

# FWS-2251

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Network Appliance

User's Manual 1<sup>st</sup> Ed

## Copyright Notice

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## Packing List

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Before setting up your product, please make sure the following items have been shipped:

Item	Quantity
● FWS-2251	1
● Power adapter	1
● Rubber foot	4
● Product DVD	1

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

## About this Document

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This User's Manual contains all the essential information, such as detailed descriptions and explanations on the product's hardware and software features (if any), its specifications, dimensions, jumper/connector settings/definitions, and driver installation instructions (if any), to facilitate users in setting up their product.

Users may refer to the [AAEON.com](http://AAEON.com) for the latest version of this document.

## Safety Precautions

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Please read the following safety instructions carefully. It is advised that you keep this manual for future references

1. All cautions and warnings on the device should be noted.
2. All cables and adapters supplied by AAEON are certified and in accordance with the material safety laws and regulations of the country of sale. Do not use any cables or adapters not supplied by AAEON to prevent system malfunction or fires.
3. Make sure the power source matches the power rating of the device.
4. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
5. Always completely disconnect the power before working on the system's hardware.
6. No connections should be made when the system is powered as a sudden rush of power may damage sensitive electronic components.
7. If the device is not to be used for a long time, disconnect it from the power supply to avoid damage by transient over-voltage.
8. Always disconnect this device from any AC supply before cleaning.
9. While cleaning, use a damp cloth instead of liquid or spray detergents.
10. Make sure the device is installed near a power outlet and is easily accessible.
11. Keep this device away from humidity.
12. Place the device on a solid surface during installation to prevent falls
13. Do not cover the openings on the device to ensure optimal heat dissipation.
14. Watch out for high temperatures when the system is running.
15. Do not touch the heat sink or heat spreader when the system is running
16. Never pour any liquid into the openings. This could cause fire or electric shock.

17. As most electronic components are sensitive to static electrical charge, be sure to ground yourself to prevent static charge when installing the internal components. Use a grounding wrist strap and contain all electronic components in any static-shielded containers.
18. If any of the following situations arises, please the contact our service personnel:
  - i. Damaged power cord or plug
  - ii. Liquid intrusion to the device
  - iii. Exposure to moisture
  - iv. Device is not working as expected or in a manner as described in this manual
  - v. The device is dropped or damaged
  - vi. Any obvious signs of damage displayed on the device
19. **DO NOT LEAVE THIS DEVICE IN AN UNCONTROLLED ENVIRONMENT WITH TEMPERATURES BEYOND THE DEVICE'S PERMITTED STORAGE TEMPERATURES (SEE CHAPTER 1) TO PREVENT DAMAGE.**

### **Warning!**



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.*

### **Attention:**

*Il y a un risque d'explosion si la batterie est remplacée de façon incorrecte. Ne la remplacer qu'avec le même modèle ou équivalent recommandé par le constructeur. Recycler les batteries usées en accord avec les instructions du fabricant et les directives gouvernementales de recyclage.*



## China RoHS Requirements (CN)

产品中有毒有害物质或元素名称及含量

AAEON Embedded Box PC/ 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	○	○	○	○	○	○
<p><b>O:</b> 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。</p> <p><b>X:</b> 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。</p> <p>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、光驱、触控模块为选购品。</p>						

## China RoHS Requirement (EN)

Poisonous or Hazardous Substances or Elements in Products  
AAEON Embedded Box PC/ Industrial System

Component	Poisonous or Hazardous Substances or Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
PCB & Other Components	○	○	○	○	○	○
Wires & Connectors for External Connections	○	○	○	○	○	○
Chassis	○	○	○	○	○	○
CPU & RAM	○	○	○	○	○	○
Hard Disk	○	○	○	○	○	○
PSU	○	○	○	○	○	○

O: The quantity of poisonous or hazardous substances or elements found in each of the component's parts is below the SJ/T 11363-2006-stipulated requirement.

X: The quantity of poisonous or hazardous substances or elements found in at least one of the component's parts is beyond the SJ/T 11363-2006-stipulated requirement.

**Note:** The Environment Friendly Use Period as labeled on this product is applicable under normal usage only

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# Chapter 1

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Product Specifications

## 1.1 Specifications

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### System

- **Processor** Onboard Intel® Celeron® J1900 (2M cache, up to 2.42 GHz)
- **System Memory** 204-pin DDR3L 1333MHz SODIMM x 2, up to 8GB
- **Chipset** -
- **VGA Controller** Processor integrated
- **Ethernet** Intel® Ethernet Controller I211-AT  
Gigabit Ethernet x 4
- **BIOS** AMI BIOS
- **Serial ATA** Onboard SATA 6.0 Gb/s port x 1 (optional CF socket x 1)  
Optional mSATA slot x 1 (shared with top side MiniCard slot)
- **SSD** -
- **Expansion Interface** MiniCard socket x 3
  - Half-size x 1 (top side)
  - Full-size with dual SIM socket x 1 (USB 2.0 only, top side)
  - Full-size with SIM socket x 1 (underside)
- **Watchdog Timer** 1~255 steps by software programming
- **RTC** Internal RTC
- **Storage** Onboard SATA 6.0 Gb/s port x 1 (optional CF

- Front Panel I/O
  - socket x 1)
  - Optional mSATA slot x 1 (shared with top side MiniCard slot)
  - Power LED x 1
  - Status LED (Optional) x 1
  - HDD Active LED x 1
  - LAN LED x 8
  - RSSI LED (Optional) x 2
  - SIM Cover x 1
  - Antenna Hole x 3
- Rear Panel I/O
  - USB 3.0 Ports x 1
  - RJ-45 Ports x 4
  - RJ-45 Console x 1
  - 12V DC Power Input x 1
  - Hardware Reset Button x 1
  - Antenna Hole x 3
- Color
  - White
- Power Requirement
  - DC 12V power-in connector x 1
  - 40 W power adapter
- Dimension (W x D x H)
  - 210 x 105 x 35 mm (8.27 x 4.13 x 1.38")
- Certification
  - CE/FCC Class A

## I/O

- Serial Port
  - RJ-45 console x 1
- Keyboard and Mouse
  - Reserved pin header
- USB
  - USB 3.0 type A x 1

## Environmental

- Operating Temperature 0 ~ 40°C (32 ~ 104°F)
- Storage Temperature -20 ~ 70°C (4 ~ 158°F)
- Operating Humidity 10 ~ 80%
- Storage Humidity 10 ~ 80% @ 40°C, non-condensing
- Anti-Vibration 2.0 G<sub>rms</sub>/5~500Hz/ operation (SATA DOM)
- Anti-Shock 30 G peak acceleration (11m sec. duration), operation



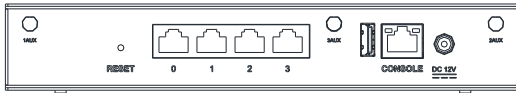
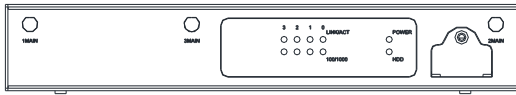
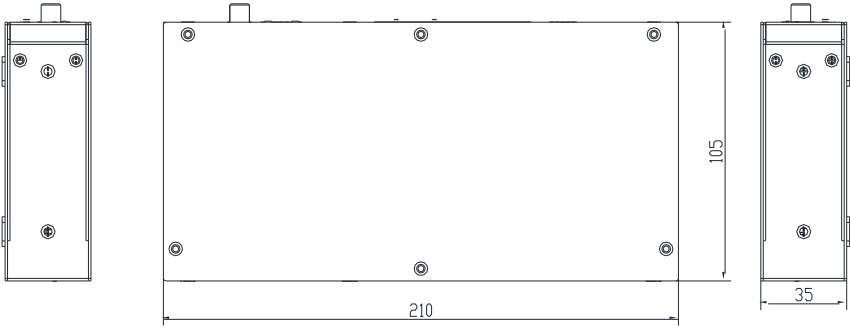
# Chapter 2

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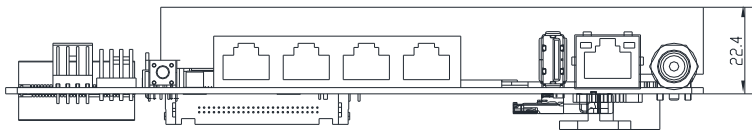
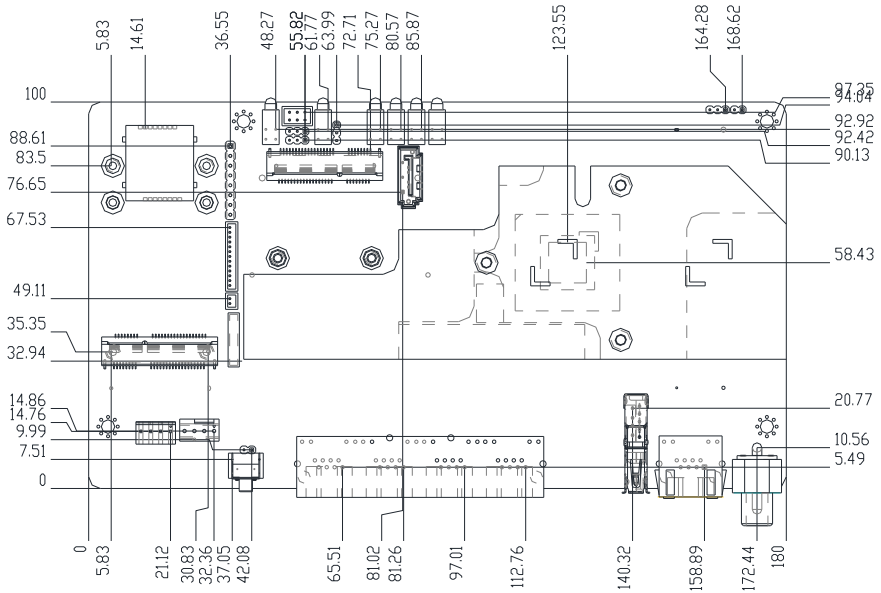
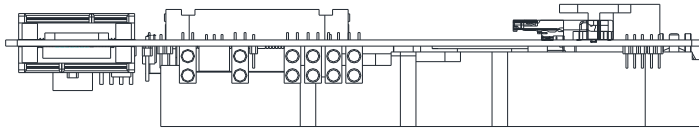
Hardware Information

