# WADE-8016

## Mini-ITX Board

## User's Manual

Version 1.1

# Table of Contents

## How to Use This Manual

# How to Use This Manual

The manual describes how to configure your WADE-8016 system board to meet various operating requirements. It is divided into five chapters, with each chapter addressing a basic concept and operation of Mini-ITX Board.

**Chapter 1: System Overview.** Presents what you have in the box and give you an overview of the product specifications and basic system architecture for this series model of Mini-ITX Board.

**Chapter 2: Hardware Configuration.** Show the definitions and locations of Jumpers and Connectors that you can easily configure your system.

**Chapter 3: System Installation.** Describes how to properly mount the CPU, main memory and Compact Flash to get a safe installation and provides a programming guide of Watch Dog Timer function.

**Chapter 4: BIOS Setup Information.** Specifies the meaning of each setup parameters, how to get advanced BIOS performance and update new BIOS. In addition, POST checkpoint list will give users some guidelines of trouble-shooting.

**Chapter 5: Troubleshooting.** Provide various of useful tips to quickly get WADE-8016 running with success. As basic hardware installation has been addressed in Chapter 3, this chapter will basically focus on system integration issues, in terms of backplane setup, BIOS setting, and OS diagnostics.

The content of this manual is subject to change without prior notice. These changes will be incorporated in new editions of the document. The vendor may make supplement or change in the products described in this document at any time.

# Chapter 1
# System Overview

## 1.1 Introduction

Portwell Inc., a world-leading innovator in the Industrial PC (IPC) market and a member of the Intel® Embedded and Communications Alliance (Intel ECA), announced today the Portwell WADE-8016 adopting the Mini-ITX form factor. The WADE-8016 of the Intel platform will provide high performance and flexibility for functional expansion, such as Gaming, Kiosk, DS, Medical, Defense, Industrial automation and control applications.

Haswell is the next major architecture from Intel. The WADE-8016 supports the latest Intel® Haswell processors in LGA1150 package which has memory and PCI Express controller integrated to support 2-channel DDR3 memory and PCI Express 2.0 lanes providing great graphics performance. Intel® Haswell processor is one of the most powerful and energy efficient CPU in the world. Portwell have taken advantage of such technology to furnish a series of products that can meet multiple industrial requirements such as cost-effective of CPU performance or industrial systems.

WADE-8016 is based on the Intel® Haswell processor and Intel® H81 chipset. The Intel H81 Express Chipset, when combined with a processor from the Intel® Dual Core/Quad Core processor family, delivers smart security, cost saving manageability, and intelligent performance for business platforms. WADE-8016 is the first Portwell off-the-shelf product by Intel® H81 Express Chipset, it can be an embedded solution and a good platform for customer to integrate it to the embedded system.

WADE-8016 showcased one of Portwell upcoming motherboard for the Intel® Haswell processors. The WADE-8016 is based on the forthcoming Intel H81 chipset and supports the new LGA 1150 socket (socket that will be used by Haswell processors). This board has lots of features, including supports total 2x SATA 3 (SATA 6.0 Gbps) storage specification and supports the latest PCIe 2.0 (one PCI-Express x16 slot) devices for double speed and bandwidth which enhances system performance, one CF slot on board supports Portwell exclusive CFEX(SATA interface), two long-DIMM memory slot for DDR3 SDRAM up to 16GB, support total 10 USB ports (4x rear IO by USB2.0 / 4x on board by USB2.0 / 4x on board by USB3.0), VGA / HDMI / DVI and two Gigabit Ethernet.

## 1.2 Check List

The WADE-8016 package should cover the following basic items

- ✓ One WADE-8016 Mini-ITX Main Board
- ✓ One SATA Cable
- ✓ One I/O Shield bracket
- ✓ One Installation Resources CD-Title

If any of these items is damaged or missing, please contact your vendor and keep all packing materials for future replacement and maintenance.

## 1.3 Product Specification

- **Main Processor**
  -Intel® Dual Core/Quad Core LGA1150 processor
  -CPU clock bus: 1333/1600 MHz
- **Chipset**
  -Intel® H81 chipset
- **System BIOS**
  -AMI BIOS
- **Main Memory**
  -Two 240 -pin DDR3 Long-DIMM socket support up to 16GB dual channel 1333/1600 MHz memory
- **Expansion Interface**
  -One PCIex16
  -One CFEX (SATA interface)
- **SATA Interface**
  -Two SATA 6Gb ports
  -Two SATA 3Gb ports
- **Serial Port**
  -Support total four com ports(one RS232 and one RS232/422/485 on rear I/O, two RS232 on board header)
- **USB Interface**
  -Support Ten USB (Universal Serial Bus) ports, four on rear I/O(USB2.0) and six on board header(4x USB 2.0 ,2x USB 3.0) for internal devices
- **Audio Interface**
  -Connector for Mic-In, Line-In and Line-Out
- **Real Time Clock/Calendar (RTC)**
  -Support Y2K Real Time Clock/Calendar

- **Watch Dog Timer**
  -Support WDT function through software programming for enable/disable and interval setting
  -General system reset
- **On-board Ethernet LAN**
  -Two Gigabit Ethernet (10/100/1000 Mbits/sec) LAN ports using Realtek RTL8111G-CG GbE Ethernet Controller
- **High Drive GPIO**
  -One pin-header for 8 bit GPIO
- **System Monitoring Feature**
  -Monitor system temperature and major power sources.
- **Outline Dimension (L x W)**
  -170mm(6.69'') x 170mm(6.69'')

- **Power Requirements**

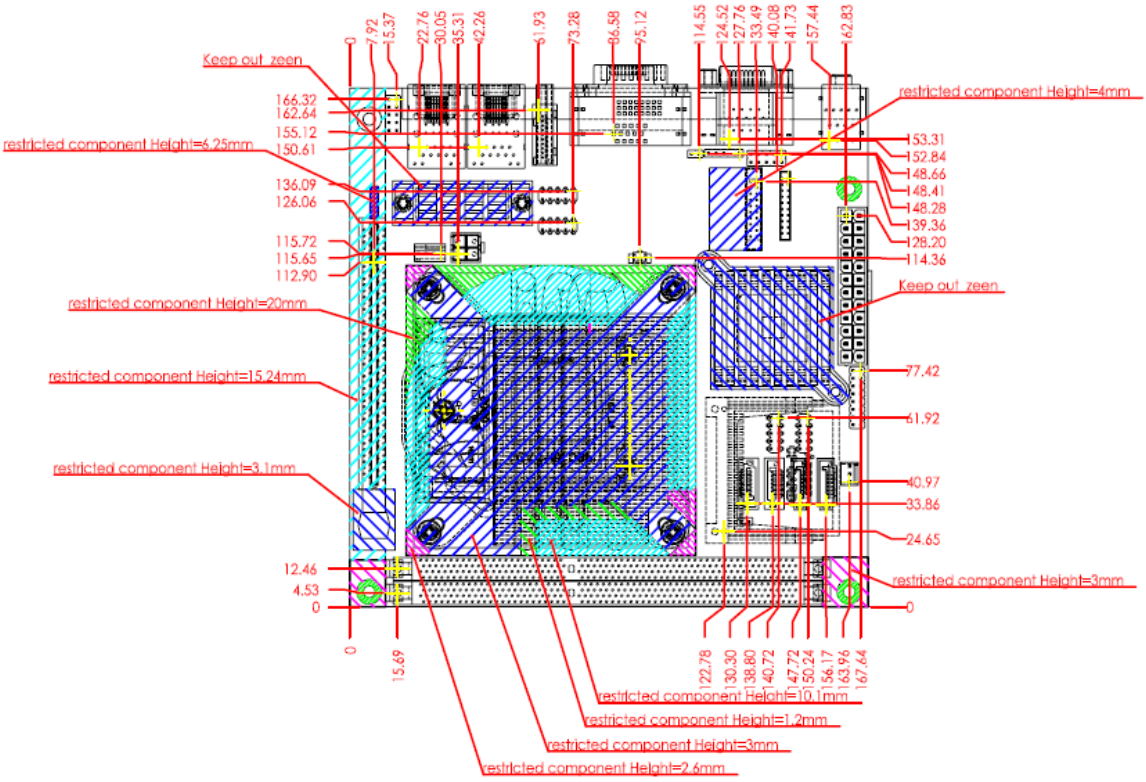
| Item | Power ON | Full Loading 10Min | Full Loading 30Min |
|---|---|---|---|
| **CPU +12V** | 1.39 | 1.53 | 1.55 |
| **System +12V** | 0.67 | 0.61 | 0.64 |
| **System +3.3V** | 0.56 | 0.66 | 0.67 |
| **System +5V** | 1.51 | 1.71 | 1.68 |
| **System+ Device +12V** | 2.79 | 2.78 | 2.76 |
| **System+ Device +5V** | 1.41 | 2.42 | 2.48 |
| **USB2.0 Loading Test** | 4.87~4.94 V/ 530 mA | | |
| **USB3.0 Loading Test** | 4.79 V/ 1060 mA | | |

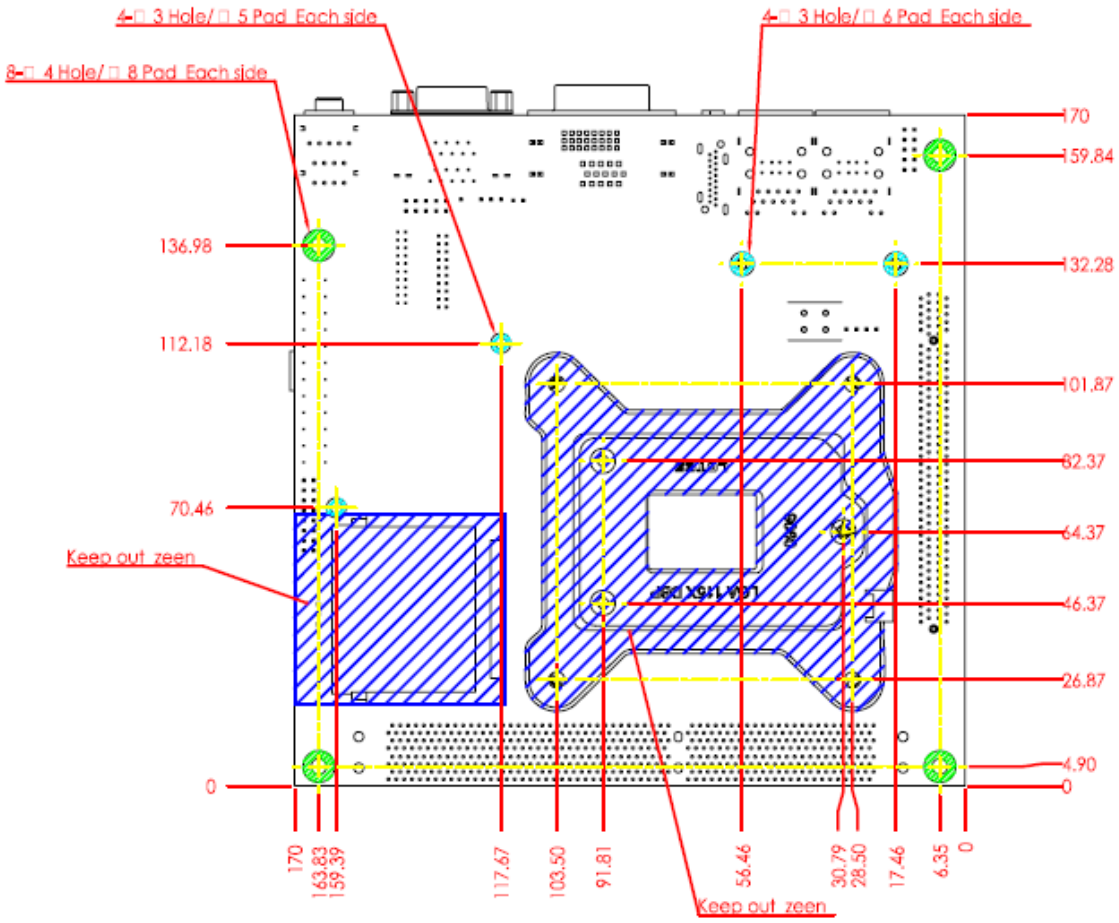
- **Configuration**

| | |
|---|---|
| **CPU Type** | Intel® Celeron® CPU G1820 @ 2.70GHz L3: 2MByte |
| **SBC BIOS** | Portwell, Inc. WADE-8016-APK TEST BIOS (40528T00) |
| **Memory** | WARIS DDR3 UB-DIMM 1333 8GB*2<br>(Hynix H5TQ4G83MFR) |
| **VGA Card** | Onboard Intel® HD Graphics |
| **VGA Driver** | Intel® HD Graphics Version: 10.18.10.3496 |
| **LAN Card** | Onboard Realtek RTL8111F PCIe GBE Family Controller |
| **LAN Driver** | Realtek RTL8111F PCIe GBE Family Controller<br>Version: 8.20.815.2013 |
| **LAN Card** | Onboard Realtek RTL8111F PCIe GBE Family Controller#2 |
| **LAN Driver** | Realtek RTL8111F PCIe GBE Family Controller#2<br>Version: 8.20.815.2013 |
| **Audio Card** | Onboard Realtek ALC892 High Definition Audio |
| **Audio Driver** | Realtek ALC892 High Definition Audio<br>Version: 6.0.1.7240 |
| **Chip Driver** | Intel® H81 Chipset Device Software Version: 10.0.13 |
| **USB 3.0 Driver** | Intel® USB3.0 eXtensible Host Controller<br>Version:6.2.9200.16384 |
| **SATA HDD** | Seagate ST3500411SV 500GB |
| **CFEX** | WARIS CFEX 8GB |
| **CDROM** | ASUS DRW-24D3ST |
| **Power Supply** | HG2-6350P 350W |

