AEC-6877

Fanless Embedded Controller

Intel® Core™ i7/ i5

Celeron® Processor

with 2 Gigabit Ethernet

2 COM, 4 USB3.0, 2 DisplayPort™

2 PCI or 1 PCI-Express[x4]

DVI-D, CFast™, SATA 3.0Gb/s

AEC-6877 Manual 1st Ed.

September 2012

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- CompactFlash™ is a trademark of the Compact Flash Association.
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Packing List

Before you begin operating your PC, please make sure that the following materials have been shipped:

- 1 AEC-6877 Embedded Controller
- 1 Phoenix Power Connector
- 4 M3 x 4mm Screws
- 6 6# -32 x 10mm Screws
- 2 Wallmount Brackets
- 1 DVD-ROM for manual (in PDF format) and Drivers

If any of these items should be missing or damaged, please contact your distributor or sales representative immediately.

Safety & Warranty

1. Read these safety instructions carefully.
2. Keep this user's manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Do not use liquid or spray detergents for cleaning. Use a damp cloth.
4. For pluggable equipment, the power outlet must be installed near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a firm surface during installation. Dropping it or letting it fall could cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. DO NOT COVER THE OPENINGS.
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient over-voltage.
12. Never pour any liquid into an opening. This could cause fire or electrical shock.
13. Never open the equipment. For safety reasons, only qualified service personnel should open the equipment.
14. If any of the following situations arises, get the equipment checked by service personnel:
    a. The power cord or plug is damaged.
    b. Liquid has penetrated into the equipment.
    c. The equipment has been exposed to moisture.

d. The equipment does not work well, or you cannot get it to work according to the user's manual.

e. The equipment has been dropped and damaged.

f. The equipment has obvious signs of breakage.

15. DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE IS BELOW -20°C (-4°F) OR ABOVE 70°C (158°F). IT MAY DAMAGE THE EQUIPMENT.

FCC

This device complies with Part 15 FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received including interference that may cause undesired operation.

Caution:

There is a danger of explosion if the 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 and your local government's recycling or disposal directives.

Below Table for China RoHS Requirements
产品中有毒有害物质或元素名称及含量
AAEON Boxer/ Industrial System

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚(PBDE)
印刷电路板及其电子组件	×	○	○	○	○	○
外部信号连接器及线材	×	○	○	○	○	○
外壳	×	○	○	○	○	○
中央处理器与内存	×	○	○	○	○	○
硬盘	×	○	○	○	○	○
电源	×	○	○	○	○	○

O：表示该有毒有害物质在该部件所有均质材料中的含量均在 **SJ/T 11363-2006** 标准规定的限量要求以下。

X：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 **SJ/T 11363-2006** 标准规定的限量要求。

备注：
一、此产品所标示之环保使用期限，系指在一般正常使用状况下。
二、上述部件物质中央处理器、内存、硬盘、电源为选购品。

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Appendix B I/O Information

Appendix C RAID & AHCI Settings

Chapter

1

General Information

1.1 Introduction

Due to the growing popularity from the IPC market, the newest Boxer series AEC-6877 has been introduced by AAEON.

The AEC-6877 is a fanless industrial grade embedded controller with superior thermal solution inside which is designed for harsh environment use.

With newly Intel® high performance 3rd generation processor provides customers powerful computing technology and AEC-6877 adopts Intel® QM77 power chipset support three independent displays which is convenient for customer in their applications.

Also with rich I/O ports with VGA, DVI, Display port, Ethernet, RS-232/422/485 and USB 3.0, it helps you shorten product development time to fulfill extensive needs in various projects. AEC-6877 is an ideal embedded platform for implementing custom applications for diversified applications.

Stable Design for Rugged Environment

The AEC-6877 is designed for rugged environments due to the following reasons; first, it can withstand tough vibration testing up to 5g rms. With the anti-vibration hard drive device option, the AEC-6877 can be used in high vibration environments. In addition, the AEC-6877 offers low power consumption system that while operating in ambient temperatures ranging from 0° to 55°C.

The AEC-6877 is a standalone high performance controller designed for long-life operation and with high reliability. It can replace traditional methods and become the mainstream controller for the multimedia entertainment market.

1.2 Features

- Fanless Design
- Intel® Core™ i7-3610QE/ i7-2710QE/ i5-2510E/ Celeron®-B810 Processor
- Intel® QM77 Chipset
- Gigabit Ethernet, RJ-45 x 2
- Three Independent Video Output for 2 DisplayPort™ + VGA or DVI
- USB3.0 x 4
- PCI-Express[x4] Slot x 1 or PCI x 2
- COM x 2

1.3 Specifications

● CPU		Intel® Core™ i7-3610QE 2.3 GHz/ i7-2710QE 2.1 GHz/ i5-2510E 2.5 GHz/ Celeron®-B810 1.6 GHz Processor with socket PGA988
● Chipset		Intel® QM77
● System Memory		204-pin dual-channel DDR3 SODIMM 1066/1333/1600 MHz x 2, up to 16 GB
● Display Interface	VGA	DB-15 x 1
	DVI	DVI-D x 1, support 1920 x 1080 @ 60 Hz
	Others	DisplayPort™ x 2
● Storage Device	SSD	CFast™ slot
	HDD	SATA 6.0Gb/s x 2 support RAID 0, 1, 5, 10
● Network	LAN	Gigabit Ethernet, RJ-45 x 2
	Wireless	Optional by Mini Card
● Front I/O	Serial Port	RS-232 x 1
	Others	Push Power button x 1 Standard Antenna Hole x 2
● Rear I/O	USB Host	USB3.0 x 4
	LAN	RJ-45 x 2
	Serial Port	RS-232/422/485 x 1
	Audio	Mic-in, Line-out, Line-out

	KB/MS	PS/2 Keyboard x 1 + Mouse x 1
	Others	Power input x 1
● Expansion	PCI-E	PCI-E[x4] x 1 (AxM series) or PCI x 2 (BxM series)
● Indicator	Front	Power LED x 1, HDD active LED x 1
● Power Requirement		DC 9~30V with 3-pin terminal block
● System Cooling		Passive cooling
● Mounting		Wallmount
● Operating Temperature		32 °F ~ 122°F (0°C ~ 50°C)—with airflow
● Storage Temperature		-4°F ~ 158°F (-20°C ~ 70°C)
● Storage Humidity		10%~95% @ 40°C, non-condensing
● Anti-Vibration		5 g rms/ 5~500 Hz/ operation-CFast™; 1 g rms/ 5~500 Hz/ operation-HDD
● Anti-Shock		20 G peak acceleration (11 msec. duration) – HDD
● Certification	EMC	CE/FCC Class A
● Dimension (W x H x D)		8.19” x 4.02” x 9.37” (208mm x 102mm x 238mm)
● Gross Weight		13.2 lb (6 Kg)
● OS Support		Windows® XP Embedded, Windows® XP, Windows® 7, Linux Fedora 10

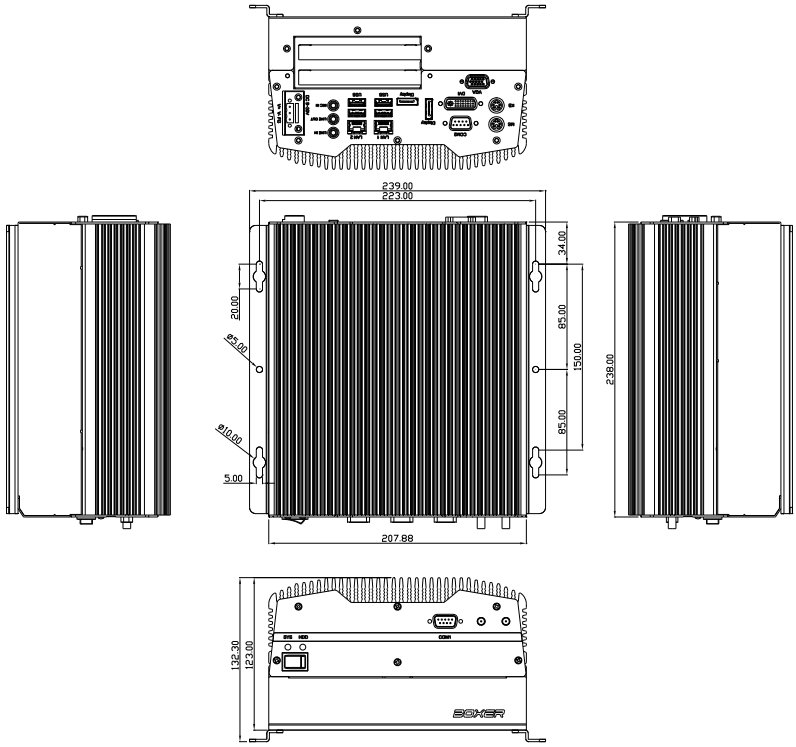

MS
KB
COM2
VGA
DVI
Display
Display
LAN 1
LAN 2
USB
USB
LINE IN
LINE OUT
MIC IN
9V~36V DC

Chapter

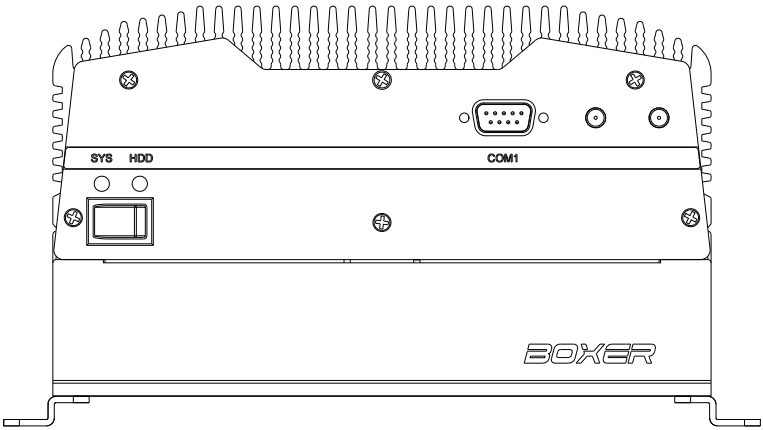
2

Hardware Installation

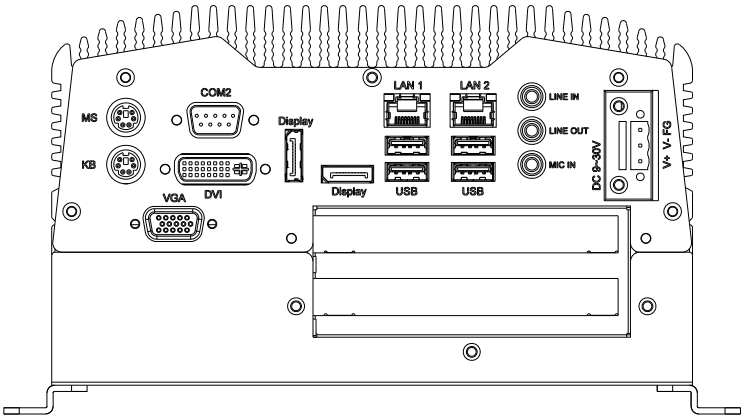
2.1 Dimension



Front side



Rear side



2.2 COM1 ~ COM2 TX / RX LED (CN2)

Pin	Signal	Pin	Signal
1	+5V	2	GND
3	TX_LED_COM1	4	-TX_LED_COM1
5	RX_LED_COM1	6	-RX_LED_COM1
7	COM2_RS232_PWR	8	GND
9	TX_LED_COM2	10	-TX_LED_COM2
11	RX_LED_COM2	12	-RX_LED_COM2
13	COM2_RS485_PWR	14	COM2_RS422_PWR

Note: The COM port cannot support baud rate at 115200 since the hardware limitation of the motherboard EMB-QM77.

2.3 RS-232 Box Header (COM 1)

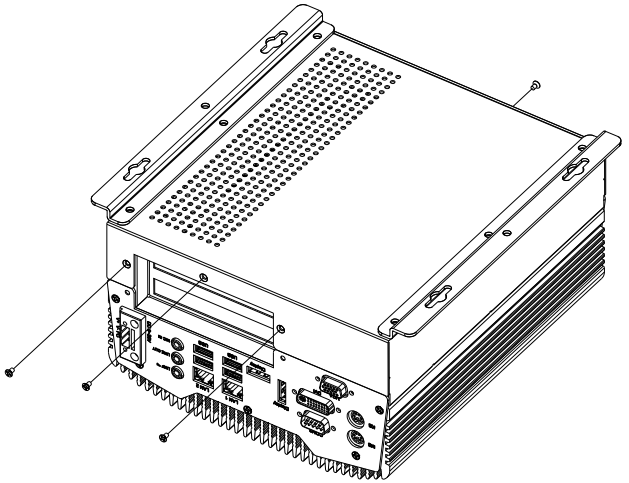
Pin	Signal	Pin	Signal
1	DCD	2	RXD
3	TXD	4	DTR
5	GND	6	DSR
7	RTS	8	CTS
9	RI	10	N.C

2.4 USB Box Header (USB1 ~ USB3)

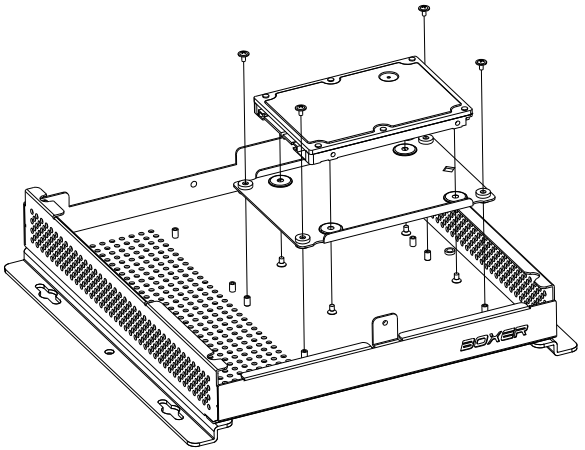
Pin	Signal	Pin	Signal
1	+5V	2	GND
3	USBD-	4	GND
5	USBD+	6	USBD+
7	GND	8	USBD-
9	GND	10	+5V

2.5 HDD Installation

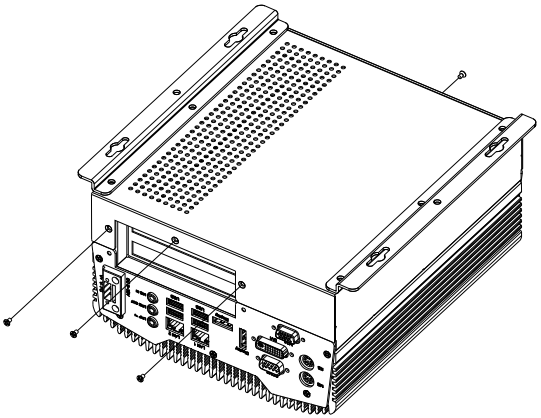
Step 1: Unfasten the four screws on the front and rear panels



Step 2: Place the HDD to the HDD bracket and fasten to the bottom lid of AEC-6877