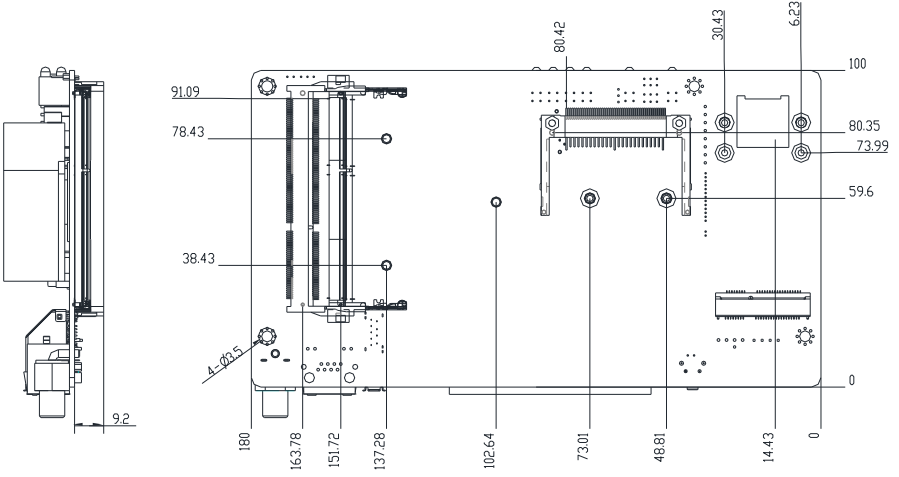
## 2.1 Dimensions

### System



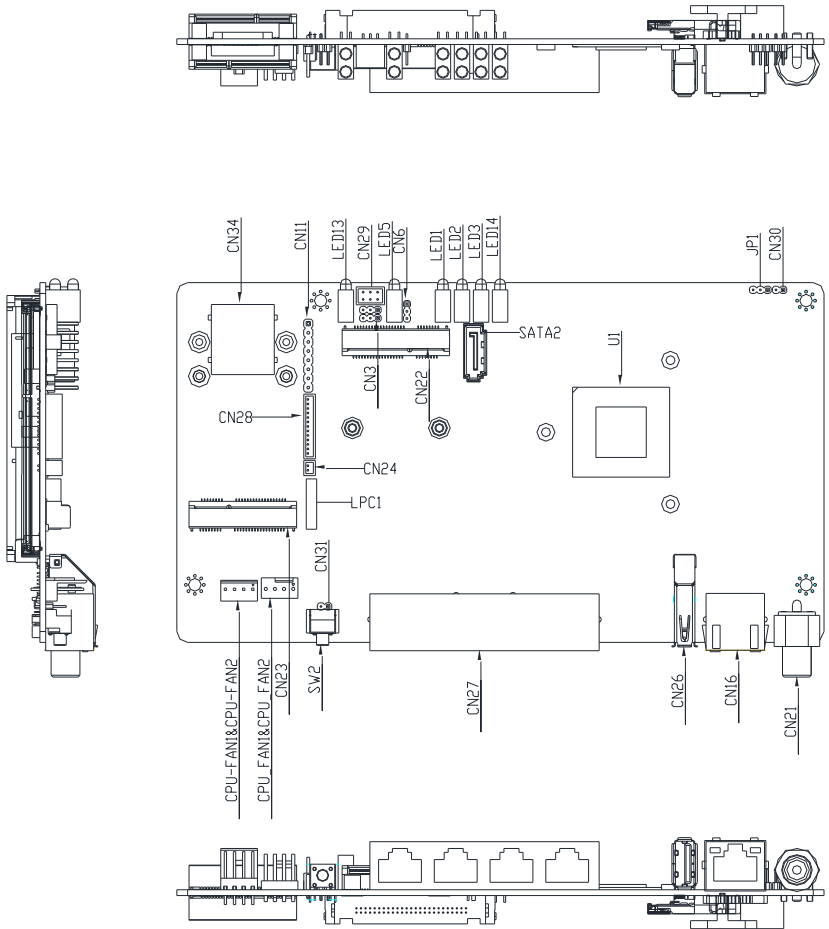
# Board

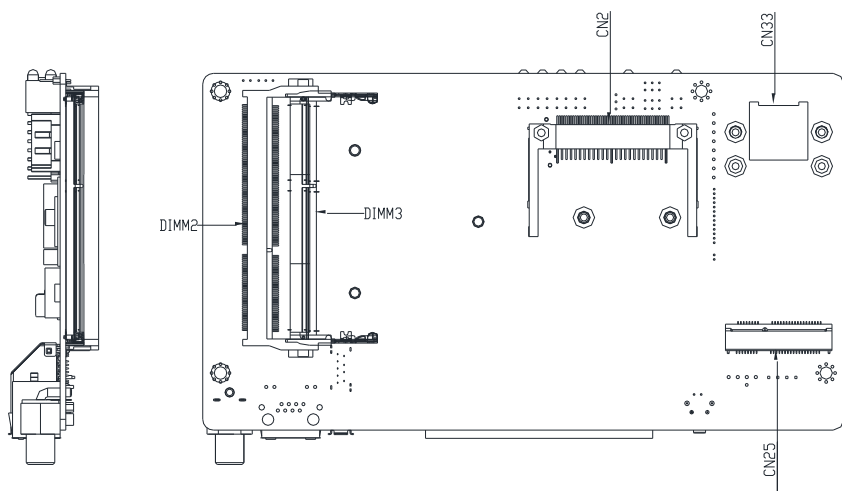




## 2.2 Jumpers and Connectors

### Component Side





## 2.3 List of Jumpers

---

Please refer to the table below for all of the board's jumpers that you can configure for your application

Label	Function
JP1	Auto Power Button
CN2	Clear ME
CN3	Clear CMOS
CN6	CF Power Select
CN30	Power Button
CN31	Software Reset

### 2.3.1 Auto PWRBTN Selection (JP1)

---

Pin	Function
1-2	Disable Auto PWRBTM (default)
2-3	Enable Auto PWRBTN

### 2.3.2 ME Setting Selection (CN2)

---

Pin	Function
1-2	Clear ME
2-3	Normal (default)

### 2.3.3 CMOS Setting Selection (CN3)

---

Pin	Function
1-2	Clear CMOS
2-3	Normal (default)

### 2.3.4 CF Power Selection (CN6)

---

Pin	Function
1-2	5 V
2-3	3.3 V



## 2.4 List of Connectors

---

Please refer to the table below for all of the board's connectors that you can configure for your application

Label	Function
CN1	HDD POWER
CN4	HDD POWER
CN5	CF SOCKET
CN16	COM1
CN19	2*USB2.0
CN21	+12V POWER IN
CN22	Mini-card socket
CN24	Battery
CN26	USB3.0+USB2.0
CN27	LAN1~4
CN28	VGA Connector
CN29	PS2 Header
CPU_FAN	CPU Fan
DIMM1	DDR3L SODIMM
DIMM2	DDR3L SODIMM
LED1	LAN1 LED Instruction
LED2	LAN2 LED Instruction
LED3	LAN3 LED Instruction
LED4	LAN4 LED Instruction
LED5	BYPASS+STATE LED Instruction
LED13	POWER+HDD LED Instruction
SW1	Power Button
SW2	Software Reset

### 2.4.1 HDD Power (CN1/ CN4)

---

Pin	Signal	Pin	Signal
1	+12V	2	GND
3	GND	4	+5V

### 2.4.2 VGA Connector (CN28)

---

Pin	Signal	Pin	Signal
1	VS	2	HS
3	GND	4	SCL
5	SDA	6	GND
7	BLUE	8	GND
9	GREEN	10	GND
11	RED	12	GND
13	5V		

### 2.4.3 SATA Power Connector (CN10)

---

Pin	Signal	Pin	Signal
1	KDAT	2	KCLK
3	GND	4	+5V
5	MDAT	6	KCLK

## 2.4.4 CPU Fan (CPU\_FAN)

---

Pin	Signal	Pin	Signal
1	GND	2	+12V
3	FANTAC	4	FANCONTROL

# Chapter 3

---

AMI BIOS Setup

## 3.1 System Test and Initialization

---

The system uses certain routines to perform testing and initialization. If an error, fatal or non-fatal, is encountered, a few short beeps or an error message will be outputted. The board can usually continue the boot up sequence with non-fatal errors.

The system configuration verification routines check the current system configuration against the values stored in the CMOS memory. If they do not match, an error message will be outputted, in which case you will need to run the BIOS setup program to set the configuration information in memory.

There are three situations in which you will need to change the CMOS settings:

- You are starting your system for the first time
- You have changed your system's hardware
- The CMOS memory has lost power and the configuration information is erased

The system's CMOS memory uses a backup battery for data retention, which is to be replaced once emptied.

## 3.2 AMI BIOS Setup

---

The AMI BIOS ROM has a pre-installed Setup program that allows users to modify basic system configurations, which is stored in the battery-backed CMOS RAM and BIOS NVRAM so that the information is retained when the power is turned off.

To enter BIOS Setup, press <Del> immediately while your computer is powering up.

The function for each interface can be found below.

**Main** – Date and time can be set here. Press <Tab> to switch between date elements

**Advanced** – Enable/ Disable boot option for legacy network devices

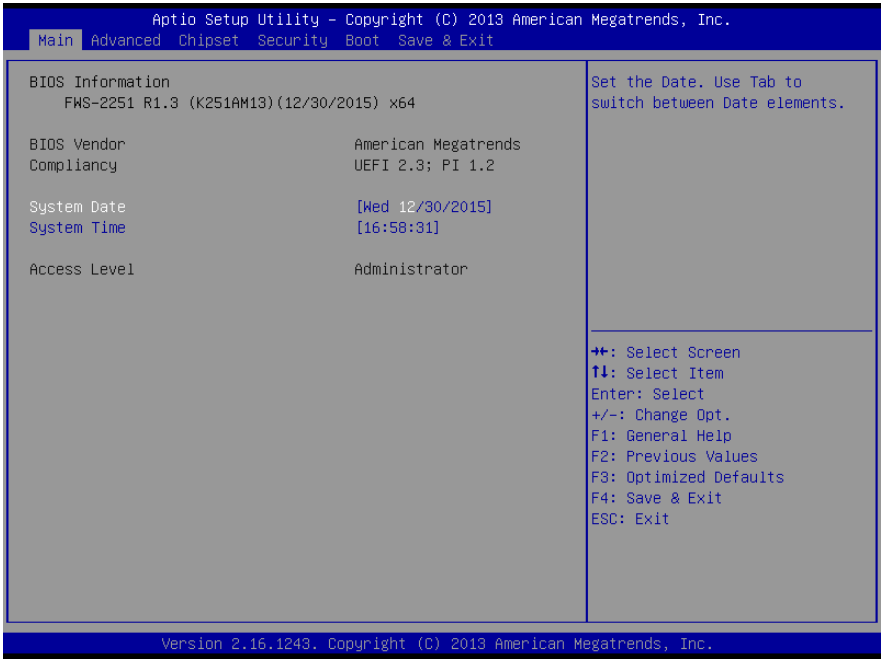
**Chipset** – For hosting bridge parameters

**Boot** – Enable/ Disable quiet Boot Option

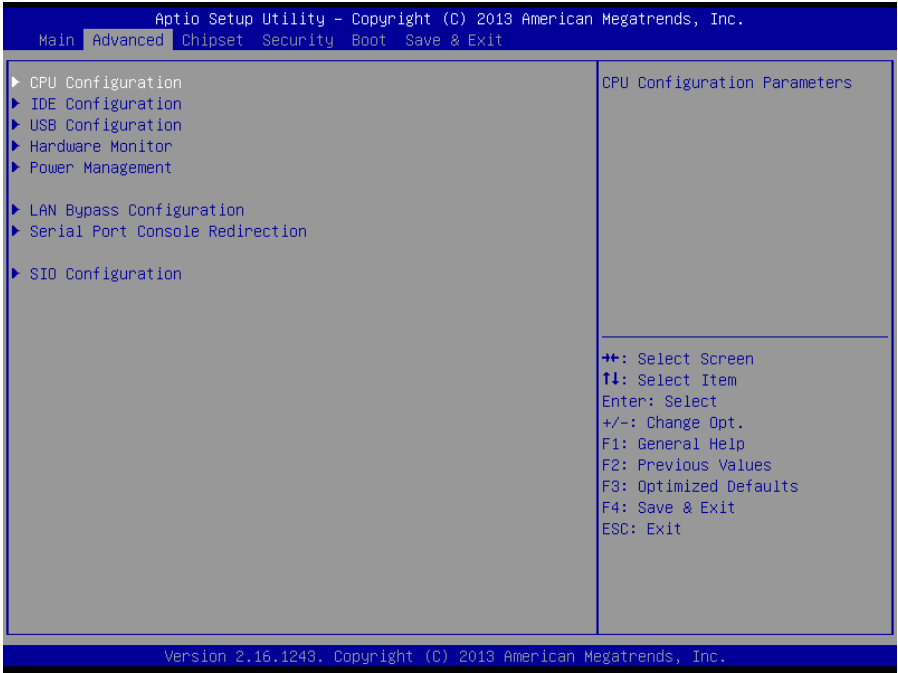
**Security** – The setup administrator password can be set here

