User Manual

FES8670: Haswell 4th generation Fanless Embedded PC

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Safety Precautions

Before getting started, please read the following important safety precautions.

1. The FES8670 does not come equipped with an operating system. An operating system must be loaded first before installing any software into the computer.

2. Be sure to ground yourself to prevent static charge when installing the internal components. Use a grounding wrist strap and place all electronic components in any static-shielded devices. Most electronic components are sensitive to static electrical charge.

3. Disconnect the power cord from the FES8670 before making any installation. Be sure both the system and the external devices are turned OFF. Sudden surge of power could ruin sensitive components. Make sure the FES8670 is properly grounded.

4. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.

5. Turn OFF the system power before cleaning. Clean the system using a cloth only. Do not spray any liquid cleaner directly onto the screen.

6. Do not leave this equipment in an uncontrolled environment where the storage temperature is below -45℃ or above 80℃. It may damage the equipment.

7. Do not open the system's back cover. If opening the cover for maintenance is a must, only a trained technician is allowed to do so. Integrated circuits on computer boards are sensitive to static electricity. To avoid damaging chips from electrostatic discharge, observe the following precautions:

   - Before handling a board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. This will help to discharge any static electricity on your body.

   - When handling boards and components, wear a wrist-grounding strap, available from most electronic component stores.

Classification

1. Degree of production against electric shock : not classified
2. Degree of protection against the ingress of water : IP40
3. Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.
4. Mode of operation : Continuous

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General Cleaning Tips

You may need the following precautions before you begin to clean the computer. When you clean any single part or component for the computer, please read and understand the details below fully.

When you need to clean the device, please rub it with a piece of dry cloth.
1. Be cautious of the tiny removable components when you use a vacuum cleaner to absorb the dirt on the floor.
2. Turn the system off before you start to clean up the component or computer.
3. Never drop the components inside the computer or get circuit board damp or wet.
4. Be cautious of all kinds of cleaning solvents or chemicals when you use it for the sake of cleaning. Some individuals may be allergic to the ingredients.
5. Try not to put any food, drink or cigarette around the computer.

Cleaning Tools:

Although many companies have created products to help improve the process of cleaning your computer and peripherals users can also use household items to clean their computers and peripherals. Below is a listing of items you may need or want to use while cleaning your computer or computer peripherals.

Keep in mind that some components in your computer may only be able to be cleaned using a product designed for cleaning that component, if this is the case it will be mentioned in the cleaning.

● Cloth: A piece of cloth is the best tool to use when rubbing up a component. Although paper towels or tissues can be used on most hardware as well, we still recommend you to rub it with a piece of cloth.

● Water or rubbing alcohol: You may moisten a piece of cloth a bit with some water or rubbing alcohol and rub it on the computer. Unknown solvents may be harmful to the plastics parts.

● Vacuum cleaner: Absorb the dust, dirt, hair, cigarette particles, and other particles out of a computer can be one of the best methods of cleaning a computer. Over time these items can restrict the airflow in a computer and cause circuitry to corrode.

● Cotton swabs: Cotton swaps moistened with rubbing alcohol or water are excellent tools for wiping hard to reach areas in your keyboard, mouse, and other locations.

● Foam swabs: Whenever possible it is better to use lint free swabs such as foam swabs.

**Note:** *We strongly recommended that you should shut down the system before you start to clean any single components.*

Please follow the steps below:
1. Close all application programs
2. Close operating software
3. Turn off power switch
4. Remove all device

Table of Contents

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CHAPTER 1
INTRODUCTION

This chapter contains general information and detailed specifications of the FES8670. The Chapter 1 includes the following sections:

- General Description
- System Specifications
- Dimensions
- I/O Outlets
- Packing List
- Model List

1.1   General Description

The FES8670 is an embedded system that supports LGA1150 Socket 4th generation Intel® Core™ i7/i5/i3/Celeron processor to support Windows 7, Windows 7 Embedded, Windows 8, Windows 8 Embedded or Linux, suitable for the most endurable operation.

It features fan less design with full feature I/O, two 204-pin unbuffered SODIMM socket for dual channel DDR3-1333/1600 MHz memory, and enhanced system dependability by built-in Watchdog Timer.

- **Features**
    1. Intel® Haswell Q87 Platform
    2. Support LGA1150 Socket Intel® Core™ i7/i5/i3/Celeron processor
    3. Maximum to 16GB SO-DIMM DDR3 1333/1600 MHz memory
    4. Supports 6 USB 3.0 ports
    5. Supports 6 jump-less RS-232/422/485
    6. Supports 4 10/100/1000Mbps Ethernet ports
    7. Supports ATX power switch with status indicator
    8. 32 channel Digital I/O (16 IN & 16 OUT), Programmable
    9. Two HDMI
    10. One DisplayPort
    11. One VGA
    12. Two 2.5" SATA HDD drive bay
    13. Two PCI Express Mini Card Slots w/ mSATA supported. (By jumper selection)
    14. One front access CFast
    15. Watchdog timer
    16. VDC power input 9~36V
    17. One SIM slot
    18. Three Antenna openings

- **Reliable and Stable Design**
  The FES8670 adopts the advanced cooling system and supporting the CFast™, which makes it especially suitable for vibration environments, best for industrial automation, digital signage and gaming application.

- **Embedded O.S. Supported**
  The FES8670 not only supports Windows 7, Windows 8, but also supports embedded OS, such as Windows 7 Embedded, Windows 8 Embedded and Linux.

- **Various Storage devices supported**
  For storage device, the FES8670 supports two 2.5" SATA storage drive bay, one CFast™ slot and mSATA device.

1.2 System Specifications

1.2.1 CPU

- **CPU**
  - LGA1150 Socket Intel® Core™ i7/i5/i3/Celeron processor
  - Working temperature depends on TDP of processor, please refer to 1.2.3 System Specification
- **Chipset**
  - Intel® Haswell Q87 chipset
- **BIOS**
  - American Megatrends Inc. UEFI (Unified Extensible Firmware Interface) BIOS.
- **System Memory**
  - Two 204-pin unbuffered DDR3 1333/1600 MHz SO-DIMM socket, max. up to 16GB

1.2.2 I/O System

- **Six jumper-less RS-232/422/485 9-pin D-Sub male connectors**
- **Two HDMI for display (Supports HDMI 1.4a, max resolution up to 4K × 2K)**
- **One VGA connector for display (Supports max resolution up to 1920x1200)**
- **One DisplayPort for display (Supports max resolution up to 2560x1600)**
- **One Audio connector (Mic-IN, Line-OUT)**
- **Four RJ-45 connectors for 10/100/1000 Base-T Ethernet ports (Intel® i210-IT,i217-LM)**
- **Six USB 3.0 connectors**
- **16 Digital Input and 16 Digital Output for digital I/O 44-pin D-Sub female connectors**
- **Two PCI Express Mini Card Slots w/ mSATA supported.**
- **DC 9~36V power input connector**
- **Oner HDD Active and two programmable indicators**
- **One Reset switch**
- **One AT/ATX switch**
- **One Power switch**
- **One Remote PWR switch**
- **Three SMA type connector opening for Antenna**

1.2.3 System Specification

- **Watchdog Timer**
  - 1~255 seconds or minutes; up to 255 levels.
- **Power Supply**
  - 9-36V wide range DC input connector
- **Operation Temperature**
  - -40℃ ~ 55℃ (-4 ⁰F ~ 131⁰F), with W.T. SSD & Memory ;CPU TDP 35W)
  - -40℃ ~ 50℃ (-4 ⁰F ~ 122⁰F), with W.T. SSD & Memory ;CPU TDP 45W)

- **Storage Temperature**
    - -45℃ ~ 80℃ (-49 ⁰F ~ 176⁰F)
- **Humidity**
    - 10% ~ 90% (non-condensation)
- **Vibration Endurance**
    - 3Grm w/ CFast (5-500Hz, X, Y, Z directions)
- **Weight**
    - 3.8 kg (8.37 lb) without package
    - 4.6 kg (10.14 lb) with package
- **Dimensions**
    - 280mm(11.02") (W) x190mm(7.48") (D) x 70mm(2.75") (H)

1.2.4 Driver CD Content

- **Driver**
    - Audio
    - Chipset
    - Ethernet
    - Graphic
    - Intel Rapid Storage Technology
    - USB 3.0
    - ME 9.0
- **Manual**
    - User Manual
    - Quick Manual

Note: All specifications and images are subject to change without notice.

1.3   Dimensions

The following diagrams show you dimensions and outlines of the FES8670.

1.3.1 System Dimension
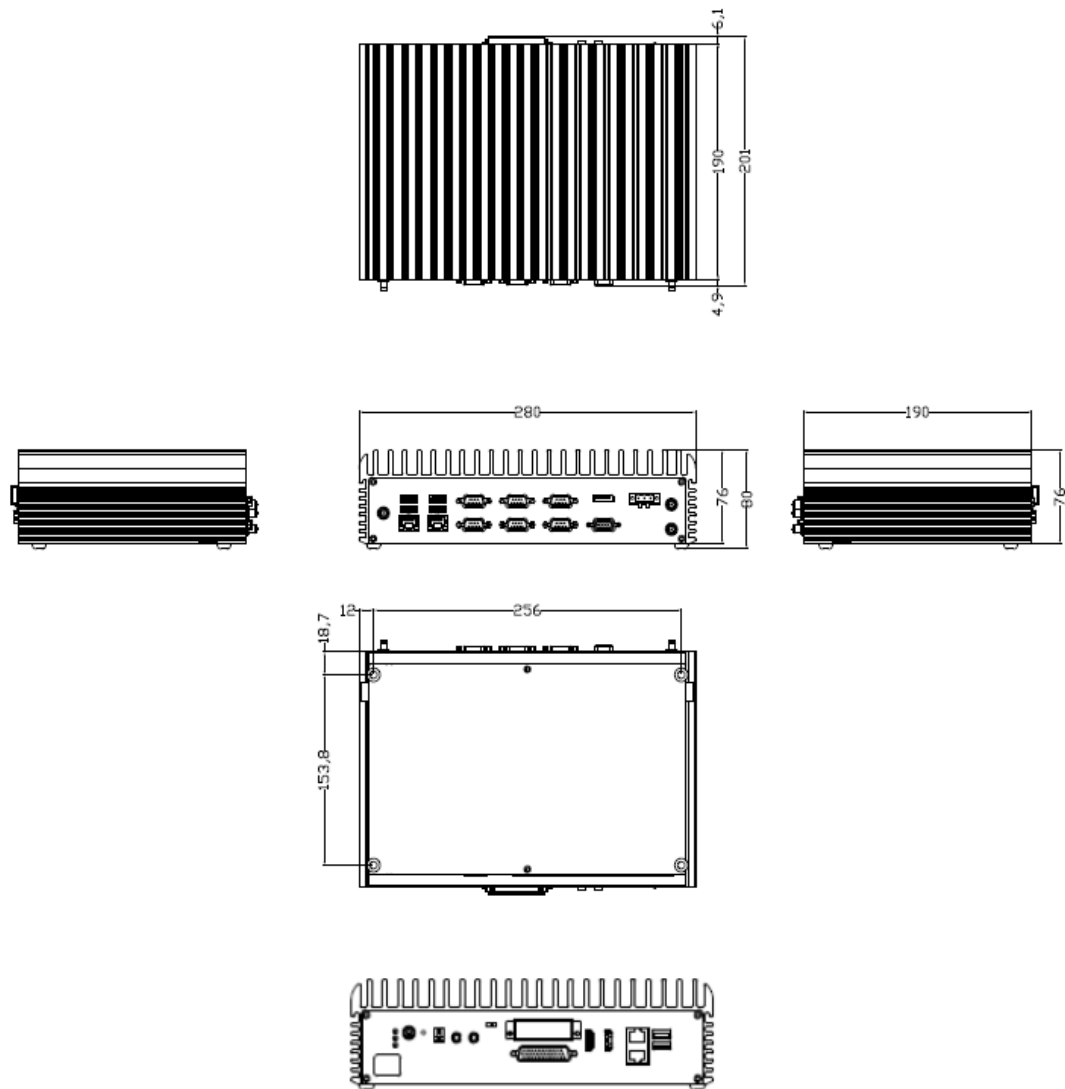
1.3.2 Wall mount Bracket Dimension
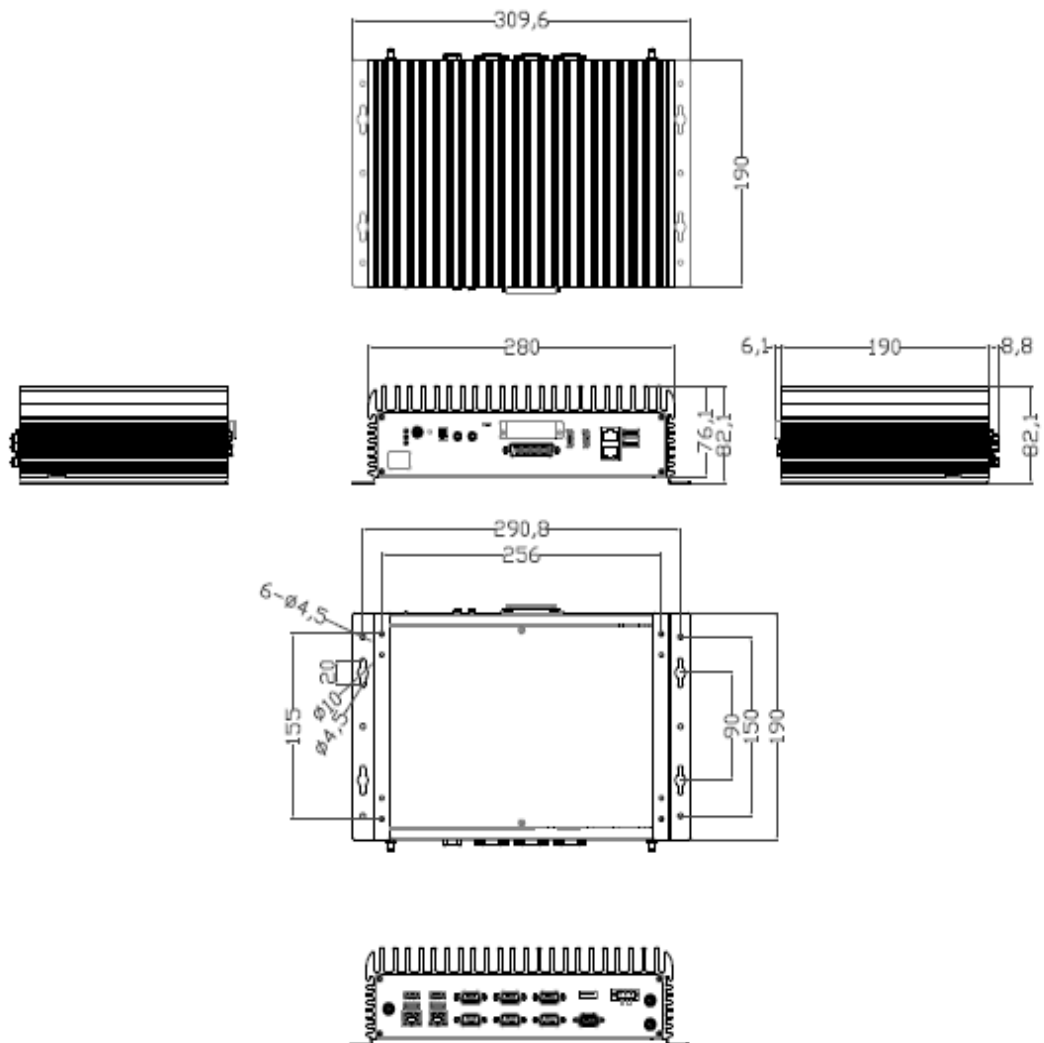
1.4   I/O Outlets