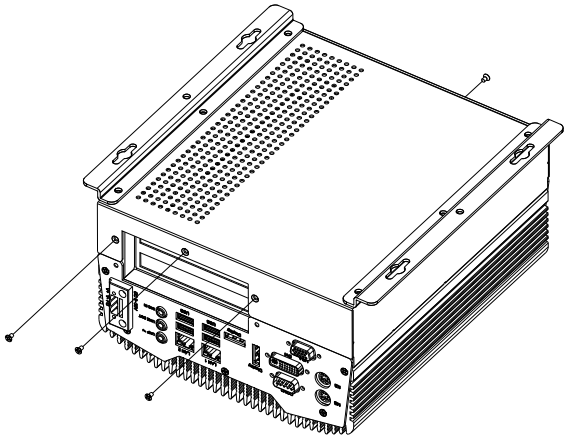


Step 3: Fasten the screws on the front and rear panels, and the brackets of AEC-6877

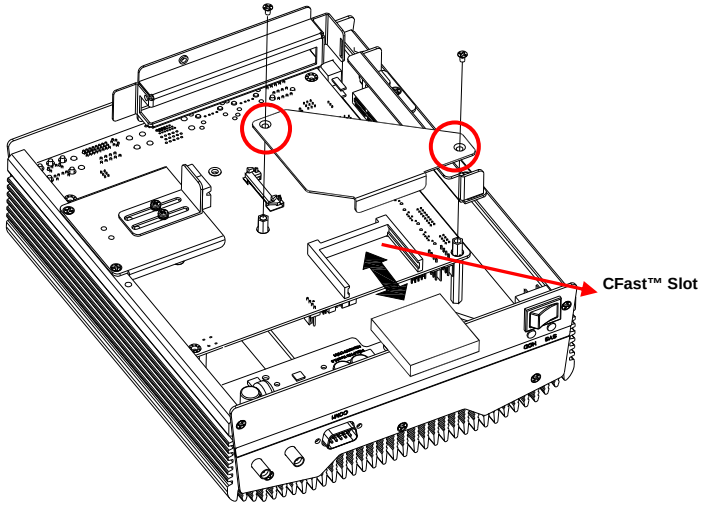


2.6 CFast™ Card Installation

Step 1: Unfasten the screws on the front and rear panels

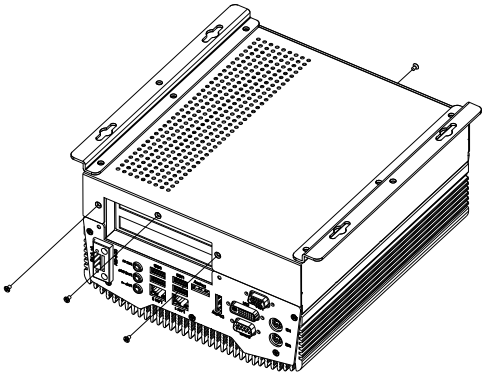


Step 2: After installing the CFast™ Card to the CFast™ Slot, you have to use the cover to fix the CFast™ Card by fastening the two screws

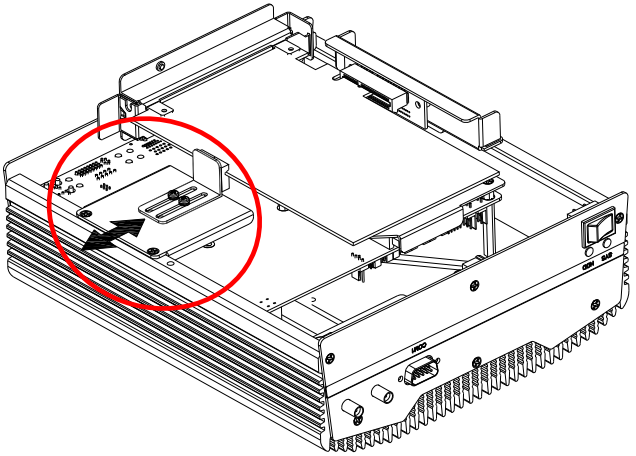


2.7 PCI-Express Card Installation

Step 1: Unfasten the screws on the front and rear panels

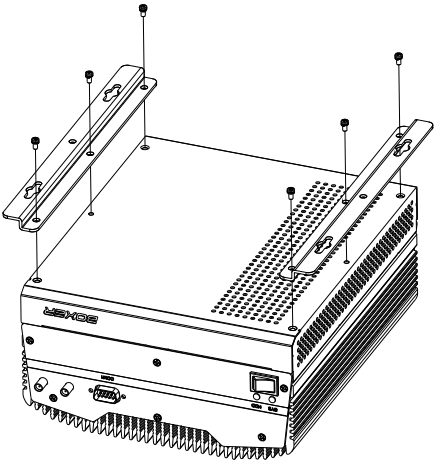


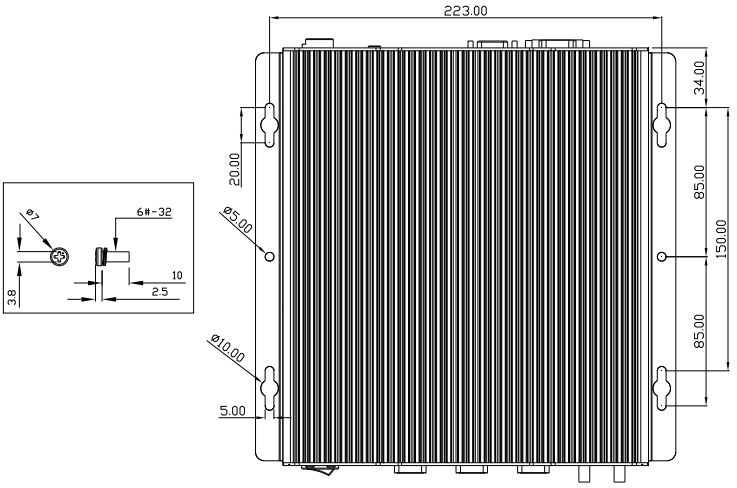
Step 2: Install a hold-down bracket to fix the PCI or PCI-Express Card and make sure the PCI or PCI-Express Card installs properly



2.8 Wallmount Bracket Installation

Fasten the brackets with the appropriate screws.





Chapter

3

AMI BIOS Setup

3.1 System Test and Initialization

These routines test and initialize board hardware. If the routines encounter an error during the tests, you will either hear a few short beeps or see an error message on the screen. There are two kinds of errors: fatal and non-fatal. The system can usually continue the boot up sequence with non-fatal errors.

System configuration verification
These routines check the current system configuration stored in the CMOS memory and BIOS NVRAM. If system configuration is not found or system configuration data error is detected, system will load optimized default and re-boot with this default system configuration automatically.

There are four situations in which you will need to setup system configuration:
1. You are starting your system for the first time
2. You have changed the hardware attached to your system
3. The system configuration is reset by Clear-CMOS jumper
4. The CMOS memory has lost power and the configuration information has been erased.

The AEC-6877 CMOS memory has an integral lithium battery backup for data retention. However, you will need to replace the complete unit when it finally runs down.

3.2 AMI BIOS Setup

AMI BIOS ROM has a built-in Setup program that allows users to modify the basic system configuration. This type of information is stored in battery-backed CMOS RAM and BIOS NVRAM so that it retains the Setup information when the power is turned off.

Entering Setup

Power on the computer and press <Del>or <F2> immediately. This will allow you to enter Setup.

Main

Set the date, use tab to switch between date elements.

Advanced

Advanced BIOS Features Setup including TPM, ACPI, etc.

Chipset

Host bridge parameters.

Boot

Enables/disable quiet boot option.

Security

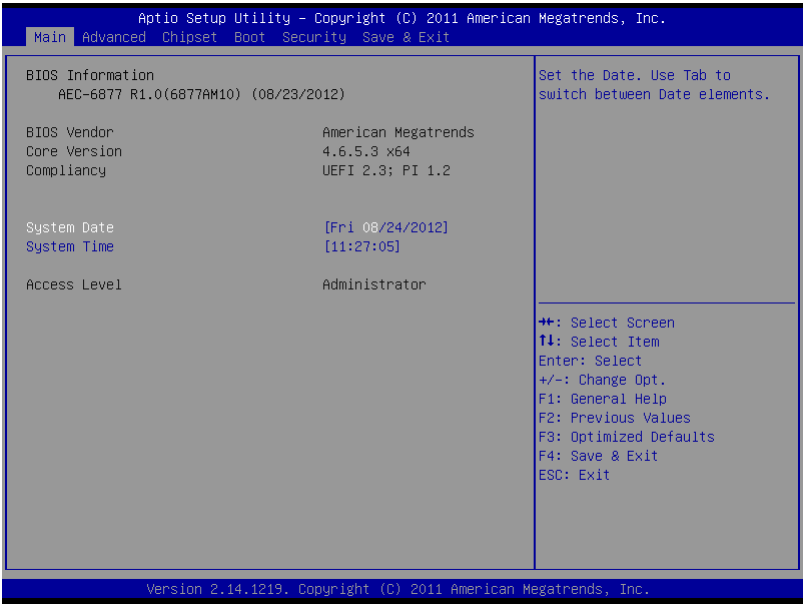
Set setup administrator password.

Save&Exit

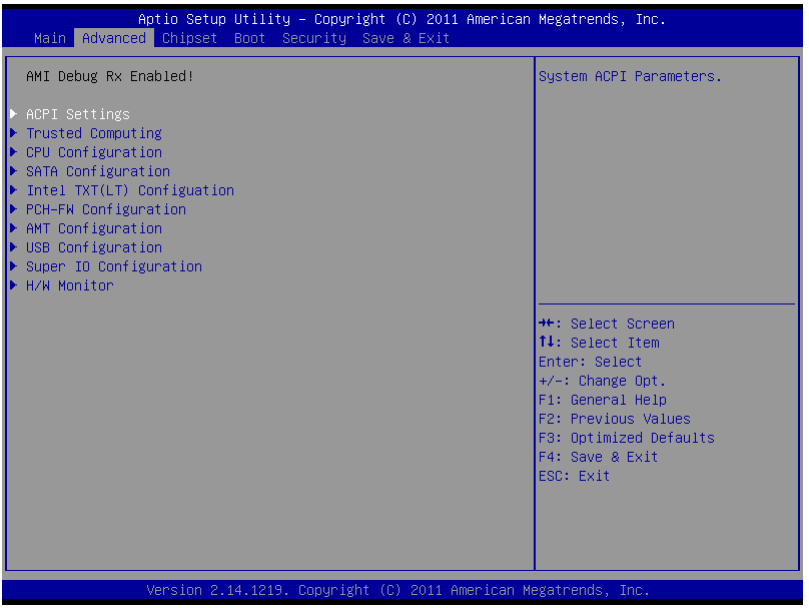
Exit system setup after saving the changes.

Setup Menu

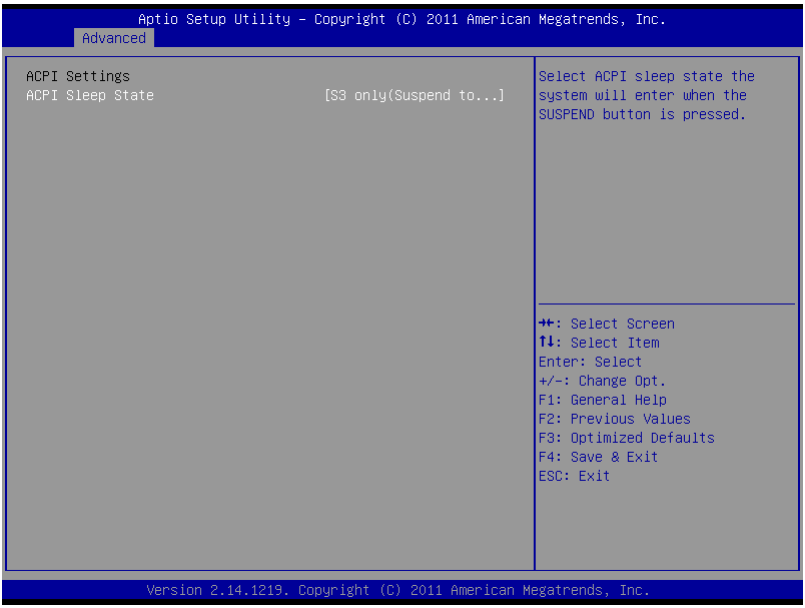
Setup submenu: Main



Setup submenu: Advanced



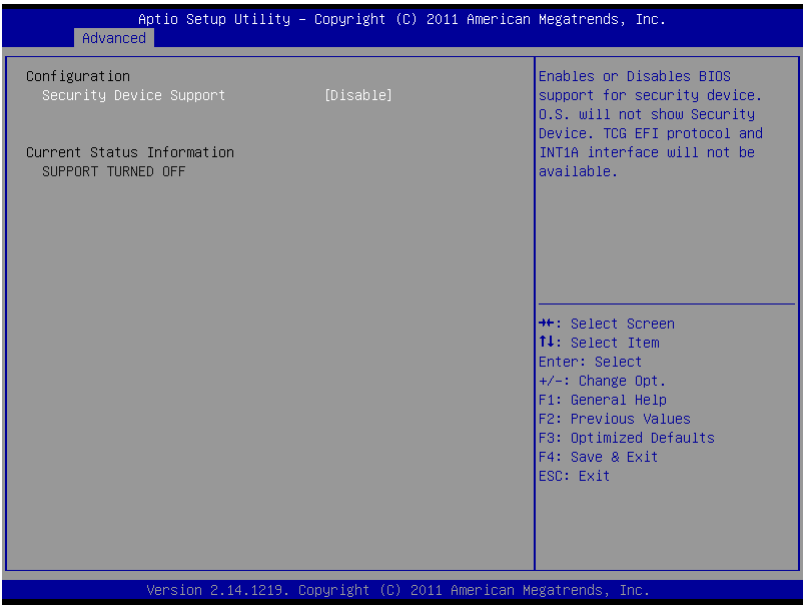
ACPI Settings



Options Summary :

ACPI Sleep State	Suspend Disabled	
	S1 (CPU Stop Clock)	
	S3 (Suspend to RAM)	Default
Select the ACPI sleep state the system will enter when the SUSPEND button is pressed.		

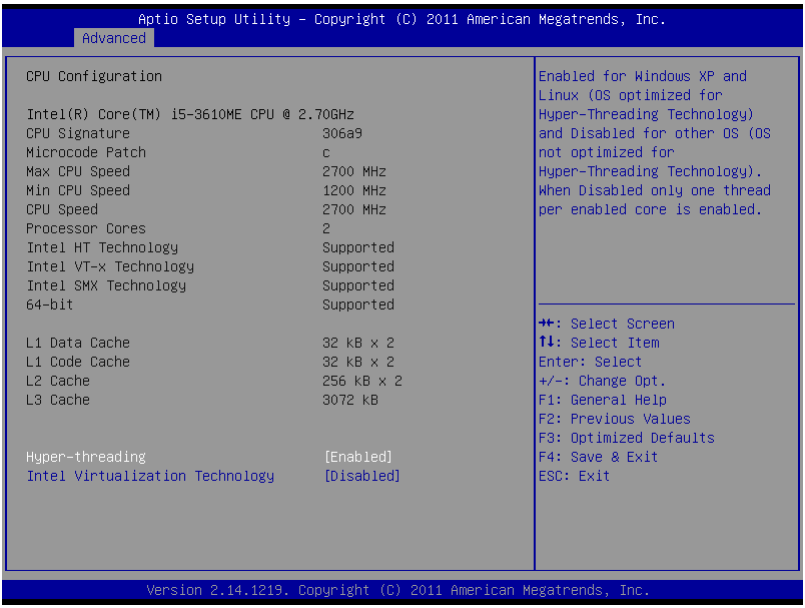
Trusted Computing



Option Summary :

TPM SUPPORT	Disable	Default
	Enable	
Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.		