- **Operting Temperature**
  0 °C ~ 60 °C
- **Storage Temperature**
  -20 ~ 80 °C
- **Relative Humidity**
  0% ~ 90%, non-condensing
- **Operting Temperature**
  0 °C ~ 60 °C
- **Storage Temperature**
  -20 ~ 80 °C
- **Relative Humidity**
  0% ~ 90%, non-condensing

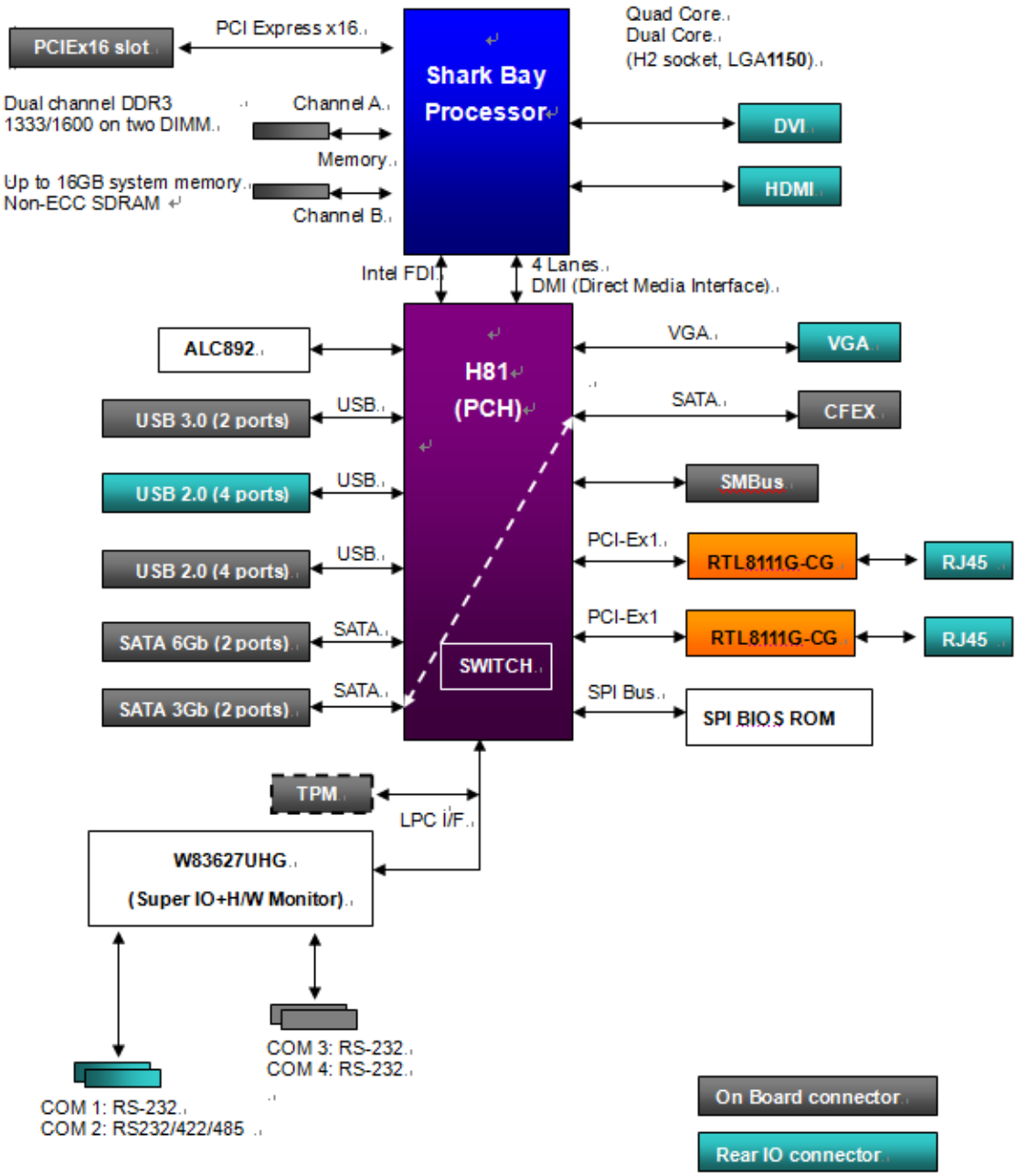
## 1.3.1 Mechanical Drawing



## 1.4 System Architecture

All of details operating relations are shown in WADE-8016 System Block Diagram.

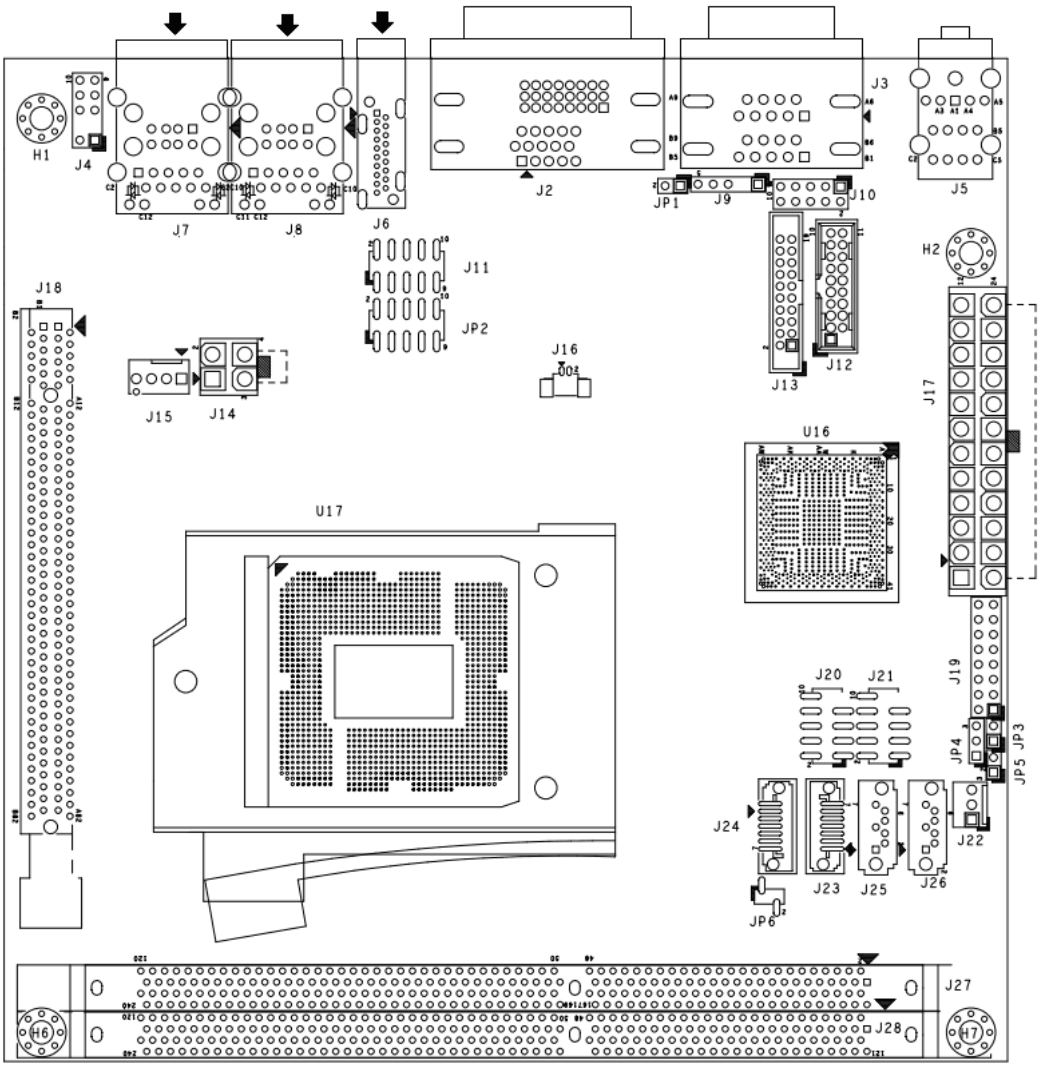



WADE-8016 System Block Diagram

# Chapter 2
# Hardware Configuration

This chapter gives the definitions and shows the positions of jumpers, headers and connectors. All of the configuration jumpers on WADE-8016 are in the proper position. The default settings shipped from factory are marked with an asterisk

## 2.1 Jumper Setting



**JP1:Case Open Pin Header**

| PIN No. | Signal Description |
|---|---|
| 1-2 open | Disable |
| 1-2 short | Enable |

**JP2: External COM Port 4 (RS-232 Only)**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | DCD#4 | 2 | RXD#4 |
| 3 | TXD#4 | 4 | DTR#4 |
| 5 | GND | 6 | DSR#4 |
| 7 | RTS#4 | 8 | CTS#4 |
| 9 | RI#4 | 10 | KEY |

**JP3: CEEX / SATA Select**

| PIN No. | Signal Description |
|---|---|
| 1-2 short | CFEX Enable , SATA J24 Disable |
| 1-2 open | SATA J24 Enable , CFEX Disable |

**JP4: Clear CMOS Select**

| PIN No. | Signal Description |
|---|---|
| 1-2 short | Normal |
| 2-3 short | Clear CMOS |

**JP5: Auto Power Button Select**

| PIN No. | Signal Description |
|---|---|
| 1-2 short | Enable (AT Mode) |
| 1-2 open | Disable (ATX Mode) |

**JP6: CFEX-SPI / SPI Select**

| PIN No. | Signal Description |
|---|---|
| 1-2 short | CFEX-SPI (Boot from J29 SPI ROM) |
| 1-2 open | SPI (Boot from U21 EEPROM) |

**J4: Key Board / Mouse Connector (PS/2)**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | MS_DT | 2 | KB_DT |
| 3 | NC | 4 | NC |
| 5 | GND | 6 | GND |
| 7 | 5VDUAL | 8 | VKBMS |
| 9 | MS_CK | 10 | KB_CK |

**J9: SMBus Connector**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | SMBus Clock | 2 | NC |
| 3 | GND | 4 | SMBus Data |
| 5 | +5V | | |

**J10: General Purpose I/O Connector**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | GPIO 50 | 2 | GPIO 54 |
| 3 | GPIO 51 | 4 | GPIO 55 |
| 5 | GPIO 52 | 6 | GPIO 56 |
| 7 | GPIO 53 | 8 | GPIO 57 |
| 9 | GND | 10 | +5V |

**J11: External COM Port 3 (RS-232 Only)**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | DCD#3 | 2 | RXD#3 |
| 3 | TXD#3 | 4 | DTR#3 |
| 5 | GND | 6 | DSR#3 |
| 7 | RTS#3 | 8 | CTS#3 |
| 9 | RI#3 | 10 | KEY |

**J12: External USB 3.0 Connector**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | 5VDUAL | 11 | USB2_P0_DP_R |
| 2 | USB3_RX1_DN_R | 12 | USB2_P0_DN_R |
| 3 | USB3_RX1_DP_R | 13 | GND |
| 4 | GND | 14 | USB3_TX2_DN_R |
| 5 | USB3_TX1_DN_R | 15 | USB3_TX2_DP_R |
| 6 | USB3_TX1_DP_R | 16 | GND |
| 7 | GND | 17 | USB3_RX2_DN_R |
| 8 | USB2_P0_DN_R | 18 | USB3_RX2_DP_R |
| 9 | USB2_P0_DP_R | 19 | 5VDUAL |
| 10 | GND | | |