The following figures show you I/O outlets on front view of the FES8670.

● **Front View drawing**
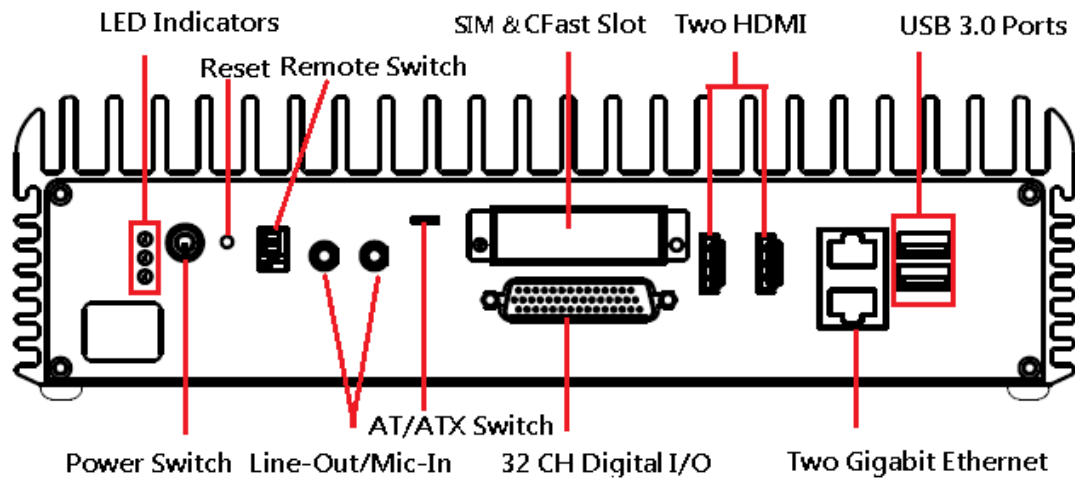
※ Indicator Information:

HDD: 1 x Orange LED for HDD active
PL1: Programmable LED (Please refer to Appendix B to set it.)
PL2: Programmable LED (Please refer to Appendix B to set it.)

● **Rear View drawing**

4 x USB 3.0 Ports   Display Port   9~36VDC Power Input

Antenna Opening

Two Gigabit Ethernet   6 x RS232/422/485   VGA   Antenna Opening
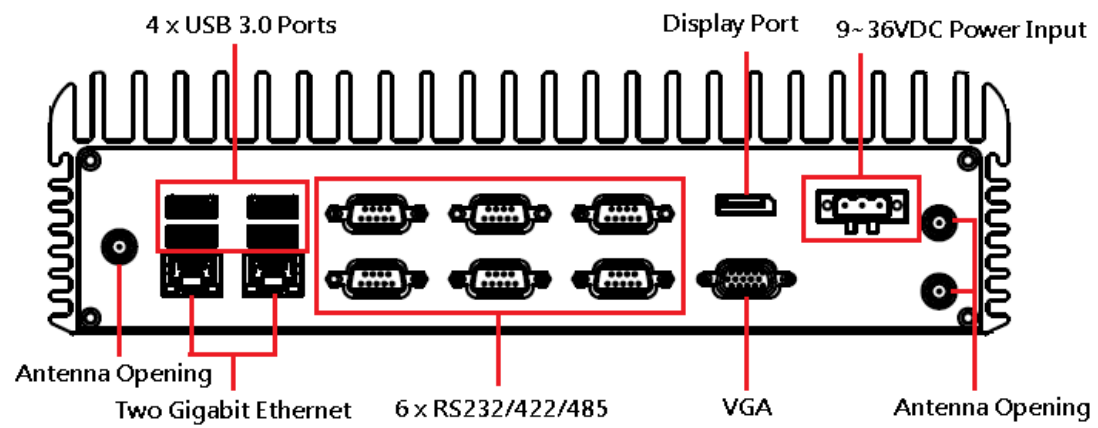
1.5   Packing List

The package bundled with your FES8670 should contain the following items:

- **FES8670 System Unit x 1**
- **FES8670 Quick Installation Guide x 1**
- **CD x 1 (For Driver and Manual)**
- **Screws Pack x1**
- **Pre-installed Intel Processor**
- **Pre-installed DDR3 SO-DIMM**
- **Pre-installed Foot pad x4**
- **Optional Wall-mount Brackets**
- **Optional Antenna**
- **Optional Mini Card module**
- **Optional 2.5" SATA Storage**
- **Optional CFast™Card**
- **Optional mSATA**

1.6   Model List

FES8670	Fanless Embedded System with Intel Core i7 /i5/i3 & Celeron Processor, Q87 PCH, HDMIx2/VGA/DisplayPort, Dual HDD, GbE LAN*4, USB3.0*6, Audio, RS-232/422/485*6, 32 Channel digital I/O, 9~36VDC

If you cannot find this package or any items are missing, please contact Acnodes immediately.

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CHAPTER 2
HARDWARE INSTALLATION

The FES8670 is convenient for your various hardware configurations, such as HDD (Hard Disk Drive), SSD (Solid State Drive), CFast™ card or PCI Express Mini Card modules. The chapter 2 will show you how to install the hardware.

2.1 Installing the 2.5" SATA Device

<< HDD-A >>

Step 1 Turn off the system, and unplug the power cord.

Step 2 Turn the system upside down to locate screws at the bottom, loosen screws.

Step 3 Remove the bottom cover.

Step 4 Please find the HDD bracket location then loosen four screws of HDD bracket to take out it.
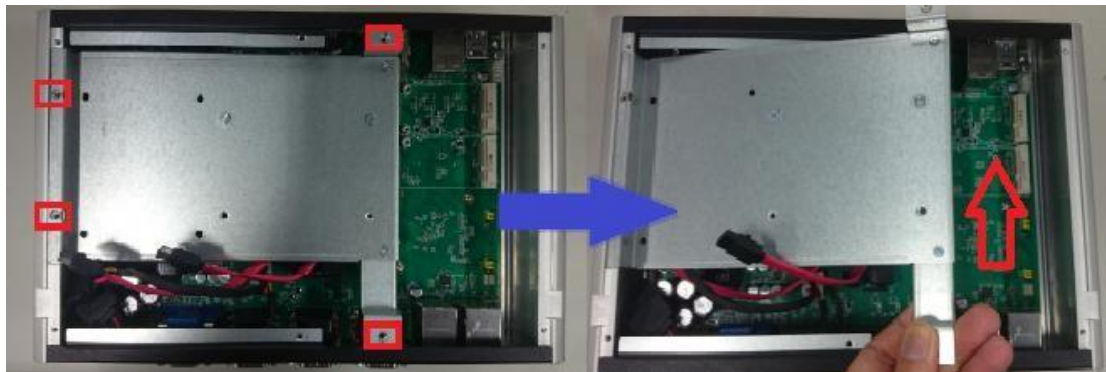
Step 5 Please prepare the following items to assemble HDD.

Get from assembled package

Step 6   Fasten total four screws between two sides of HDD/SSD.

Get from assembled package
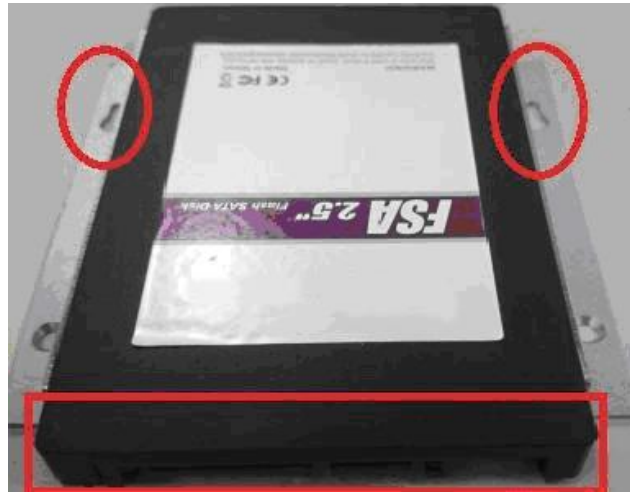
＊**Please notice that you should base on the photo to check HDD's direction.**

Step
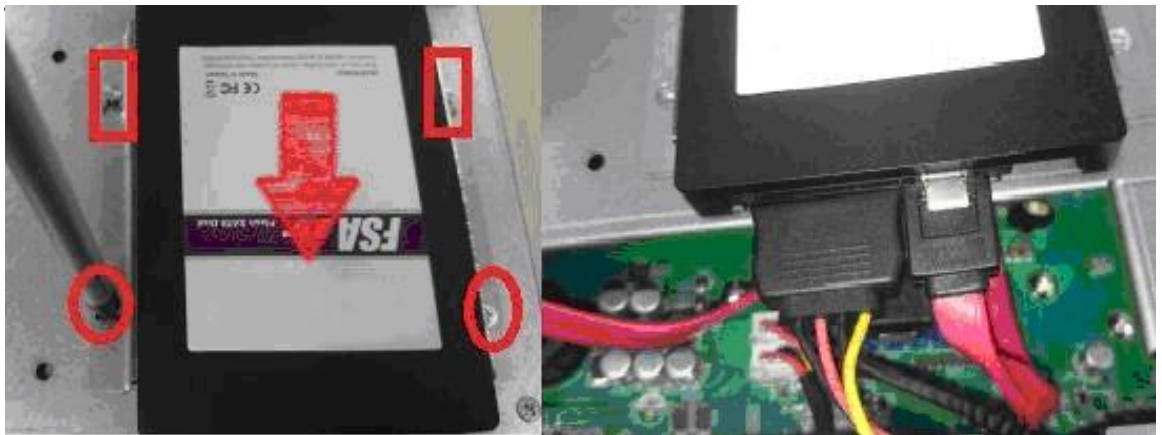
Step 8   Please fasten screws of HDD bracket to complete first HDD installation.