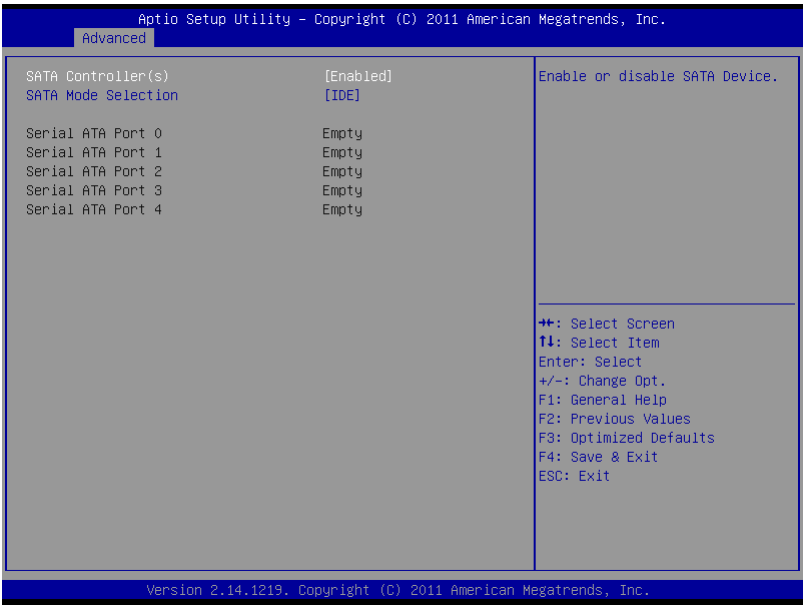
CPU Configuration



Options Summary :

Hyper-threading	Disabled	
	Enabled	Default
Enabled for Windows XP and Linux (OS optimized for Hyper-Threading Technology) and Disabled for other OS (OS not optimized for Hyper-Threading Technology). When Disabled only one thread per enabled core is enabled.		
Intel Virtualization Technology	Disabled	Default
	Enabled	
When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology		

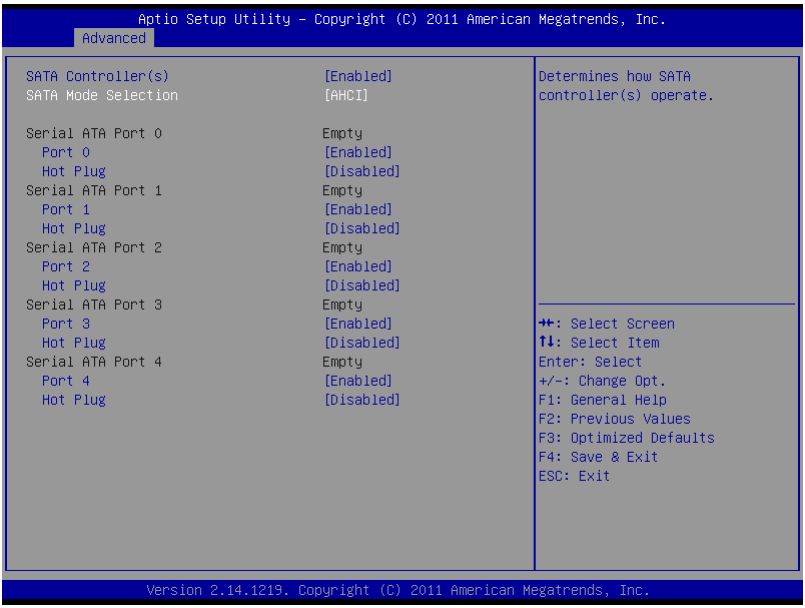
SATA Configuration (IDE)



Options Summary :

SATA Controller(s)	Enabled	Default
	Disabled	
Enable or disable SATA Device.		
SATA Mode Selection	IDE	Default
	AHCI	
	RAID	
Determines how SATA controller(s) operate.		

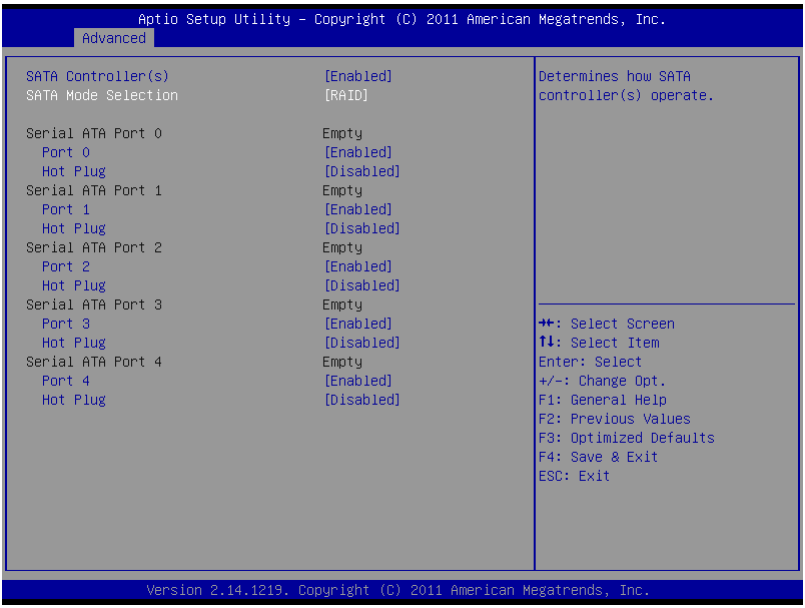
IDE Configuration (AHCI)



Options Summary :

SATA Controller(s)	Disabled	
	Enabled	Default
Enable or Disable SATA Port.		
SATA Mode Selection	IDE	
	AHCI	Selected
	RAID	
Determines how SATA controller(s) operate.		
Port 0 ~ Port 4	Disable	
	Enabled	Enabled
Enable or Disable SATA Port		
Serial ATA Port Hot Plug Port 0 ~ Port 4	Disable	Default
	Enabled	
Designates this port as Hot Pluggable.		

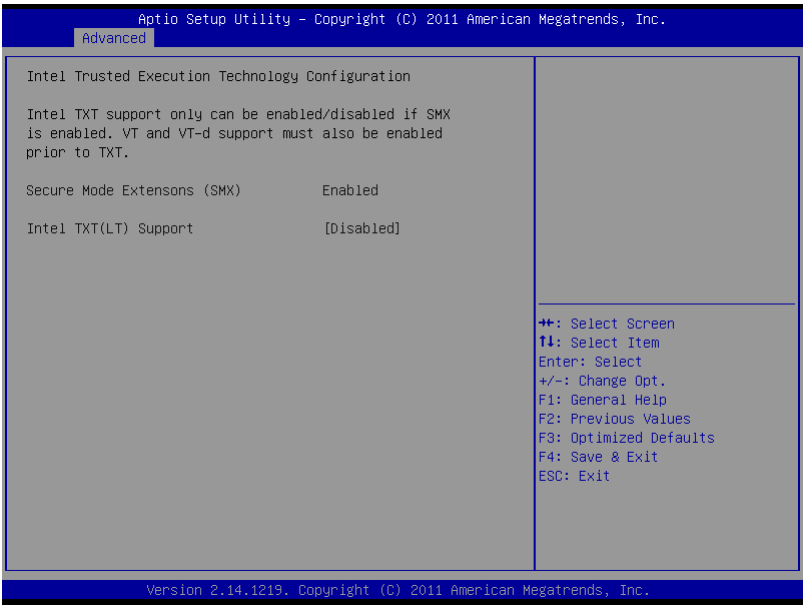
IDE Configuration (RAID)



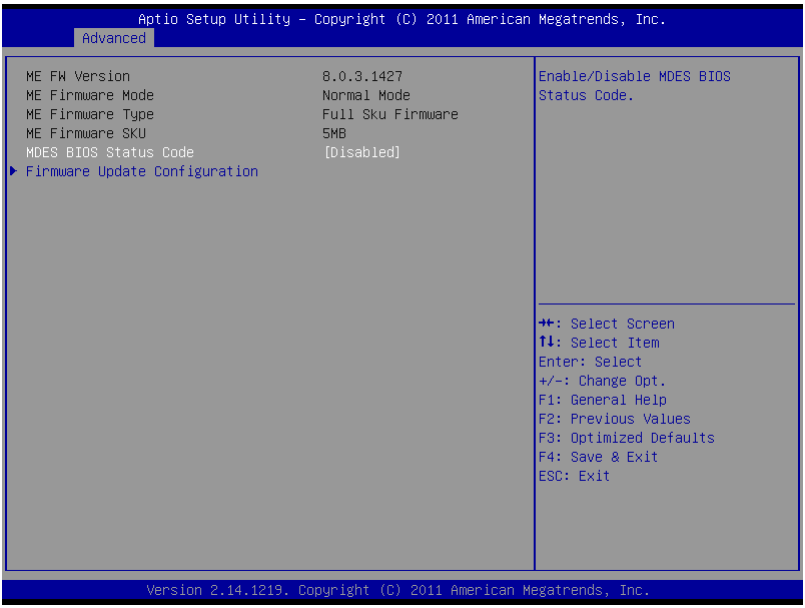
Options Summary :

SATA Controller(s)	Disabled	
	Enabled	Default
Enable or Disable SATA Port.		
SATA Mode Selection	IDE	
	AHCI	
	RAID	Selected
Determines how SATA controller(s) operate.		
Port 0 ~ Port 4	Disable	
	Enabled	Enabled
Enable or Disable SATA Port		
Serial ATA Port Hot Plug Port 0 ~ Port 4	Disable	Default
	Enabled	
Designates this port as Hot Pluggable.		

Intel TXT(LT) Configuration



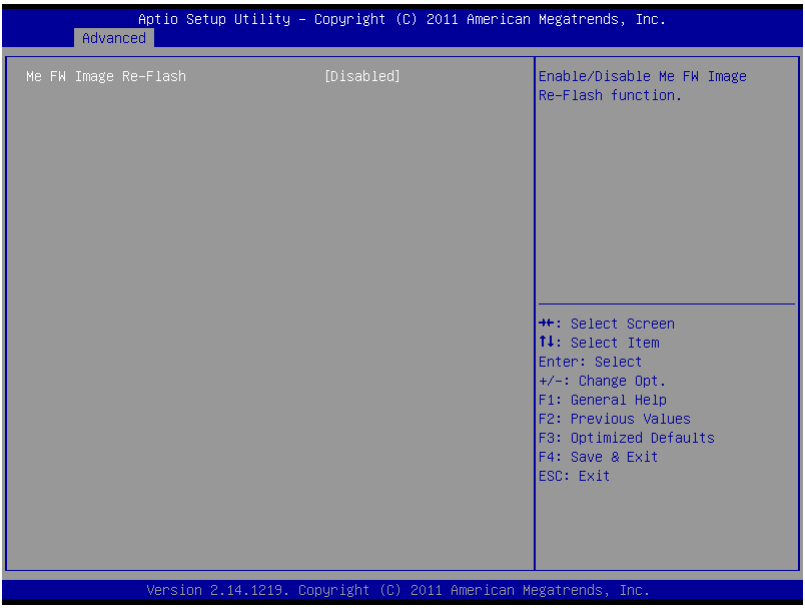
PCH-FW Configuration



Options Summary :

MDES BIOS Status Code	Disabled	Default
	Enabled	
Enable/Disable MDES BIOS Status Code.		
Firmware Update Configuration	Configure Management Engine Technology Parameters	

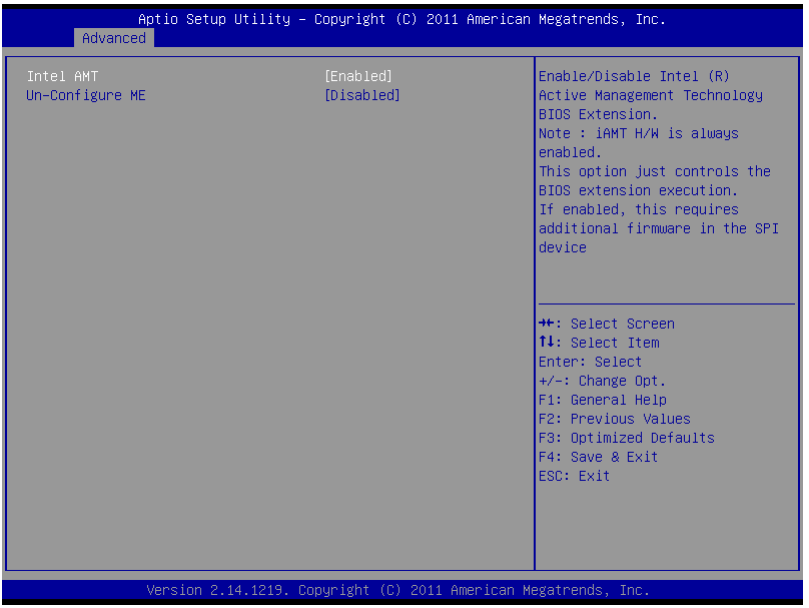
Firmware Update Configuration



Options Summary :

Me FW Image Re-Flash	Disabled	Default
	Enabled	
Enable/Disable Me FW Image Re-Flash function.		

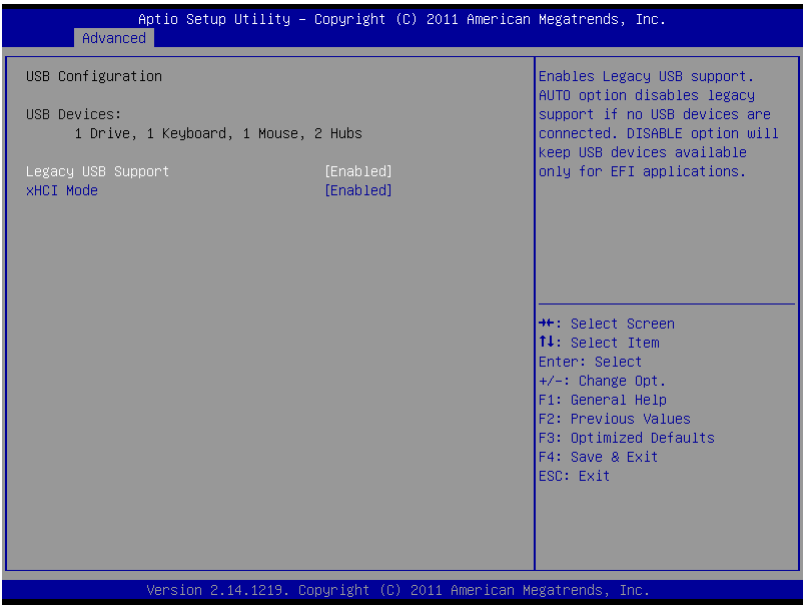
AMT Configuration



Options Summary :

Intel AMT	Disabled	
	Enabled	Default
Enable/Disable Intel ® Active Management Technology BIOS Extension. Note : iAMT H/W is always enabled. This option just controls the BIOS extension execution. If enabled, this requires additional firmware in the SPI device		
Un-Configure ME	Disabled	Default
	Enabled	
OEMFlag Bit 15: Un-Configure ME without password.		

