliant System
IRQ	Intel(R) Ethernet Connection I217-LM
IRQ	Intel(R) HD Graphics 4600
IRQ	Intel(R) 8 Series/C220 Series PCI Express Root Port
IRQ	Intel(R) USB 3.0 eXtensible Host Controller
IRQ	Intel(R) 8 Series/C220 Series PCI Express Root Port

DMA CHANNELS MAP

TIMER CHANNEL	ASSIGNMENT
Channel 4	Direct memory access controller

I/O MAP

I/O MAP	ASSIGNMENT
0x000002F8-0x000002FF	Communications Port (COM2)
0x00001854-0x00001857	Motherboard resources
0x0000E000-0x0000E01F	Ethernet Controller
0x0000E000-0x0000E01F	Intel(R) 8 Series/C220 Series PCI Express Root Port
0x00000060-0x00000060	Standard PS/2 Keyboard
0x00000064-0x00000064	Standard PS/2 Keyboard
0x00000000-0x00000CF7	PCI bus
0x00000000-0x00000CF7	Direct memory access controller
0x00000D00-0x0000FFFF	PCI bus
0x00000070-0x00000077	System CMOS/real time clock
0x00000070-0x00000077	Motherboard resources
0x0000F040-0x0000F05F	Intel(R) 8 Series/C220 Series SMBus Controller
0x00000010-0x0000001F	Motherboard resources
0x00000022-0x0000003F	Motherboard resources
0x00000044-0x0000005F	Motherboard resources
0x00000072-0x0000007F	Motherboard resources
0x00000080-0x00000080	Motherboard resources
0x00000080-0x00000080	Motherboard resources
0x00000084-0x00000086	Motherboard resources
0x00000088-0x00000088	Motherboard resources
0x0000008C-0x0000008E	Motherboard resources
0x00000090-0x0000009F	Motherboard resources
0x000000A2-0x000000BF	Motherboard resources
0x000000E0-0x000000EF	Motherboard resources
0x000004D0-0x000004D1	Motherboard resources
0x000004D0-0x000004D1	Programmable interrupt controller
0x0000F0E0-0x0000F0E7	PCI Serial Port
0x00000020-0x00000021	Programmable interrupt controller
0x00000024-0x00000025	Programmable interrupt controller
0x00000028-0x00000029	Programmable interrupt controller

I/O MAP	ASSIGNMENT
0x0000002C-0x0000002D	Programmable interrupt controller
0x00000030-0x00000031	Programmable interrupt controller
0x00000034-0x00000035	Programmable interrupt controller
0x00000038-0x00000039	Programmable interrupt controller
0x0000003C-0x0000003D	Programmable interrupt controller
0x000000A0-0x000000A1	Programmable interrupt controller
0x000000A4-0x000000A5	Programmable interrupt controller
0x000000A8-0x000000A9	Programmable interrupt controller
0x000000AC-0x000000AD	Programmable interrupt controller
0x000000B0-0x000000B1	Programmable interrupt controller
0x000000B4-0x000000B5	Programmable interrupt controller
0x000000B8-0x000000B9	Programmable interrupt controller
0x000000BC-0x000000BD	Programmable interrupt controller
0x00000290-0x0000029F	Motherboard resources
0x000002A0-0x000002AF	Motherboard resources
0x0000F000-0x0000F03F	Intel(R) HD Graphics 4600
0x000003B0-0x000003BB	Intel(R) HD Graphics 4600
0x000003C0-0x000003DF	Intel(R) HD Graphics 4600
0x0000002E-0x0000002F	Motherboard resources
0x0000004E-0x0000004F	Motherboard resources
0x00000061-0x00000061	Motherboard resources
0x00000063-0x00000063	Motherboard resources
0x00000065-0x00000065	Motherboard resources
0x00000067-0x00000067	Motherboard resources
0x00000092-0x00000092	Motherboard resources
0x000000B2-0x000000B3	Motherboard resources
0x00000680-0x0000069F	Motherboard resources
0x0000FFFF-0x0000FFFF	Motherboard resources
0x0000FFFF-0x0000FFFF	Motherboard resources
0x0000FFFF-0x0000FFFF	Motherboard resources
0x00001C00-0x00001CFE	Motherboard resources
0x00001D00-0x00001DFE	Motherboard resources