<< HDD-B >>

Step 1 Please find the HDD bracket location then loosen four screws of HDD bracket to take out it.
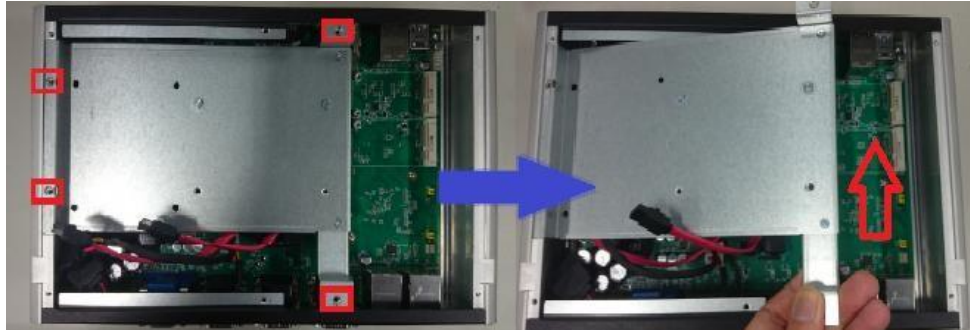
Step 2 You can refer to below photo to find out four screw holes and then set your HDD on bracket.
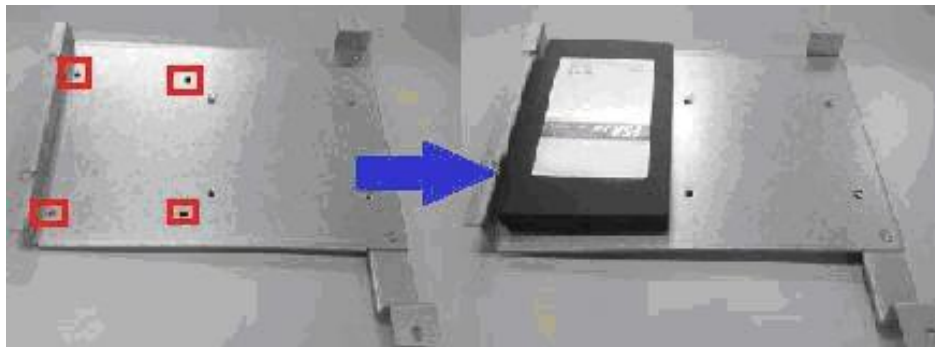
Step 3 Then turn the bracket upside down then fasten screws with your 2.5" HDD/SSD. Connect SATA and Power cables.

Step 4 Finally, set the bracket into chassis then fasten screws to fix it.

2.2   Installing the Express Mini Card

Step 1 **Turn off the system, and unplug the power cord.**
Step 2 **Turn the system upside down to locate screws at the bottom, loosen screws.**

Step 3 **Remove the top cover then find Mini Card location.**
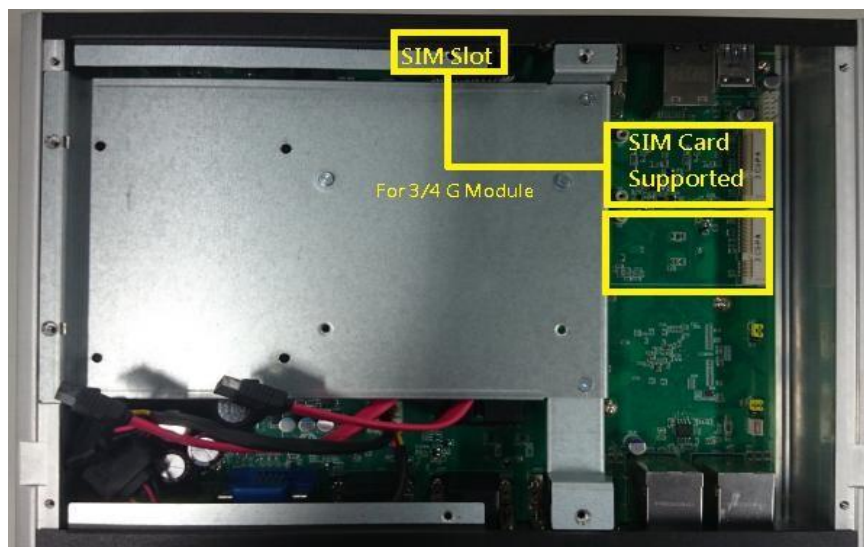
Step 4 **Please follow your requirement to connect PCI Express Mini Card module, EX: 3G/4G, WIFI, mSATA and GPS/Bluetooth modules.**

Slide Mini card into Mini Card slot with caution, and fasten screw of Express Mini Card.

Step 5 **Assembly the Bottom Cover back and fasten all screws.**

2.3   Installing the CFast Card

Step 1   Turn off the system, and unplug the power cord.

Step 2   Turn the system to the side with CFast & SIM cover.

Step 3   Loosen screws to remove the CFast & SIM cover.

Step4   Slide CFast card into CFast slot with caution.

Step5   Close the cover to the chassis and fasten all screws.

2.4 Installing the SIM Card

Step 1 Turn off the system, and unplug the power cord.

Step 2 Turn the system to the side with CFast & SIM cover.

Step 3 Loosen screws to remove the CFast & SIM cover.

Step4 Insert SIM card into SIM slot with caution.

Step5 Close the cover to the chassis and fasten all screws.

2.5   Installing the SO-DIMM Memory

Basically, we strongly recommend you to order SO-DIMM memory from Acnodes, since we can follow your requirement to assemble compatible SO-DIMM memory to avoid any unexpected problems. If you would like to assemble memory or upgrade memory; please refer to the following information to add thermal pad by yourself.

Step 1   Turn off the system, and unplug the power cord.

Step 2   Please loosen all of screws and hexagon copper pillars, since two SO-DIMM slots are on the top side of main board.

Step 3   You can get thermal pad of memory from accessory box.

(If you don't order memory from Acnodes, you will get them from accessory box.)
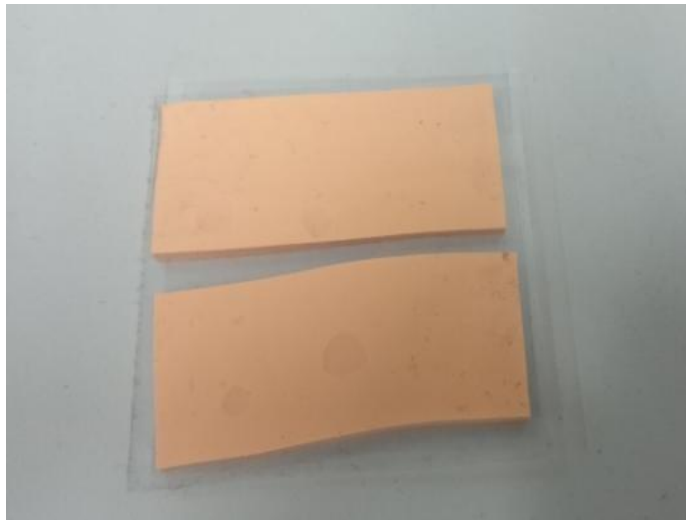
Step 4   Stick the thermal pad onto motherboard then insert your memory to the slot.

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CHAPTER 3
JUMPER SETTING & CONNECTOR

Proper jumper settings configure the **FES8670** to meet your application purpose. We are herewith listing a summary table of all jumpers and default settings for onboard devices, respectively.

3.1 Jumper & Connector Location

SBC87883 Top Side

SBC87883 Bottom Side
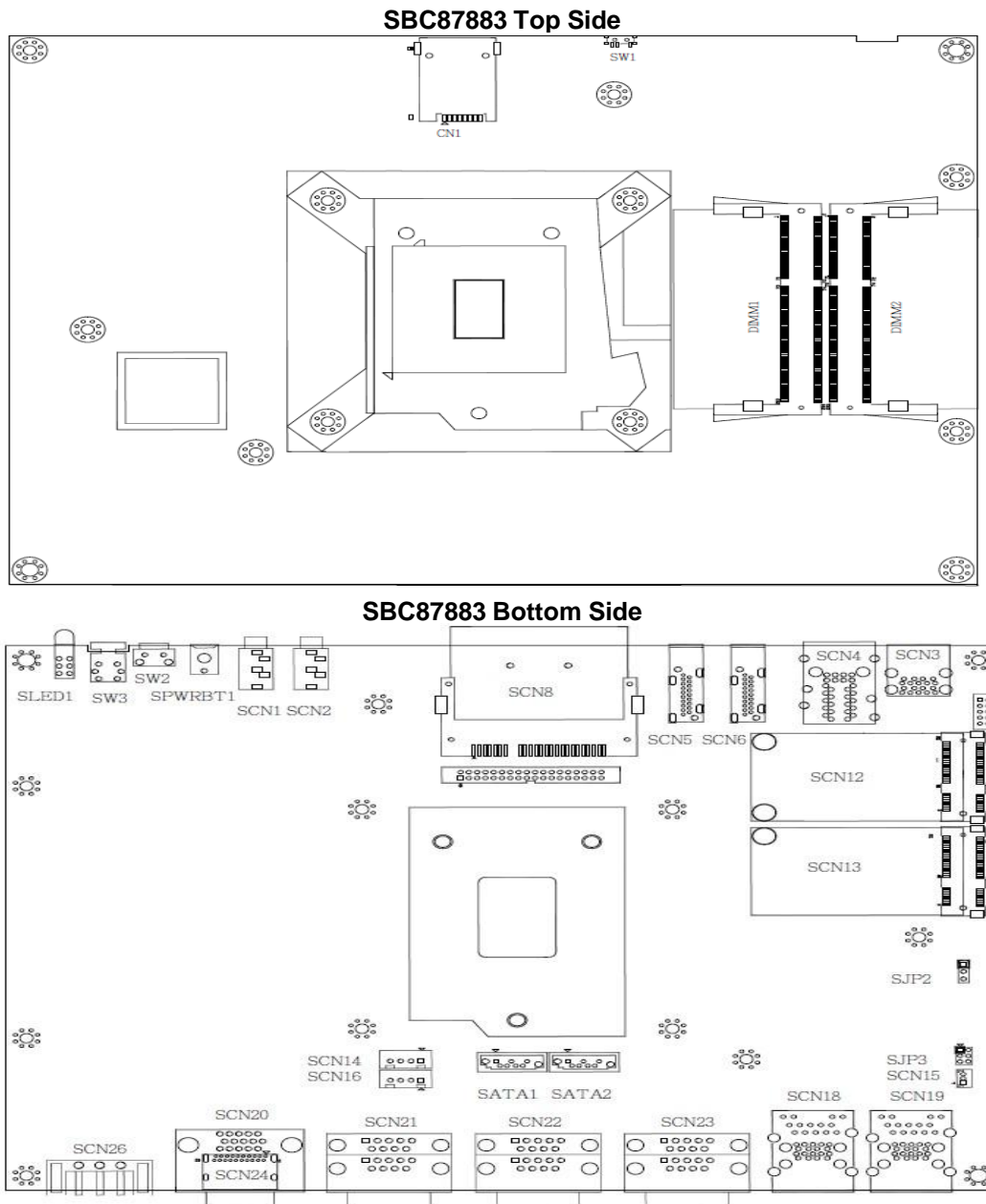
Note: We strongly recommended that you should not modify any unmentioned jumper setting without Acnodes FAE's instruction. Any modification without instruction might cause system to become damage.

3.2 Jumper Setting Summary

Proper jumper settings configure the FES8670 to meet your application purpose. We are herewith listing a summary table of all jumpers and default settings for onboard devices, respectively.

Jumper	Function/Default Setting	Jumper Setting
SJP2	Restore BIOS Optimal Defaults Default: Normal Operation	Short 1-2
SJP3	mSATA / PCIe Selection	SCN12: 3-5 Short SCN13: 4-6 Short

Note: How to setup Jumpers

The illustration shows how to set up jumpers. When the jumper cap is placed on pins, the jumper is "close", if not, that means the jumper is "open".

[Open]   [Closed]   [Pin1-2 Closed]

3.2.1 Restore BIOS Optimal Defaults (SJP2)

Put jumper clip to pin 2-3 for a few seconds then move it back to pin 1-2. Doing this procedure can restore BIOS optimal defaults.

Function	Setting
Normal (Default)	1-2
Clear RTC	2-3

3.2.2 Mini Card Selection (SJP3)

Select mSATA or PCI-Express x1 support on PCI-Express Mini Card socket.

Function	SCN12	SCN13
mSATA	1-3 Short	2-4 Short
PCI-E/USB	3-5 Short	4-6 Short
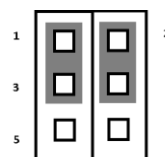
3.3 Connectors

Connectors connect the board with other parts of the system. Loose or improper connection might cause problems. Make sure all connectors are properly and firmly connected. Here is a summary table shows you all connectors and button on the **FES8670** Series.

External Connectors / Buttons	Section
DC-in Phoenix Power Connector	3.3.1
VGA Connector	3.3.2
HDMI Connector	3.3.3
DisplayPort Connector	3.3.4
COM Serial Port Connector	3.3.5
USB 3.0 Connector	3.3.6
Ethernet Connector	3.3.7
Audio Connector	3.3.8
ATX Power On/OFF Button	3.3.9
Rest Button	3.3.10
Remote Power Switch Connector	3.3.11
AT/ATX Switch	3.3.12
SIM Card Slots	3.3.13
Serial ATA Connectors (SATA1-SATA2)	3.3.14
CFast Socket	3.3.15
Digital I/O Connector	3.3.16
PCI Express Mini Card interface	3.3.18

3.3.1 DC-in Phoenix Power Connector

The system supports a wide range 9~36V Phoenix DC-in connector for system power input.

Pin	Signal
1	DC+
2	GND
3	DC-
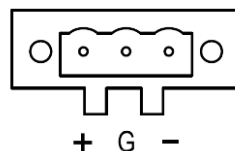
3.3.2 VGA Connector

The VGA connector is a slim type 15-pin D-Sub connector which is common for the CRT VGA display. The VGA interface configuration can be configured via the software utility.