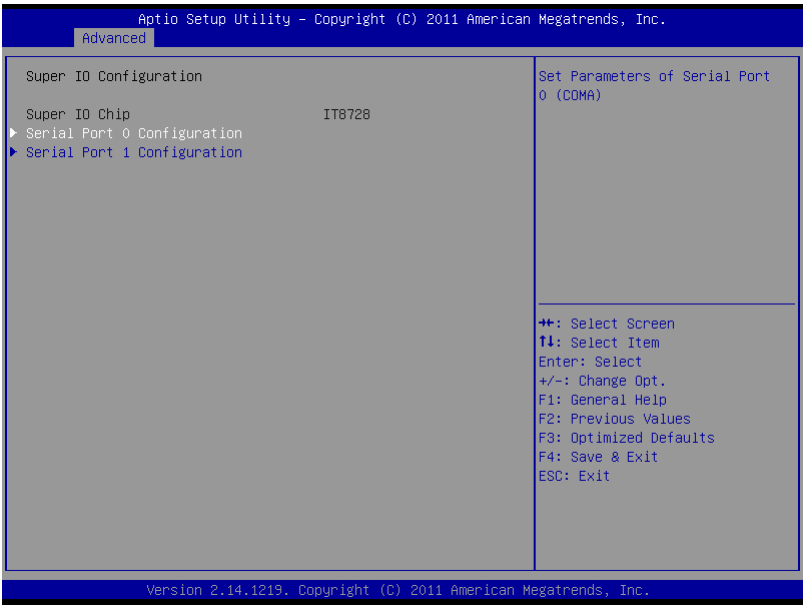
USB Configuration



Options Summary :

Legacy USB Support	Enabled	Default
	Disabled	
	Auto	
Enable Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.		
xHCI Mode	Disabled	
	Enabled	
Mode of operation of xHCI controller.		

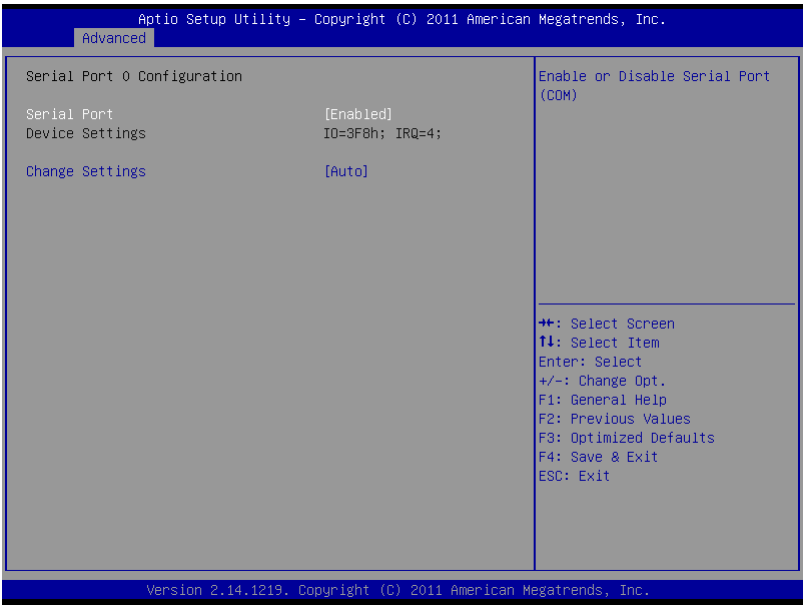
Super IO Configuration



Options Summary :

Serial Port 0 Configuration	Set Parameters of Serial Port 3 (COMA)
Serial Port 1 Configuration	Set Parameters of Serial Port 4 (COMB)

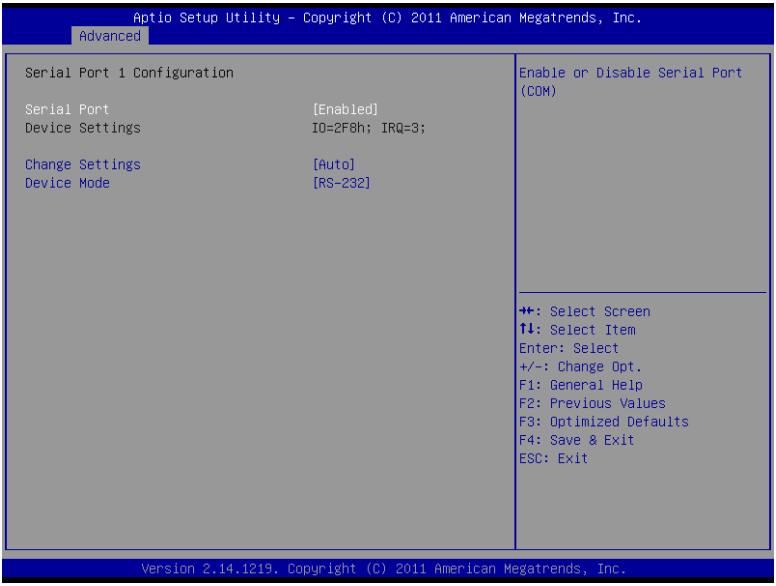
Serial Port 0 Configuration



Options Summary :

Serial Port	Disabled	
	Enabled	Default
Enable or Disable Serial Port (COM)		
Change Settings	Auto	Default
	IO=3F8h; IRQ=3,4;	
	IO=2F8h; IRQ=3,4;	
	IO=3E8h; IRQ=3,4;	
	IO=2E8h; IRQ=3,4;;	
Select an optimal setting for Super IO device.		

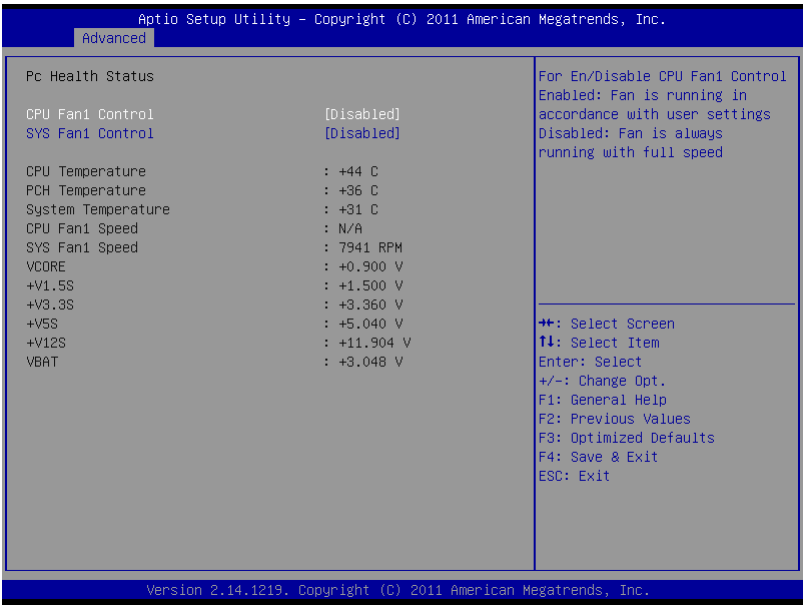
Serial Port 1 Configuration



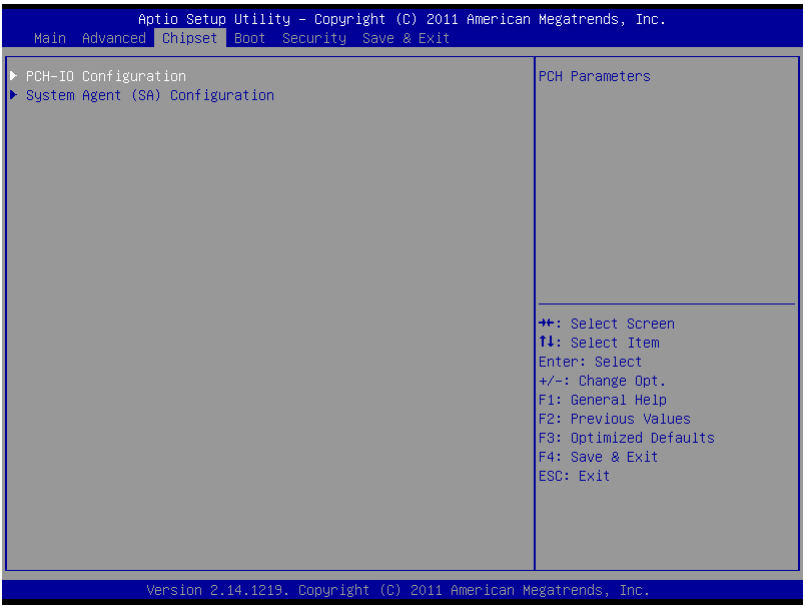
Options Summary :

Serial Port	Disabled	
	Enabled	Default
Enable or Disable Serial Port (COM)		
Change Settings	Auto	Default
	IO=3F8h; IRQ=3,4;	
	IO=2F8h; IRQ=3,4;	
	IO=3E8h; IRQ=3,4;	
	IO=2E8h; IRQ=3,4;;	
Select an optimal setting for Super IO device.		
Device Mode	RS-232	Default
	RS-422	
	RS-485	
Change the Serial Port mode. Select <RS-232> or <RS-422> or <RS-485> mode		

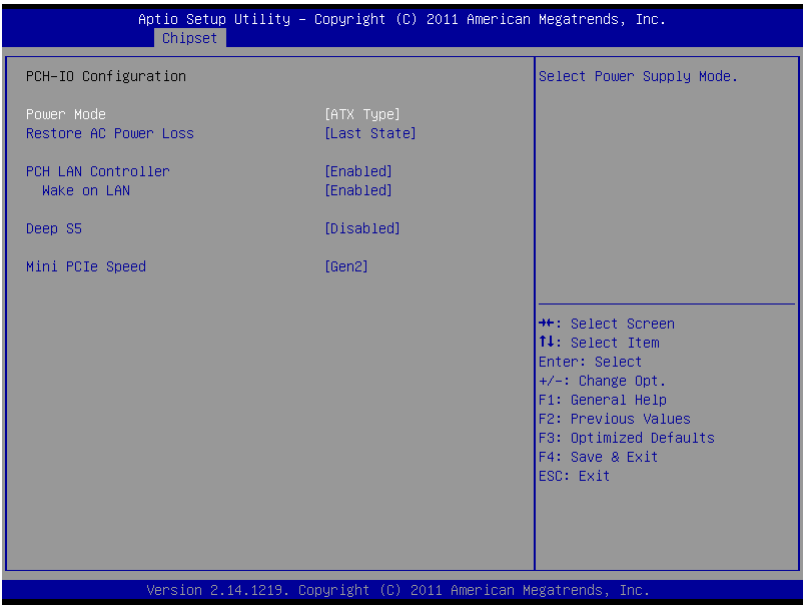
H/W Monitor


Aptio Setup Utility – Copyright (C) 2011 American Megatrends, Inc.
Advanced
Pc Health Status
CPU Fan1 Control [Disabled]
SYS Fan1 Control [Disabled]
CPU Temperature : +44 C
PCH Temperature : +36 C
System Temperature : +31 C
CPU Fan1 Speed : N/A
SYS Fan1 Speed : 7941 RPM
VCORE : +0.900 V
+V1.5S : +1.500 V
+V3.3S : +3.360 V
+V5S : +5.040 V
+V12S : +11.904 V
VBAT : +3.048 V
For En/Disable CPU Fan1 Control
Enabled: Fan is running in
accordance with user settings
Disabled: Fan is always
running with full speed
→←: 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.

Setup submenu: Chipset



PCH-IO Configuration

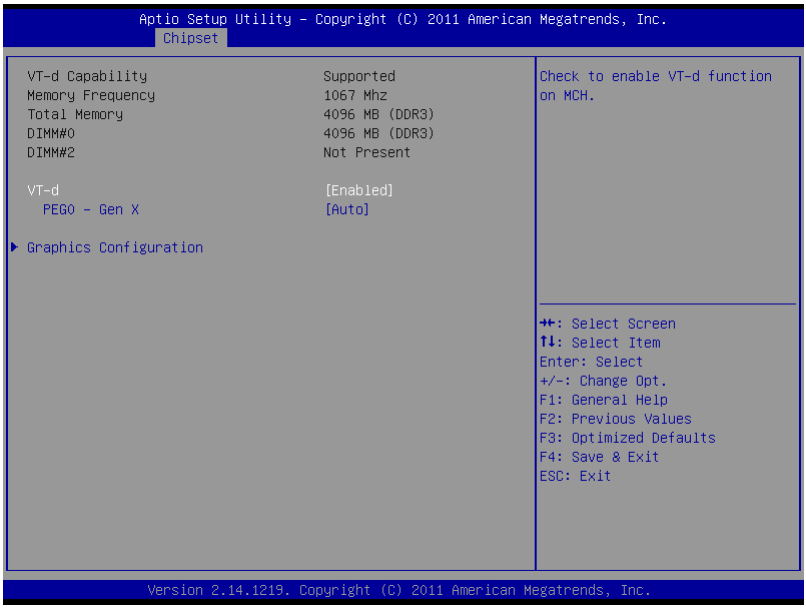


Options Summary :

Power Mode	ATX Type	Default
	AT Type	
Select power supply mode.		
Restore AC Power Loss	Power off	
	Power on	
	Last State	Default
Select AC power state when power is re-applied after a power failure. Notice: The system will power up after restore AC power if this item set to last state and shuts down via iAMT remote control.		
PCH LAN Controller	Enabled	Default
	Disabled	
Enable or disable onboard NIC.		
Wake on LAN	Enabled	Default
	Disabled	
Enable or disable integrated LAN to wake the system. (The Wake On LAN cannot be disabled if ME is on at Sx state.)		

Deep S5	Disabled	Default
	Enabled	
Enabled/Disabled Deep S5. Note : When Deep S5 is enabled, Intel ® AMT and Wake On PCH LAN functions are not available In system shut down.		
Mini PCIe Speed	Gen1	
	Gen2	Default
Select Mini PCI Express port speed.		

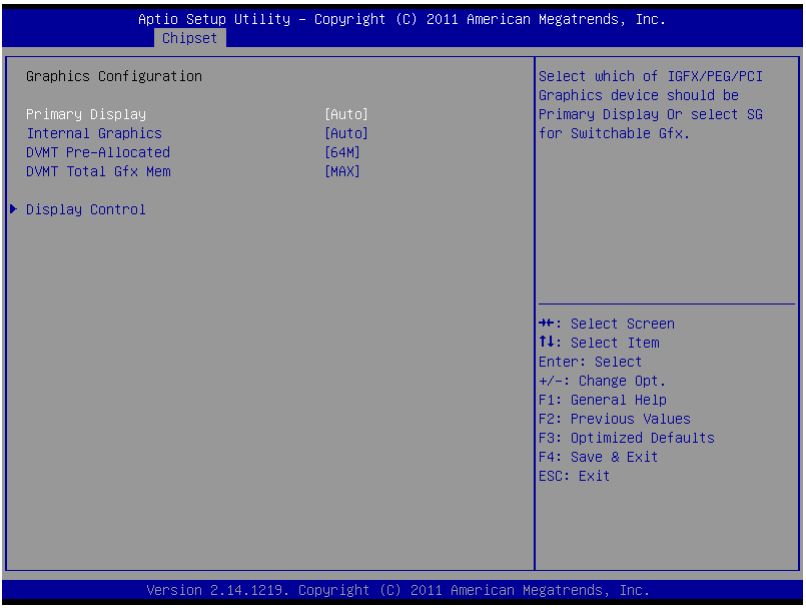
System Agent (SA) Configuration



Options Summary :

VT-d	Disabled	
	Enabled	Default
Check to enable VT-d function on MCH		
PEG0 – Gen X	Auto	Default
	Gen1	
	Gen2	
	Gen3	
Configure PEG0 B0:D1:F0 Gen1-Gen3		
Graphics Configuration	Config Graphics Settings.	