**Save & Exit** – Save your changes and exit the program

### 3.3 Setup Submenu: Main

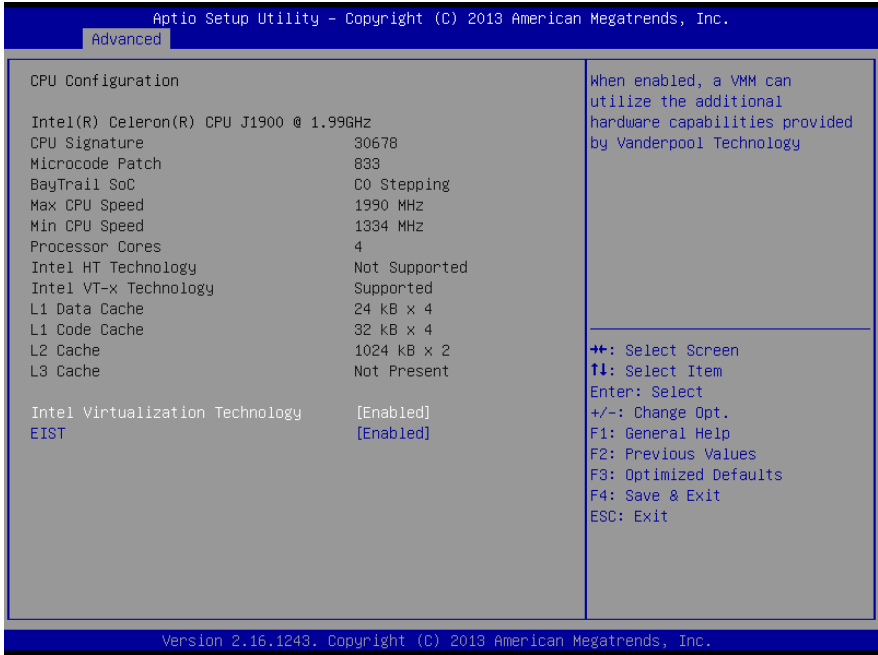


### 3.4 Setup Submenu: Advanced





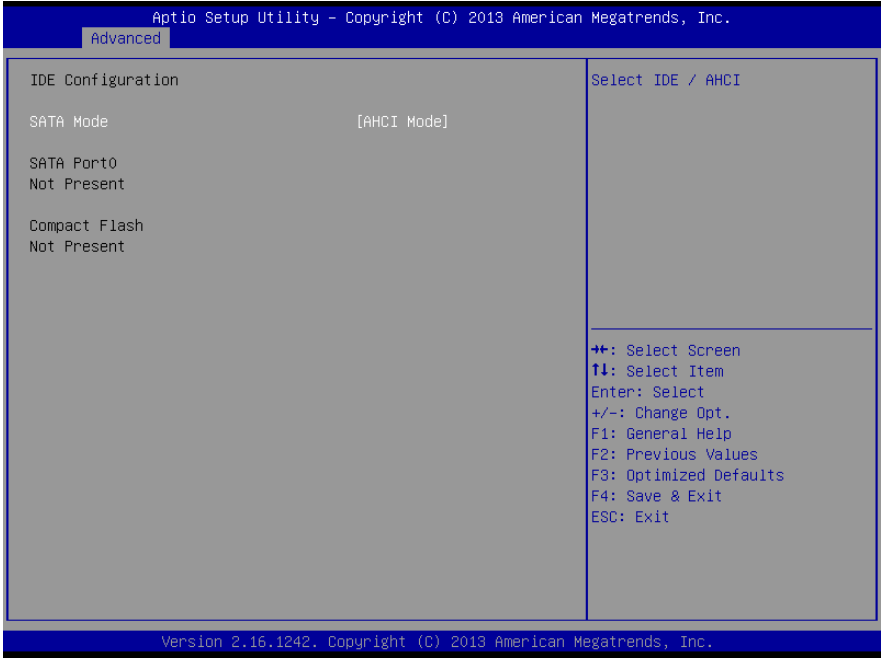
### 3.4.1 Advanced: CPU Configuration



Options summary:

Intel Virtualization Technology	Disabled	
	Enabled	Optimal Default, Failsafe Default
EIST	Disabled	
	Enabled	Optimal Default, Failsafe Default

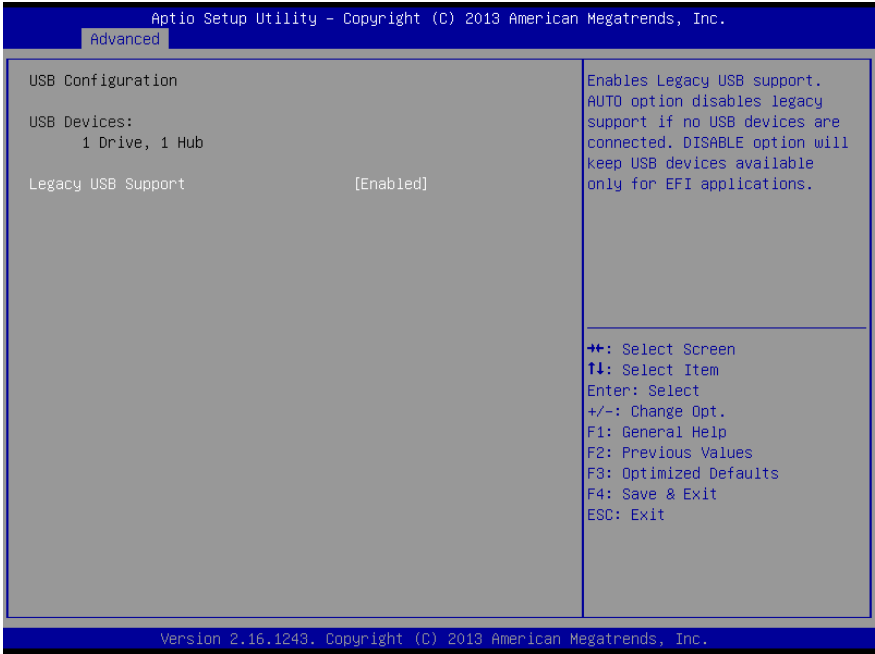
### 3.4.2 Advanced: IDE Configuration



Options summary:

SATA Mode	IDE Mode	
	AHCI Mode	Optimal Default, Failsafe Default

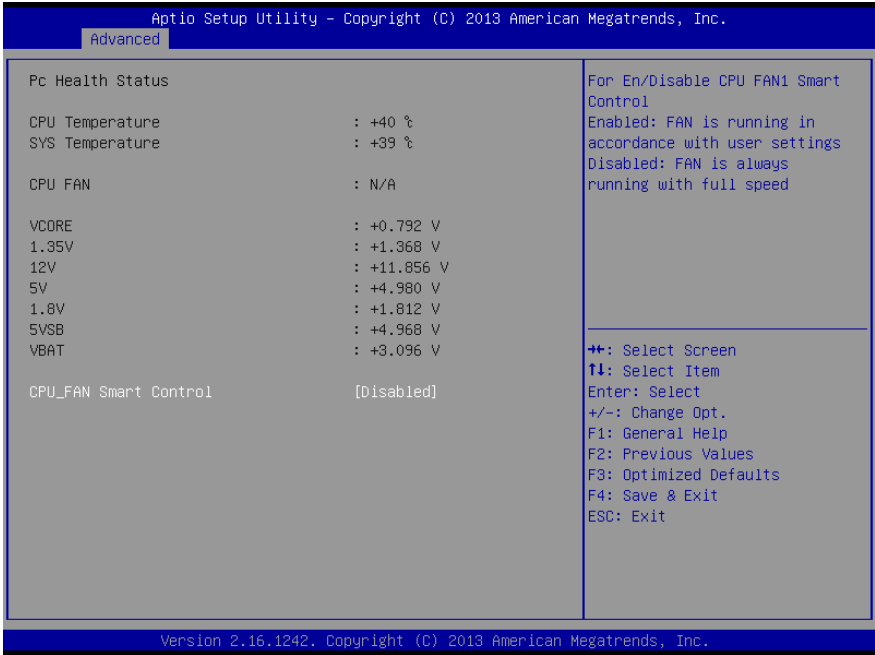
### 3.4.3 Advanced: USB Configuration



Options summary:

Legacy USB Support	Enabled	Optimal Default, Failsafe Default
	Disabled	
	Auto	
Enables BIOS Support for Legacy USB Support. When enabled, USB can be functional in legacy environment like DOS. AUTO option disables legacy support if no USB devices are connected		
Device Name (Emulation Type)	Auto	Optimal Default, Failsafe Default
	Floppy	
	Forced FDD	
	Hard Disk	
	CDROM	
If Auto. USB devices less than 530MB will be emulated as Floppy and remaining as Floppy and remaining as hard drive. Forced FDD option can be used to force a HDD formatted drive to boot as FDD(Ex. ZIP drive)		
USB Port 0/1 function routing	FCH USB port 8/9	Optimal Default, Failsafe Default
	FCH USB port 0/1	

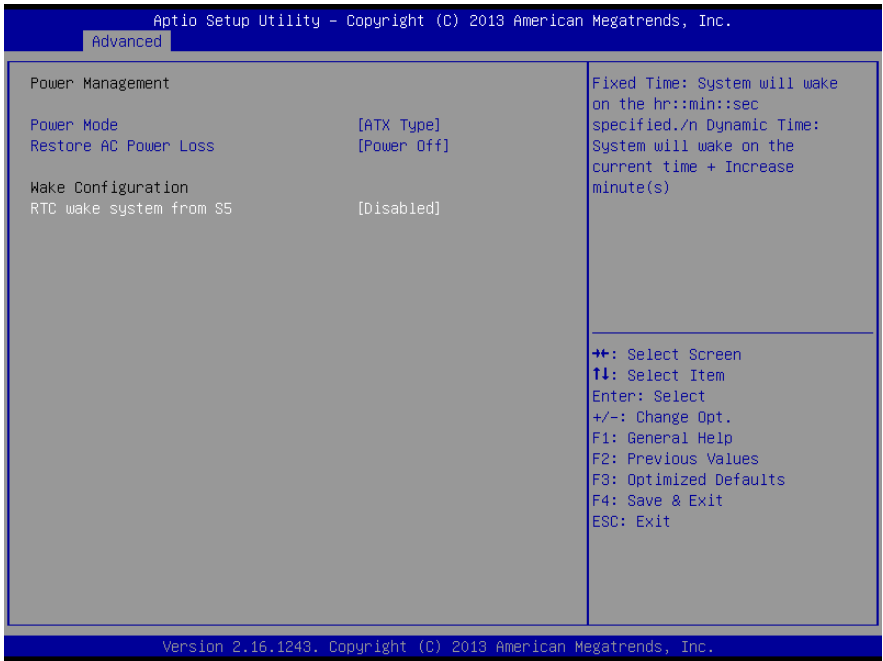
### 3.4.4 Advanced: Hardware Monitor



Options summary:

CPU_FAN Smart Control	Disabled	Optimal Default, Failsafe Default
	Enabled	

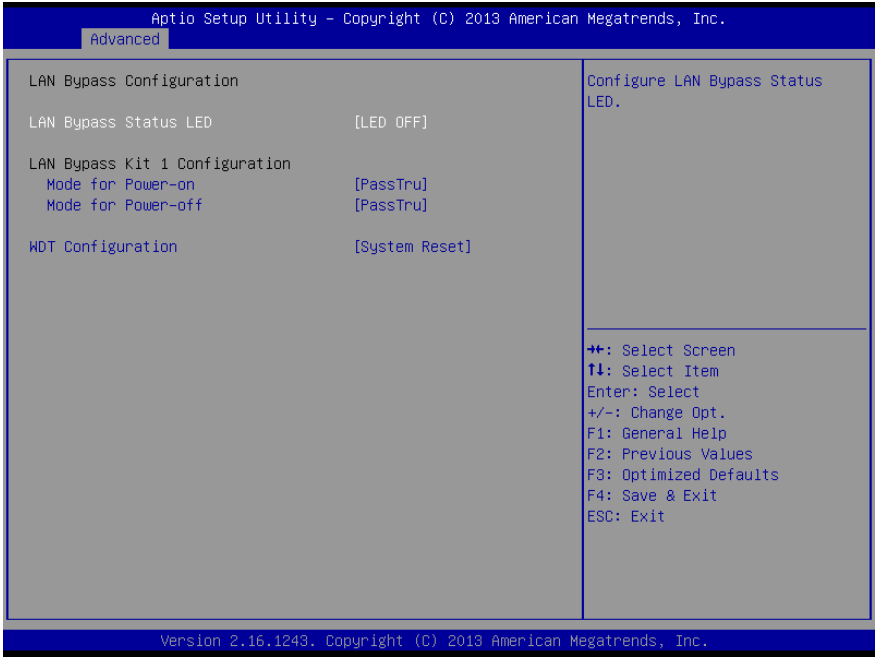
### 3.4.5 Advanced: Power Management



Options summary:

Power Mode	ATX Type	Optimal Default, Failsafe Default
	AT Type	
Select power supply mode.		
Restore on Power Loss	Last State	Optimal Default, Failsafe Default
	Power On	
	Power Off	
Select power state when power is re-applied after a power failure.		
RTC wake system from S5	Disabled	Optimal Default, Failsafe Default
	Fixed Time	
	Dynamic Time	
Enable or disable System wake on alarm event. When enabled, System will wake on the hr::min::sec specified		

### 3.4.6 Advanced: LAN Bypass Configuration

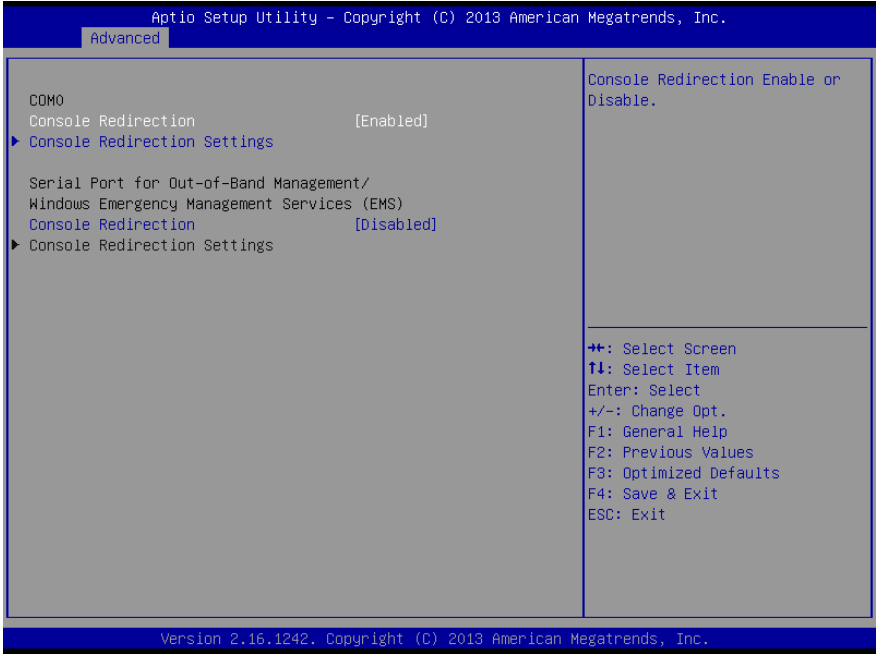


Options summary:

LAN Bypass Status LED	LED OFF	Optimal Default, Failsafe Default
	RED LED ON	
	RED LED BLINK	
	RED LED FAST BLINK	
	GREEN LED ON	
	GREEN LED BLINK	
Configure LAN Bypass Status LED.		
Mode for Power-on	PassTru	Optimal Default, Failsafe Default
	ByPass	
Configure LAN kit behavior when system in power-on state. (Bypass/Pass Through)		
Mode for Power-off State	PassTru	Optimal Default, Failsafe Default
	ByPass	
Configure LAN kit behavior when system in power-off state. (Bypass/Pass Through)		
WDT Configuration	Force ByPass	Optimal Default, Failsafe Default
	System Reset	

Configure WDT behavior , System Reset , Force Bypass

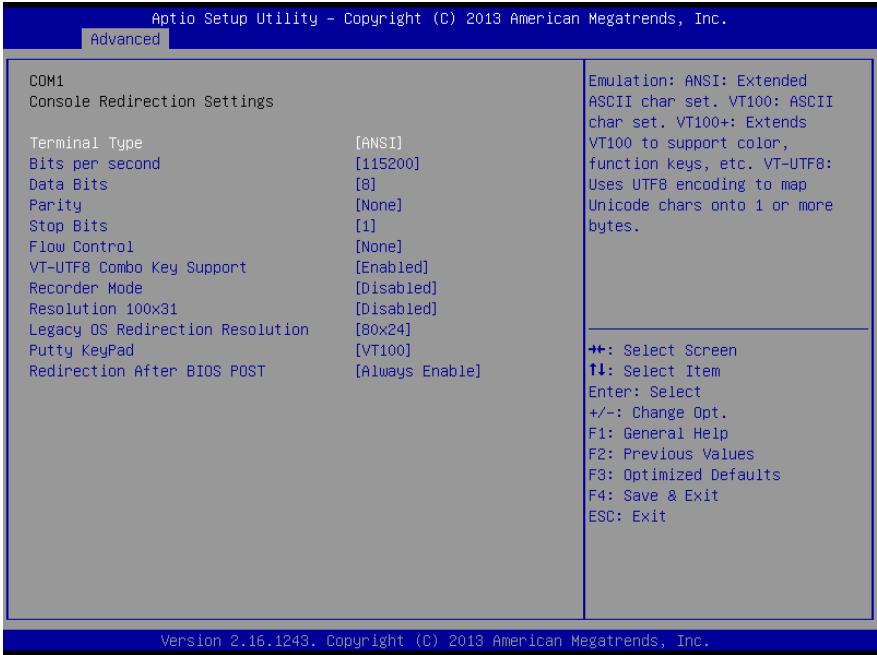
### 3.4.7 Advanced: Serial Port Console Redirection



Options summary:

Console Redirection	Disabled	Optimal Default, Failsafe Default
	Enabled	
Console Redirection Enable or Disable		

### 3.4.7.1 Serial Port Console Redirection: Console Redirection Settings



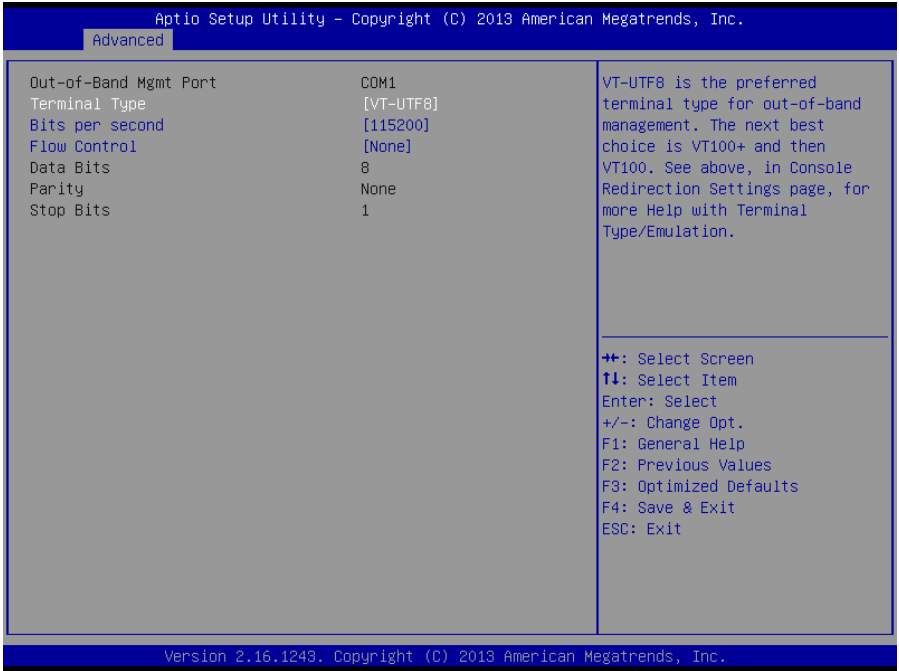
Options summary:

Terminal Type	VT100	Optimal Default, Failsafe Default
	VT100+	
	VT-UTF8	
	ANSI	
Emulation: ANSI, VT100, VT100+, VT-UTF8		
Bit per second	9600	Optimal Default, Failsafe Default
	19200	
	38400	
	57600	
	115200	
Selects serial port transmission speed		
Data Bits	7	Optimal Default, Failsafe Default
	8	
Data Bits		



Parity	None	Optimal Default, Failsafe Default
	Even	
	Odd	
	Mark	
	Space	
A parity bit can be sent with the data bits to detect some transmission errors.		
Stop Bits	1	Optimal Default, Failsafe Default
	2	
Stop bits indicate the end of a serial data packet.		
Flow Control	None	Optimal Default, Failsafe Default
	Hardware RTS/CTS	
Flow control can prevent data loss from buffer overflow.		
VT-UTF8 Combo Key Support	Disable	Optimal Default, Failsafe Default
	Enable	
Enable VT-UTF8 Combo Key Support for ANSI/VT100 terminals.		
Recorder Mode	Disable	Optimal Default, Failsafe Default
	Enable	
On this mode enabled only text will be sent. This is to capture Terminal data.		
Resolution 100x31	Disable	Optimal Default, Failsafe Default
	Enable	
Enable or disable extended terminal resolution		
Legacy OS Redirection Resolution	80x24	Optimal Default, Failsafe Default
	80x25	
On Legacy OS, the number of Rows and Columns supported redirection.		
Putty KeyPad	VT100	Optimal Default, Failsafe Default
	LINUX	
	XTERMR6	
	SCO	
	ESCN	
	VT400	
Emulation		
Redirection After BIOS POST	Always Enable	Optimal Default, Failsafe Default
	BootLoader	

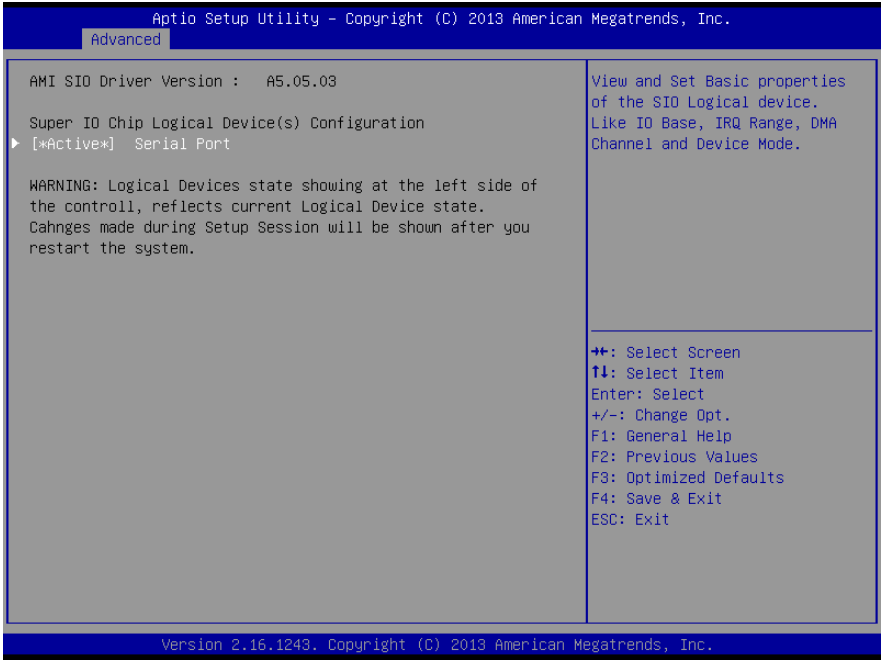
### 3.4.7.2 Serial Port Console Redirection: Out-of-Band Management Port