Pin	Signal	Pin	Signal
1	Red	2	Green
3	Blue	4	N.C.
5	GND	6	DETECT
7	GND	8	GND
9	VCC	10	GND
11	N.C.	12	DDC DATA
13	Horizontal Sync	14	Vertical Sync
15	DDC CLK		
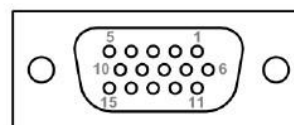
3.3.3 HDMI Connector

The HDMI (High-Definition Multimedia Interface) is a compact digital interface which is capable of transmitting high-definition video and high-resolution audio over a single cable.

Pin	Signal	Pin	Signal
1	HDMI OUT_DATA2+	11	GND
2	GND	12	HDMI OUT Clock-
3	HDMI OUT_DATA2-	13	N.C.
4	HDMI OUT_DATA1+	14	N.C.
5	GND	15	HDMI OUT_SCL
6	HDMI OUT_DATA1-	16	HDMI OUT_SDA
7	HDMI OUT_DATA0+	17	GND
8	GND	18	+5V
9	HDMI OUT_DATA0-	19	HDMI_HTPLG
10	HDMI OUT Clock+		
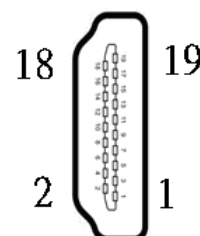
3.3.4 DisplayPort Connector

DisplayPort interface is also called DP port.

Pin	Signal
1	DPB_LANE0
2	GND
3	DPB_LANE0#
4	DPB_LANE1
5	GND
6	DPB_LANE1#
7	DPB_LANE2
8	GND
9	DPB_LANE2#
10	DPB_LANE3
11	GND
12	DPB_LANE3#
13	Detect Pin
14	GND
15	DPB_AUX
16	GND
17	DPB_AUX#
18	DPB_HPDE
19	GND
20	+3.3V
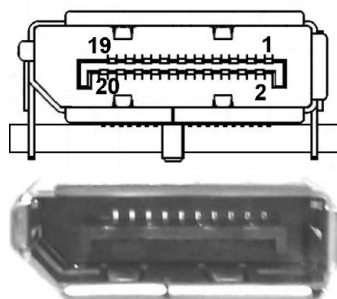
3.3.5 COM1~COM6 Serial Port Connector

The system has six serial ports. COM1~COM6 are RS-232/422/485 ports. Please refer to Chapter 4 for the detail of BIOS setting.

Pin	RS-232	RS-422	RS-485
1	DCD, Data Carrier Detect	TX-	Data-
2	RXD, Receive Data	TX+	Data+
3	TXD, Transmit Data	RX+	No use
4	DTR, Data Terminal Ready	RX-	No use
5	GND, Ground	No use	No use
6	DSR, Data Set Ready	No use	No use
7	RTS, Request To Send	No use	No use
8	CTS, Clear To Send	No use	No use
9	RI, Ring Indicator	No use	No use

COM1~COM6
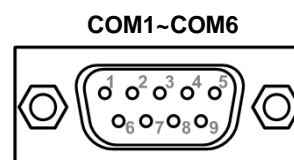
3.3.6 USB 3.0 Connector

The Universal Serial Bus connectors are compliant with USB 3.0 (5Gb/s), and ideally for installing USB peripherals such as keyboard, mouse, scanner, etc.

Pin	Signal USB Port 0	Pin	Signal USB Port 1
1	USB_VCC (+5V level standby power)	10	USB_VCC (+5V level standby power)
2	USB_Data2-	11	USB_Data3-
3	USB_Data2+	12	USB_Data3+
4	GND	13	GND
5	SSRX2-	14	SSRX3-
6	SSRX2+	15	SSRX3+
7	GND	16	GND
8	SSTX2-	17	SSTX3-
9	SSTX2+	18	SSTX3+
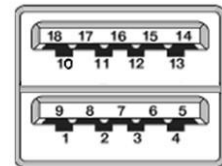
3.3.7 Ethernet Connector (LAN1~LAN4)

The RJ-45 connector is for Ethernet-**(Intel i210-IT, i217-V)**. To connect the board to a 1000/100/10 Base-T hub, just plug one end of the cable into connector and connect the other end (phone jack) to a 1000/100/10-Base-T hub.

Pin	Signal	Pin	Signal
L1	MDI0+	L5	MDI2-
L2	MDI0-	L6	MDI1-
L3	MDI1+	L7	MDI3+
L4	MDI2+	L8	MDI3-
A	Active LED (Yellow)		
B	100 LAN LED (Green)/ 1000 LAN LED (Orange)		
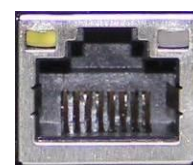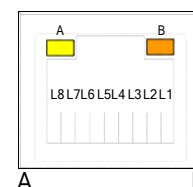
3.3.8 Audio Connector (SCN2, SCN1)

These two audio jacks ideal are for Audio Mic-In and Audio Line-out.

Pin	Signal
1	Line Out
2	Microphone In
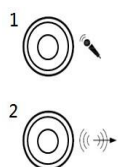
3.3.9 ATX Power On/OFF Button

The ATX power button is on the I/O side. It can allow users to control eBOX635-881-FL power on/off.

Function	Description
On	Turn on/off system
Off	Keep system status

3.3.10 Reset Button

The Reset button can allow users to reset eBOX635-881-FL.

Function	Description
On	Reset system
Off	Keep system status

3.3.11 Remote Power Switch Connector (SPWRBT1)

One 2-pin connector output for remote power on/off switch.

Function	Description
Short(1-2)	Turn on/off system
Open	Keep system status
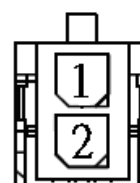
3.3.12 AT/ATX Switch

If you set AT/ATX switch to AT mode, the system will be automatically power on without pressing soft power button during power input; we can use this switch to achieve auto power on demand.

AT ⟷ ATX
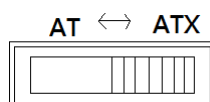
3.3.13 SIM Card Slots

FES8670 includes one SIM slots on the bottom side of the system for inserting SIM Card. It is mainly used in 3G wireless network application.

Pin	Signal	Pin	Signal
1	PWR	5	GND
2	RST	6	VPP
3	CLK	7	IO
4	NC	8	NC

3.3.14 Serial ATA Connectors (SATA1-SATA2)

These Serial Advanced Technology Attachment (Serial ATA or SATA) connectors are for high-speed SATA interfaces. They are computer bus interfaces for connecting to devices such as hard disk drives. This board has two SATA 3.0 ports with 6Gb/s performance.

Pin	Signal
1	GND
2	SATA_TX+
3	SATA_TX-
4	GND
5	SATA_RX-
6	SATA_RX+
7	GND
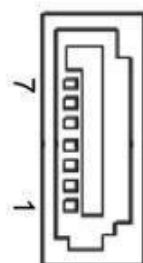
3.3.15 CFast™ Socket

The system is equipped with a CFast™ socket on the bottom side to support a CFast™ card which is based on the Serial ATA bus. The socket is specially designed to avoid incorrect installation of the CFast™ card. When installing or removing the CFast™ card, please make sure the system power is off. The CFast™ card by default identifies itself as C: or D: drive in your PC system.

Pin	Signal	Pin	Signal
S1	GND	PC1	NC
S2	TX+	PC2	GND
S3	TX-	PC3	NC
S4	GND	PC4	NC
S5	RX-	PC5	NC
S6	RX+	PC6	NC
S7	GND	PC7	GND
		PC8	NC
		PC9	NC
		PC10	NC
		PC11	NC
		PC12	NC
		PC13	3.3V
		PC14	3.3V
		PC15	GND
		PC16	GND
		PC17	NC
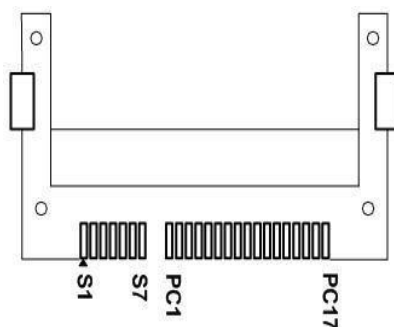
3.3.16 Digital I/O Connector

The system is equipped with 32bit Programmable Digital I/O for 44-pin D-Sub female connectors, please refer to the following table to get default pin define. Default is 16in/16out.

The digital I/O can be configured to control cash drawers and sense warning signals from an Uninterrupted Power System (UPS), or perform store security control. You may use software programming to control these digital signals.

Pin	Signal	Pin	Signal
1	VCC	2	VCC
3	Din	4	Dout
5	Din	6	Dout
7	Din	8	Dout
9	Din	10	Dout
11	Din	12	Dout
13	Din	14	Dout
15	Din	16	Dout
17	Din	18	Dout
19	Din	20	Dout
21	Din	22	Dout
23	Din	24	Dout
25	Din	26	Dout
27	Din	28	Dout
29	Din	30	Dout
31	Din	32	Dout
33	Din	34	Dout
35	GND	36	GND
37	N/A	38	N/A
39	N/A	40	N/A
41	N/A	42	N/A
43	N/A	44	N/A
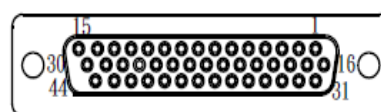
3.3.17 Express Mini Card Slot (SCN12, SCN13)

FES8670 provides two PCI Express Mini Card slots and they all supports a PCI Express x1 link and a USB 2.0 link with mSATA function. **You can adjust SJP3 to set mSATA function for SCN12 or SCN13.**

Pin	Signal	Pin	Signal
1	WAKE#	2	+3.3VSB
3	No use	4	GND
5	No use	6	+1.5V
7	CLKREQ#	8	No use
9	GND	10	No use
11	REFCLK-	12	No use
13	REFCLK+	14	No use
15	GND	16	No use
17	No use	18	GND
19	No use	20	No use
21	GND	22	PERST#
23	PE_RXN3	24	+3.3VSB
25	PE_RXP3	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	PE_TXN3	32	SMB_DATA.
33	PE_TXP3	34	GND
35	GND	36	USB_D8-
37	GND	38	USB_D8+
39	+3.3VSB	40	GND.
41	+3.3VSB	42	No use
43	GND	44	No use
45	No use	46	No use
47	No use	48	+1.5V
49	No use	50	GND
51	No use	52	+3.3VSB

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CHAPTER 4
BIOS SETUP UTILITY

This chapter provides users with detailed description how to set up basic system configuration through the BIOS setup utility.

4.1 Starting

To enter the setup screens, follow the steps below:

1. Turn on the computer and press the <Del> key immediately.
2. After you press the <Del> key, the main BIOS setup menu displays. You can access the other setup screens from the main BIOS setup menu, such as the Advanced and Chipset menus.

It is strongly recommended that you should avoid changing the chipset's defaults. Both AMI and your system manufacturer have carefully set up these defaults that provide the best performance and reliability.

4.2 Navigation Keys

The BIOS setup/utility uses a key-based navigation system called hot keys. Most of the BIOS setup utility hot keys can be used at any time during the setup navigation process. These keys include <F1>, <F2>, <Enter>, <ESC>, <Arrow> keys, and so on.

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

Hot Keys	Description
→← Left/Right	The Left and Right <Arrow> keys allow you to select a setup screen.
↑↓ Up/Down	The Up and Down <Arrow> keys allow you to select a setup screen or sub-screen.
+− Plus/Minus	The Plus and Minus <Arrow> keys allow you to change the field value of a particular setup item.
Tab	The <Tab> key allows you to select setup fields.
F1	The <F1> key allows you to display the General Help screen.
F2	The <F2> key allows you to Load Previous Values.
F3	The <F3> key allows you to Load Optimized Defaults.
F4	The <F4> key allows you to save any changes you have made and exit Setup. Press the <F4> key to save your changes.
Esc	The <Esc> key allows you to discard any changes you have made and exit the Setup. Press the <Esc> key to exit the setup without saving your changes.
Enter	The <Enter> key allows you to display or change the setup option listed for a particular setup item. The <Enter> key can also allow you to display the setup sub- screens.