Graphics Configuration

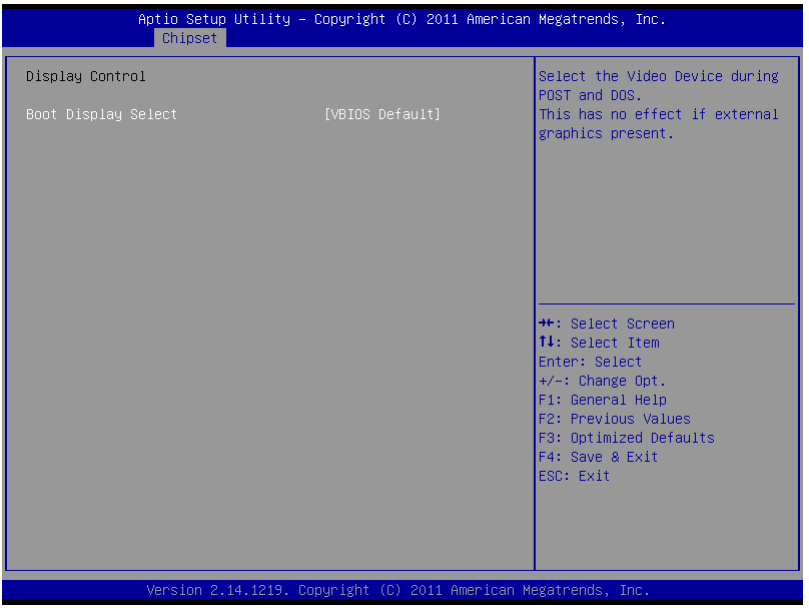


Options Summary :

Primary Display	Auto	Default
	IGfx	
	PEG	
Select which of IGFX/PEG/PCI Graphics device should be Primary Display Or select SG for Switchable Gfx		
Internal Graphics	Auto	Default
	Disabled	
	Enabled	
Keep IGD enabled based on the setup options.		
DVMT Pre-Allocated	0M	
	32M	
	64M	Default
	96M	
	128M	
	160M	
	192M	

	224M	
	256M	
	288M	
	320M	
	352M	
	384M	
	416M	
	448M	
	480M	
	512M	
Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.		
DVMT Total Gfx Men	128M	
	256M	
	MAX	Default
Select DVMT5.0 Total Graphic Memory size used by the Internal Graphics Device.		

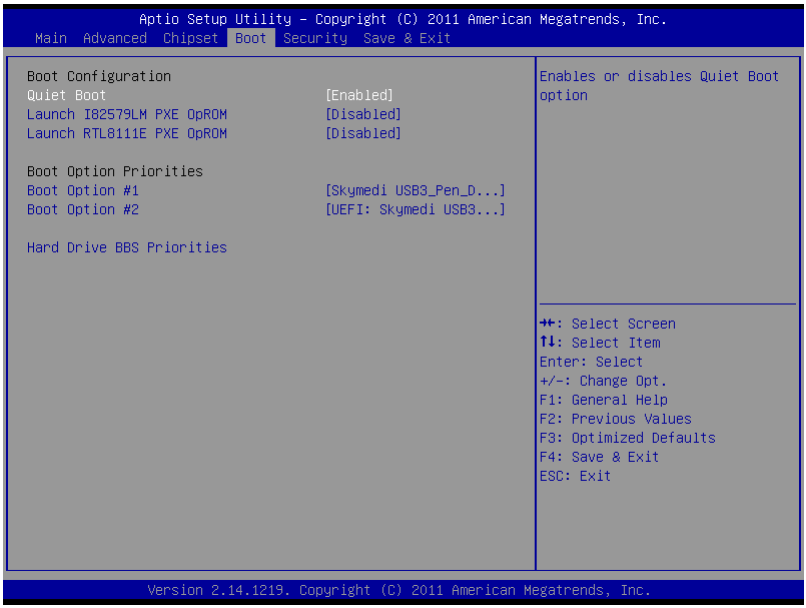
Display Control



Options Summary :

Boot Display Select	VBIOS Default	Default
	CRT	
	DisplayPort 1	
	DVI	
	DisplayPort 2	
Select the Video Device during POST and DOS. This has no effect if external graphics present.		

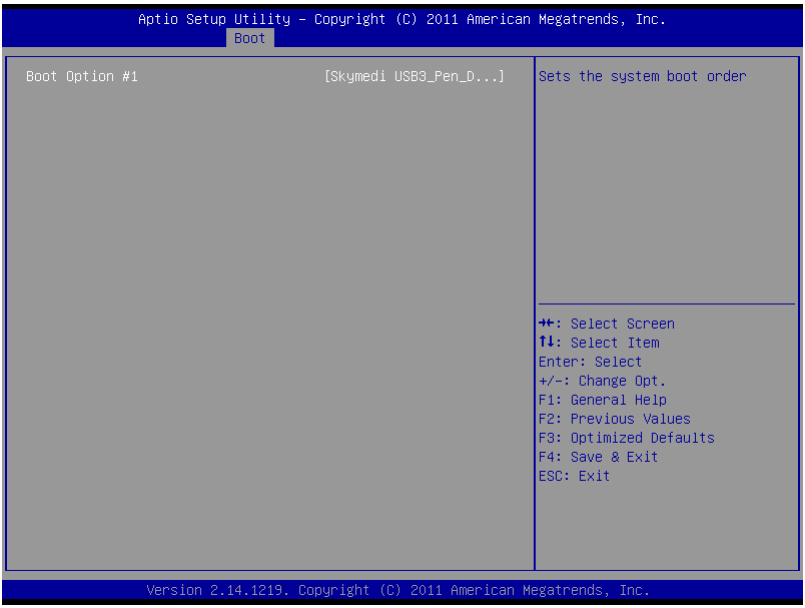
Setup submenu: Boot



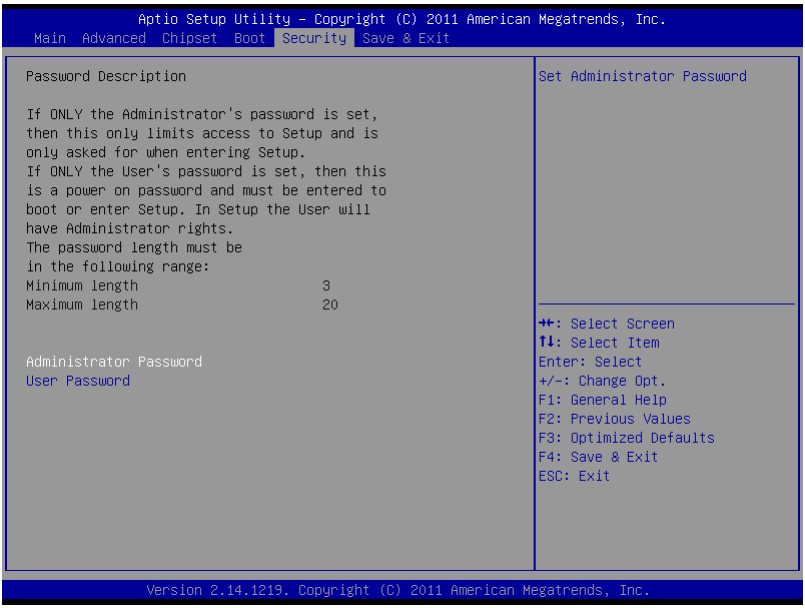
Options Summary :

Quiet Boot	Disabled	
	Enabled	Default
Enables or disables Quiet Boot option		
Launch I82579LM PXE OpROM	Disabled	Default
	Enabled	
Enable or Disable Legacy Boot Option for I82579LM.		
Launch RTL8111E PXE OpROM	Disabled	Default
	Enabled	
Enable or Disable Legacy Boot Option for RTL8111E		
Boot options #X	Your storage/disk devices	
Sets the system boot order		

Hard Drives BBS Priorities



Submenu: Security



Change User/Supervisor Password

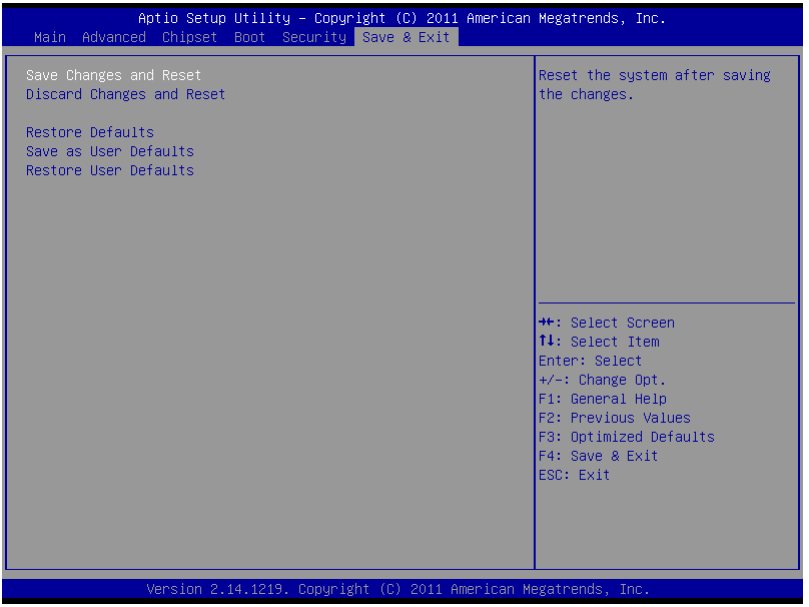
You can install a Supervisor password, and if you install a supervisor password, you can then install a user password. A user password does not provide access to many of the features in the Setup utility.

If you highlight these items and press Enter, a dialog box appears which lets you enter a password. You can enter no more than six letters or numbers. Press Enter after you have typed in the password. A second dialog box asks you to retype the password for confirmation. Press Enter after you have retyped it correctly. The password is required at boot time, or when the user enters the Setup utility.

Removing the Password

Highlight this item and type in the current password. At the next dialog box press Enter to disable password protection.

Setup submenu: Exit



Chapter

4

Driver Installation

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The AEC-6877 comes with an AutoRun DVD-ROM that contains all drivers and utilities that can help you to install the driver automatically.

Insert the driver DVD, the driver DVD-title will auto start and show the installation guide. If not, please follow the sequence below to install the drivers.

Follow the sequence below to install the drivers:

Step 1 – Install Chipset Driver

Step 2 – Install VGA Driver

Step 3 – Install LAN Driver

Step 4 – Install Audio Driver

Step 5 – Install USB3.0 Driver

Step 6 – Install RAID & AHCI Driver

Step 7 – Install ME Driver

Please read instructions below for further detailed installations.

4.1 Installation:

Insert the AEC-6877 DVD-ROM into the DVD-ROM drive. And install the drivers from Step 1 to Step 7 in order.

Step 1 – Install Chipset Driver

1. Click on the ***Step 1-Chipset*** folder and double click on the ***infinst_autol.exe*** file
2. Follow the instructions that the window shows
3. The system will help you install the driver automatically

Step 2 – Install VGA Driver

1. Click on the ***Step 2-VGA*** folder and select the OS folder your system is
2. Double click on the ***Setup.exe*** file located in each OS folder
3. Follow the instructions that the window shows
4. The system will help you install the driver automatically

Step 3 –Install LAN Driver

1. Click on the ***Step 3-LAN*** folder and select the folder of LAN chip the system adopted
2. Select the OS folder your system is and double click on the ***.exe*** file located in each OS folder
3. Follow the instructions that the window shows
4. The system will help you install the driver automatically

Step 4 –Install Audio Driver

1. Click on the ***Step 4- Audio*** folder and select the OS folder your system is
2. Double click on the ***.exe*** located in each OS folder
3. Follow the instructions that the window shows
4. The system will help you install the driver automatically

Step 5 – Install USB3.0 Driver

1. Click on the ***Step 5-USB3.0*** folder and double click on the ***Setup.exe*** file
2. Follow the instructions that the window shows
3. The system will help you install the driver automatically

Step 6 – Install RAID & AHCI Driver

Please refer to the ***Appendix C RAID & AHCI Settings***

Step 7 – Install ME Driver

1. Click on the ***Step 7-ME*** folder and double click on the ***setup.exe*** file
2. Follow the instructions that the window shows
3. The system will help you install the driver automatically

Appendix

A

Programming the Watchdog Timer

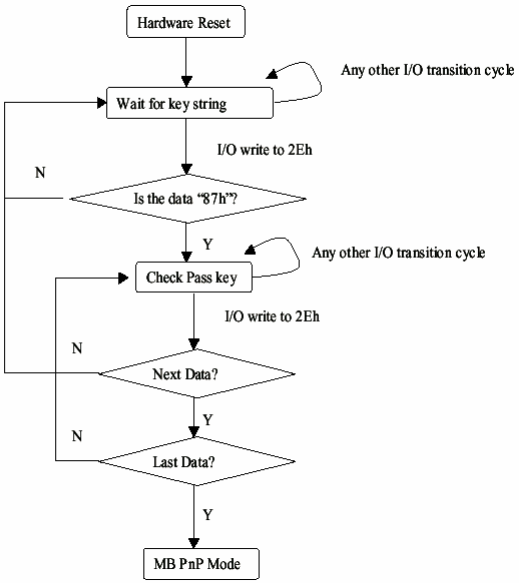
A.1 Programming

AEC-6877 utilizes ITE IT8728 chipset as its watchdog timer controller.

Below are the procedures to complete its configuration and the AAEON intial watchdog timer program is also attached based on which you can develop customized program to fit your application.

Configuring Sequence Description

After the hardware reset or power-on reset, the ITE 8728 enters the normal mode with all logical devices disabled except KBC. The initial state (enable bit) of this logical device (KBC) is determined by the state of pin 121 (DTR1#) at the falling edge of the system reset during power-on reset.



There are three steps to complete the configuration setup: (1) Enter the MB PnP Mode; (2) Modify the data of configuration registers; (3) Exit the MB PnP Mode. Undesired result may occur if the MB PnP Mode is not exited normally.

(1) Enter the MB PnP Mode

To enter the MB PnP Mode, four special I/O write operations are to be performed during Wait for Key state. To ensure the initial state of the key-check logic, it is necessary to perform four write operations to the Special Address port (2EH). Two different enter keys are provided to select configuration ports (2Eh/2Fh) of the next step.

	Address Port	Data Port
87h, 01h, 55h, 55h:	2Eh	2Fh

(2) Modify the Data of the Registers

All configuration registers can be accessed after entering the MB PnP Mode. Before accessing a selected register, the content of Index 07h must be changed to the LDN to which the register belongs, except some Global registers.

(3) Exit the MB PnP Mode

Set bit 1 of the configure control register (Index=02h) to 1 to exit the MB PnP Mode.

WatchDog Timer Configuration Registers

LDN	Index	R/W	Reset	Configuration Register or Action
All	02H	W	N/A	Configure Control
07H	71H	R/W	00H	WatchDog Timer Control Register
07H	72H	R/W	00H	WatchDog Timer Configuration Register
07H	73H	R/W	00H	WatchDog Timer Time-out Value Register

Configure Control (Index=02h)

This register is write only. Its values are not sticky; that is to say, a hardware reset will automatically clear the bits, and does not require the software to clear them.

Bit	Description
7-2	Reserved
1	Returns to the Wait for Key state. This bit is used when the configuration sequence is completed
0	Resets all logical devices and restores configuration registers to their power-on states.