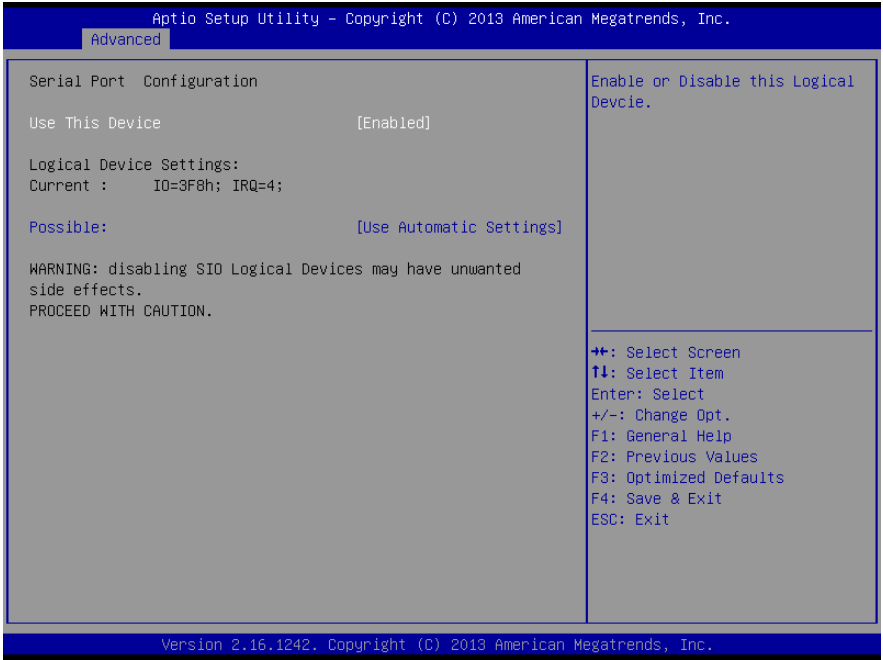
Options summary:

Terminal Type	VT100	Optimal Default, Failsafe Default
	VT100+	
	VT-UTF8	
	ANSI	
Emulation: ANSI, VT100, VT100+, VT-UTF8		
Bit per second	9600	Optimal Default, Failsafe Default
	19200	
	57600	
	115200	
Selects serial port transmission speed		
Flow Control	None	Optimal Default, Failsafe Default
	Hardware RTS/CTS	
	Software Xon/Xoff	
Flow control can prevent data loss from buffer overflow.		

### 3.4.8 Advanced: SIO Configuration



### 3.4.8.1 SIO Configuration: Serial Port Configuration

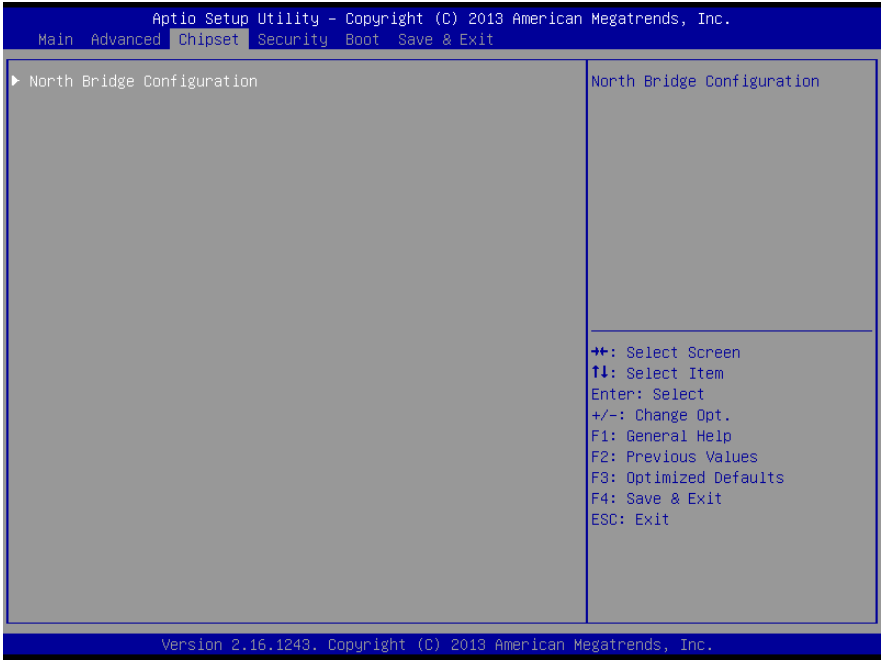


Options summary:

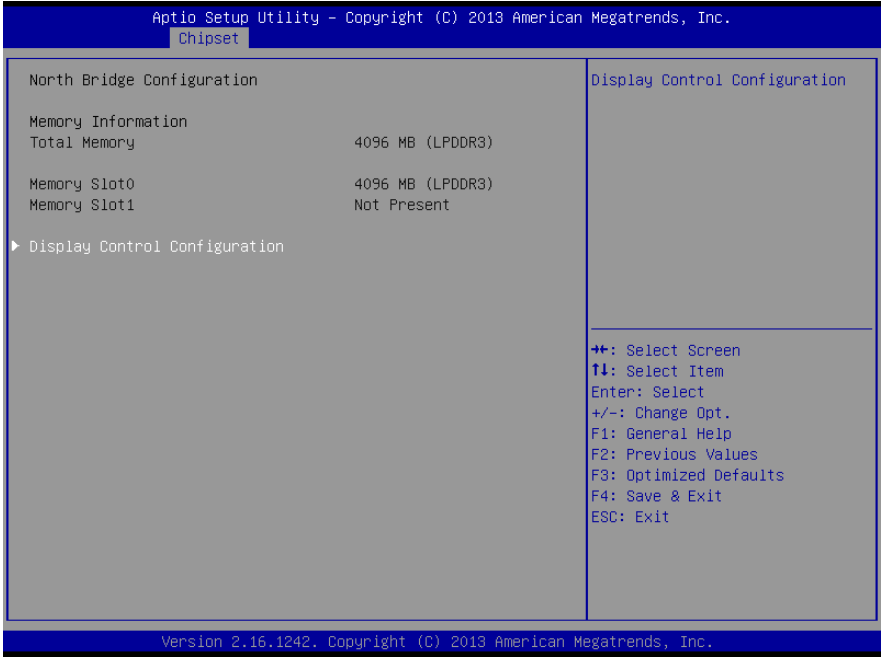
Use This Device	Disabled	Optimal Default, Failsafe Default
	Enabled	
En/Disable Serial Port (COM)		
Possible:	Use Automatic Settings	Optimal Default, Failsafe Default
	IO=3F8; IRQ=4;	
	IO=2F8; IRQ=3;	
Select an optimal setting for IO device		

### 3.5 Setup submenu: Chipset

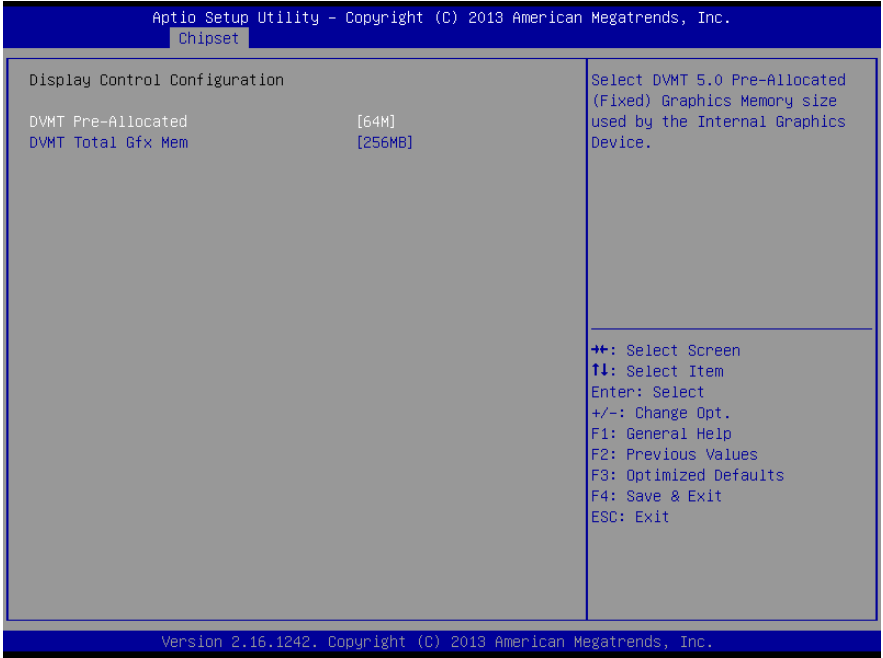
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### 3.5.1 Chipset: North Bridge



### 3.5.1.1 North Bridge: Display Control Configuration



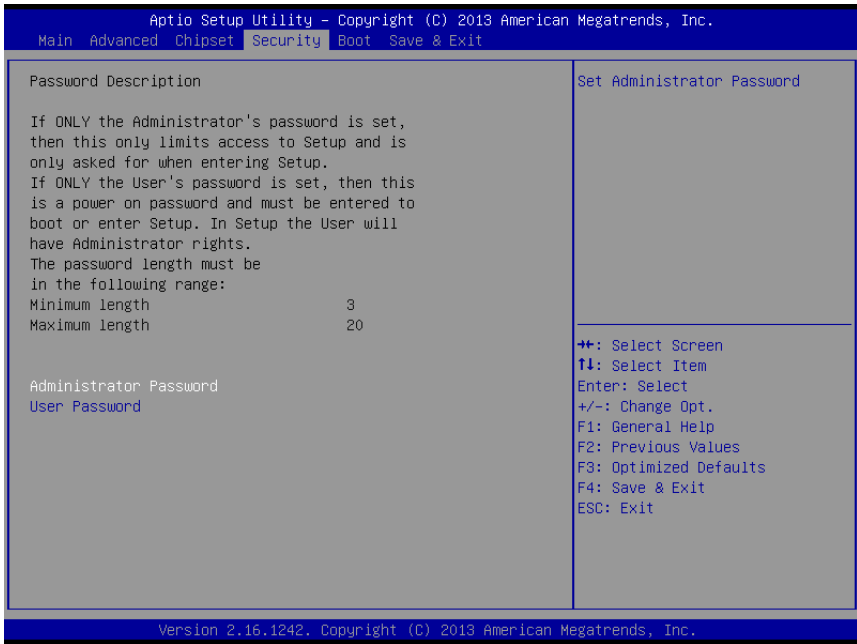
Options summary:

DVMT Pre-Allocated	64M	Optimal Default, Failsafe Default
	96M	
	128M	
	160M ...	
	192M	
	224M	
	256M	
	288M	
	320M	
	352M	
	384M	
	416M	
	448M	
	480M	
512M		
Select DVMT 5.0 Pre-Allocated Graphics Memory size		

DVMT Total Gfx Mem	128MB	Optimal Default, Failsafe Default
	256MB	
	Max	
Select DVMT 5.0 Total Graphics Memory size used by the Internal Graphics Device		