4.3   Main Menu

The first time you enter the setup utility, you will enter the Main setup screen. You can always return to the Main setup screen by selecting the Main tab. System Time/Date can be set up as described below. The Main BIOS setup screen is shown below.

```
          Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
  Main  Advanced  Chipset  Boot  Security  Save & Exit

  BIOS Version              SBC87883 X002          Set the Date. Use Tab to
  Build Date                07/11/2013             switch between Date elements.

  System Date               [Wed 07/17/2013]
  System Time               [10:55:51]

  Access Level              Administrator


                                                   →←: Select Screen
                                                   ↑↓: Select Item
                                                   Enter: Select
                                                   +/-: Change Opt.
                                                   F1: General Help
                                                   F2: Previous Values
                                                   F3: Optimized Defaults
                                                   F4: Save & Exit
                                                   ESC: Exit


          Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

BIOS Information

Display the auto-detected BIOS information.

System Date/Time

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

Access Level

Display the access level of current user.

4.2   Advanced Menu

● **Launch PXE OpROM**
  Use this item to enable or disable the boot ROM function of the onboard LAN chip when
  the system boots up.

The Advanced menu also allows users to set configuration of the CPU and other system
devices. You can select any of the items in the left frame of the screen to go to the sub menus:

  ► ACPI Settings
  ► CPU Configuration
  ► IDE Configuration
  ► NCT6627UD Super IO Configuration
  ► NCT6627UD HW Monitor

For items marked with "►", please press <Enter> for more options.
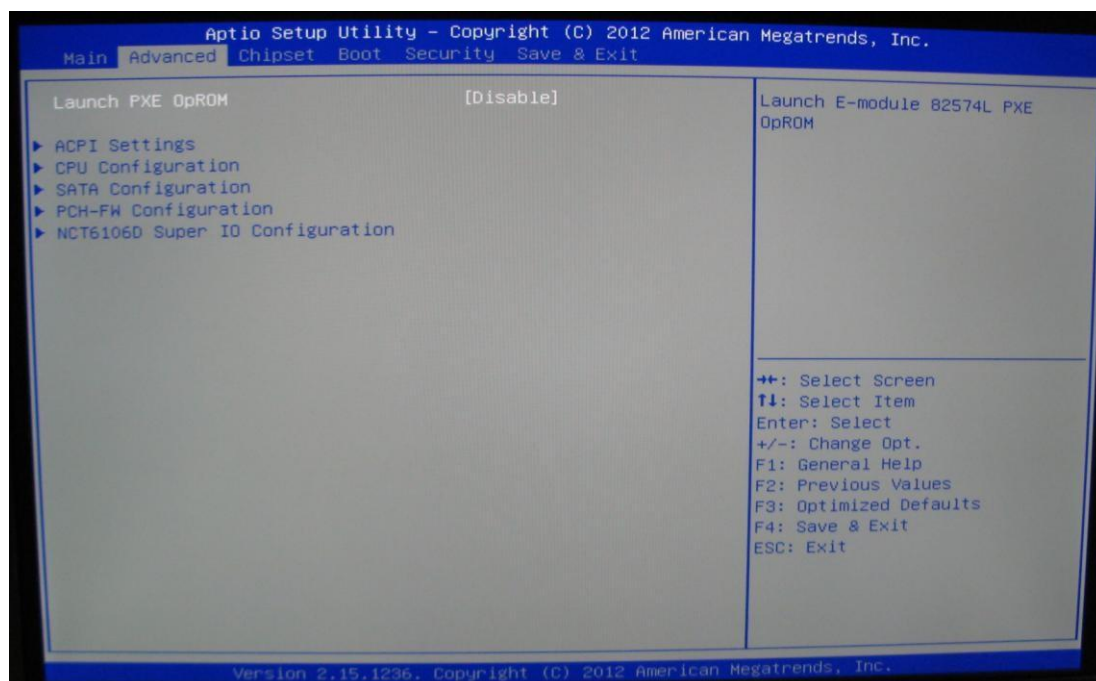
● **ACPI Settings**

You can use this screen to select options for the ACPI configuration, and change the value of the selected option. A description of the selected item appears on the right side of the screen.
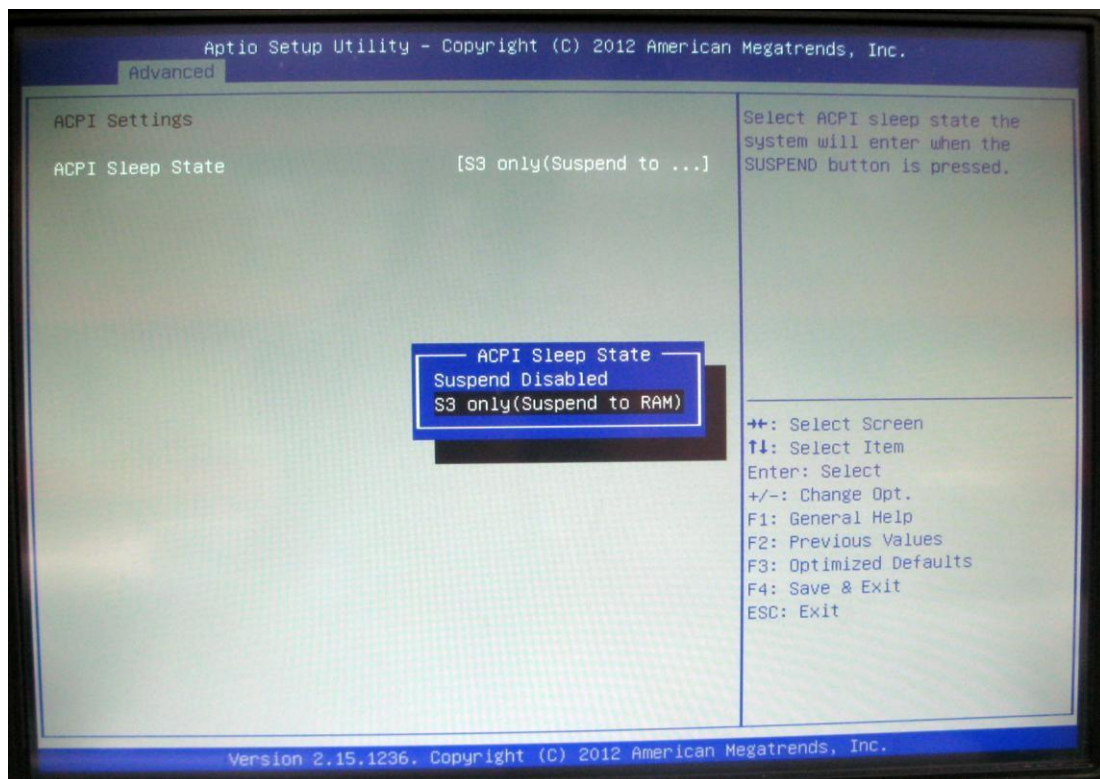
ACPI Sleep State

Allow you to select the Advanced Configuration and Power Interface (ACPI) sleep state. Here are the options for your selection: Suspend Dissabled and S3 (Suspend to RAM). The S3 (Suspend to RAM) option selects the highest ACPI sleep state the system will enter when SUSPEND button is pressed.

● **CPU Configuration**

This screen shows the CPU information.
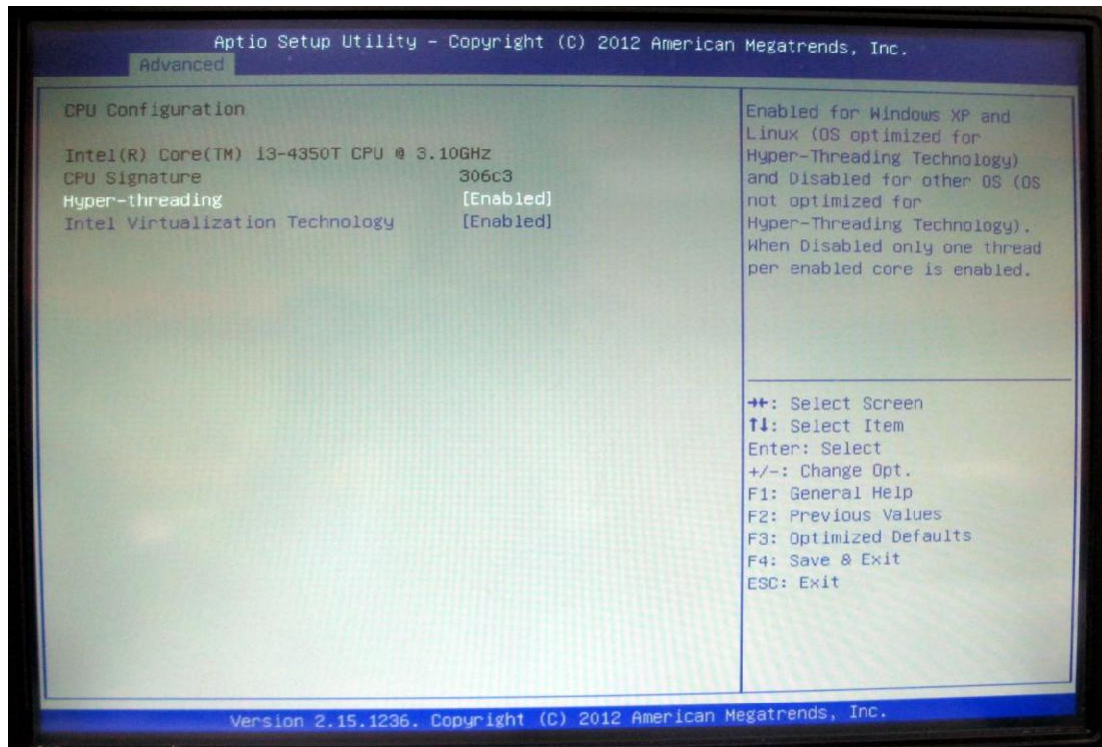
Hyper-threading
To enable hyperthreading you must first enable it in your system's BIOS settings, the default is enabled.

Intel Virtualization Technology
If you want to enable or disable Intel Virtualization Technology function through BIOS, please adjust this item.

● **SATA Configuration**

In this Configuration menu, you can see the currently installed hardware in the SATA ports. During system boot up, the BIOS automatically detects the presence of SATA devices.
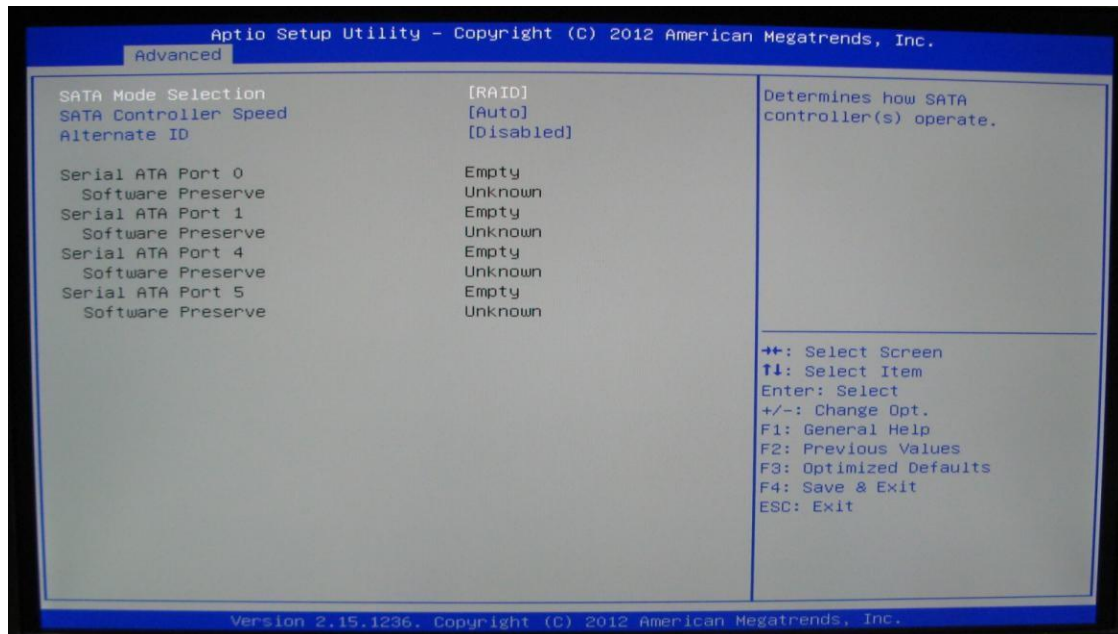
SATA Mode Selection

Determine how SATA controller(s) operate. Operation mode options are **RAID Mode, IDE Mode and AHCI Mode.**

SATA Control Speed

Use this item to choose the SATA speed. Here are the options for your selection: Auto Gen1, Gen2 and Gen3.

● **PCH-FW Configuration**
This screen shows the ME Firmware version, and its detail information.
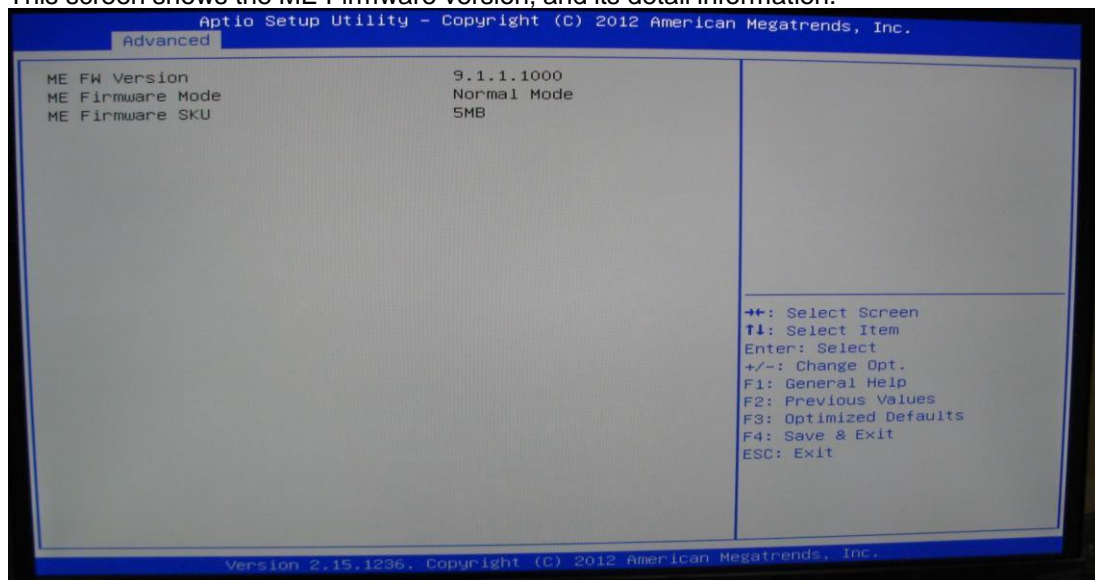
● **NCT6627UD Super IO Configuration**

You can use this screen to select options for the Super IO Configuration, and change the value of the selected option.

A description of the selected item appears on the right side of the screen. For items marked with "►", please press <Enter> for more options.
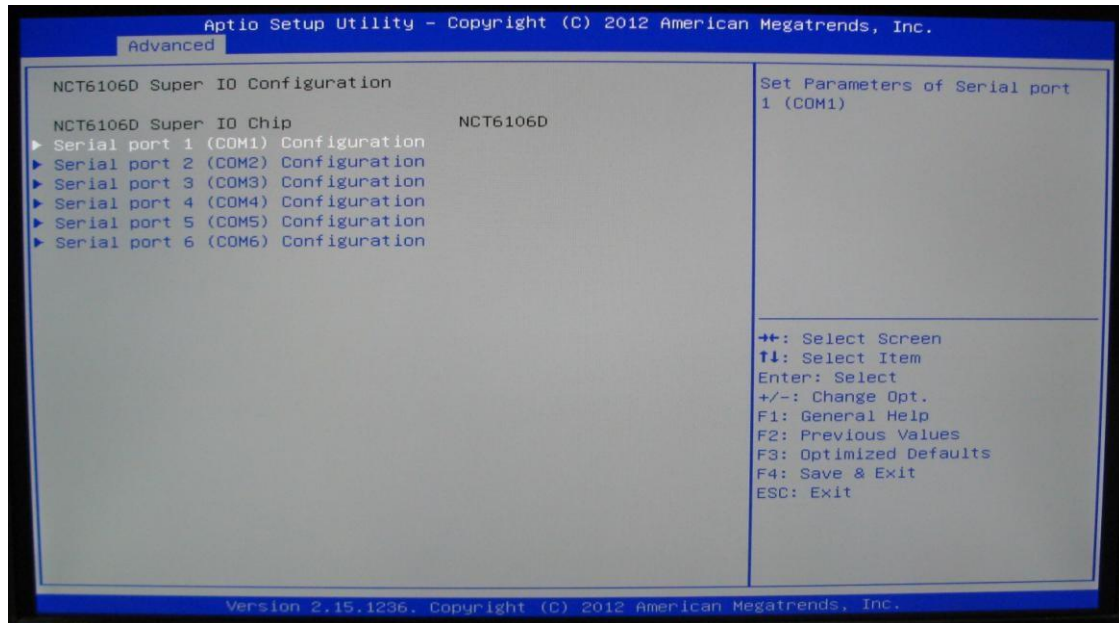
Serial Port 1~6 Configuration

Use these items to set parameters of Serial Port 1~6.

● **Serial Port 1 Configuration**
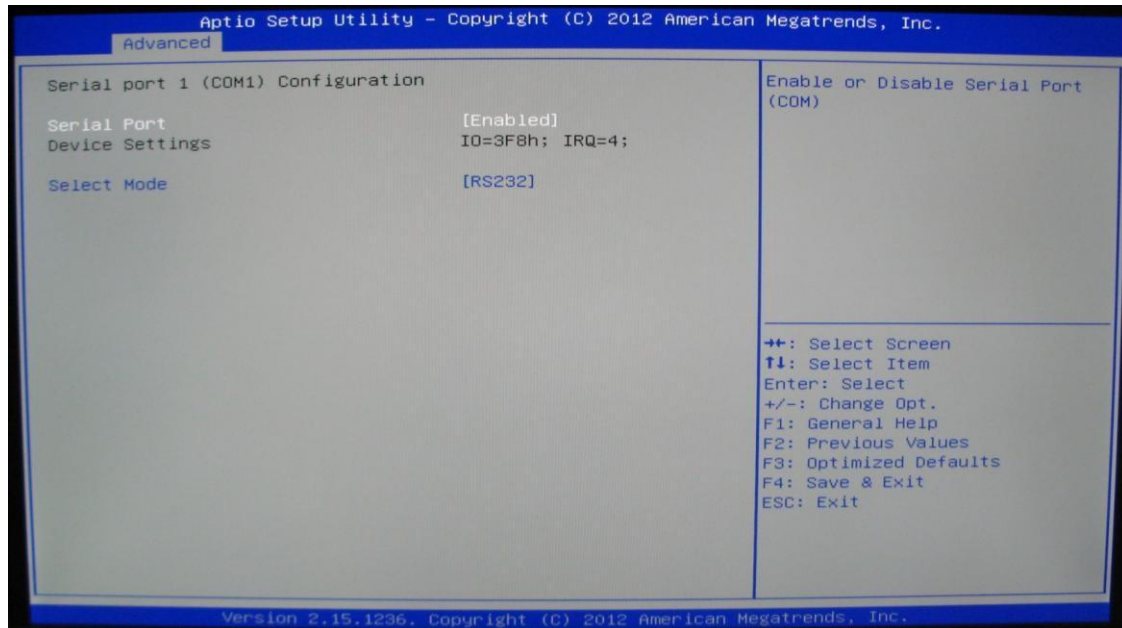