WatchDog Timer Control Register (Index=71h, Default=00h)

Bit	Description
7	WDT is reset upon a CIR interrupt
6	WDT is reset upon a KBC (mouse) interrupt
5	WDT is reset upon a KBC (keyboard) interrupt
4	WDT is reset upon a read or a write to the Game Port base address
3-2	Reserved
1	Force Time-out. This bit is self-clearing
0	WDT Status
	1: WDT value reaches 0.
	0: WDT value is not 0

WatchDog Timer Configuration Register (Index=72h, Default=00h)

Bit	Description
7	WDT Time-out value select
	1: Second
	0: Minute
6	WDT output through KRST (pulse) enable
5-4	Reserved
3-0	Select the interrupt level[Note] for WDT

WatchDog Timer Time-out Value Register (Index=73h, Default=00h)

Bit	Description
7-0	WDT Time-out value 7-0

A.2 ITE8728 Watchdog Timer Initial Program

```
        .MODEL SMALL
        .CODE
Main:
        CALL Enter_Configuration_mode
        CALL Check_Chip
        mov cl, 7
        call Set_Logic_Device
        ;time setting
        mov cl, 10 ; 10 Sec
        dec al
Watch_Dog_Setting:
        ;Timer setting
        mov al, cl
        mov cl, 73h
        call Superio_Set_Reg
        ;Clear by keyboard or mouse interrupt
        mov al, 0f0h
        mov cl, 71h
        call Superio_Set_Reg
        ;unit is second.
        mov al, 0C0H
        mov cl, 72h
        call Superio_Set_Reg
```

```
; game port enable
mov cl, 9
call Set_Logic_Device

Initial_OK:
CALL Exit_Configuration_mode
MOV AH,4Ch
INT 21h

Enter_Configuration_Mode PROC NEAR
MOV SI,WORD PTR CS:[Offset Cfg_Port]

MOV DX,02Eh
MOV CX,04h
Init_1:
MOV AL,BYTE PTR CS:[SI]
OUT DX,AL
INC SI
LOOP Init_1
RET
Enter_Configuration_Mode ENDP

Exit_Configuration_Mode PROC NEAR
MOV AX,0202h
CALL Write_Configuration_Data
```

```
        RET
        Exit_Configuration_Mode ENDP

        Check_Chip PROC NEAR

        MOV AL,20h
        CALL Read_Configuration_Data
        CMP AL,87h
        JNE Not_Initial

        MOV AL,21h
        CALL Read_Configuration_Data
        CMP AL,12h
        JNE Not_Initial

Need_Initial:
        STC
        RET
Not_Initial:
        CLC
        RET
        Check_Chip ENDP
        Read_Configuration_Data PROC NEAR
        MOV DX,WORD PTR CS:[Cfg_Port+04h]
        OUT DX,AL
```

```
MOV DX,WORD PTR CS:[Cfg_Port+06h]
IN AL,DX
RET
Read_Configuration_Data ENDP

Write_Configuration_Data PROC NEAR
MOV DX,WORD PTR CS:[Cfg_Port+04h]
OUT DX,AL
XCHG AL,AH
MOV DX,WORD PTR CS:[Cfg_Port+06h]
OUT DX,AL
RET
Write_Configuration_Data ENDP

Superio_Set_Reg proc near
push ax
MOV DX,WORD PTR CS:[Cfg_Port+04h]
mov al,cl
out dx,al
pop ax
inc dx
out dx,al
ret
Superio_Set_Reg endp.Set_Logic_Device proc near
Set_Logic_Device    proc    near
```

```
push ax
push cx
xchg al,cl
mov cl,07h
call Superio_Set_Reg
pop cx
pop ax
ret
Set_Logic_Device endp

;Select 02Eh->Index Port, 02Fh->Data Port
Cfg_Port DB 087h,001h,055h,055h

DW 02Eh,02Fh
```

END Main

Note: Interrupt level mapping

0Fh-Dh: not valid

0Ch: IRQ12

.

.

03h: IRQ3

02h: not valid

01h: IRQ1

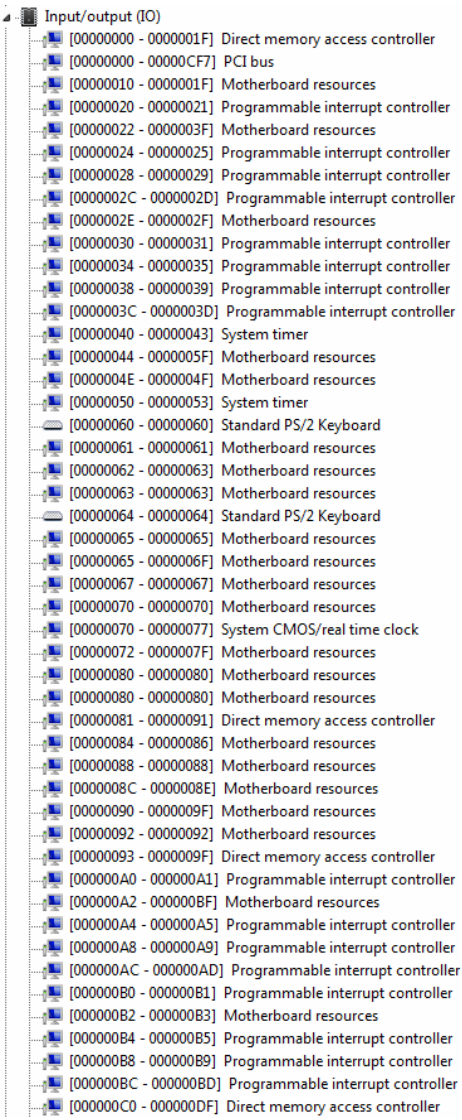
00h: no interrupt selected

Appendix

B

I/O Information

B.1 I/O Address Map

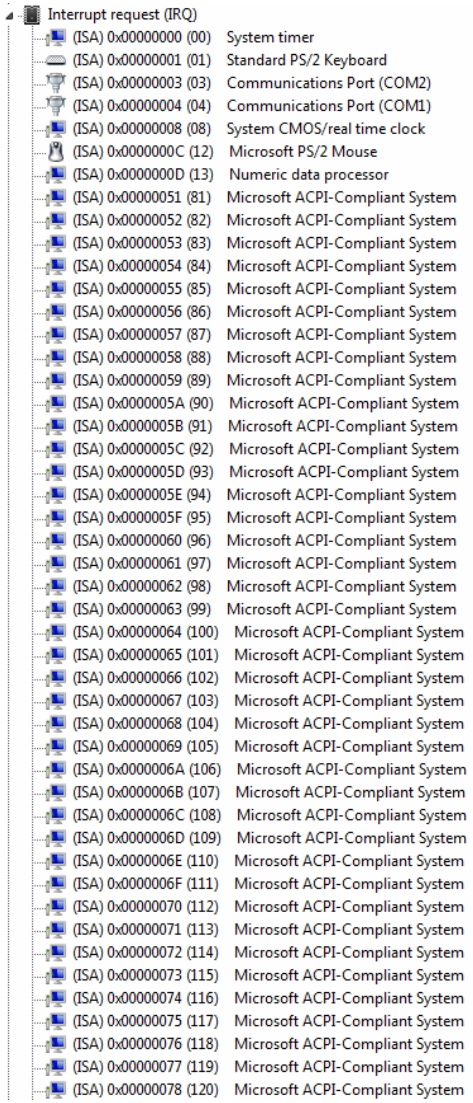


- [000000E0 - 000000EF] Motherboard resources
- [000000F0 - 000000FF] Numeric data processor
- [00000200 - 0000020F] Motherboard resources
- [000002F8 - 000002FF] Communications Port (COM2)
- [000003B0 - 000003BB] Intel(R) HD Graphics 4000
- [000003C0 - 000003DF] Intel(R) HD Graphics 4000
- [000003F8 - 000003FF] Communications Port (COM1)
- [00000400 - 00000453] Motherboard resources
- [00000454 - 00000457] Motherboard resources
- [00000458 - 0000047F] Motherboard resources
- [000004D0 - 000004D1] Motherboard resources
- [000004D0 - 000004D1] Programmable interrupt controller
- [00000500 - 0000057F] Motherboard resources
- [00000680 - 0000069F] Motherboard resources
- [00000A00 - 00000A1F] Motherboard resources
- [00000A20 - 00000A2F] Motherboard resources
- [00000A30 - 00000A3F] Motherboard resources
- [00000D00 - 0000FFFF] PCI bus
- [0000164E - 0000164F] Motherboard resources
- [0000E000 - 0000E0FF] Realtek PCIe GBE Family Controller #3
- [0000E000 - 0000EFFF] Intel(R) 7 Series/C216 Chipset Family PCI Express Root Port 2 - 1E12
- [0000F000 - 0000F03F] Intel(R) HD Graphics 4000
- [0000F040 - 0000F05F] Intel(R) 7 Series/C216 Chipset Family SMBus Host Controller - 1E22
- [0000F060 - 0000F07F] Intel(R) 7 Series Chipset Family SATA AHCI Controller
- [0000F0A0 - 0000F0A3] Intel(R) 7 Series Chipset Family SATA AHCI Controller
- [0000F0B0 - 0000F0B7] Intel(R) 7 Series Chipset Family SATA AHCI Controller
- [0000F0C0 - 0000F0C3] Intel(R) 7 Series Chipset Family SATA AHCI Controller
- [0000F0D0 - 0000F0D7] Intel(R) 7 Series Chipset Family SATA AHCI Controller
- [0000F0E0 - 0000F0E7] Intel(R) Active Management Technology - SOL (COM3)
- [0000FFFF - 0000FFFF] Motherboard resources
- [0000FFFF - 0000FFFF] Motherboard resources

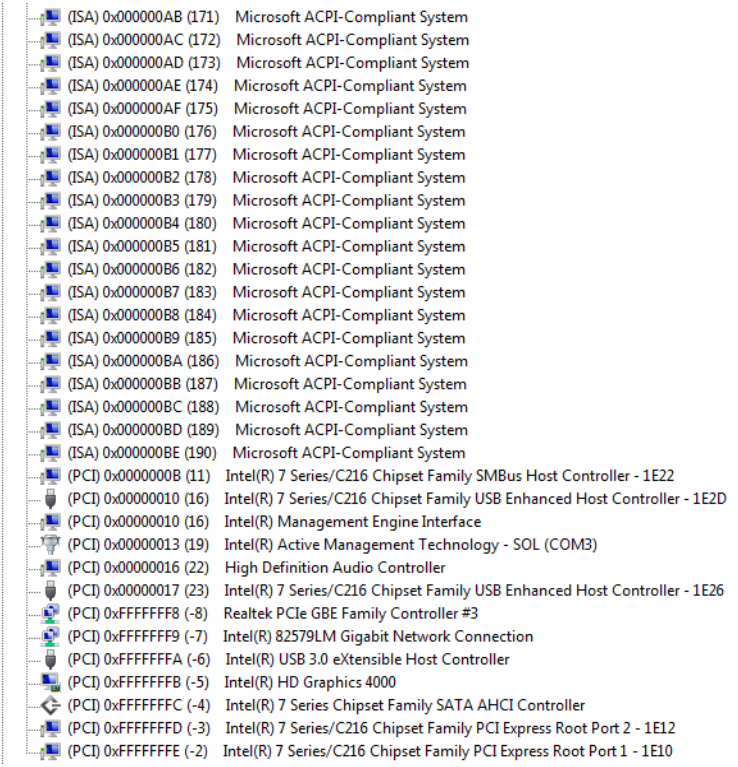
B.2 Memory Address Map

Memory
- [000A0000 - 000BFFFF] Intel(R) HD Graphics 4000
- [000A0000 - 000BFFFF] PCI bus
- [000D0000 - 000D3FFF] PCI bus
- [000D4000 - 000D7FFF] PCI bus
- [000D8000 - 000DBFFF] PCI bus
- [000DC000 - 000DFFFF] PCI bus
- [000E0000 - 000E3FFF] PCI bus
- [000E4000 - 000E7FFF] PCI bus
- [20000000 - 201FFFFF] System board
- [40004000 - 40004FFF] System board
- [DFA00000 - DFA00FFF] Motherboard resources
- [DFA00000 - FEAFFFFF] PCI bus
- [E0000000 - EFFFFFFF] Intel(R) HD Graphics 4000
- [F0000000 - F0003FFF] Realtek PCIe GBE Family Controller #3
- [F0000000 - F00FFFFF] Intel(R) 7 Series/C216 Chipset Family PCI Express Root Port 2 - 1E12
- [F7800000 - F7BFFFFF] Intel(R) HD Graphics 4000
- [F7C00000 - F7C00FFF] Realtek PCIe GBE Family Controller #3
- [F7C00000 - F7CFFFFF] Intel(R) 7 Series/C216 Chipset Family PCI Express Root Port 2 - 1E12
- [F7D00000 - F7D1FFFF] Intel(R) 82579LM Gigabit Network Connection
- [F7D20000 - F7D2FFFF] Intel(R) USB 3.0 eXtensible Host Controller
- [F7D30000 - F7D33FFF] High Definition Audio Controller
- [F7D35000 - F7D350FF] Intel(R) 7 Series/C216 Chipset Family SMBus Host Controller - 1E22
- [F7D36000 - F7D367FF] Intel(R) 7 Series Chipset Family SATA AHCI Controller
- [F7D37000 - F7D373FF] Intel(R) 7 Series/C216 Chipset Family USB Enhanced Host Controller - 1E26
- [F7D38000 - F7D383FF] Intel(R) 7 Series/C216 Chipset Family USB Enhanced Host Controller - 1E2D
- [F7D39000 - F7D39FFF] Intel(R) 82579LM Gigabit Network Connection
- [F7D3A000 - F7D3AFFF] Intel(R) Active Management Technology - SOL (COM3)
- [F7D3C000 - F7D3C00F] Intel(R) Management Engine Interface
- [F8000000 - FBFFFFFF] Motherboard resources
- [FED00000 - FED003FF] High precision event timer
- [FED10000 - FED17FFF] Motherboard resources
- [FED18000 - FED18FFF] Motherboard resources
- [FED19000 - FED19FFF] Motherboard resources
- [FED1C000 - FED1FFFF] Motherboard resources
- [FED20000 - FED3FFFF] Motherboard resources
- [FED40000 - FED44FFF] System board
- [FED45000 - FED8FFFF] Motherboard resources
- [FED90000 - FED93FFF] Motherboard resources
- [FEE00000 - FEEFFFFF] Motherboard resources
- [FF000000 - FFFFFFFF] Intel(R) 82802 Firmware Hub Device
- [FF000000 - FFFFFFFF] Motherboard resources