## 3.6 Setup submenu: Security



### Change User/Administrator Password

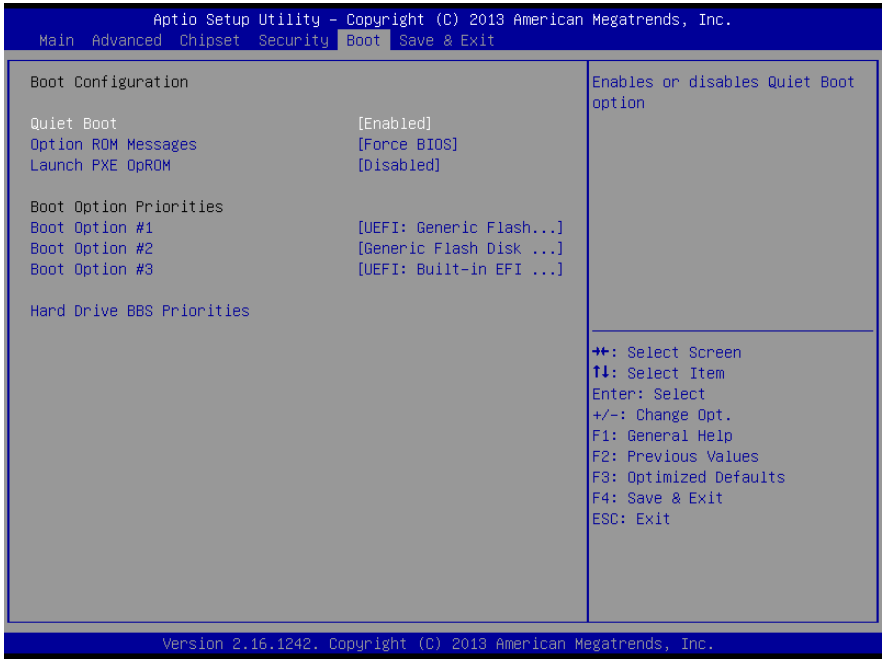
You can set a User Password once an Administrator Password is set. The password will be required during boot up, or when the user enters the Setup utility. Please Note that a User Password does not provide access to many of the features in the Setup utility.

Select the password you wish to set, press Enter to open a dialog box to enter your password (you can enter no more than six letters or numbers). Press Enter to confirm your entry, after which you will be prompted to retype your password for a final confirmation. Press Enter again after you have retyped it correctly.

### Removing the Password

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

### 3.7 Setup submenu: Boot

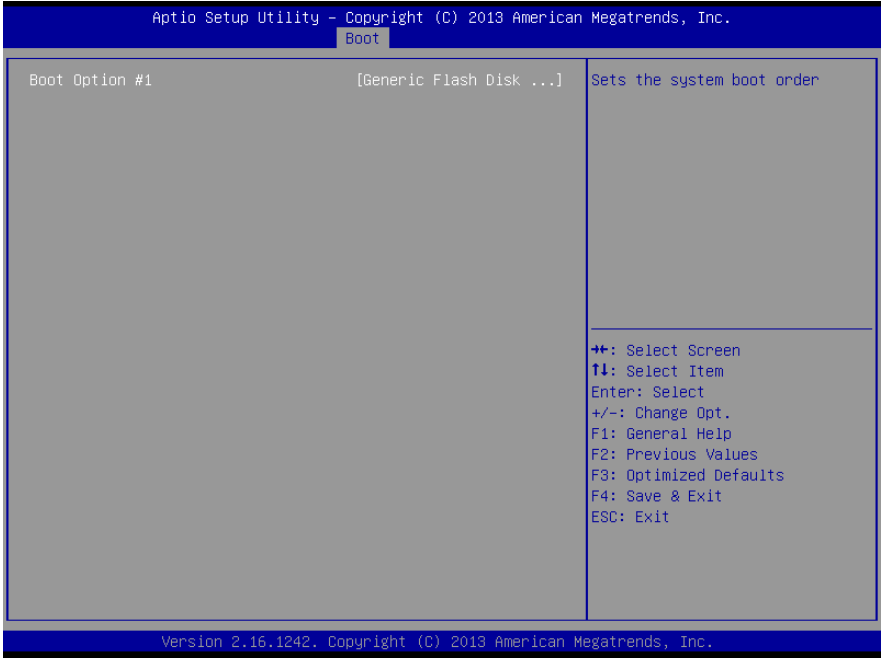


Options summary:

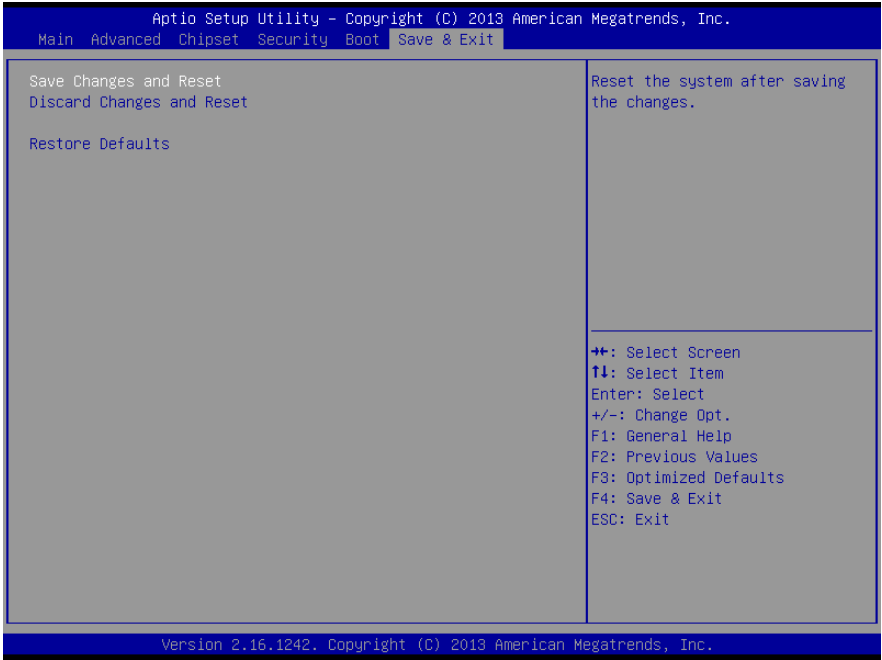
Quiet Boot	Disabled	Default
	Enabled	
En/Disable showing boot logo.		
Option ROM Messages	Force BIOS	Default
	Keep Current	
Set display mode for Option ROM		
Launch PXE OpROM	Disabled	Default
	Enabled	
En/Disable Legacy Boot Option		

### 3.7.1 Boot: BBS Priorities

---



### 3.8 Setup submenu: Exit



# Chapter 4

---

Drivers Installation

## 4.1 Driver Installation

---

The drivers can be found in the product page for FWS-2251 at [aaeon.com](http://aaeon.com). Please follow the sequence below to install the drivers.

### Step 1 – Install Chipset Drivers

1. Download and open **Chipset.exe**
2. Follow the instructions
3. Drivers will be installed automatically

### Step 2 – Install Graphics Driver

1. Download and open **Setup.exe** for your OS
2. Follow the instructions
3. Drivers will be installed automatically

### Step 3 – Install Network Driver

1. Download and open the **.exe file** for your OS
2. Follow the instructions
3. Drivers will be installed automatically

### Step 4 – Install xHCI Driver (Windows 7 only)

1. Download and open **Setup.exe**
2. Follow the instructions
3. Drivers will be installed automatically

### Step 5 – Install Intel Sideband Fabric Device Driver (Windows 8.1 only)

1. Download and open the **Setup.exe file**

2. Follow the instructions
3. Drivers will be installed automatically

# Appendix A

---

## Watchdog Timer Programming



## A.1 Watchdog Timer Initial Program

Table 1 : SuperIO relative register table		
	Default Value	Note
Index	0x2E(Note1)	SIO MB PnP Mode Index Register 0x2E or 0x4E
Data	0x2F(Note2)	SIO MB PnP Mode Data Register 0x2F or 0x4F