```
           Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
    Advanced

 Serial port 1 (COM1) Configuration                          Enable or Disable Serial Port
                                                             (COM)
 Serial Port                          [Enabled]
 Device Settings                      IO=3F8h; IRQ=4;

 Select Mode                          [RS232]



                                                             →←: Select Screen
                                                             ↑↓: Select Item
                                                             Enter: Select
                                                             +/-: Change Opt.
                                                             F1: General Help
                                                             F2: Previous Values
                                                             F3: Optimized Defaults
                                                             F4: Save & Exit
                                                             ESC: Exit



           Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

Serial Port

Use this item to enable or disable serial port 1. The optimal setting for base I/O address is 3F8h and for interrupt request line is IRQ4.

Select Mode

Use this item to configure serial port 0. Here are the options for your selection:

RS232

RS422

RS485.

● **Serial Port 2 Configuration**
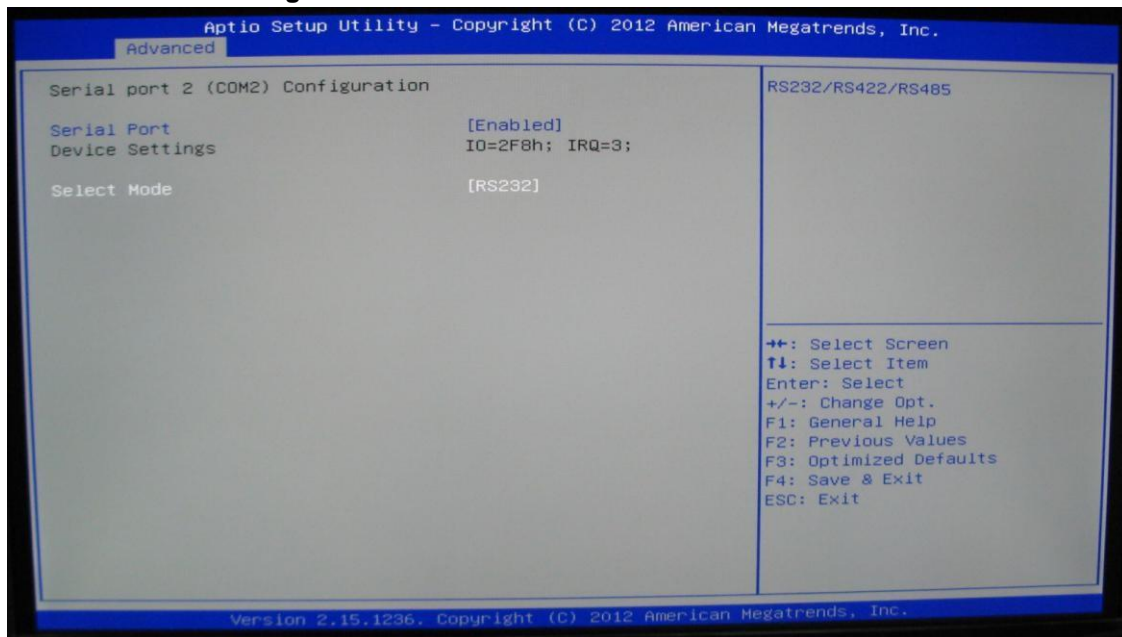
Serial Port

Use this item to enable or disable serial port 1. The optimal setting for base I/O address is 2F8h and for interrupt request line is IRQ3.

Select Mode

Use this item to configure serial port 0. Here are the options for your selection:

RS232

RS422

RS485.

- **Serial Port 3 Configuration**
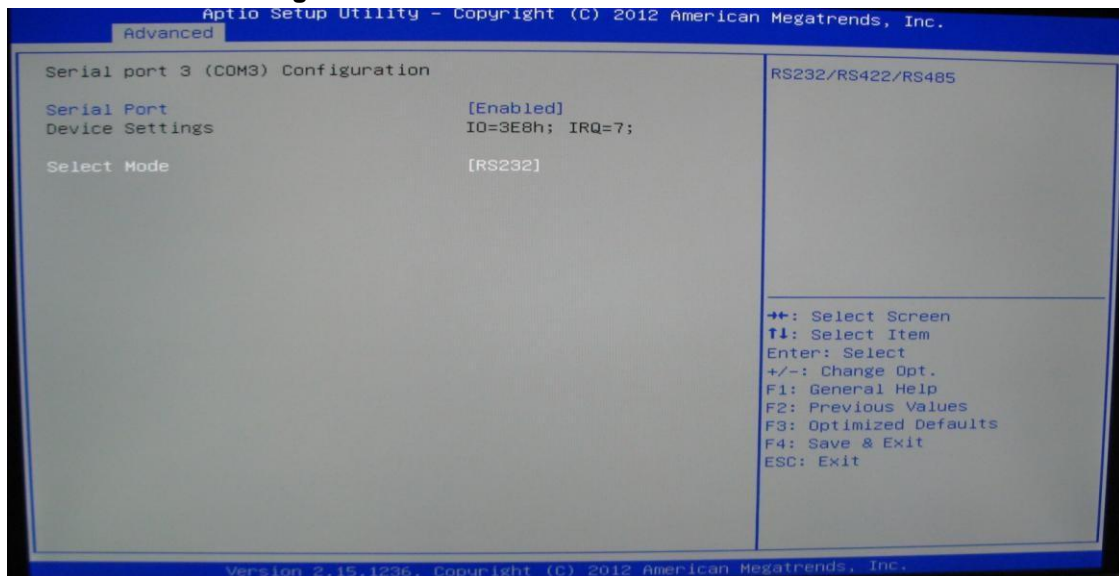
Serial Port

Use this item to enable or disable serial port 1. The optimal setting for base I/O address is 3E8h and for interrupt request line is IRQ7.

Select Mode

Use this item to configure serial port 0. Here are the options for your selection:

RS232

RS422

RS485.