**J13: TPM Connector**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | TPM Clock | 2 | Ground |
| 3 | LFRAME# | 4 | NC |
| 5 | PLTRST# | 6 | +5V |
| 7 | LAD3 | 8 | LAD2 |
| 9 | +3.3V | 10 | LAD1 |
| 11 | LAD0 | 12 | Ground |
| 13 | SMB_CLK | 14 | SMB_DATA |
| 15 | 3VSB | 16 | SERIRQ |
| 17 | GND | 18 | NC |
| 19 | NC | 20 | NC |

**J14: 4 Pin ATX Power Connector**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | GND | 2 | GND |
| 3 | +12V | 4 | +12V |

**J15: CPU Fan Connector**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | GND | 2 | +12V |
| 3 | Fan on/off output | 4 | Fan Speed control |

**J16: Battery Connector**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | +3.3V | 2 | GND |

**J17: 24 Pin ATX Power Connector**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | +3.3V | 2 | +3.3V |
| 3 | GND | 4 | +5V |
| 5 | GND | 6 | +5V |
| 7 | GND | 8 | ATX Power OK |
| 9 | +5VSB | 10 | +12V |
| 11 | +12V | 12 | +3.3V |
| 13 | +3.3V | 14 | -12V |
| 15 | GND | 16 | PS_ON# |
| 17 | GND | 18 | GND |
| 19 | GND | 20 | NC |
| 21 | +5V | 22 | +5V |
| 23 | +5V | 24 | GND |

**J19: Front Pannel Connector**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | PWR_LED(+) | 2 | Speaker(+) |
| 3 | PWR_LED(-) | 4 | NC |
| 5 | J7LAN_ACT(+) | 6 | NC |
| 7 | J7LAN_LINK(-) | 8 | Speaker(-) |
| 9 | J8LAN_LINK(-) | 10 | GND |
| 11 | J8LAN_ACT(+) | 12 | Power Button |
| 13 | HDD_LED(+) | 14 | Rest |
| 15 | HDD_LED(-) | 16 | GND |

**J20 / J21: USB 2.0 Connector**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | 5V Dual | 2 | 5V Dual |
| 3 | USB- | 4 | USB- |
| 5 | USB+ | 6 | USB+ |
| 7 | GND | 8 | GND |
| 9 | NC | 10 | GND |

**J22: System Fan Connector**

| PIN No. | Signal Description | PIN No. | Signal Description |
|---|---|---|---|
| 1 | GND | 2 | +12V |
| 3 | Fan on/off output | | |

**J3: COM1/COM2 Serial Port Connector ( RS-232 / 422 / 485 )**

| PIN No | Signal Description | | |
|---|---|---|---|
| | RS-232 | RS-422 (COM2) | RS-485 (COM2) |
| 1 | DCD (Data Carrier Detect) | TX- | DATA- |
| 2 | DSR (Data Set Ready) | N/C | N/C |
| 3 | RXD (Receive Data) | TX+ | DATA+ |
| 4 | RTS (Request to Send) | N/C | N/C |
| 5 | TXD (Transmit Data) | RX+ | N/C |
| 6 | CTS (Clear to Send) | N/C | N/C |
| 7 | DTR (Data Terminal Ready) | RX- | N/C |
| 8 | RI (Ring Indicator) | N/C | N/C |
| 9 | GND (Ground) | GND | GND |
| 10 | N/C | N/C | N/C |

**J5: Audio connector**

| PIN No. | Signal Description |
|---|---|
| Red | Mic |
| Green | Line-Out |
| Blue | Line-In |

**Connector Allocation**

I/O peripheral devices are connected to the interface connectors.
Connector Function List

| Connector | Function | Remark |
|---|---|---|
| J2 | DVI + VGA Connector | |
| J3 | COM Port 1 and COM Port 2 | COM1 Only Support RS-232<br>COM2 Support RS-232/422/485 |
| J4 | Key Board / Mouse Connector (PS/2) | |
| J5 | Audio Connector | |
| J6 | HDMI Connector | |
| J7 | RJ45 (LAN#1) Connector + USB 2.0 Connector | |
| J8 | RJ45 (LAN#2) Connector + USB 2.0 Connector | |
| J9 | SMBus Connector | |
| J10 | General Purpose Connector | |
| J11 | External COM Port 3 Connector | Only Support RS-232 |
| J12 | External USB 3.0 Connetor | |
| J13 | TPM Connector | |
| J14 | 4 Pin ATX Power Connector | |
| J15 | CPU Fan Connector | |
| J16 | Battery Cpnnector | |
| J17 | 24 Pin ATX Connector | |
| J18 | PCIE X16 Connector | Support to PCIE Gen2 (H81 Support Gen2 only) |
| J19 | Front Pannel Connector | |
| J20 | External USB 2.0 Connetor | |
| J21 | External USB 2.0 Connetor | |
| J22 | System Fan Connector | |
| J23 | SATA Gen2 Connector | Support to SATA Gen2 |
| J24 | SATA Gen2 Connector | Support to SATA Gen2 |

| | | |
|---|---|---|
| | | Switch with J29 (CFEX-SATA) |
| J25 | SATA Gen3 Connector | Support to SATA Gen3 |
| J26 | SATA Gen3 Connector | Support to SATA Gen3 |
| J27 | DDR3 Slot(Channel A) | DDR3-1333 (G1820 Support 1333 only) |
| J28 | DDR3 Slot(Channel B) | DDR3-1333 (G1820 Support 1333 only) |
| J29 | CFEX Connector | Switch with J24 ( SATA ) Switch with U21 ( SPI ) |
| JP1 | Case Open Enable | |
| JP2 | External COM Port4 | COM4 Only Support RS-232 |
| JP5 | Auto Power Button Enable | Swith ATX Mode and AT Mode |
| JP6 | CFEX-SPI / SPI Switch | |
| SW1 | ATX Detect &BIOS Recovery Switch | |
| U16 | Haswell PCH H81 | |
| U17 | Haswell CPU Socket | |
| U21 | BIOS Socket | Switch with J29 ( CFEX-SPI ) |

**Note:**
JP3 controll enable the J24 or CFEX

JP6 controll boot from the SPI-ROM or CFEX-SPI ROM

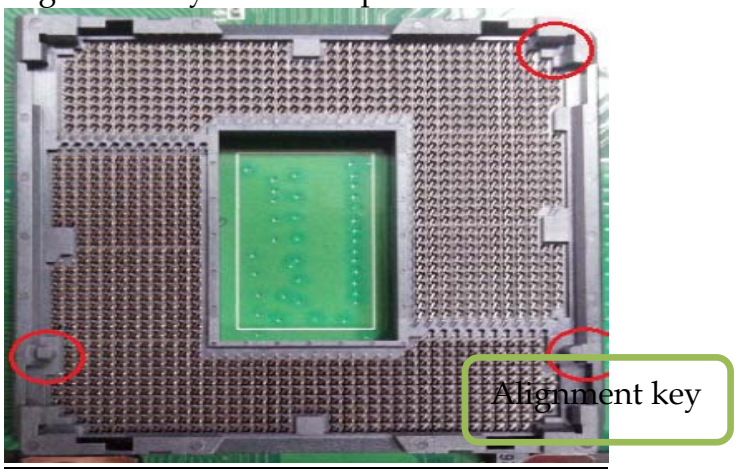
# Chapter 3
# System Installation

This chapter provides you with instructions to set up your system. The additional information is enclosed to help you set up onboard PCI device and handle Watch Dog Timer (WDT) and operation of GPIO in software programming.

## 3.1 Intel Haswell Processor

**LGA-1155 CPU Socket**

In the top, right corner of the CPU Socket is Pin1, and the red two circles are alignment key under the picture.




**LGA-1155 CPU**

In the top, the Yellow Triangle of the CPU is Pin1.

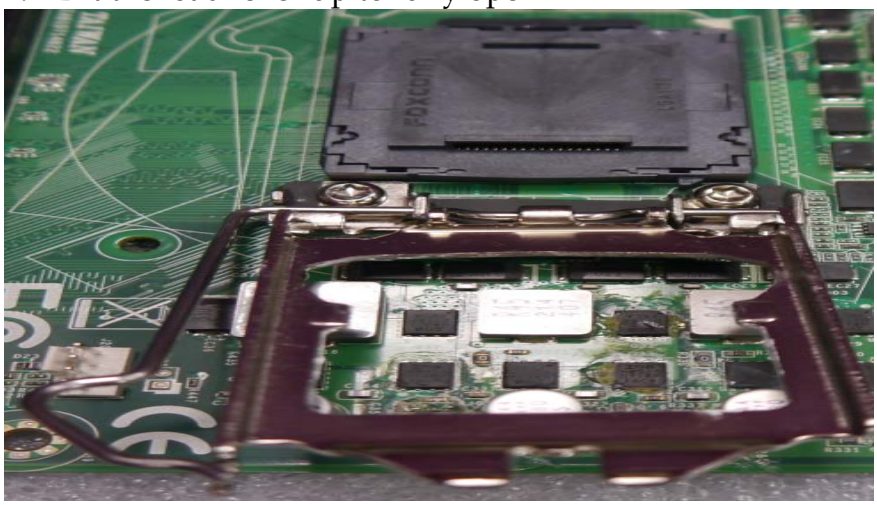

**Please remember to locate the alignment keys on the CPU socket of the motherboard and the notches on the CPU.**

## LGA-1155 CPU Installation Steps

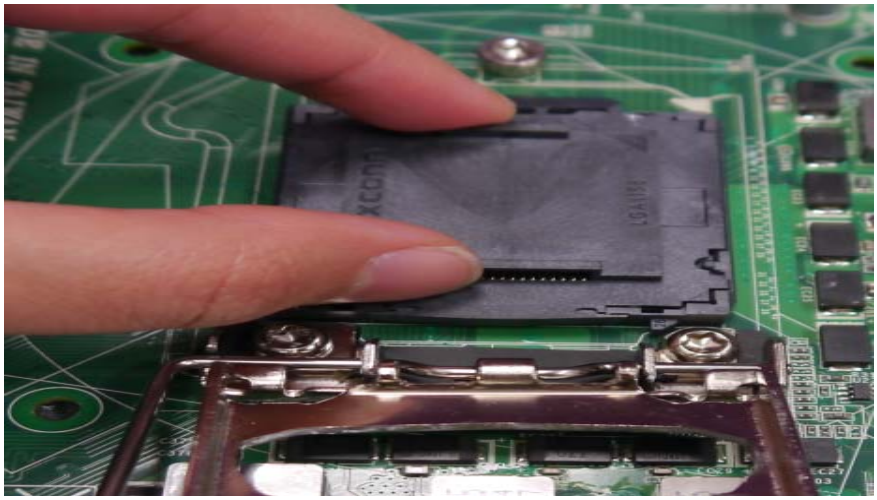
**Before install the CPU, please make sure to turn off the power first!!**

1. Open the load lever.


2. Lift the load lever up to fully open



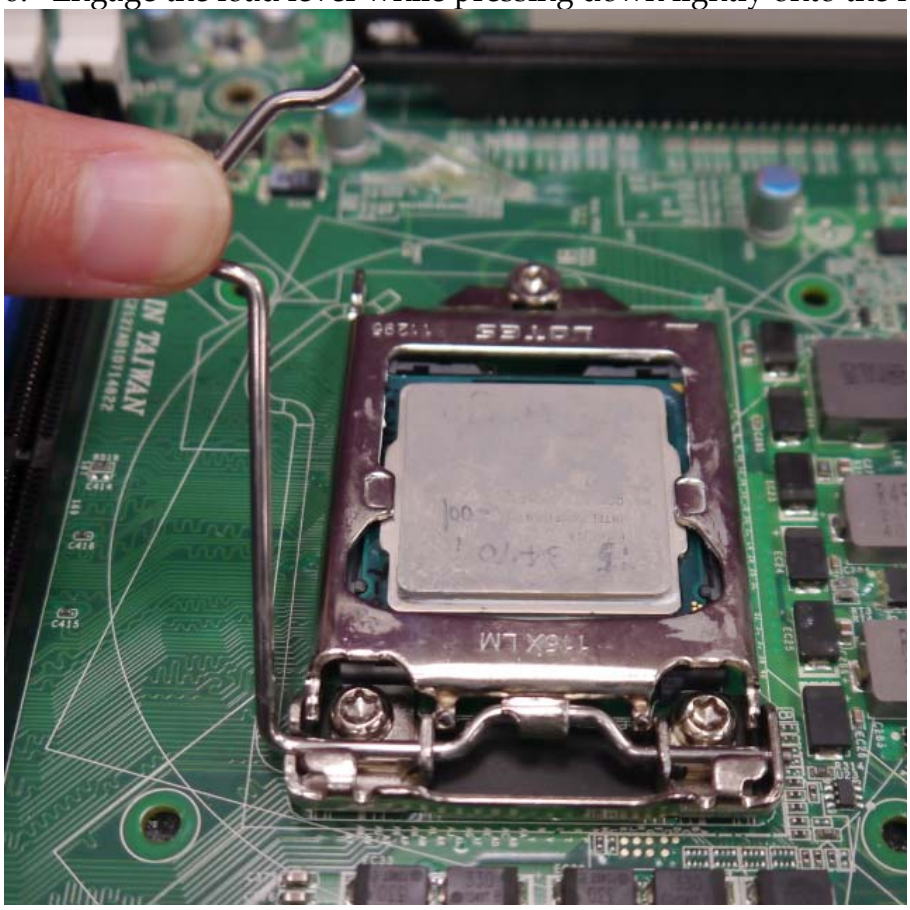

3. Remove the plastic cap on the CPU socket. Before you install the CPU, always cover it to protect the socket pin.



4. After confirming the CPU direction for correct mating, put down the CPU in the socket housing frame. Note that alignment keys are matched.