I/O MAP	ASSIGNMENT
0x00001E00-0x00001EFE	Motherboard resources
0x00001F00-0x00001FFE	Motherboard resources
0x00001800-0x000018FE	Motherboard resources
0x0000164E-0x0000164F	Motherboard resources
0x00000040-0x00000043	System timer
0x00000050-0x00000053	System timer
0x000000F0-0x000000F0	Numeric data processor
0x0000F0D0-0x0000F0D7	Intel(R) 8 Series SATA AHCI Controller - 8C03
0x0000F0C0-0x0000F0C3	Intel(R) 8 Series SATA AHCI Controller - 8C03
0x0000F0B0-0x0000F0B7	Intel(R) 8 Series SATA AHCI Controller - 8C03
0x0000F0A0-0x0000F0A3	Intel(R) 8 Series SATA AHCI Controller - 8C03
0x0000F060-0x0000F07F	Intel(R) 8 Series SATA AHCI Controller - 8C03
0x00000081-0x00000091	Direct memory access controller
0x00000093-0x0000009F	Direct memory access controller
0x000000C0-0x000000DF	Direct memory access controller
0x000003F8-0x000003FF	Communications Port (COM1)

WATCHDOG TIMER CONFIGURATION

The I/O port address of the watchdog timer is 2E (hex) and 2F (hex). 2E (hex) is the address port. 2F (hex) is the data port. User must first assign the address of register by writing address value into address port 2E (hex), then write/read data to/from the assigned register through data port 2F (hex).

Configuration Sequence

To program F81866 configuration registers, the following configuration sequence must be followed:

1. Enter the extended function mode

To place the chip into the Extended Function Mode, two successive writes of 0x87 must be applied to Extended Function Enable Registers (EFERs, i.e. 2Eh or 4Eh).

2. Configure the configuration registers

The chip selects the Logical Device and activates the desired Logical Devices through Extended Function Index Register (EFIR) and Extended Function Data Register (EFDR). The EFIR is located at the same address as the EFER, and the EFDR is located at address (EFIR+1). First, write the Logical Device Number (i.e. 0x07) to the EFIR and then write the number of the desired Logical Device to the EFDR. If accessing the Chip (Global) Control Registers, this step is not required. Secondly, write the address of the desired configuration register within the Logical Device to the EFIR and then write (or read) the desired configuration register through the EFDR.

3. Exit the extended function mode

To exit the Extended Function Mode, writing 0xAA to the EFER is required. Once the chip exits the Extended Function Mode, it is in the normal running mode and is ready to enter the configuration mode.

Example Program

Enable watchdog timer and set 30 seconds as the timeout interval.

```
;------ Enter to extended function mode ------------------------------------------------------
mov     dx,     2eh
mov     al,     87h
out     dx,     al
out     dx,     al
;------ Select Logical Device 7 of watchdog timer ----------------------------------------
mov     al,     07h
out     dx,     al
inc     dx
mov     al,     07h
out     dx,     al
;------ Enable watchdog feature ----------------------------------------
mov     al,     030h
out     dx,     al
inc     dx
mov     al,     01h
out     dx,     al
;------ Enable Watch PME----------------------------------------
dec     dx
mov     al,     0FAh
out     dx,     al
inc     dx
in      al,     dx
and     al,     51h
out     dx,     al
;------ Set second as counting unit ----------------------------------------------------------
dec     dx
mov     al,     0f5h
out     dx,     al
inc     dx
```