● **Serial Port 4 Configuration**
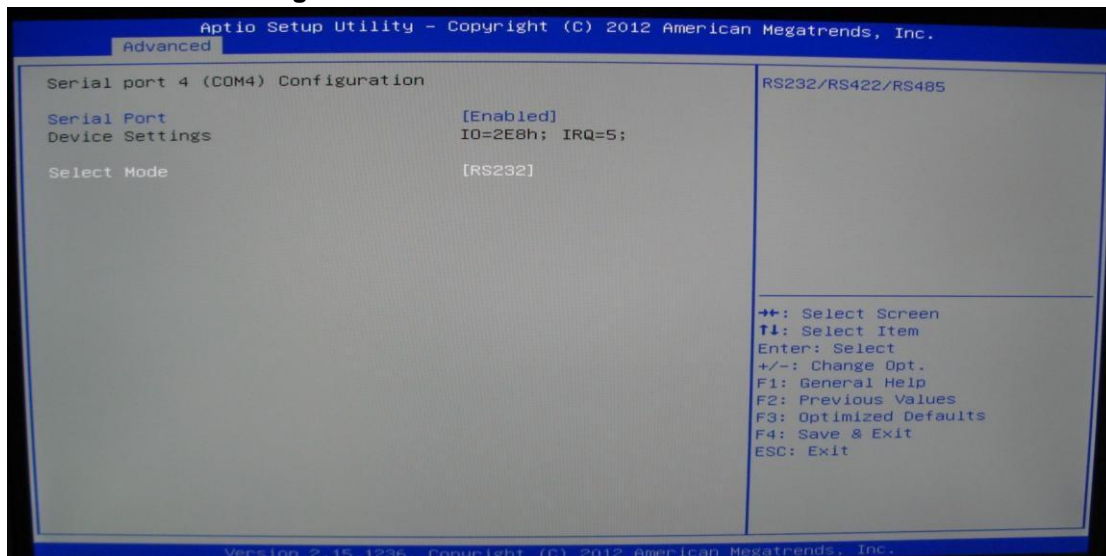
```
         Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
    Advanced

 Serial port 4 (COM4) Configuration                          RS232/RS422/RS485

 Serial Port                        [Enabled]
 Device Settings                    IO=2E8h; IRQ=5;

 Select Mode                        [RS232]




                                                          →←: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F3: Optimized Defaults
                                                          F4: Save & Exit
                                                          ESC: Exit



         Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

Serial Port

Use this item to enable or disable serial port 1. The optimal setting for base I/O address is 2E8h and for interrupt request line is IRQ5.

Select Mode

Use this item to configure serial port 0. Here are the options for your selection:

RS232

RS422

RS485.

● **Serial Port 5 Configuration**
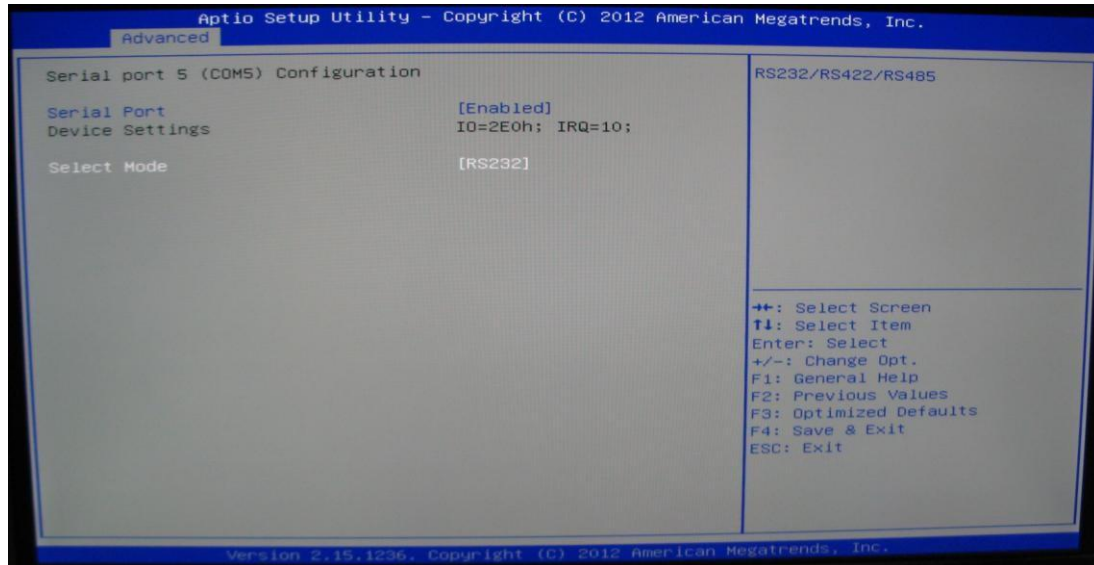
Serial Port

Use this item to enable or disable serial port 1. The optimal setting for base I/O address is 2E0h and for interrupt request line is IRQ10.

Select Mode

Use this item to configure serial port 0. Here are the options for your selection:

RS232

RS422

RS485.

● **Serial Port 6 Configuration**
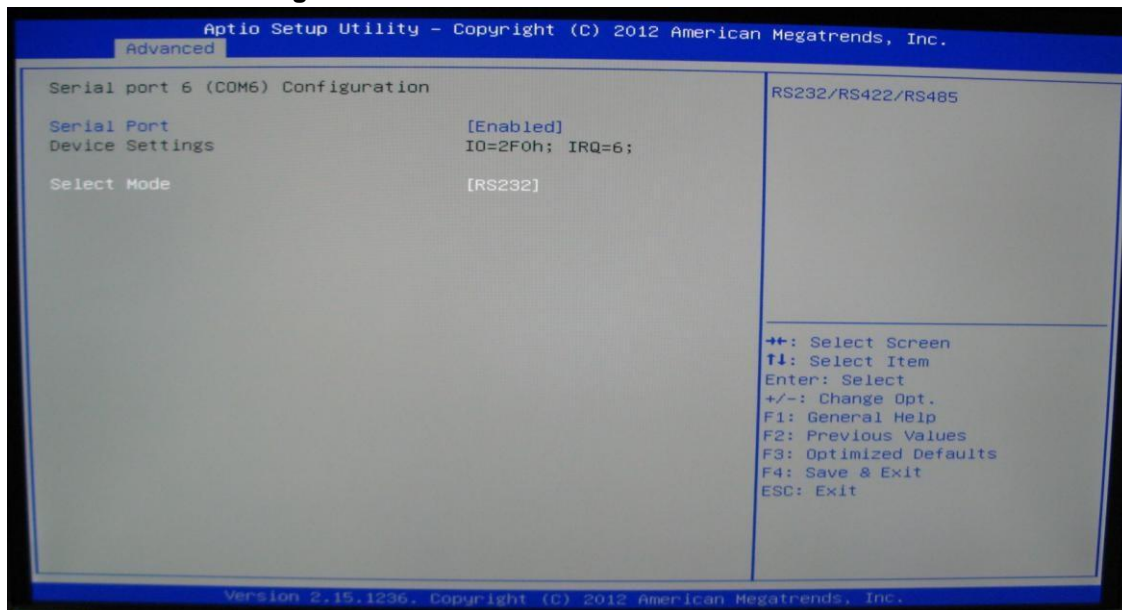
Serial Port

Use this item to enable or disable serial port 1. The optimal setting for base I/O address is 2F0h and for interrupt request line is IRQ6.

Select Mode

Use this item to configure serial port 0. Here are the options for your selection:

RS232

RS422

RS485.

4.3   Chipset Menu

The Chipset menu allows users to change the advanced chipset settings. You can select any of the items in the left frame of the screen to go to the sub menus:

> ► PCH-IO Configuration
> ► System Agent (SA) Configuration

For items marked with "►", please press <Enter> for more options.
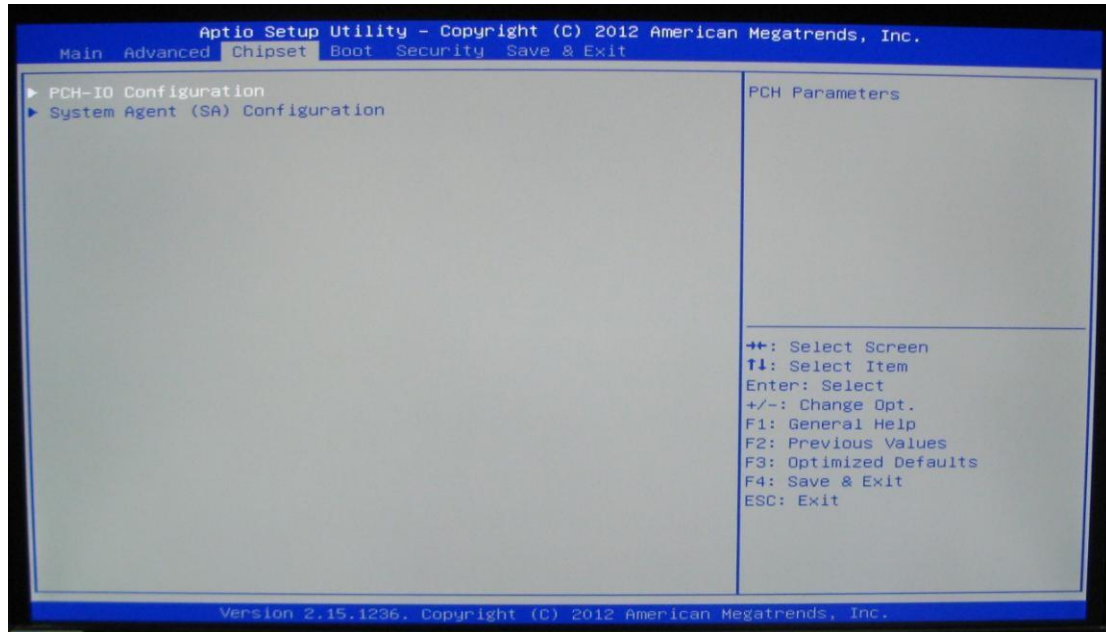
● **PCH-IO Configuration**

This screen shows memory information. For items marked with "►", please press <Enter> for more options.
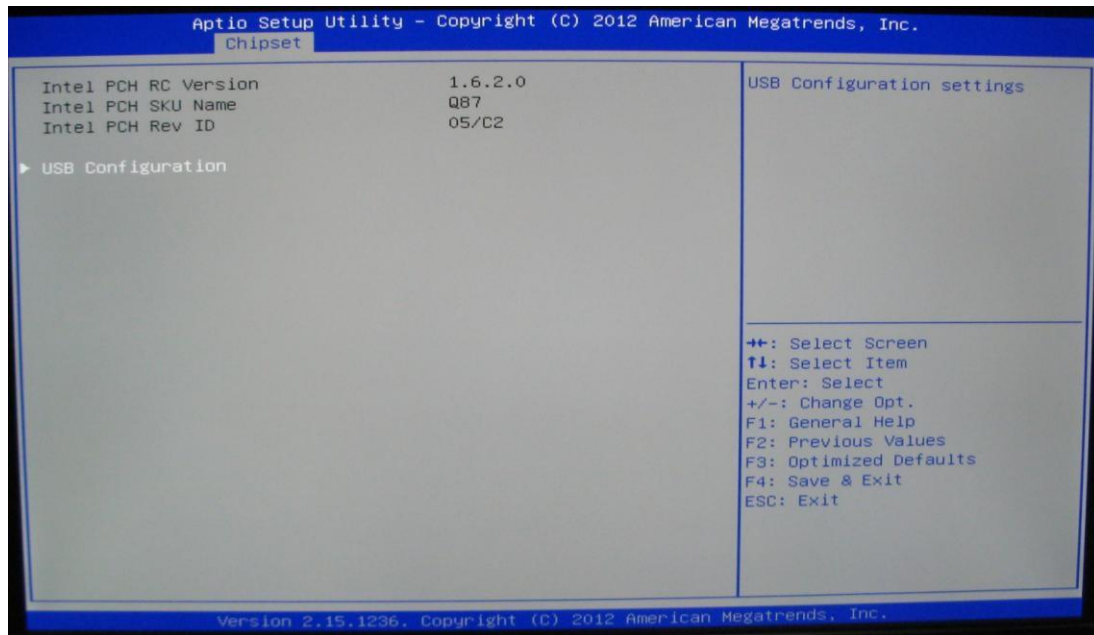
USB Configuration
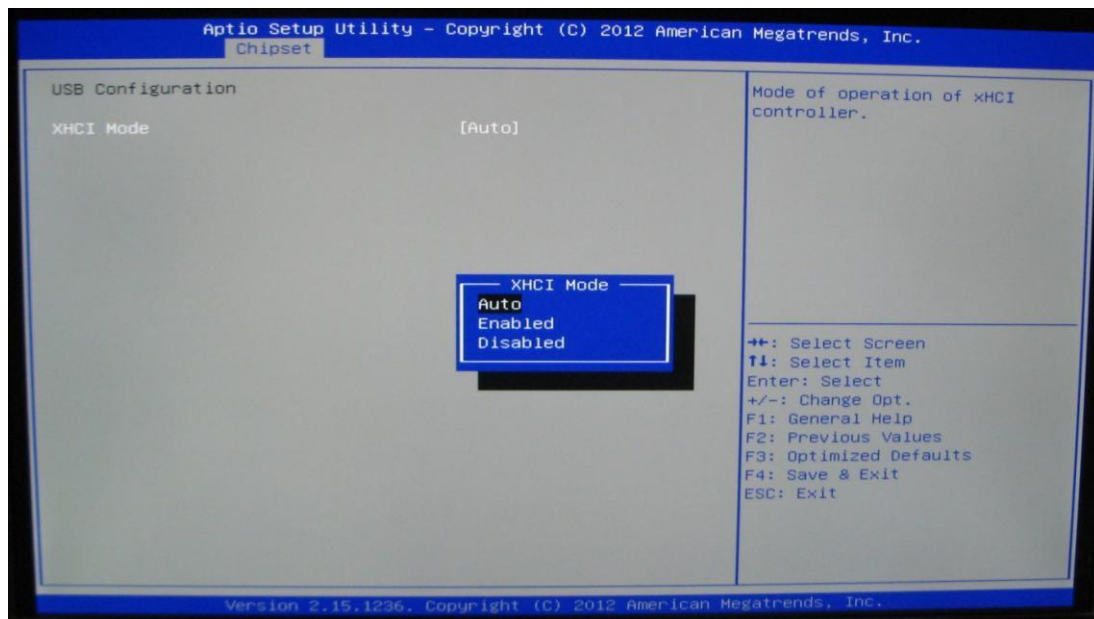
XHCI Mode
Use this item to enable, disable or Auto mode for XHCI, it is one USB Spec compatible and provide an interface to different hardware host controller implementations.

● **System Agent (SA) Configuration**

This screen provides function for specifying internal graphics controller and memory related parameters.
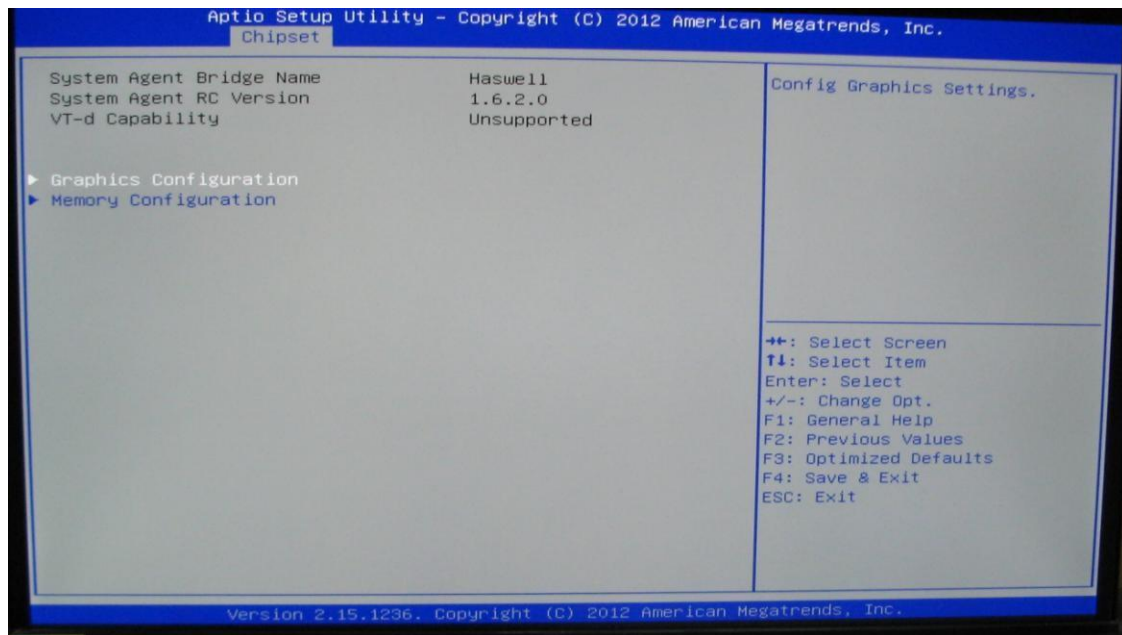
Graphics Configuration

Internal Graphics

You can use this item to select internal graphics to enable or disable.

Graphics Control

Use this item for further setting of graphics control; we can get the following items to choose your display interface, default is auto mode.

Primary IGFX Boot Display

Select the video device which will be activated during POST (Power-On Self Test).

This has no effect if external graphics present.

BIOS Setup Utility

- **Memory Configuration**

Use this item for further setting of memory configuration, this screen displays memory information, and allows user to set memory configuration.