5. Make sure the CPU has been seated well into the socket. If not, take out the CPU and reinstall.

6. Engage the load lever while pressing down lightly onto the load Plate



7. Push the CPU socket lever back into its locked position.

8. Please make sure four hooks are in proper position before you install the core

## 3.2 Main Memory

WADE-8016 has two 240 pin DIMM sockets which supports Dual channel 1333/1600 DDR3-SDRAM as main memory, Non-ECC (Error Checking and Correcting), non-register functions. The maximum memory can be up to 16GB. Memory clock and related settings can be detected by BIOS via SPD interface.

For system compatibility and stability, do not use memory module without brand. Memory configuration can be set to either one double-sided DIMM in one DIMM socket or two single-sided DIMM in both sockets.

Beware of the connection and lock integrity from memory module to socket. Inserting
Improperly it will affect the system reliability.

**Note:**
To insure the system stability, please do not change any of DRAM parameters in BIOS setup to modify system the performance without acquired technical information.

## 3.3 Installing the Mini-ITX Board Computer

To install your WADE-8016 into standard chassis or proprietary environment, please perform the following:

Step 1 : Check all jumpers setting on proper position
Step 2 : Install and configure CPU and memory module on right position
Step 3 : Place WADE-8016 into the dedicated position in the system
Step 4 : Attach cables to existing peripheral devices and secure it

**WARNING**
Please ensure that SBC is properly inserted and fixed by mechanism.

**Note:**
Please refer to section 3.3.1 to 3.3.4 to install INF/VGA/LAN/Audio drivers.

### 3.3.1 Chipset Component Driver

WADE-8016 uses Intel Lynx Point. It's a new chipset that some old operating systems might not be able to recognize. To overcome this compatibility issue, for Windows Operating Systems such as Windows 7, please install its INF before any of other Drivers are installed. You can find very easily this chipset component driver in WADE-8016 CD-title

### 3.3.2 Intel Integrated Graphics Controller

WADE-8016 integrated 3D graphics Media Accelerator. WADE-8016 uses Intel Lynx Point integrated graphic chipset to gain an outstanding graphic performance. WADE-8016 supports VGA, DVI-D, and HDMI display output. It can select two of them to use dual display function. This combination makes WADE-8016 an excellent piece of multimedia hardware.

**Drivers Support**
Please find the Graphic drivers in the WADE-8016 CD-title. The driver supports Windows 7.

### 3.3.3 On-board Gigabit Ethernet Controller

**Drivers Support**
Please find Realtek RTL8111G-CG 10/100/1000M LAN driver in /Ethernet directory of WADE-8016 CD-title. The driver supports Windows 7.

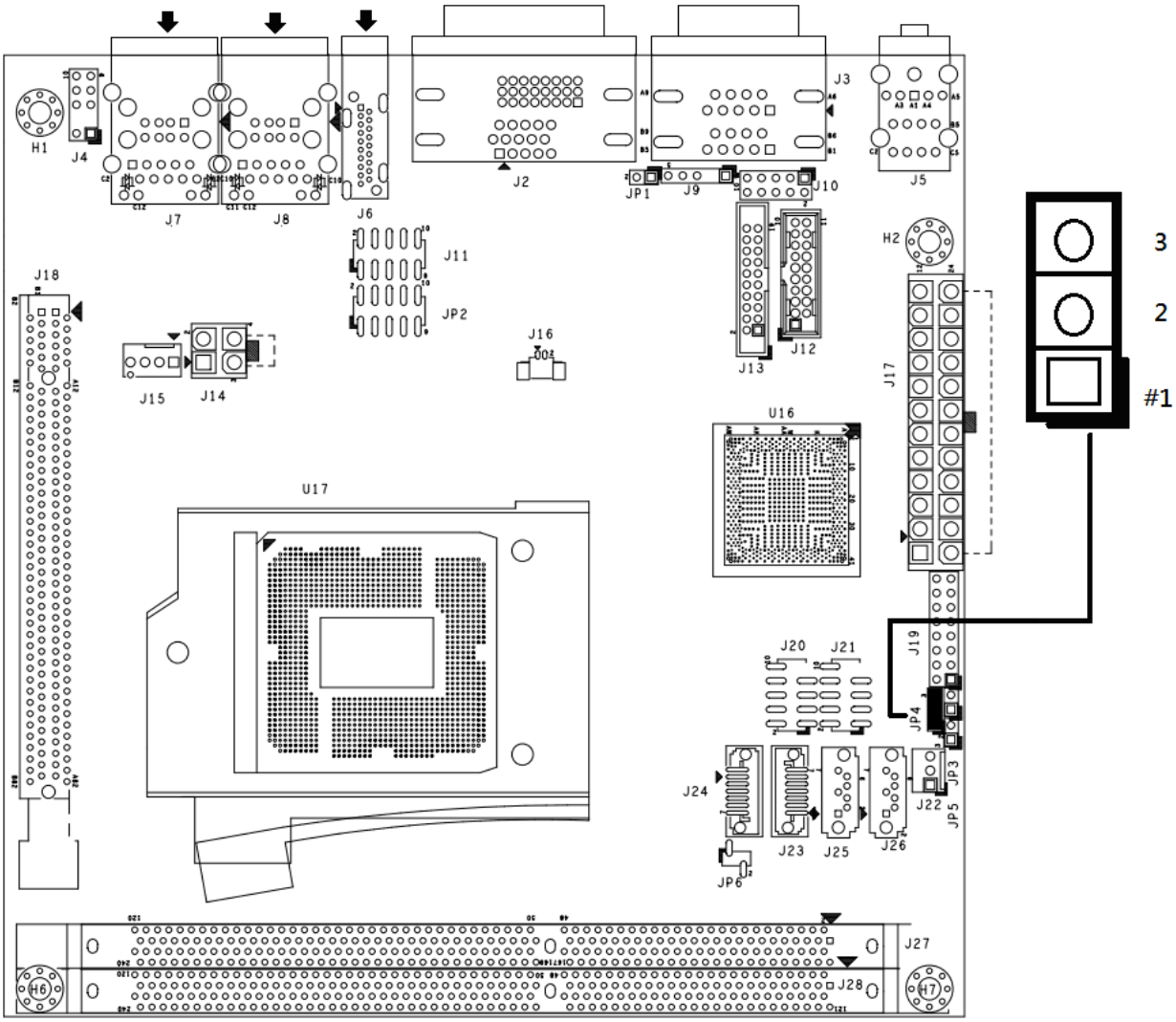
### 3.3.4 Realtek ALC892 HD Audio Controller

Please find Realtek ALC892 (High Definition Audio driver) form WADE-8016 CD-title. The driver supports Windows 7.

## 3.4 Clear CMOS Operation

The following table indicates how to enable/disable Clear CMOS Function hardware circuit by putting jumper in the board.

| PIN No. | Signal Description |
|---|---|
| 1-2 short | Normal ★ |
| 2-3 short | Clear CMOS |



## 3.5 WDT Function

```
int main ()
{
// Enter Extended Function Mode
outp(0x002E, 0x87);
outp(0x002E, 0x87);

// Enable Pin 77 as WDTO#
// Select Logic Device 8
outp(0x002E, 0x07);
outp(0x002F, 0x08);

// Active Logic Device 8
outp(0x002E, 0x30);
outp(0x002F, 0x01);

// Select Count Mode
outp(0x002E, 0xF5);
outp(0x002F, (inp(0x002F) & 0xF7) | ( 0x00 & 0x08));   //Count-mode  Register  =
0x00

// Specify Time-out Value
outp(0x002E, 0xF6);
outp(0x002F, 0x05 );

//Time-out Value Register = 0x05
// Disable WDT reset by keyboard/mouse interrupts
outp(0x002E, 0xF7);
outp(0x002F, 0x00);

// Exit Extended Function Mode
outp(0x002E, 0xAA);
return 0;
}

/*********************************************
Definitions of Variables:

Value of Count-mode Register:
        0x00      Count down in seconds (Bit3 = 0)
        0x08      Count down in minutes (Bit3 = 1)
Value of Time-out Value Register
        0x00              Time-out Disable
        0x01~0xFF         Value for counting down
*********************************************/
```

## 3.6 GPIO

```
#define EFER 0x2e //Address for Extended Function Enable Register
#define DEVICE_NUM_REG 0x07 //Address for Logic Device Number Register
#define GPIO_LOGIC_NUM 0x08 //Logic device number for GPIO
#define GPIO_BASE_REG 0x30 //Set GPIO
#define GPIO_IO_REG 0xe0 //Address for GPIO I/O Register
#define GPIO_MODE_OUT 0
#define GPIO_DATA_REG 0xe1 //Address for GPIO Data Register
#define MAX_GPIO_NUM 8

int main(){
        int pin_num = 5;  //select pin number        (pin 5)
        int mode = 0;     //select I/O mode          (output)
        int value = 1;    //set GPO value            (high)
        int tmp = 1 << pin_num;
if(pin_num < 0 || pin_num > MAX_GPIO_NUM || mode < 0 || mode > 1 ||
value < 0 || value > 1){
        printf("GPIO_Pin_Set:Invalid parameter\n");
        return -1;
        }

        //Enter the Extended Function Mode
        outp(EFER, 0x87);
        outp(EFER, 0x87);

        //Now set the configuration register
        outp(EFER, DEVICE_NUM_REG); //Select Logic Device Number
Register
        outp(EFER + 1, GPIO_LOGIC_NUM); //device number for GPIO2,3,4,5
is 9
        outp(EFER, GPIO_BASE_REG);
        outp(EFER + 1, 0x07);
        outp(EFER, GPIO_IO_REG); //Select GPIO3 I/O Register
        outp(EFER + 1,(inp(EFER + 1) & ~tmp) | (tmp * mode));//Set I/O
mode, 0:output 1:input

        //If mode is GPO, set value
        if(mode == GPIO_MODE_OUT){
        outp(EFER, GPIO_DATA_REG); //Select GPIO3 Data Register
        outp(EFER + 1,(inp(EFER + 1) & ~tmp) | (tmp * value));//Set GPO
value, 0:low 1:high
        printf("GPIO_Pin_Set: Set GPIO(%d) to GPO, Value = %d\n", pin_num,
value);
        }
```

```
        else{
        printf("GPIO_Pin_Set: Set GPIO(%d) to GPI\n", pin_num);
        }
        //Exit the Extended Function Mode
        outp(EFER, 0xAA);
        return 0;
}
```

# Chapter 4
# BIOS Setup Information

WADE-8016 is equipped with the AMI BIOS stored in Flash ROM. These BIOS has a built-in Setup program that allows users to modify the basic system configuration easily. This type of information is stored in CMOS RAM so that it is retained during power-off periods. When system is turned on, WADE-8016 communicates with peripheral devices and checks its hardware resources against the configuration information stored in the CMOS memory. If any error is detected, or the CMOS parameters need to be initially defined, the diagnostic program will prompt the user to enter the SETUP program. Some errors are significant enough to abort the start up.