Table 2 : Watchdog relative register table					
	LDN	Register	BitNum	Value	Note
Timer Counter	0x07(Note3)	0x73(Note4)		(Note24)	Time of watchdog timer (0~255) This register is byte access
Counting Unit	0x07(Note5)	0x72(Note6)	7(Note7)	1(Note8)	Select time unit. 1: second 0: minute
Watchdog Enable (KRST)	0x07(Note9)	0x72(Note10)	6(Note11)	1(Note12)	0: Disable 1: Enable
Timeout Status	0x07(Note13)	0x71(Note14)	0(Note15)	1	1: Clear timeout status

```
*****
// SuperIO relative definition (Please reference to Table 1)
#define byte   SIOIndex //This parameter is represented from Note1
#define byte   SIOData //This parameter is represented from Note2
#define void   IOWriteByte(byte IOPort, byte Value);
#define byte   IOReadByte(byte IOPort);
// Watch Dog relative definition (Please reference to Table 2)
#define byte   TimerLDN //This parameter is represented from Note3
#define byte   TimerReg //This parameter is represented from Note4
#define byte   TimerVal // This parameter is represented from Note24
#define byte   UnitLDN //This parameter is represented from Note5
#define byte   UnitReg //This parameter is represented from Note6
#define byte   UnitBit //This parameter is represented from Note7
#define byte   UnitVal //This parameter is represented from Note8
#define byte   EnableLDN //This parameter is represented from Note9
#define byte   EnableReg //This parameter is represented from Note10
#define byte   EnableBit //This parameter is represented from Note11
#define byte   EnableVal //This parameter is represented from Note12
#define byte   StatusLDN // This parameter is represented from Note13
#define byte   StatusReg // This parameter is represented from Note14
#define byte   StatusBit // This parameter is represented from Note15
*****
```

```
*****
VOID Main(){
    // Procedure : AaeonWDTConfig
    // (byte)Timer : Time of WDT timer.(0x00~0xFF)
    // (boolean)Unit : Select time unit(0: second, 1: minute).
    AaeonWDTConfig();

    // Procedure : AaeonWDTEnable
    // This procedure will enable the WDT counting.
    AaeonWDTEnable();
}
*****
```

```
*****
// Procedure : AaeonWDTEnable
VOID  AaeonWDTEnable (){
    WDTEnableDisable(EnableLDN, EnableReg, EnableBit, 1);
}

// Procedure : AaeonWDTConfig
VOID  AaeonWDTConfig (){
    // Disable WDT counting
    WDTEnableDisable(EnableLDN, EnableReg, EnableBit, 0);
    // Clear Watchdog Timeout Status
    WDTClearTimeoutStatus();
    // WDT relative parameter setting
    WDTParameterSetting();
}

VOID  WDTEnableDisable(byte LDN, byte Register, byte BitNum, byte Value){
    SIOBitSet(LDN, Register, BitNum, Value);
}

VOID  WDTParameterSetting(){
    // Watchdog Timer counter setting
    SIOByteSet(TimerLDN, TimerReg, TimerVal);
    // WDT counting unit setting
    SIOBitSet(UnitLDN, UnitReg, UnitBit, UnitVal);
}

VOID  WDTClearTimeoutStatus(){
    SIOBitSet(StatusLDN, StatusReg, StatusBit, 1);
}
*****
```

```
*****
VOID  SIOEnterMBPnPMode(){
    Switch(SIOIndex){
        Case 0x2E:
            IOWriteByte(SIOIndex, 0x87);
            IOWriteByte(SIOIndex, 0x01);
            IOWriteByte(SIOIndex, 0x55);
            IOWriteByte(SIOIndex, 0x55);
            Break;
        Case 0x4E:
            IOWriteByte(SIOIndex, 0x87);
            IOWriteByte(SIOIndex, 0x01);
            IOWriteByte(SIOIndex, 0x55);
            IOWriteByte(SIOIndex, 0xAA);
            Break;
    }
}

VOID  SIOExitMBPnPMode(){
    IOWriteByte(SIOIndex, 0x02);
    IOWriteByte(SIOData, 0x02);
}

VOID  SIOSelectLDN(byte LDN){
    IOWriteByte(SIOIndex, 0x07); // SIO LDN Register Offset = 0x07
    IOWriteByte(SIOData, LDN);
}
*****
```

```
*****
VOID  SIOBitSet(byte LDN, byte Register, byte BitNum, byte Value){
    Byte TmpValue;

    SIOEnterMBPnPMode();
    SIOSelectLDN(byte LDN);
    IOWriteByte(SIOIndex, Register);
    TmpValue = IOReadByte(SIOData);
    TmpValue &= ~(1 << BitNum);
    TmpValue |= (Value << BitNum);
    IOWriteByte(SIOData, TmpValue);
    SIOExitMBPnPMode();
}

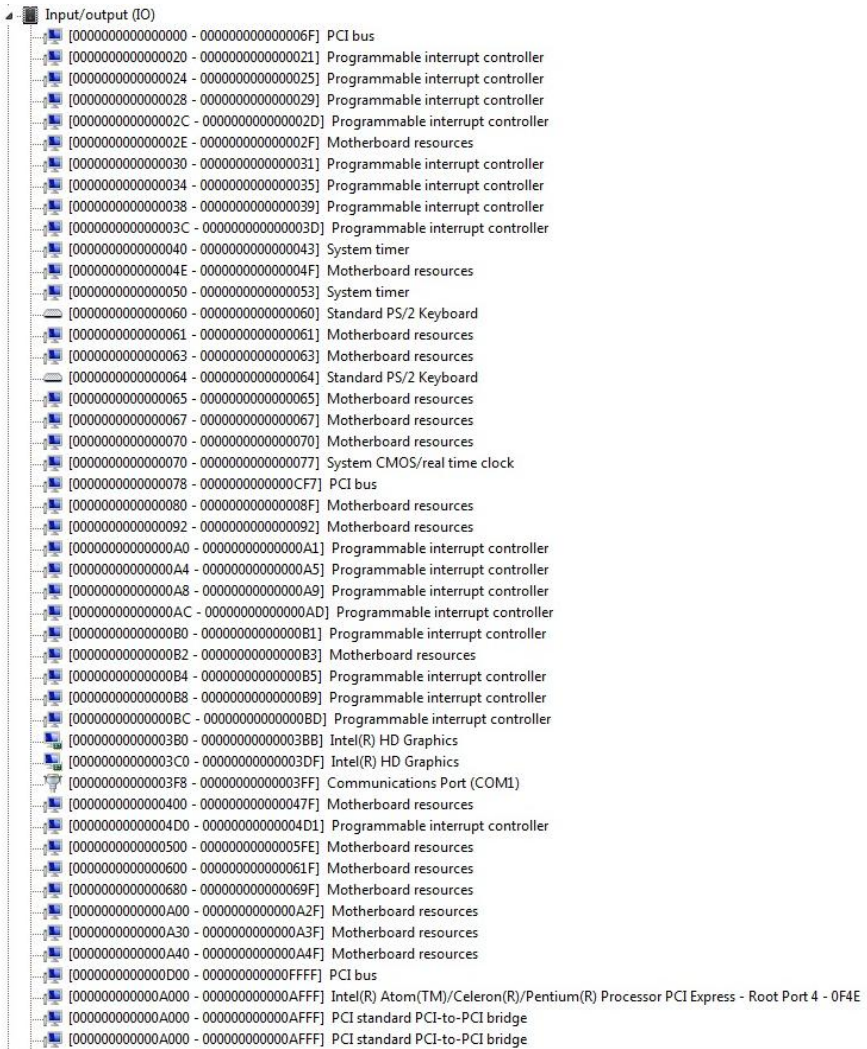
VOID  SIOByteSet(byte LDN, byte Register, byte Value){
    SIOEnterMBPnPMode();
    SIOSelectLDN(LDN);
    IOWriteByte(SIOIndex, Register);
    IOWriteByte(SIOData, Value);
    SIOExitMBPnPMode();
}
*****
```

# Appendix B

---

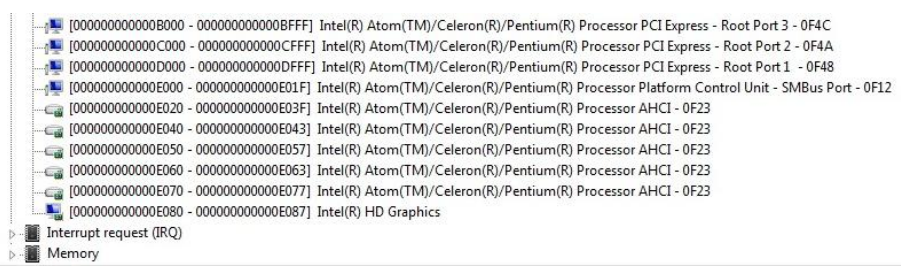
I/O Information

## B.1 I/O Address Map



Address Range	Device Name
[0000000000000000 - 000000000000006F]	PCI bus
[0000000000000020 - 0000000000000021]	Programmable interrupt controller
[0000000000000024 - 0000000000000025]	Programmable interrupt controller
[0000000000000028 - 0000000000000029]	Programmable interrupt controller
[000000000000002C - 000000000000002D]	Programmable interrupt controller
[000000000000002E - 000000000000002F]	Motherboard resources
[0000000000000030 - 0000000000000031]	Programmable interrupt controller
[0000000000000034 - 0000000000000035]	Programmable interrupt controller
[0000000000000038 - 0000000000000039]	Programmable interrupt controller
[000000000000003C - 000000000000003D]	Programmable interrupt controller
[0000000000000040 - 0000000000000043]	System timer
[000000000000004E - 000000000000004F]	Motherboard resources
[0000000000000050 - 0000000000000053]	System timer
[0000000000000060 - 0000000000000060]	Standard PS/2 Keyboard
[0000000000000061 - 0000000000000061]	Motherboard resources
[0000000000000063 - 0000000000000063]	Motherboard resources
[0000000000000064 - 0000000000000064]	Standard PS/2 Keyboard
[0000000000000065 - 0000000000000065]	Motherboard resources
[0000000000000067 - 0000000000000067]	Motherboard resources
[0000000000000070 - 0000000000000070]	Motherboard resources
[0000000000000070 - 0000000000000077]	System CMOS/real time clock
[0000000000000078 - 000000000000007F]	PCI bus
[0000000000000080 - 000000000000008F]	Motherboard resources
[0000000000000092 - 0000000000000092]	Motherboard resources
[00000000000000A0 - 00000000000000A1]	Programmable interrupt controller
[00000000000000A4 - 00000000000000A5]	Programmable interrupt controller
[00000000000000A8 - 00000000000000A9]	Programmable interrupt controller
[00000000000000AC - 00000000000000AD]	Programmable interrupt controller
[00000000000000B0 - 00000000000000B1]	Programmable interrupt controller
[00000000000000B2 - 00000000000000B3]	Motherboard resources
[00000000000000B4 - 00000000000000B5]	Programmable interrupt controller
[00000000000000B8 - 00000000000000B9]	Programmable interrupt controller
[00000000000000BC - 00000000000000BD]	Programmable interrupt controller
[00000000000003B0 - 00000000000003BB]	Intel(R) HD Graphics
[00000000000003C0 - 00000000000003DF]	Intel(R) HD Graphics
[00000000000003F8 - 00000000000003FF]	Communications Port (COM1)
[0000000000000400 - 000000000000047F]	Motherboard resources
[00000000000004D0 - 00000000000004D1]	Programmable interrupt controller
[0000000000000500 - 00000000000005FE]	Motherboard resources
[0000000000000600 - 000000000000061F]	Motherboard resources
[0000000000000680 - 000000000000069F]	Motherboard resources
[0000000000000A00 - 0000000000000A2F]	Motherboard resources
[0000000000000A30 - 0000000000000A3F]	Motherboard resources
[0000000000000A40 - 0000000000000A4F]	Motherboard resources
[0000000000000D00 - 0000000000000FFF]	PCI bus
[000000000000A000 - 000000000000AFFE]	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor PCI Express - Root Port 4 - 0F4E
[000000000000A000 - 000000000000AFFE]	PCI standard PCI-to-PCI bridge
[000000000000A000 - 000000000000AFFE]	PCI standard PCI-to-PCI bridge

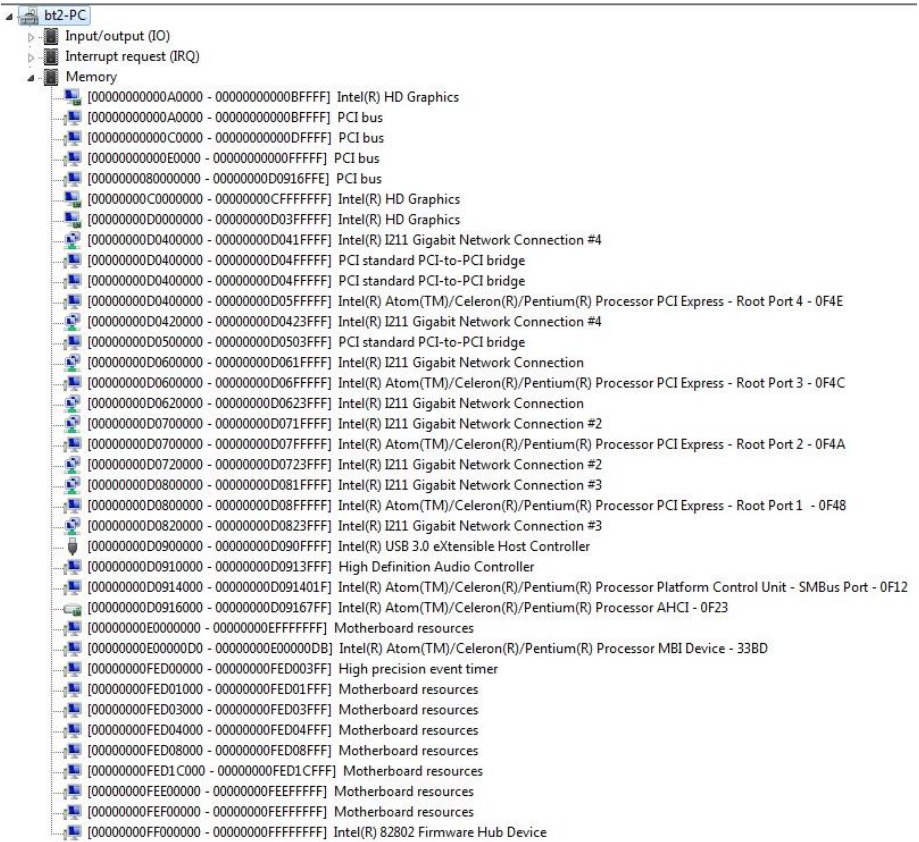




The image shows a list of hardware components with their memory addresses and descriptions. The components are:

- [000000000000B000 - 000000000000BFFF] Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor PCI Express - Root Port 3 - 0F4C
- [000000000000C000 - 000000000000CFFF] Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor PCI Express - Root Port 2 - 0F4A
- [000000000000D000 - 000000000000DFFF] Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor PCI Express - Root Port 1 - 0F48
- [000000000000E000 - 000000000000E01F] Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor Platform Control Unit - SMBus Port - 0F12
- [000000000000E020 - 000000000000E03F] Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor AHCI - 0F23
- [000000000000E040 - 000000000000E043] Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor AHCI - 0F23
- [000000000000E050 - 000000000000E057] Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor AHCI - 0F23
- [000000000000E060 - 000000000000E063] Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor AHCI - 0F23
- [000000000000E070 - 000000000000E077] Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor AHCI - 0F23
- [000000000000E080 - 000000000000E087] Intel(R) HD Graphics
- Interrupt request (IRQ)
- Memory
















