```
            Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
              Chipset

     Memory Information

     Memory RC Version              1.6.2.1
     Memory Frequency               1333 Mhz
     Total Memory                   4096 MB (DDR3)
     Memory Voltage                 1.50v
     DIMM#0                         4096 MB (DDR3)
     DIMM#2                         Not Present


                                                            →←: Select Screen
                                                            ↑↓: Select Item
                                                            Enter: Select
                                                            +/-: Change Opt.
                                                            F1: General Help
                                                            F2: Previous Values
                                                            F3: Optimized Defaults
                                                            F4: Save & Exit
                                                            ESC: Exit



            Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

4.4   Boot Menu

The Boot menu allows users to change boot options of the system.

```
                   Aptio Setup Utility – Copyright (C) 2012 American Megatrends, Inc.
    Main   Advanced   Chipset   Boot   Security   Save & Exit
  ┌─────────────────────────────────────────────────────────┬────────────────────────────┐
   Boot Configuration                                          Number of seconds to wait for
   Setup Prompt Timeout                   1                    setup activation key.
                                                               65535(0xFFFF) means indefinite
   CSM16 Module Version                   07.69                waiting.

   Driver Option Priorities

   Boot Option Priorities
   Boot Option #1                 [SATA  PM: ST3160316...]

   Hard Drive BBS Priorities

                                                              →←: Select Screen
                                                              ↑↓: Select Item
                                                              Enter: Select
                                                              +/-: Change Opt.
                                                              F1: General Help
                                                              F2: Previous Values
                                                              F3: Optimized Defaults
                                                              F4: Save & Exit
                                                              ESC: Exit


               Version 2.15.1226. Copyright (C) 2012 American Megatrends, Inc.
```

Setup Prompt Timeout

Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.

Boot Option Priorities

These are settings for boot priority. Specify the boot device priority sequence from the available devices.

Hard Drive BBS Priorities

This item is for configuring the boot order for a specific device class. Its option(s) is only visible if at least one device for this class is detected.

4.5　Security Menu

The Security menu allows users to change the security settings for the system.

```
                Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
    Main   Advanced   Chipset   Boot   Security   Save & Exit

   Password Description                                Set Administrator Password

   If ONLY the Administrator's password is set,
   then this only limits access to Setup and is
   only asked for when entering Setup.
   If ONLY the User's password is set, then this
   is a power on password and must be entered to
   boot or enter Setup. In Setup the User will
   have Administrator rights.
   The password length must be
   in the following range:
   Minimum length                     3
   Maximum length                     20               →←: Select Screen
                                                       ↑↓: Select Item
                                                       Enter: Select
   Administrator Password                              +/-: Change Opt.
   User Password                                       F1: General Help
                                                       F2: Previous Values
   HDD Security Configuration:                         F3: Optimized Defaults
   HDD0:ST3160316AS                                    F4: Save & Exit
                                                       ESC: Exit


                Version 2.15.1226. Copyright (C) 2012 American Megatrends, Inc.
```
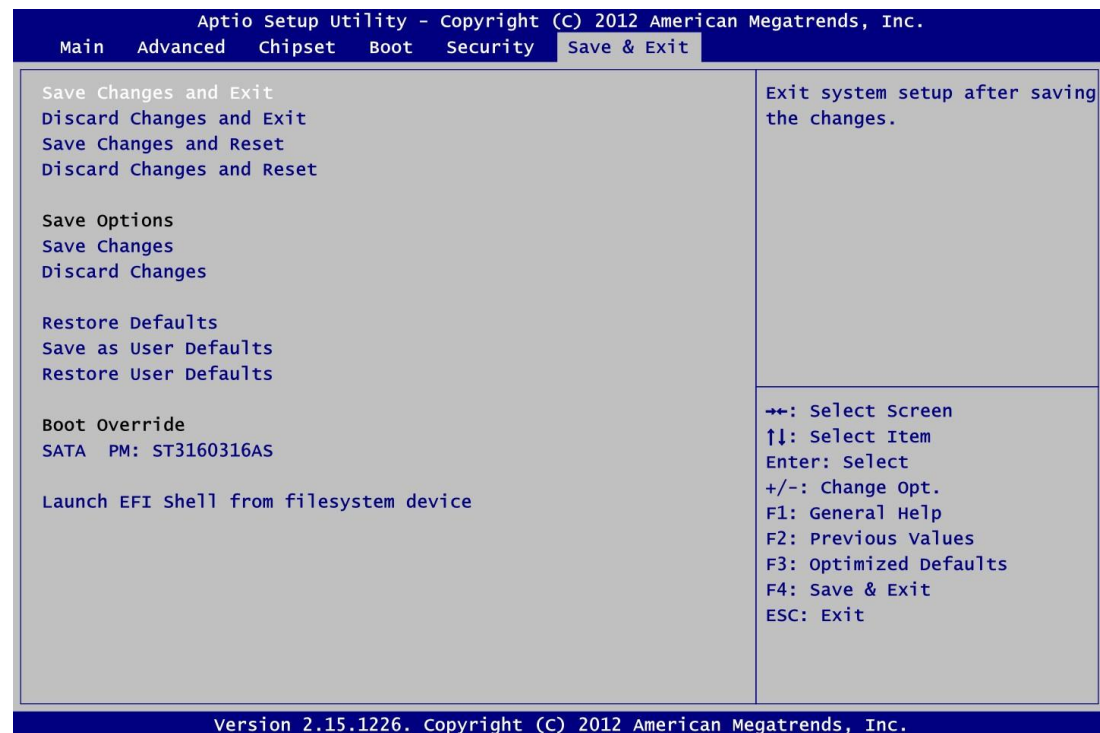
Administrator Password

This item indicates whether an administrator password has been set (installed or uninstalled).

User Password

This item indicates whether an user password has been set (installed or uninstalled).

4.6   Save & Exit Menu

The Save & Exit menu allows users to load your system configuration with optimal or fail-safe default values.

```
            Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
    Main   Advanced   Chipset   Boot   Security   Save & Exit

 Save Changes and Exit                              Exit system setup after saving
 Discard Changes and Exit                           the changes.
 Save Changes and Reset
 Discard Changes and Reset

 Save Options
 Save Changes
 Discard Changes

 Restore Defaults
 Save as User Defaults
 Restore User Defaults
                                                    →←: Select Screen
 Boot Override                                      ↑↓: Select Item
 SATA  PM: ST3160316AS                              Enter: Select
                                                    +/-: Change Opt.
 Launch EFI Shell from filesystem device            F1: General Help
                                                    F2: Previous Values
                                                    F3: Optimized Defaults
                                                    F4: Save & Exit
                                                    ESC: Exit



            Version 2.15.1226. Copyright (C) 2012 American Megatrends, Inc.
```

Save Changes and Exit

When you have completed the system configuration changes, select this option to leave Setup and return to Main Menu. Select Save Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to save changes and exit.

Discard Changes and Exit

Select this option to quit Setup without making any permanent changes to the system configuration and return to Main Menu. Select Discard Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to discard changes and exit.

Save Changes and Reset

When you have completed the system configuration changes, select this option to leave Setup and reboot the computer so the new system configuration parameters can take effect. Select Save Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to save changes and reset.

Discard Changes and Reset

Select this option to quit Setup without making any permanent changes to the system configuration and reboot the computer. Select Discard Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to discard changes and reset.

Save Changes

When you have completed the system configuration changes, select this option to save changes. Select Save Changes from the Save & Exit menu and press <Enter>. Select Yes to save changes.

Discard Changes

Select this option to quit Setup without making any permanent changes to the system configuration. Select Discard Changes from the Save & Exit menu and press <Enter>. Select Yes to discard changes.

Restore Defaults

It automatically sets all Setup options to a complete set of default settings when you select this option. Select Restore Defaults from the Save & Exit menu and press <Enter>.

Save as User Defaults

Select this option to save system configuration changes done so far as User Defaults. Select Save as User Defaults from the Save & Exit menu and press <Enter>.

Restore User Defaults

It automatically sets all Setup options to a complete set of User Defaults when you select this option. Select Restore User Defaults from the Save & Exit menu and press <Enter>.

Boot Override

Select a drive to immediately boot that device regardless of the current boot order.

Launch EFI Shell from filesystem device

Attempt to launch EFI Shell application (Shellx64.efi) from one of   the available filesystem devices.

This page is intentionally left blank.

About Watchdog Timer

Software stability is major issue in most application. Some embedded systems are not watched by human for 24 hours. It is usually too slow to wait for someone to reboot when computer hangs. The systems need to be able to reset automatically when things go wrong. The watchdog timer gives us solution.

The watchdog timer is a counter that triggers a system reset when it counts down to zero from a preset value. The software starts counter with an initial value and must reset it periodically. If the counter ever reaches zero which means the software has crashed, the system will reboot.

Sample Program

Following is example to enable configuration by using debug tool.

● **Enable WDT**

   1. Enable configuration
                 -O 2E 87
                 -O 2E 87

   2. Select Logic device:
                 -O 2E 07
                 -O 2F 08

   3. WDT Device Enable
                 -O 2E 30
                 -O 2F 01

   5. Set timer unit
                 -O 2E F0
                 -O 2F 00 ➜ (00: Sec; 08: Minute)

   4. Set base timer:
                 -O 2E F1
                 -O 2F 0A ➜Set Reset Time (Ex.0A:10 Sec)

● **Disable WDT**

   1. Enable configuration
                 -O 2E 87
                 -O 2E 87

   2. Select Logic device:
                 -O 2E 07
                 -O 2F 08

   3. WDT Device Disable

                 -O 2E 30

                 -O 2F 00

APPENDIX B
PROGRAMMABLE LED

About Programmable LED

FES8670 supports two programmable LED which allows user to program the LED status. It can do as special indicator or alarm. Below is the way to program the LED.

Sample Code

1. Enable configuration

-O 2E 87

-O 2E 87

2. Select Logic device:

-O 2E 07

-O 2F 07

3. Enable GPIO 3x

-O 2E 30

-O 2F 08 -> Set Bit 4 to high.

4. Program Output Status

-O 2E ED

-O 2F 03 -> Set LEDs to light. (Set Bit 0 & Bit 1 to high)

Note: The N has 8 bits. Only bit 0 and bit 1 are for programmable LED and bits 2 to 7 are for other function registers, so please don't set to this range to cause unexpected issues.

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