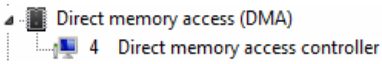
B.3 IRQ Mapping Chart



(ISA) 0x00000079 (121) Microsoft ACPI-Compliant System
(ISA) 0x0000007A (122) Microsoft ACPI-Compliant System
(ISA) 0x0000007B (123) Microsoft ACPI-Compliant System
(ISA) 0x0000007C (124) Microsoft ACPI-Compliant System
(ISA) 0x0000007D (125) Microsoft ACPI-Compliant System
(ISA) 0x0000007E (126) Microsoft ACPI-Compliant System
(ISA) 0x0000007F (127) Microsoft ACPI-Compliant System
(ISA) 0x00000080 (128) Microsoft ACPI-Compliant System
(ISA) 0x00000081 (129) Microsoft ACPI-Compliant System
(ISA) 0x00000082 (130) Microsoft ACPI-Compliant System
(ISA) 0x00000083 (131) Microsoft ACPI-Compliant System
(ISA) 0x00000084 (132) Microsoft ACPI-Compliant System
(ISA) 0x00000085 (133) Microsoft ACPI-Compliant System
(ISA) 0x00000086 (134) Microsoft ACPI-Compliant System
(ISA) 0x00000087 (135) Microsoft ACPI-Compliant System
(ISA) 0x00000088 (136) Microsoft ACPI-Compliant System
(ISA) 0x00000089 (137) Microsoft ACPI-Compliant System
(ISA) 0x0000008A (138) Microsoft ACPI-Compliant System
(ISA) 0x0000008B (139) Microsoft ACPI-Compliant System
(ISA) 0x0000008C (140) Microsoft ACPI-Compliant System
(ISA) 0x0000008D (141) Microsoft ACPI-Compliant System
(ISA) 0x0000008E (142) Microsoft ACPI-Compliant System
(ISA) 0x0000008F (143) Microsoft ACPI-Compliant System
(ISA) 0x00000090 (144) Microsoft ACPI-Compliant System
(ISA) 0x00000091 (145) Microsoft ACPI-Compliant System
(ISA) 0x00000092 (146) Microsoft ACPI-Compliant System
(ISA) 0x00000093 (147) Microsoft ACPI-Compliant System
(ISA) 0x00000094 (148) Microsoft ACPI-Compliant System
(ISA) 0x00000095 (149) Microsoft ACPI-Compliant System
(ISA) 0x00000096 (150) Microsoft ACPI-Compliant System
(ISA) 0x00000097 (151) Microsoft ACPI-Compliant System
(ISA) 0x00000098 (152) Microsoft ACPI-Compliant System
(ISA) 0x00000099 (153) Microsoft ACPI-Compliant System
(ISA) 0x0000009A (154) Microsoft ACPI-Compliant System
(ISA) 0x0000009B (155) Microsoft ACPI-Compliant System
(ISA) 0x0000009C (156) Microsoft ACPI-Compliant System
(ISA) 0x0000009D (157) Microsoft ACPI-Compliant System
(ISA) 0x0000009E (158) Microsoft ACPI-Compliant System
(ISA) 0x0000009F (159) Microsoft ACPI-Compliant System
(ISA) 0x000000A0 (160) Microsoft ACPI-Compliant System
(ISA) 0x000000A1 (161) Microsoft ACPI-Compliant System
(ISA) 0x000000A2 (162) Microsoft ACPI-Compliant System
(ISA) 0x000000A3 (163) Microsoft ACPI-Compliant System
(ISA) 0x000000A4 (164) Microsoft ACPI-Compliant System
(ISA) 0x000000A5 (165) Microsoft ACPI-Compliant System
(ISA) 0x000000A6 (166) Microsoft ACPI-Compliant System
(ISA) 0x000000A7 (167) Microsoft ACPI-Compliant System
(ISA) 0x000000A8 (168) Microsoft ACPI-Compliant System
(ISA) 0x000000A9 (169) Microsoft ACPI-Compliant System
(ISA) 0x000000AA (170) Microsoft ACPI-Compliant System



B.4 DMA Channel Assignments



Appendix

C

RAID & AHCI Settings

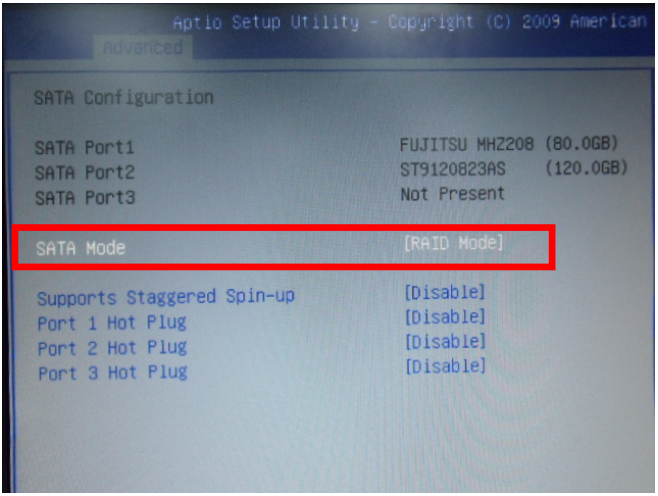
C.1 Setting RAID

OS installation to setup RAID Mode

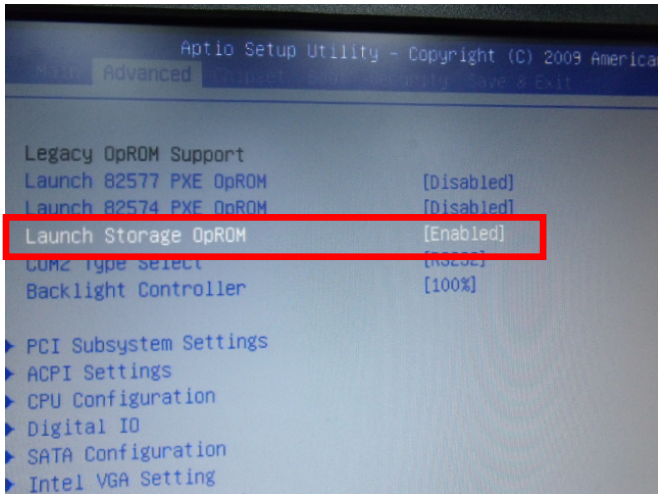
Step 1: Copy the files below from "***Driver CD ->Step 6 - RAID&AHCI -> F6 Floppy - x86***" to Disk

Step 2: Connect the USB Floppy (disk with RAID files) to the board

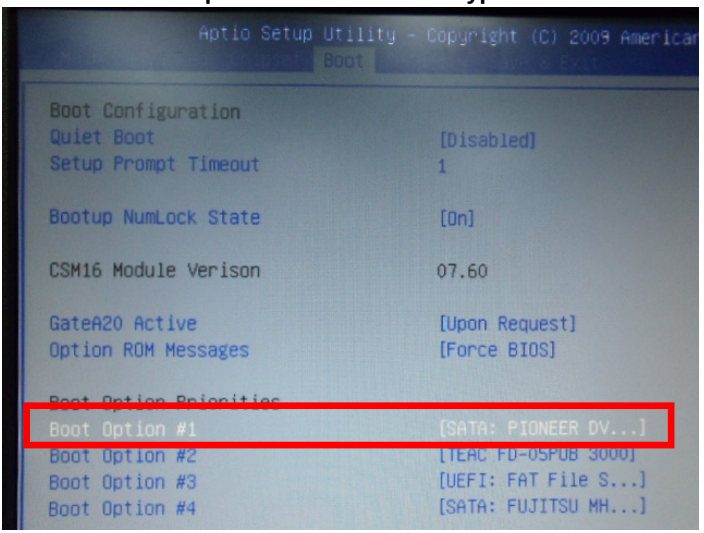
Step 3: The setting procedures " **In BIOS Setup Menu**"
A: Advanced -> SATA Configuration -> SATA Mode -> RAID Mode



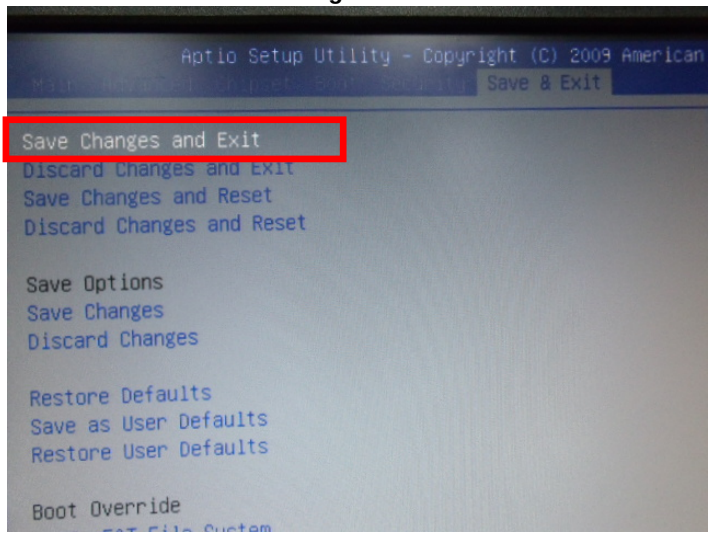
Step 4: The setting procedures "**In BIOS Setup Menu**"
B: Advanced -> Launch Storage OpROM -> Enabled



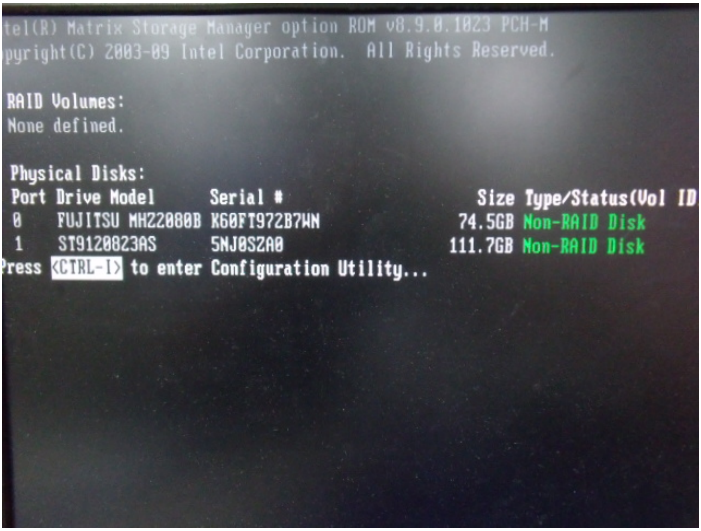
Step 5: The setting procedures "**In BIOS Setup Menu"**
C: Boot -> Boot Option #1 -> DVD-ROM Type



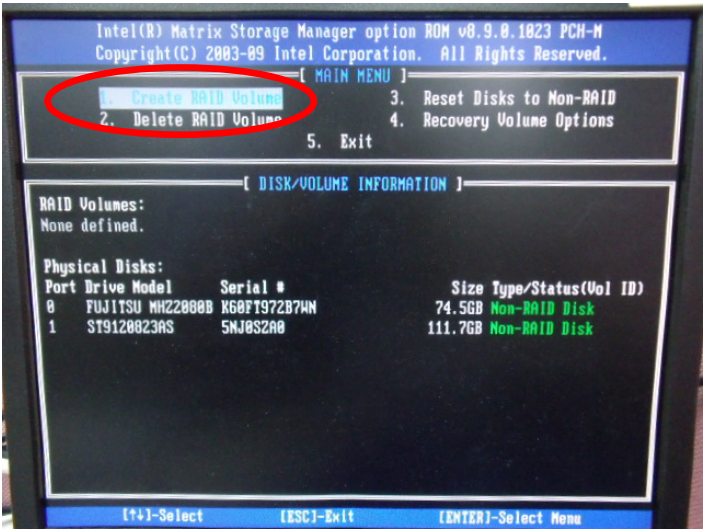
Step 6: The setting procedures "**In BIOS Setup Menu"**
D: Save & Exit -> Save Changes and Exit



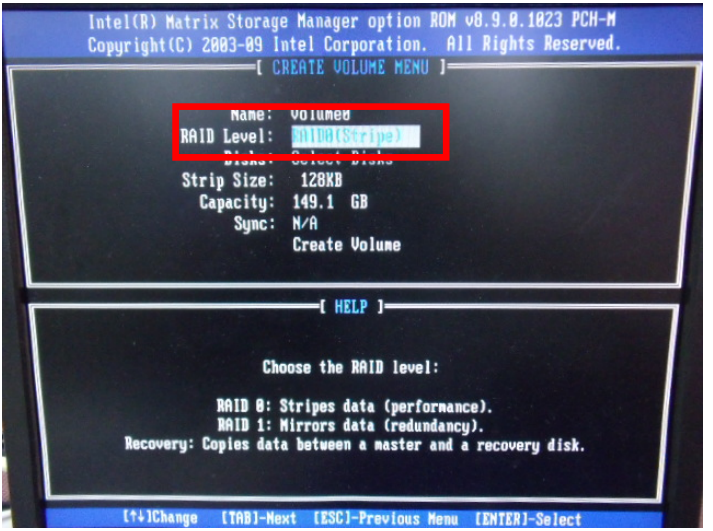
Step 7: Press **Ctrl-I** to enter **MAIN MENU**



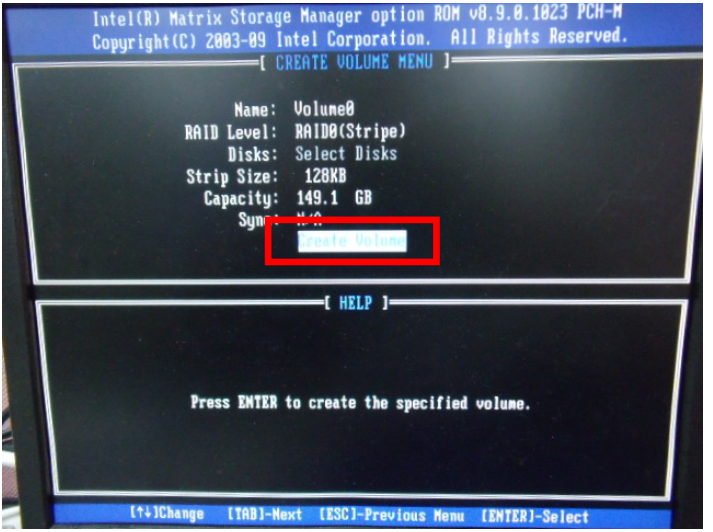
Step 8: Choose "**1.Create RAID Volume**"



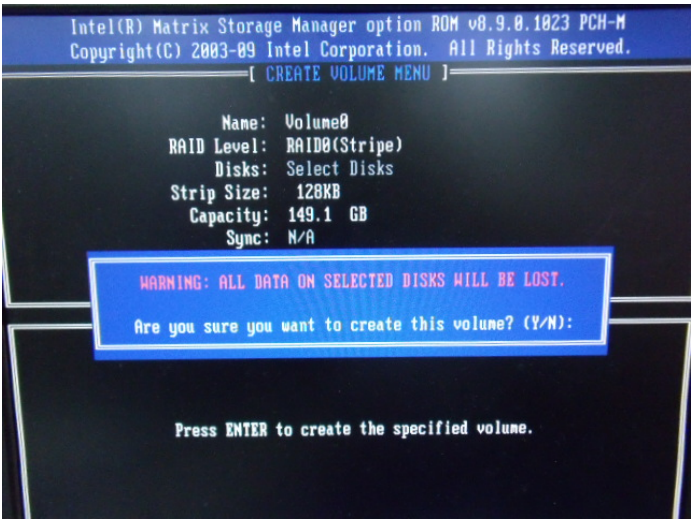
Step 9: RAID Level -> RAID0(Stripe)