## 4.1 Entering Setup

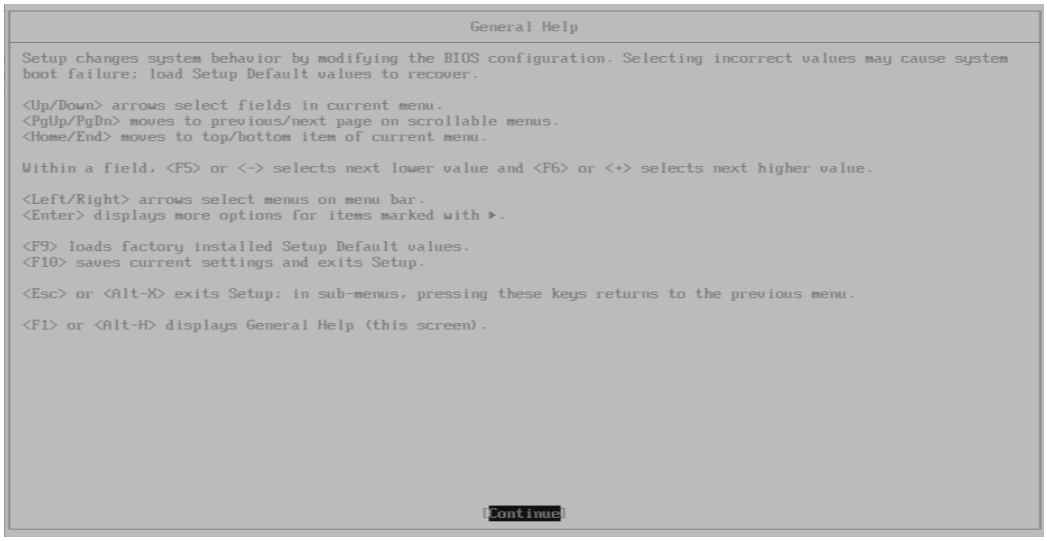
Power on the computer and the system will start POST (Power On Self Test) process. When the message below appears on the screen, press <Del> key will enter BIOS setup screen.

**Press <Del> to enter SETUP**

If the message disappears before responding and still wish to enter Setup, please restart the system by turning it OFF and On or pressing the RESET button. It can be also restarted by pressing <Ctrl>, <Alt>, and <Delete> keys on keyboard simultaneously.

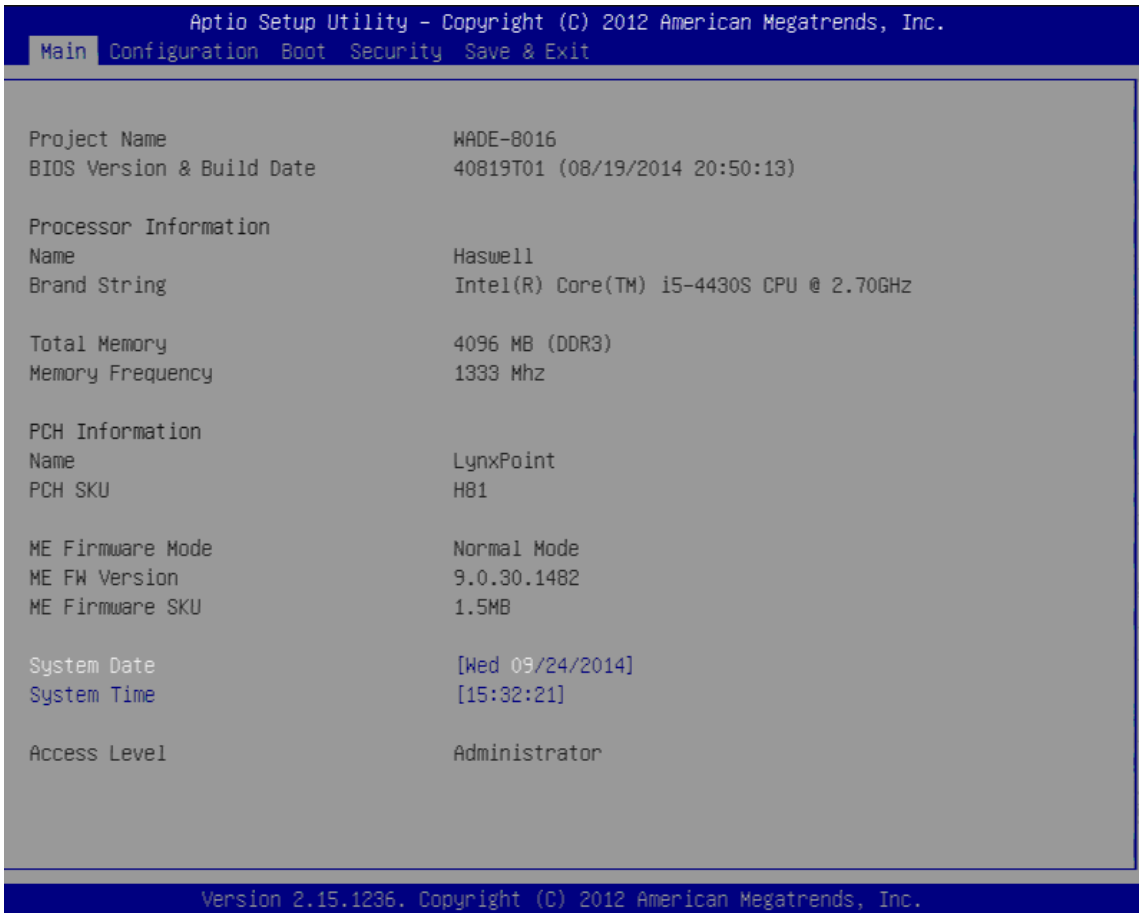
**Press <F1> to Run General Help or Resume**

The BIOS setup program provides a General Help screen. The menu can be easily called up from any menu by pressing <F1>. The Help screen lists all the possible keys to use and the selections for the highlighted item. Press <Esc> to exit the Help screen.



## 4.2 Main

Use this menu for basic system configurations, such as time, date etc.

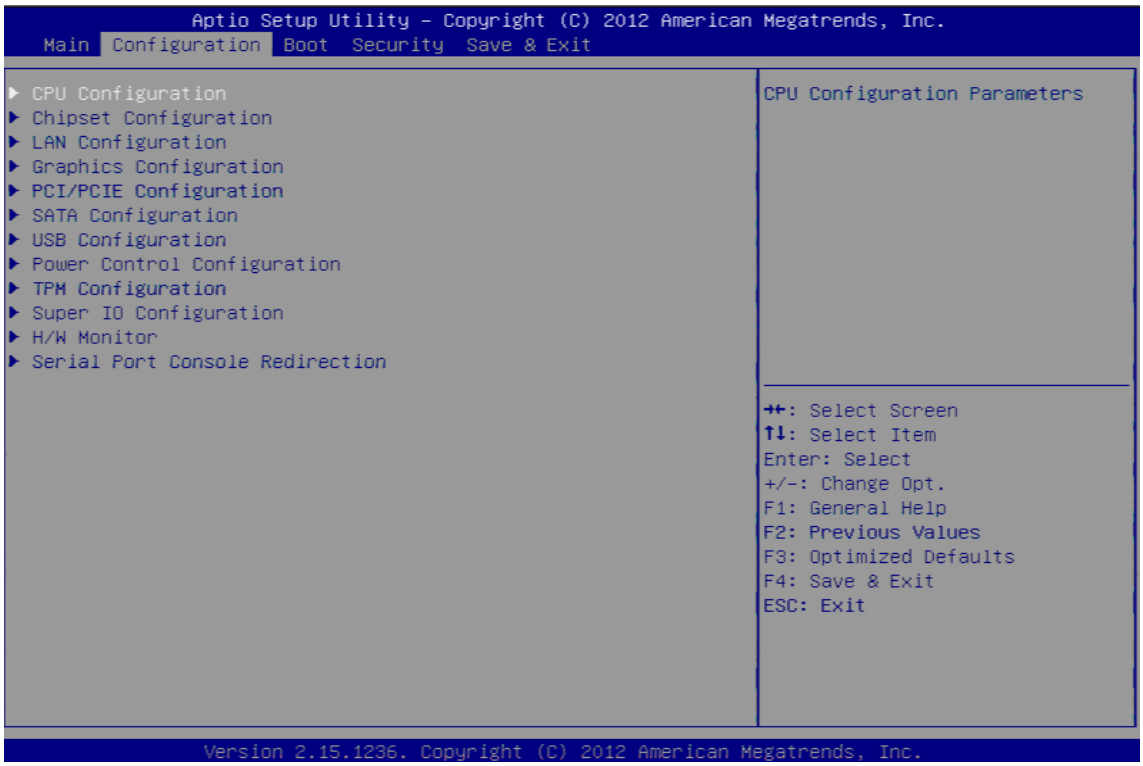



**System Date**
View or set system date
The date format is <Day>, <Month> <Date> <Year>. Use [+] or [−] to configure system Date.

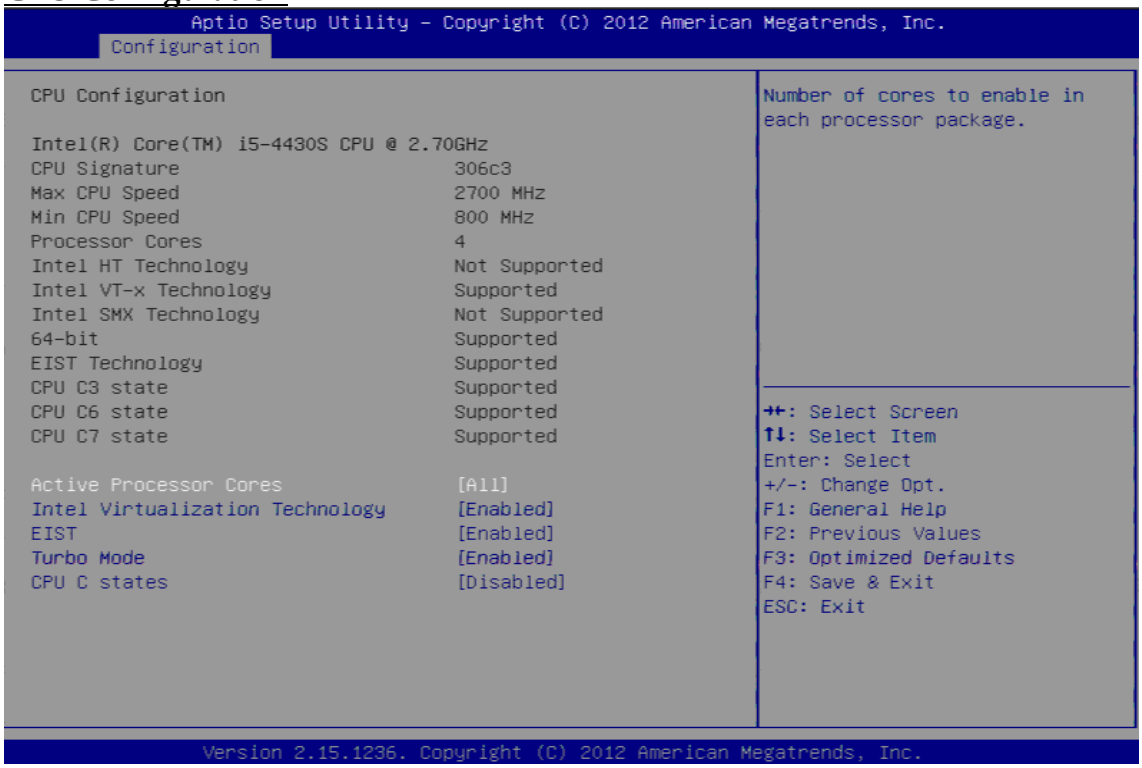
**System Time**
View or set system time
The time format is <Hour> <Minute> <Second>. Use [+] or [−] to configure system Time.