## B.2 Memory Address Map


















































Address Range	Device Name
[0000000000A0000 - 0000000000BFFFFF]	Intel(R) HD Graphics
[0000000000A0000 - 0000000000BFFFFF]	PCI bus
[0000000000C0000 - 0000000000DFFFFF]	PCI bus
[0000000000E0000 - 0000000000FFFFFF]	PCI bus
[00000000008000000 - 00000000D0916FFF]	PCI bus
[00000000C0000000 - 00000000CFFFFFFF]	Intel(R) HD Graphics
[00000000D0000000 - 00000000D03FFFFFFF]	Intel(R) HD Graphics
[00000000D0400000 - 00000000D041FFFFF]	Intel(R) I211 Gigabit Network Connection #4
[00000000D0400000 - 00000000D04FFFFFFF]	PCI standard PCI-to-PCI bridge
[00000000D0400000 - 00000000D04FFFFFFF]	PCI standard PCI-to-PCI bridge
[00000000D0400000 - 00000000D05FFFFFFF]	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor PCI Express - Root Port 4 - 0F4E
[00000000D0420000 - 00000000D0423FFF]	Intel(R) I211 Gigabit Network Connection #4
[00000000D0500000 - 00000000D0503FFF]	PCI standard PCI-to-PCI bridge
[00000000D0600000 - 00000000D061FFFFF]	Intel(R) I211 Gigabit Network Connection
[00000000D0600000 - 00000000D06FFFFFFF]	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor PCI Express - Root Port 3 - 0F4C
[00000000D0620000 - 00000000D0623FFF]	Intel(R) I211 Gigabit Network Connection
[00000000D0700000 - 00000000D071FFFFF]	Intel(R) I211 Gigabit Network Connection #2
[00000000D0700000 - 00000000D07FFFFFFF]	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor PCI Express - Root Port 2 - 0F4A
[00000000D0720000 - 00000000D0723FFF]	Intel(R) I211 Gigabit Network Connection #2
[00000000D0800000 - 00000000D081FFFFF]	Intel(R) I211 Gigabit Network Connection #3
[00000000D0800000 - 00000000D08FFFFFFF]	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor PCI Express - Root Port 1 - 0F48
[00000000D0820000 - 00000000D0823FFF]	Intel(R) I211 Gigabit Network Connection #3
[00000000D0900000 - 00000000D090FFFFF]	Intel(R) USB 3.0 eXtensible Host Controller
[00000000D0910000 - 00000000D0913FFF]	High Definition Audio Controller
[00000000D0914000 - 00000000D091401F]	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor Platform Control Unit - SMBus Port - 0F12
[00000000D0916000 - 00000000D09167FF]	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor AHCI - 0F23
[00000000E0000000 - 00000000FFFFFFF]	Motherboard resources
[00000000E00000D0 - 00000000E00000DB]	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor MBI Device - 33BD
[00000000FED00000 - 00000000FED003FF]	High precision event timer
[00000000FED01000 - 00000000FED01FFF]	Motherboard resources
[00000000FED03000 - 00000000FED03FFF]	Motherboard resources
[00000000FED04000 - 00000000FED04FFF]	Motherboard resources
[00000000FED08000 - 00000000FED08FFF]	Motherboard resources
[00000000FED1C000 - 00000000FED1CFFF]	Motherboard resources
[00000000FEE00000 - 00000000FEEFFFFFFF]	Motherboard resources
[00000000FEF00000 - 00000000FEFFFFFFFF]	Motherboard resources
[00000000FF000000 - 00000000FFFFFFFFF]	Intel(R) 82802 Firmware Hub Device

## B.3 IRQ Mapping Chart

Interrupt request (IRQ)	
(ISA) 0x00000000 (00)	System timer
(ISA) 0x00000001 (01)	Standard PS/2 Keyboard
(ISA) 0x00000004 (04)	Communications Port (COM1)
(ISA) 0x00000008 (08)	High precision event timer
(ISA) 0x0000000C (12)	Microsoft PS/2 Mouse
(ISA) 0x00000051 (81)	Microsoft ACPI-Compliant System
(ISA) 0x00000052 (82)	Microsoft ACPI-Compliant System
(ISA) 0x00000053 (83)	Microsoft ACPI-Compliant System
(ISA) 0x00000054 (84)	Microsoft ACPI-Compliant System
(ISA) 0x00000055 (85)	Microsoft ACPI-Compliant System
(ISA) 0x00000056 (86)	Microsoft ACPI-Compliant System
(ISA) 0x00000057 (87)	Microsoft ACPI-Compliant System
(ISA) 0x00000058 (88)	Microsoft ACPI-Compliant System
(ISA) 0x00000059 (89)	Microsoft ACPI-Compliant System
(ISA) 0x0000005A (90)	Microsoft ACPI-Compliant System
(ISA) 0x0000005B (91)	Microsoft ACPI-Compliant System
(ISA) 0x0000005C (92)	Microsoft ACPI-Compliant System
(ISA) 0x0000005D (93)	Microsoft ACPI-Compliant System
(ISA) 0x0000005E (94)	Microsoft ACPI-Compliant System
(ISA) 0x0000005F (95)	Microsoft ACPI-Compliant System
(ISA) 0x00000060 (96)	Microsoft ACPI-Compliant System
(ISA) 0x00000061 (97)	Microsoft ACPI-Compliant System
(ISA) 0x00000062 (98)	Microsoft ACPI-Compliant System
(ISA) 0x00000063 (99)	Microsoft ACPI-Compliant System
(ISA) 0x00000064 (100)	Microsoft ACPI-Compliant System
(ISA) 0x00000065 (101)	Microsoft ACPI-Compliant System
(ISA) 0x00000066 (102)	Microsoft ACPI-Compliant System
(ISA) 0x00000067 (103)	Microsoft ACPI-Compliant System
(ISA) 0x00000068 (104)	Microsoft ACPI-Compliant System
(ISA) 0x00000069 (105)	Microsoft ACPI-Compliant System
(ISA) 0x0000006A (106)	Microsoft ACPI-Compliant System
(ISA) 0x0000006B (107)	Microsoft ACPI-Compliant System
(ISA) 0x0000006C (108)	Microsoft ACPI-Compliant System
(ISA) 0x0000006D (109)	Microsoft ACPI-Compliant System
(ISA) 0x0000006E (110)	Microsoft ACPI-Compliant System
(ISA) 0x0000006F (111)	Microsoft ACPI-Compliant System
(ISA) 0x00000070 (112)	Microsoft ACPI-Compliant System
(ISA) 0x00000071 (113)	Microsoft ACPI-Compliant System
(ISA) 0x00000072 (114)	Microsoft ACPI-Compliant System
(ISA) 0x00000073 (115)	Microsoft ACPI-Compliant System
(ISA) 0x00000074 (116)	Microsoft ACPI-Compliant System
(ISA) 0x00000075 (117)	Microsoft ACPI-Compliant System
(ISA) 0x00000076 (118)	Microsoft ACPI-Compliant System
(ISA) 0x00000077 (119)	Microsoft ACPI-Compliant System
(ISA) 0x00000078 (120)	Microsoft ACPI-Compliant System
(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
	(ISA) 0x000000AB (171)	Microsoft ACPI-Compliant System
	(ISA) 0x000000AC (172)	Microsoft ACPI-Compliant System

	(ISA) 0x000000AD (173)	Microsoft ACPI-Compliant System
	(ISA) 0x000000AE (174)	Microsoft ACPI-Compliant System
	(ISA) 0x000000AF (175)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B0 (176)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B1 (177)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B2 (178)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B3 (179)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B4 (180)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B5 (181)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B6 (182)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B7 (183)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B8 (184)	Microsoft ACPI-Compliant System
	(ISA) 0x000000B9 (185)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BA (186)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BB (187)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BC (188)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BD (189)	Microsoft ACPI-Compliant System
	(ISA) 0x000000BE (190)	Microsoft ACPI-Compliant System
	(PCI) 0x0000000A (10)	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor Platform Control Unit - SMBus Port - 0F12
	(PCI) 0x00000010 (16)	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor PCI Express - Root Port 1 - 0F48
	(PCI) 0x00000010 (16)	PCI standard PCI-to-PCI bridge
	(PCI) 0x00000011 (17)	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor PCI Express - Root Port 2 - 0F4A
	(PCI) 0x00000011 (17)	PCI standard PCI-to-PCI bridge
	(PCI) 0x00000012 (18)	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor PCI Express - Root Port 3 - 0F4C
	(PCI) 0x00000012 (18)	PCI standard PCI-to-PCI bridge
	(PCI) 0x00000013 (19)	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor AHCI - 0F23
	(PCI) 0x00000013 (19)	Intel(R) Atom(TM)/Celeron(R)/Pentium(R) Processor PCI Express - Root Port 4 - 0F4E
	(PCI) 0x00000013 (19)	PCI standard PCI-to-PCI bridge
	(PCI) 0x00000016 (22)	High Definition Audio Controller
	(PCI) 0xFFFFF5E (-27)	Intel(R) I211 Gigabit Network Connection
	(PCI) 0xFFFFF5E (-26)	Intel(R) I211 Gigabit Network Connection
	(PCI) 0xFFFFF5E (-25)	Intel(R) I211 Gigabit Network Connection
	(PCI) 0xFFFFF5E (-24)	Intel(R) I211 Gigabit Network Connection
	(PCI) 0xFFFFF5E (-23)	Intel(R) I211 Gigabit Network Connection
	(PCI) 0xFFFFF5E (-22)	Intel(R) I211 Gigabit Network Connection
	(PCI) 0xFFFFF5E (-21)	Intel(R) I211 Gigabit Network Connection #2
	(PCI) 0xFFFFF5E (-20)	Intel(R) I211 Gigabit Network Connection #2
	(PCI) 0xFFFFF5E (-19)	Intel(R) I211 Gigabit Network Connection #2
	(PCI) 0xFFFFF5E (-18)	Intel(R) I211 Gigabit Network Connection #2
	(PCI) 0xFFFFF5E (-17)	Intel(R) I211 Gigabit Network Connection #2
	(PCI) 0xFFFFF5E (-16)	Intel(R) I211 Gigabit Network Connection #2
	(PCI) 0xFFFFF5E (-15)	Intel(R) I211 Gigabit Network Connection #3
	(PCI) 0xFFFFF5E (-14)	Intel(R) I211 Gigabit Network Connection #3
	(PCI) 0xFFFFF5E (-13)	Intel(R) I211 Gigabit Network Connection #3
	(PCI) 0xFFFFF5E (-12)	Intel(R) I211 Gigabit Network Connection #3
	(PCI) 0xFFFFF5E (-11)	Intel(R) I211 Gigabit Network Connection #3
	(PCI) 0xFFFFF5E (-10)	Intel(R) I211 Gigabit Network Connection #3
	(PCI) 0xFFFFF5E (-9)	Intel(R) USB 3.0 eXtensible Host Controller
	(PCI) 0xFFFFF5E (-8)	Intel(R) HD Graphics
	(PCI) 0xFFFFF5E (-7)	Intel(R) I211 Gigabit Network Connection #4
	(PCI) 0xFFFFF5E (-6)	Intel(R) I211 Gigabit Network Connection #4
	(PCI) 0xFFFFF5E (-5)	Intel(R) I211 Gigabit Network Connection #4
	(PCI) 0xFFFFF5E (-4)	Intel(R) I211 Gigabit Network Connection #4
	(PCI) 0xFFFFF5E (-3)	Intel(R) I211 Gigabit Network Connection #4
	(PCI) 0xFFFFF5E (-2)	Intel(R) I211 Gigabit Network Connection #4
	Memory	