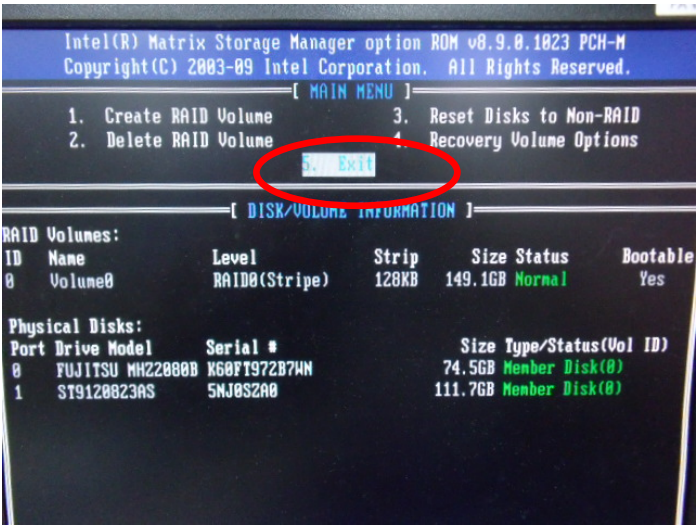
Step 10: Choose "**Create Volume**"



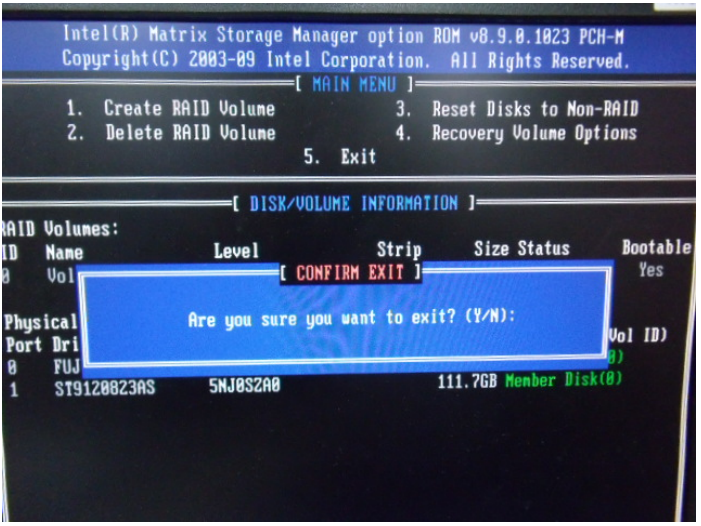
Step 11: Choose "**Y**"



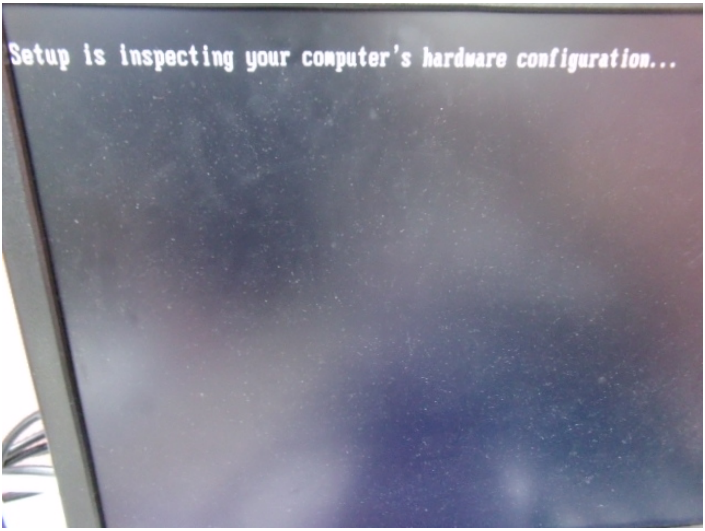
Step 12: Choose "**5. Exit**"



Step 13: Choose "**Y**"

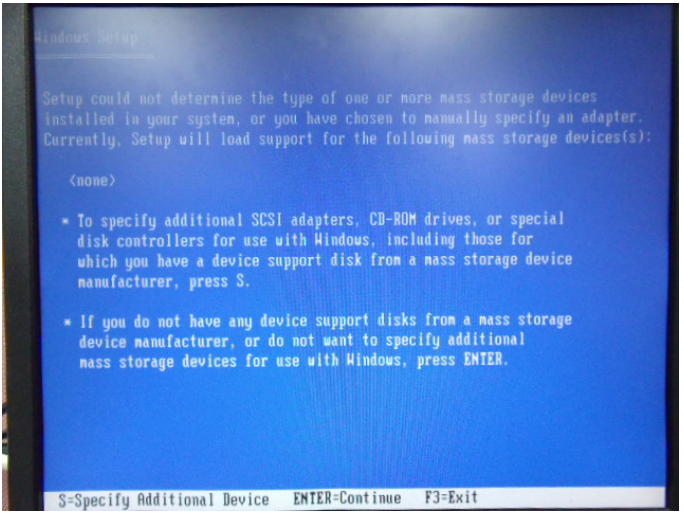


Step 14: Setup OS

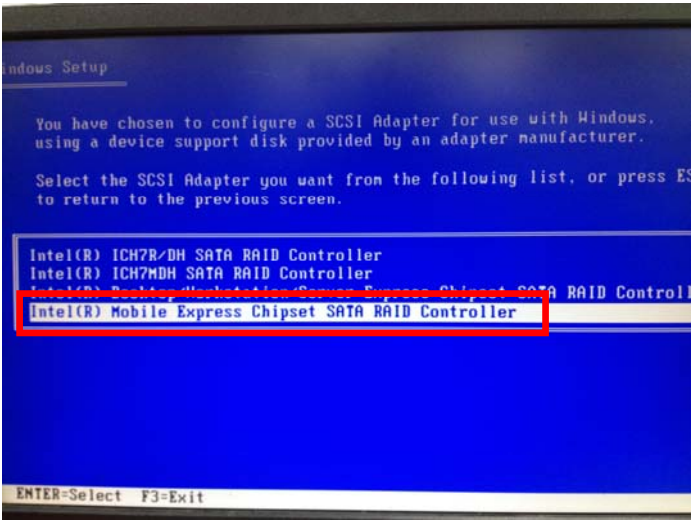


Step 15: Press "**F6**"

Step 16: Choose "**S**"

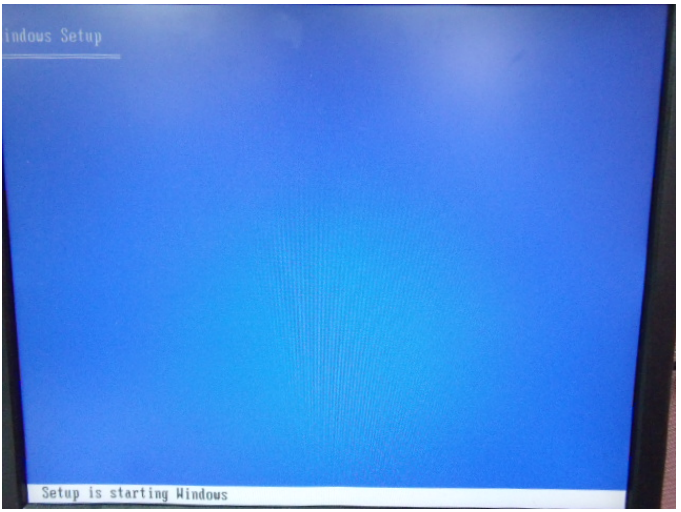


Step 17: Choose "**Intel(R) Mobile Express Chipset SATA RAID Controller"**



Step 18: It will show the model number you select and then press "**ENTER**"

Step 19: Setup is starting Windows



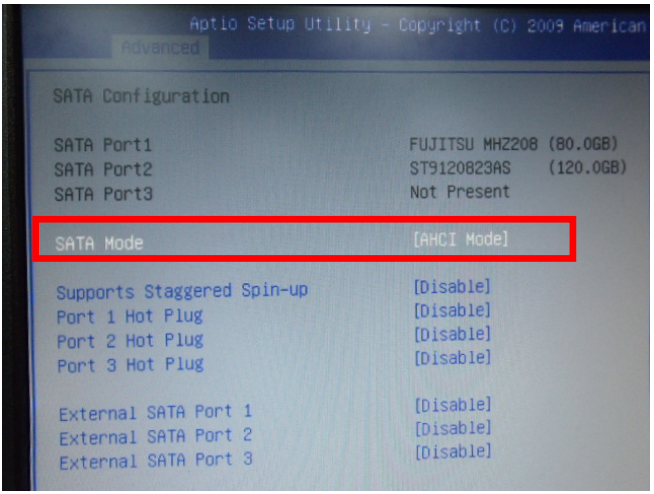
C.2 Setting AHCI

OS installation to setup AHCI Mode

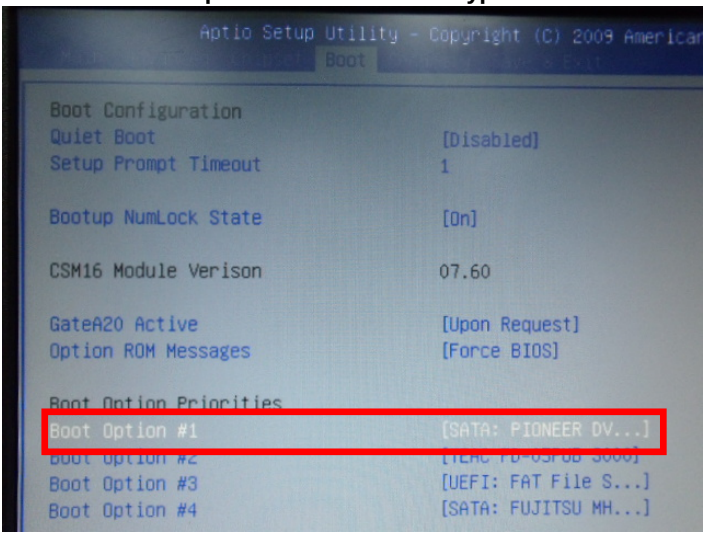
Step 1: Copy the files below from "***Driver CD -> Raid Driver -> F6 Floppy - x86***" to Disk

Step 2: Connect the USB Floppy (disk with AHCI files) to the board

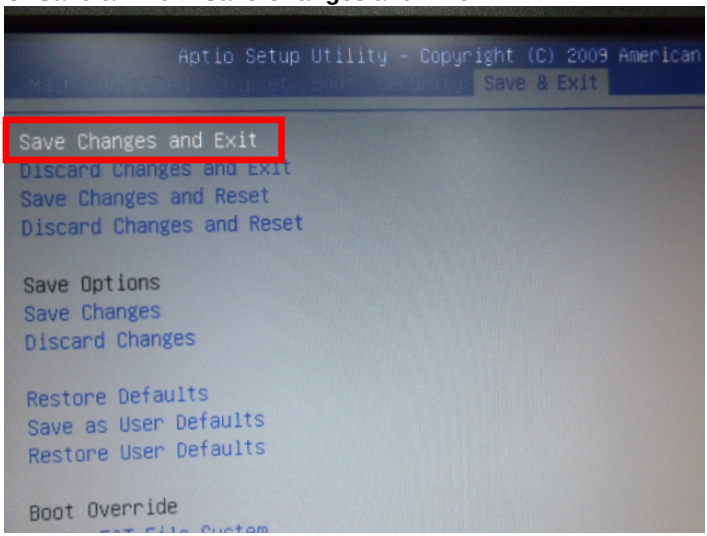
Step 3: The setting procedures " **In BIOS Setup Menu**"
A: Advanced -> SATA Configuration -> SATA Configuration -> SATA Mode -> AHCI Mode



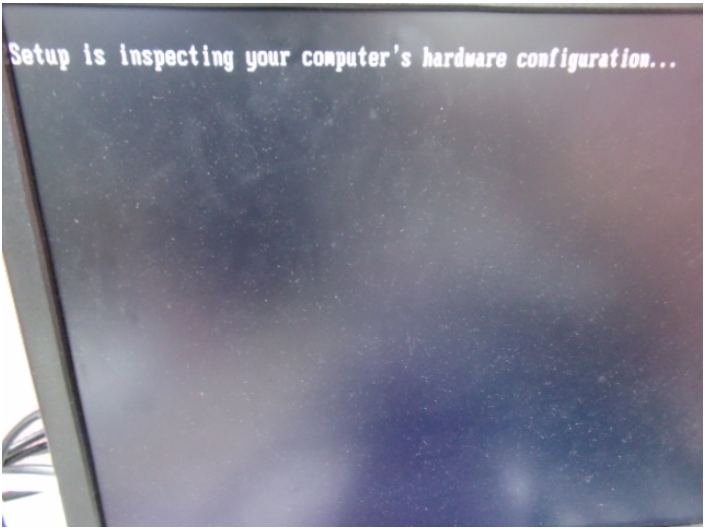
Step 4: The setting procedures "**In BIOS Setup Menu"**
B: Boot -> Boot Option #1 -> DVD-ROM Type



Step 5: The setting procedures "**In BIOS Setup Menu"**
C: Save & Exit -> Save Changes and Exit

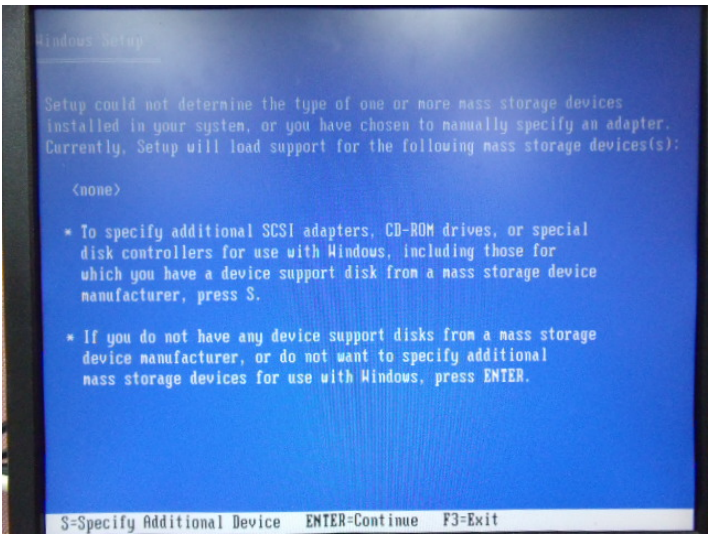


Step 6: Setup OS

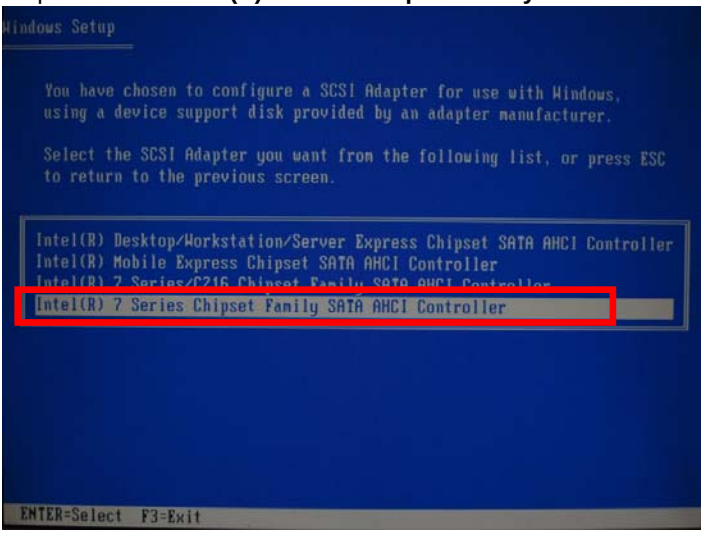


Step 7: Press "**F6**"

Step 8: Choose "**S**"



Step 9: Choose "**Intel(R) 7 Series Chipset Family SATA AHCI Controller**"



Step 10: It will show the model number you select and then press "**ENTER**"

Step 11: Setup is loading files