## 4.3 Configutation

**Setup Warning:**
**Setting items on this screen to incorrect values may cause system to malfunction!**




**CPU Configuration**



**Active Processor Cores**
Number of cores to enable in each processor package
Choices: All, 1, 2, 3.

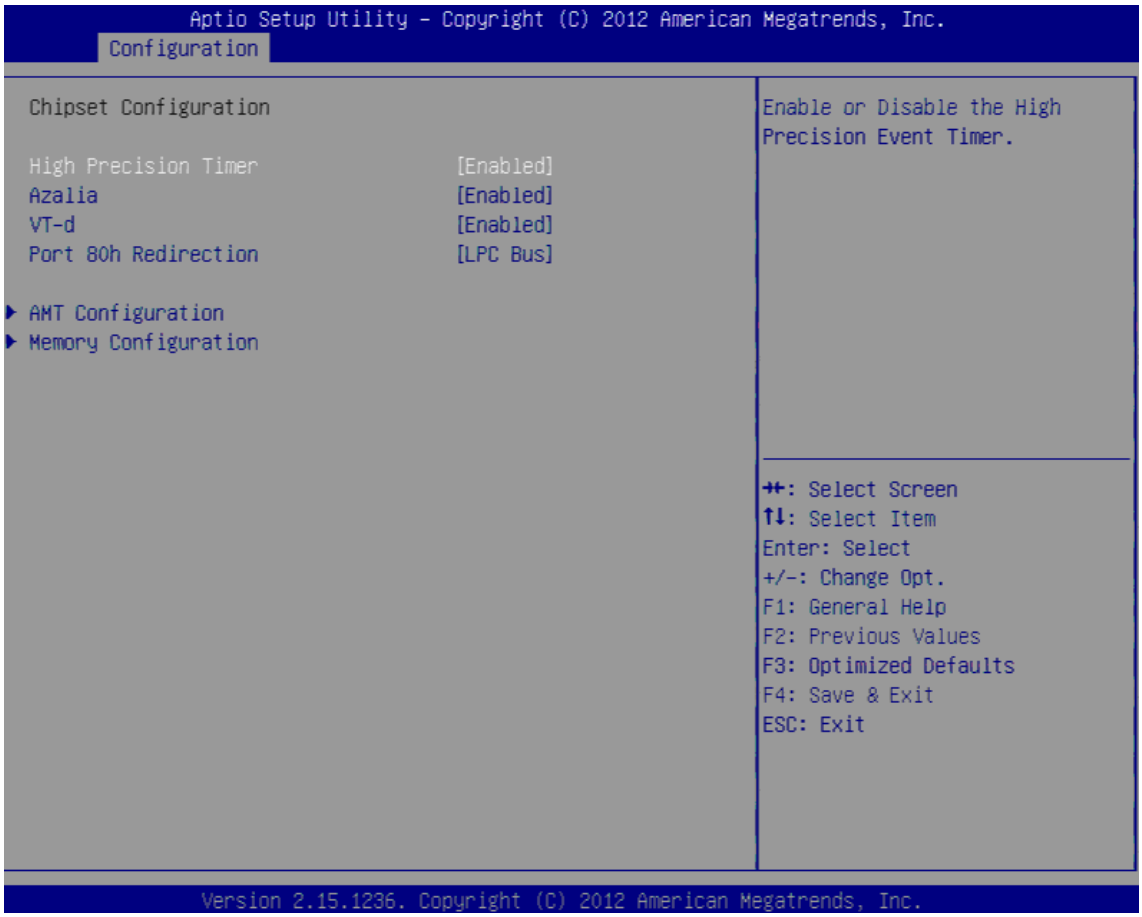
**Intel Virtualization Technology**
When enable, a VWM can utilize the additional hardware capabilities provide by Vander pool Technology.
Choices: Disable, Enable.

**EIST**
Disable/Enable Intel Speed Step
Choices: Disable, Enable.

**Turbo Mode**
Turbo Mode
Choices: Disable, Enable.

**CPU C States**
Disable or Enable CPU C states
Choices: Disable, Enable.

**Chipset Configuration**



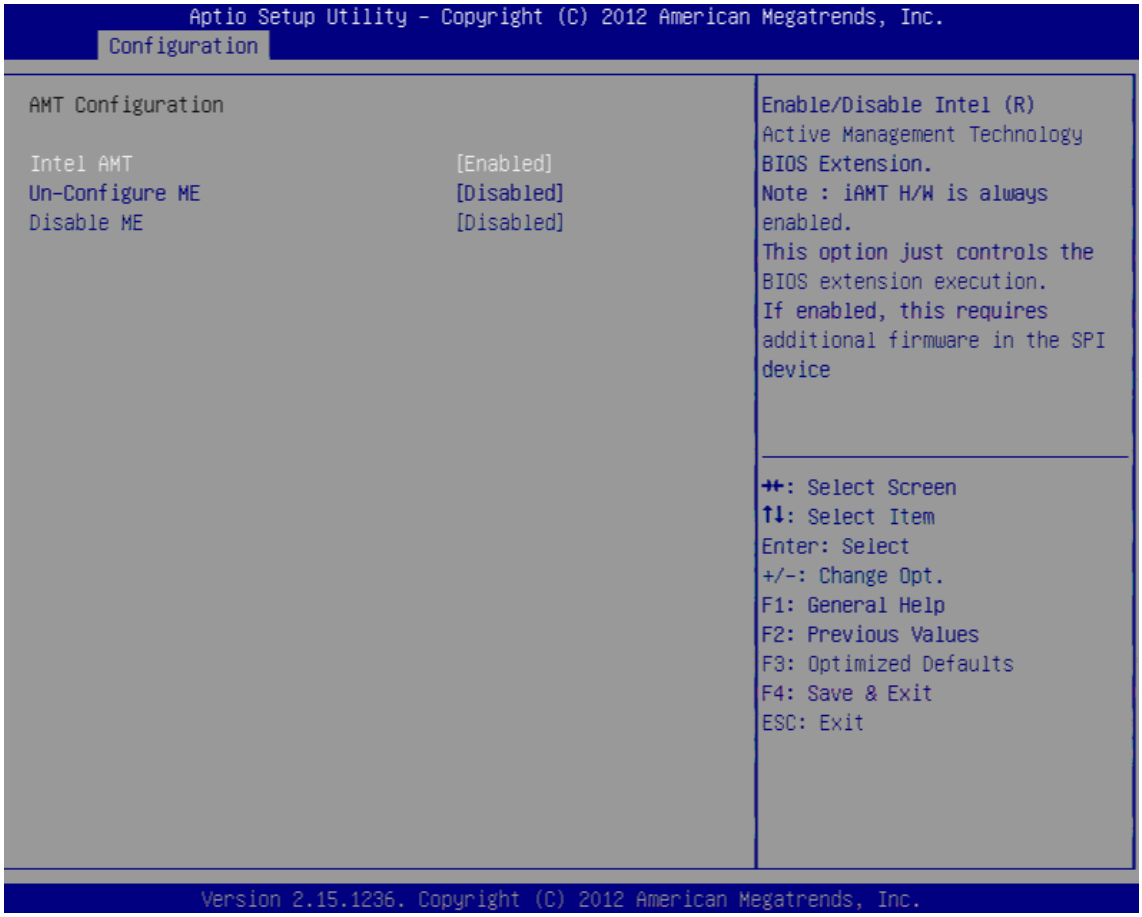
**High Precision Timer**
Enable or disable the High precision Event Timer.
Choices: Disabled, Enabled.

**Azalia**
Control Detection of the Azalia device.
Choices: Disabled, Enabled.

**VT-d**
Check to enable VT-d function on MCH.
Choices: Disabled, Enabled.

**Port 80h Redirection**
[LPC Bus] Forward I/O Port 80 to LPC.
Choices: LPC Bus.

**AMT Configuration**

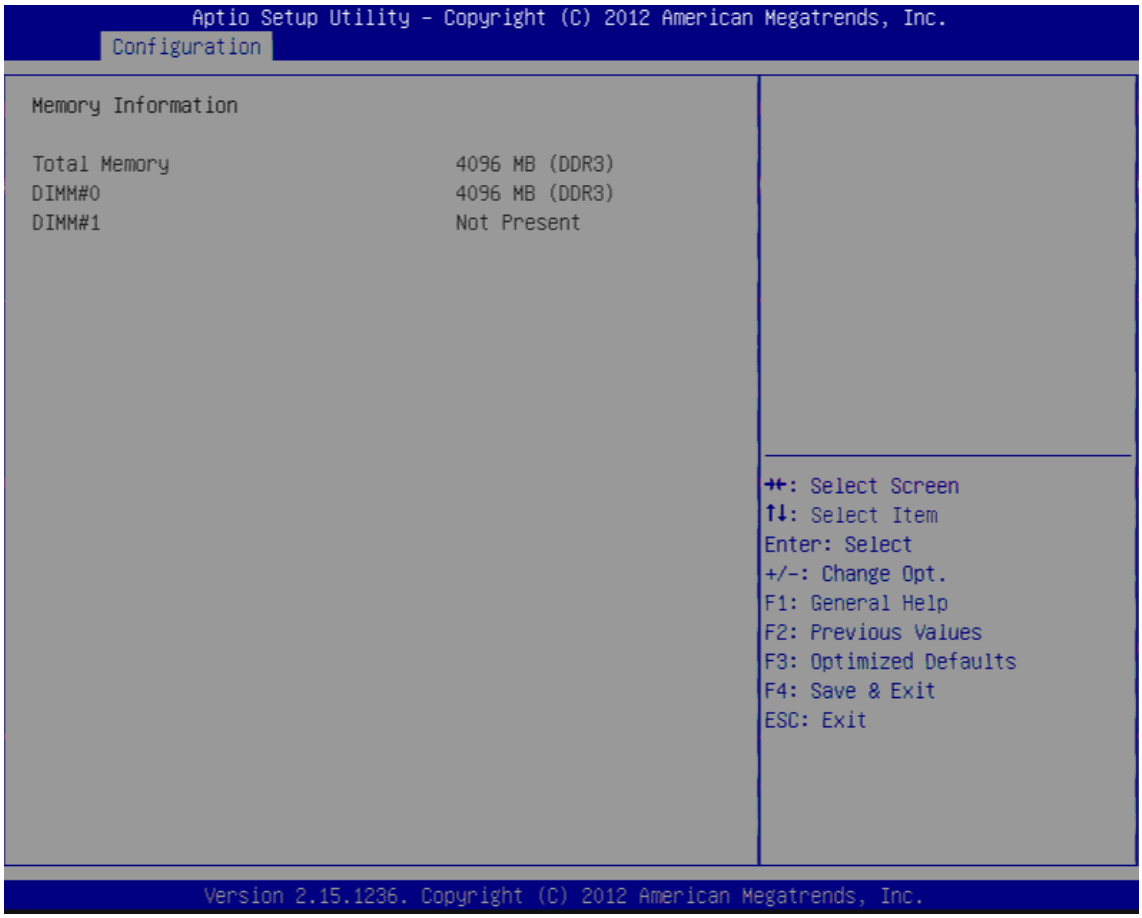



**Intel AMT**
Enable or disable Intel Active Management Technology BIOS Extension.
Choices: Disabled, Enabled.

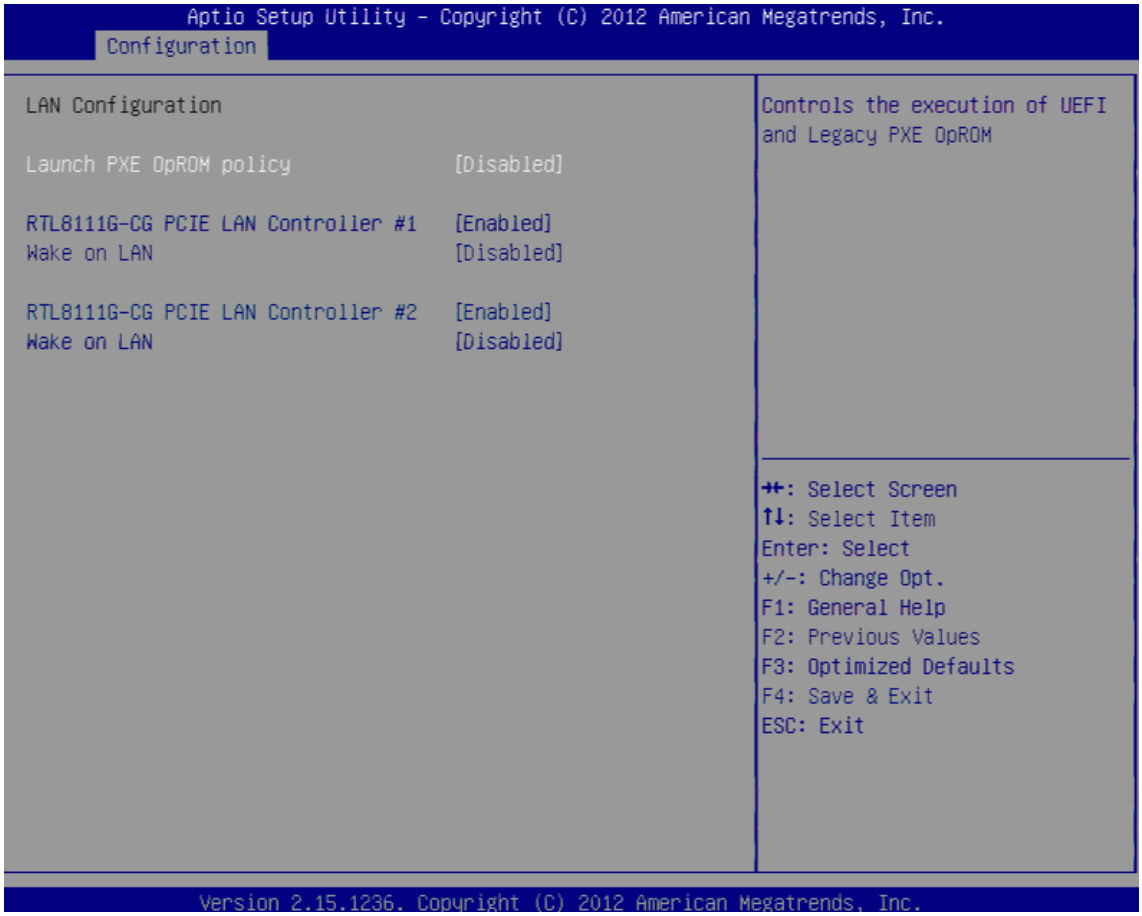
**Un-Configure ME**
OEMFlag Bit 15:Un-Configure ME without password.
Choices: Disabled, Enabled.