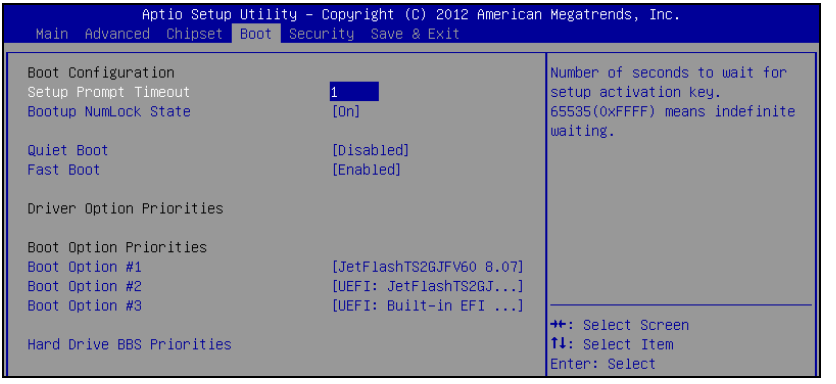
```
in      al,     dx
and     al,     20h
out     dx,     al
;------ Set timeout interval as 30seconds and start counting ---------------------------------
dec     dx
mov     al,     0f6h
out     dx,     al
inc     dx
mov     al,     1Eh
out     dx,     al
;------ Exit the extended function mode -------------------------------------------------------
dec     dx
mov     al,     0aah
out     dx,     al
```

Flash BIOS Update

I. Before System BIOS update

1. Prepare a bootable media (ex. USB storage device) which can boot system to DOS prompt.
2. Download and save the BIOS file (ex. C2300PQ1.bin) to the bootable device.
3. Copy AMI flash utility – AFUDOS.exe (V3.05.02) into bootable device.

4. Make sure the target system can first boot to the bootable device.
   a. Connect the bootable USB device.
   b. Turn on the computer and press <Del> or <ESC> key during boot to enter BIOS Setup.
   c. System will go into the BIOS setup menu.
   d. Select [Boot] menu.
   e. Select [Hard Drive BBS Priorities], set the USB bootable device to be the 1st boot device.
   f. Press <F4> key to save configuration and exit the BIOS setup menu.



II. AFUDOS Command for System BIOS Update

AFUDOS.exe is the AMI firmware update utility; the command line is shown as below:

AFUDOS <ROM File Name> [option1] [option2]…

You can type AFUDOS /? to see all the definition of each control options. The recommended options for BIOS ROM update consist of following parameters:

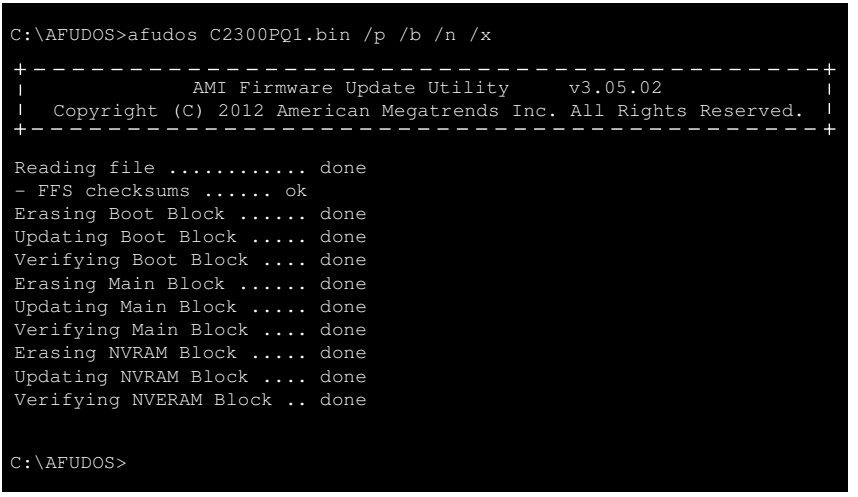
/P: program main BIOS image
/B: program Boot Block
/N: program NVRAM
/X: don't check ROM ID

III. BIOS update procedure

1. Use the bootable USB device to boot up system into the MS-DOS command prompt.
2. Type in AFUDOS C2300PQ1.BIN /p /b /n /x and press enter to start the flash procedure.

   Note: xxxx means the BIOS revision part, ex. 0PW1…

3. During the update procedure, you will see the BIOS update process status and its percentage. Beware! Do not turn off system power or reset your computer if the whole procedure are not complete yet, or it may crash the BIOS ROM and make system unable to boot up next time.
4. After BIOS update procedures is complete, the messages should be like the figure shown below:



5. You can restart the system and boot up with new BIOS now.
6. Update is complete after restart.

7. Verify during following boot that the BIOS version displayed at initialization screen has changed.