**Disable ME**
Set ME to Soft Temporary Disabled.
Choices: Disabled, Enabled.

**Memory Information**



## LAN Configuration

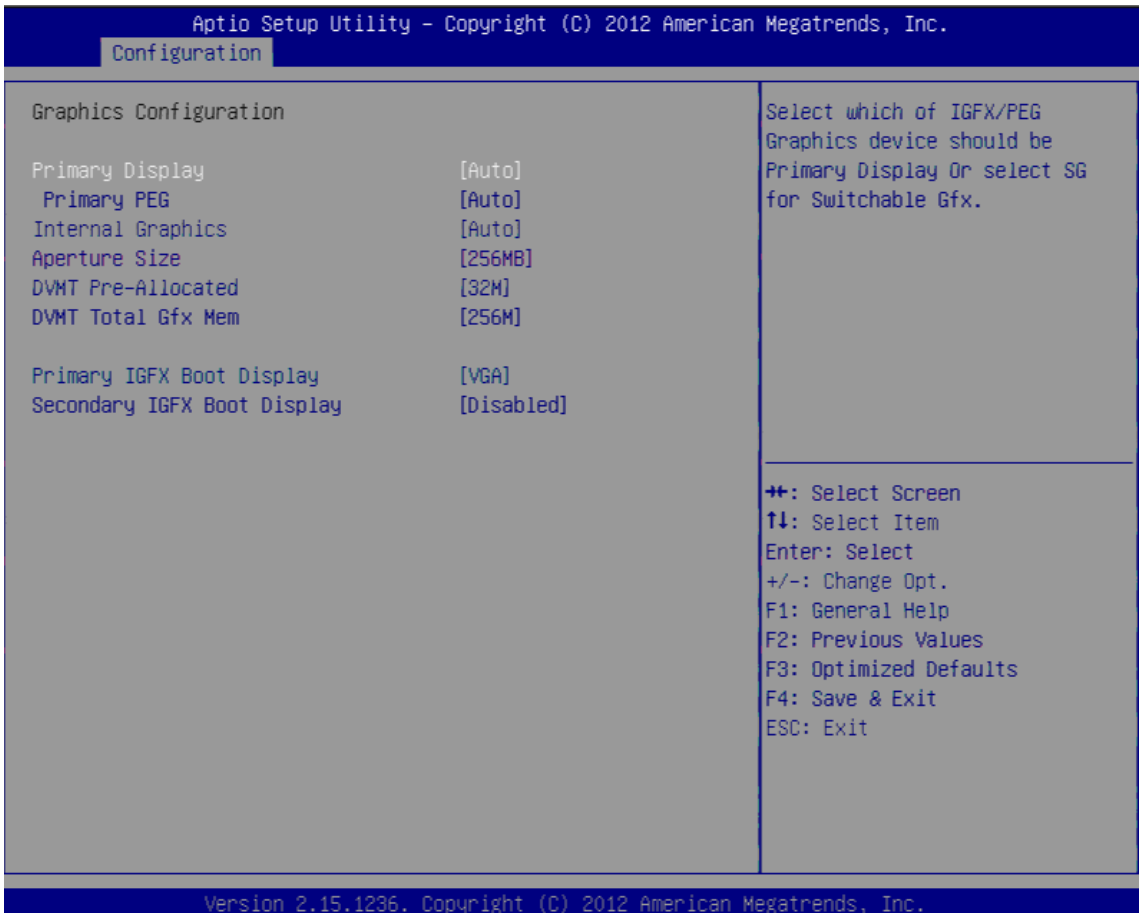



**Launch PXE OpROM policy**
Controls the execution of UEFI and Legacy PXE OpROM
Choices: Disable, UEFI only, Enable.

**RTL8111G-CG PCIE LAN Controller #1~#2**
Control the PCI Express Root Port
Choices: Disabled, Enabled.

**Wake on LAN**
Enable or disable the wake on LAN feature
Choices: Disabled, Enabled.

## Graphics Configuration




**Primary Display**
Select which of IGFX/PEG Graphics device should be Primary Display.
Choices: Auto, IGEX, PEG.

**Primary PEG**
Select PEG0/PEG1/PEG2/PEG3 Graphics device should be Primary PEG.
Choices: Auto, PEG1, PEG2.

**Internal Graphics**
Keep IGD enabled based on the setup options.
Choices: Auto, Disable, Enable.

**Aperture Size**
Select the Aperture Size
Choices: 128MB, 256MB, 512MB.

**DVMT Pre-Allocated**
Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory sized used by the Internal Graphic Device

Choices: 32M, 64M, 96M, 128M, 160M, 192M, 224M, 256M, 288M, 320M, 352M, 384M, 416M, 448M, 480M, 512M, 1024M.

**DVMT Total Gfx Mem**

Select DVMT 5.0 Total Graphic Memory size used by the Internal Graphics Device.
Choices: 128M, 256M, MAX.

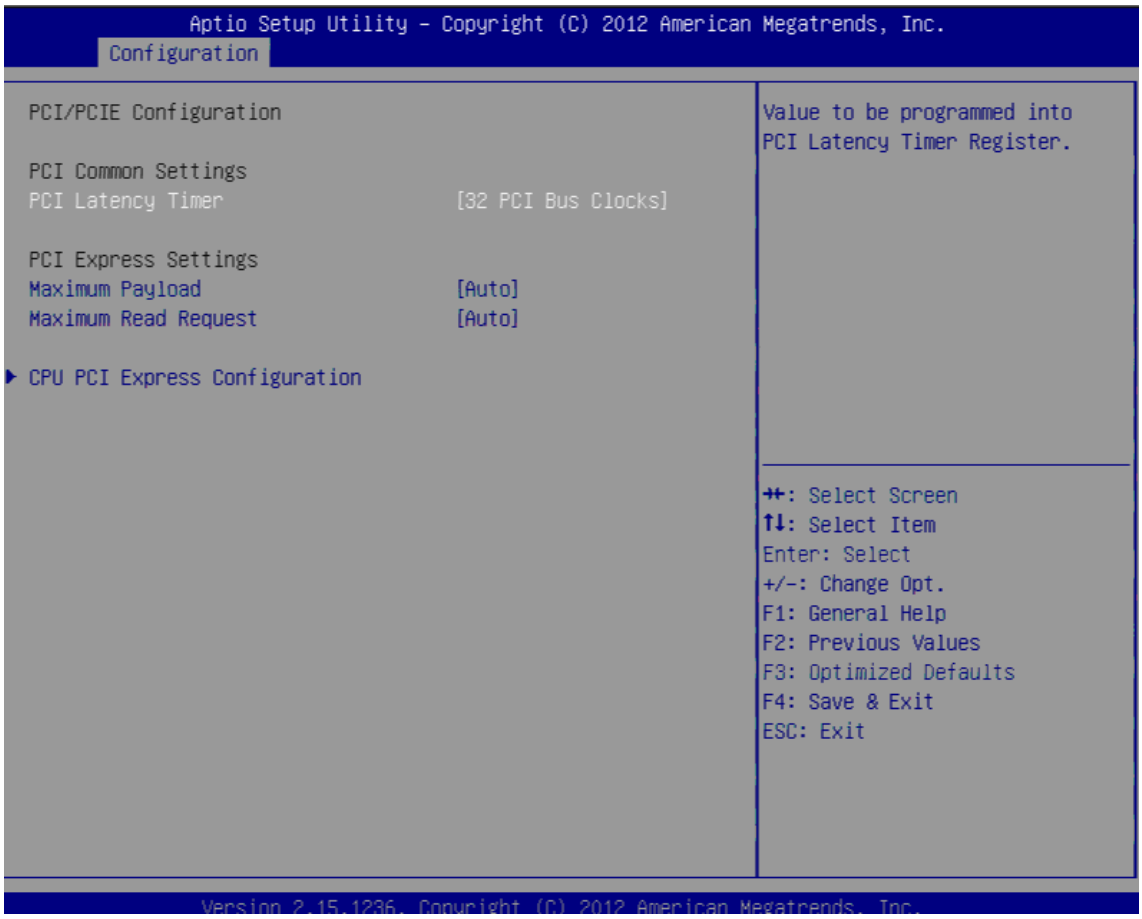
**Primary IGFX Boot Display**

Select the Video Device which will be activated during POST.
Choices: VBIOS Default, VGA, DVI, HDMI.

**Secondary IGFX Boot Display**

Select secondary display device.
Choices: Disable, DVI, HDMI.

**PCI/PCIE Configuration**




**PCI Latency Timer**

Value to be programmed into PCI Latency Timer Register
Choices: 32PCI Bus Clocks, 64PCI Bus Clocks, 96PCI Bus Clocks, 128PCI Bus Clocks, 160PCI Bus Clocks, 192PCI Bus Clocks, 224PCI Bus Clocks, 248PCI Bus Clocks.

## PCI Express Settings

### Maximum Payload

Ser Maximum Payload of PCI Express Device or allow System BIOS to select the value.
Choices: Auto, 128Bytes, 256Bytes, 521Bytes, 1024Bytes, 2048Bytes, 4096Bytes

### Maximum Read Request

Ser Maximum Read Request size of PCI Express Device or allow System BIOS to select the value.
Choices: Auto, 128Bytes, 256Bytes, 521Bytes, 1024Bytes, 2048Bytes, 4096Bytes

### CPU PCI Express Configuration


### PEG0 – Gen X

Configure PEG0 B0:D0:F0 Gen1-Gen3
Choices: Auto, GEN1, GEN2.

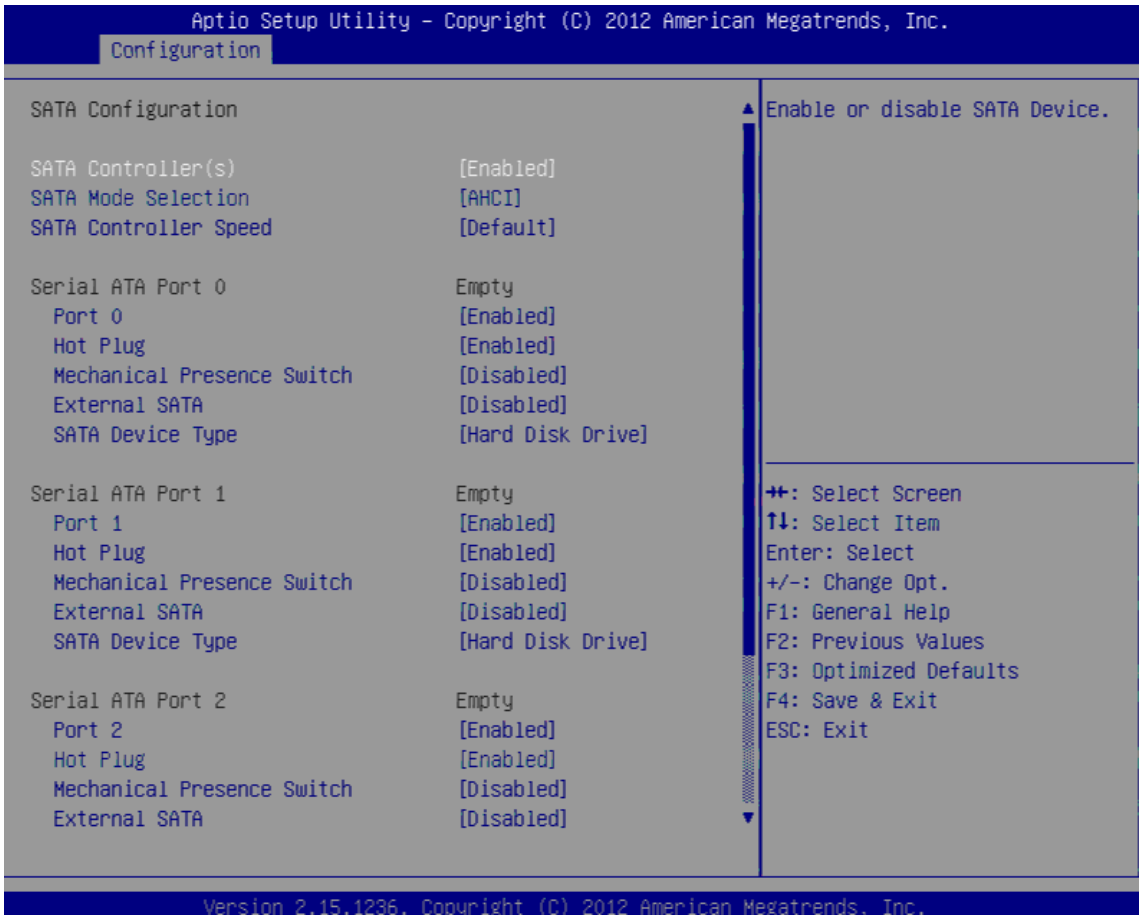
### PEG0-ASPM

Control ASPM support for the PEG Device.
Choices: Disable, Auto, ASPM L0s, ASPM L1,ASPM L0sL1.

### Enable PEG

Choices: Disable, Enable, Auto

## SATA Configuration




### SATA Controller(s)
Choices: Disable, Enable

### SATA Mode Selection
Determines how SATA controller(s) operate
Choices: IDE, AHCI

### SATA Controller Speed
Indicates the maximum speed the SATA controller can support
Choices: Default, Gen1, Gen2, Gen3

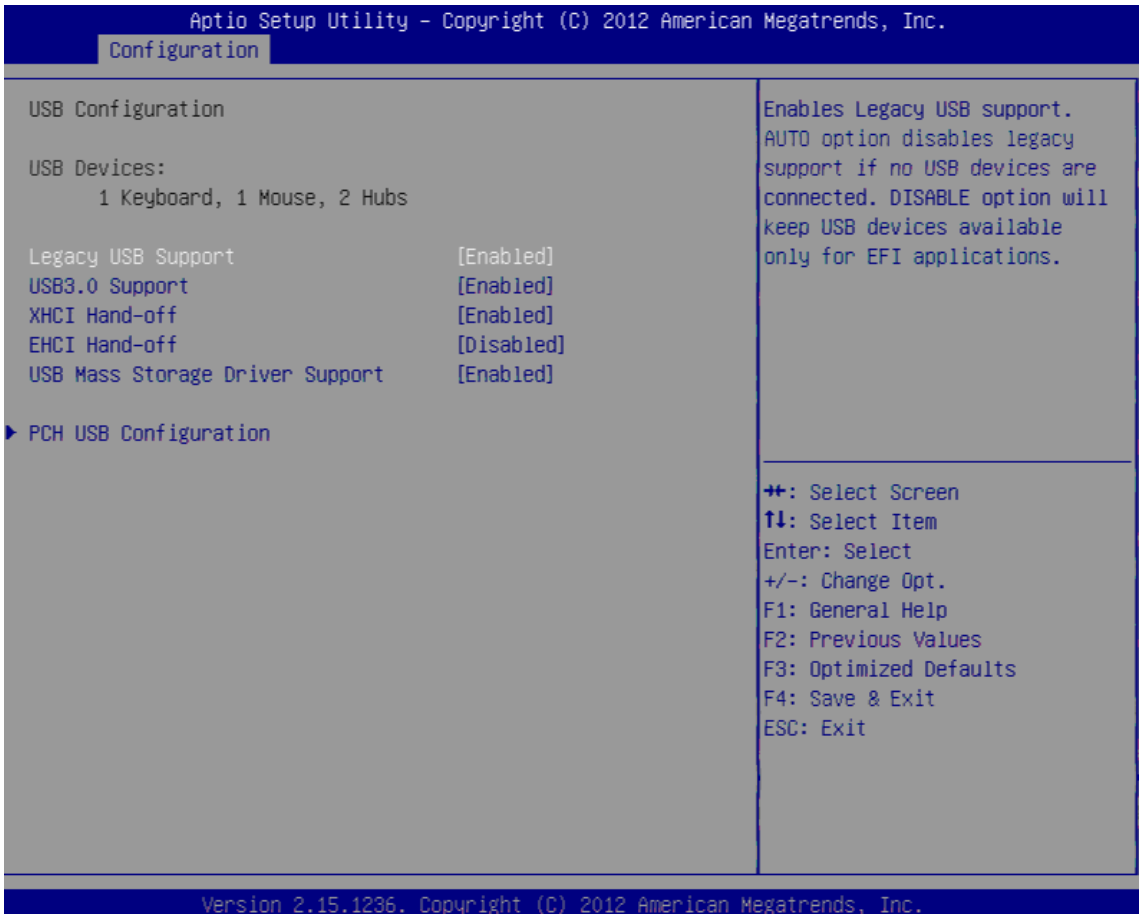
### Serial ATA Port 0/1/2/3 Capability
Port 0/1/2/3
Choices: Enable, Disable.

### Hot Plug
Designates this port as Hot Pluggable
Choices: Enable, Disable.

**Mechanical Presence Switch**
Controls reporting if this port has an Mechanical presence switch.
Choices: Enable, Disable.
**External SATA**
Choices: Enable, Disable.

**SATA Device Type**
Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.
Choices: Hard Disk Drive, Solid State Drive.

**USB Configuration**
USB Configuration settings




**Legacy USB Support**
Enable legacy USB support.
Choices: Enable, Disable, Auto.

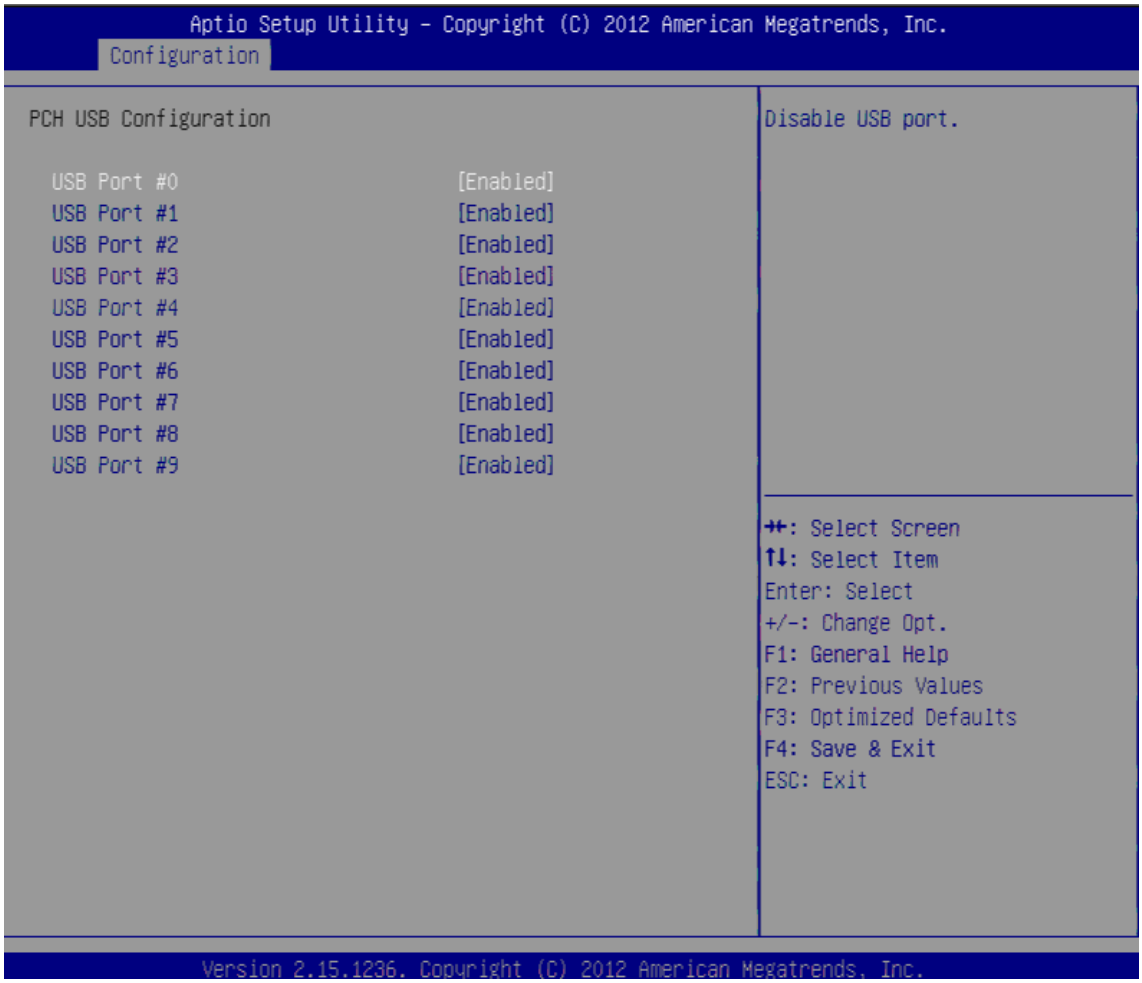
**USB3.0 Support**
External Enable/disable USB3.0 (XHCI) Controller support
Choices: Enable, Disable

**XHCI Hand-off**
Choices: Enable, Disable.

**EHCI Hand-off**
Choices: Enable, Disable.

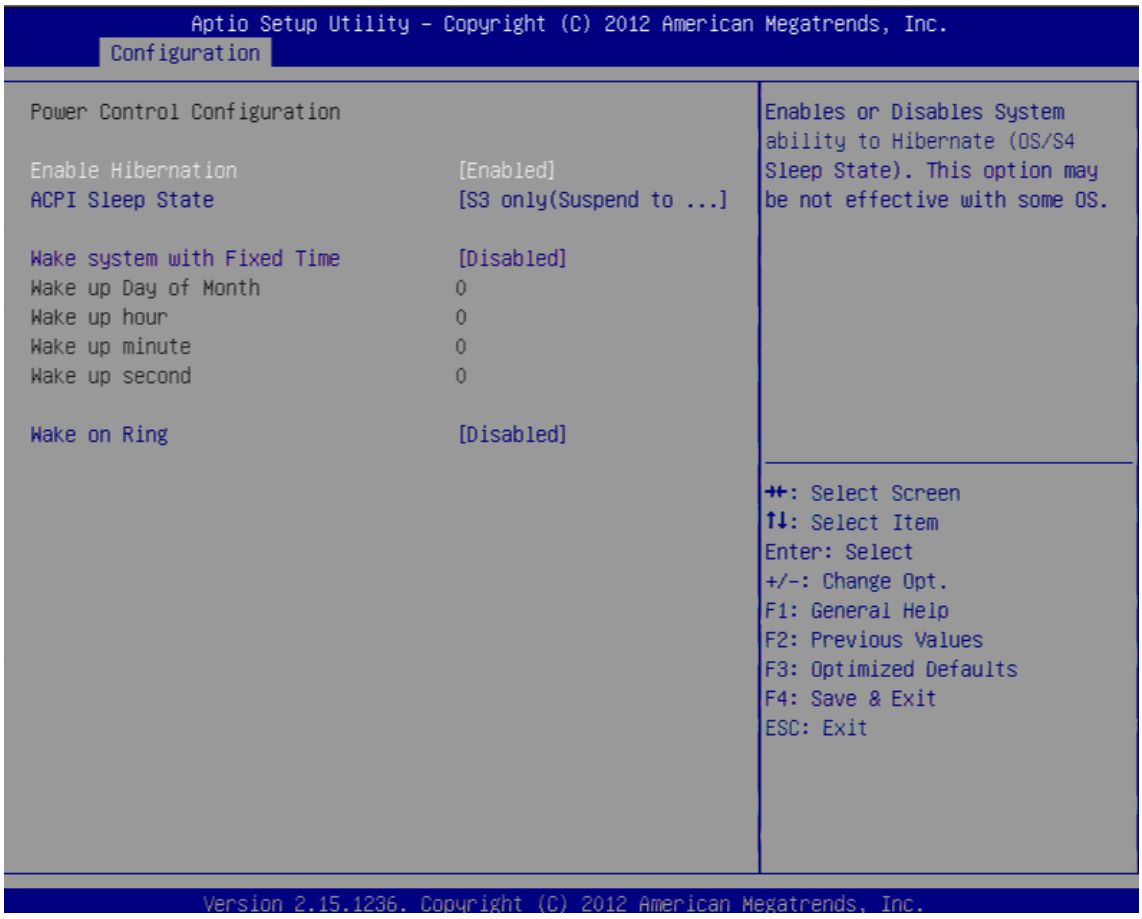
**USB Mass Storage Drive Support**
Choices: Enable, Disable.

**PCH USB Configuration**




**USB Port #0~#9**
Disable USB port
Choices: Disable, Enable.

## Power Control Configuration




### Enable Hibernation

Enables or disables system ability to hibernate (OS/S4 Sleep state)
Choices: Disable, Enable.

### ACPI Sleep States

Select ACPI sleep state the system will enter when the suspend button is pressed.
Choices: S3 only(suspend to RAM)

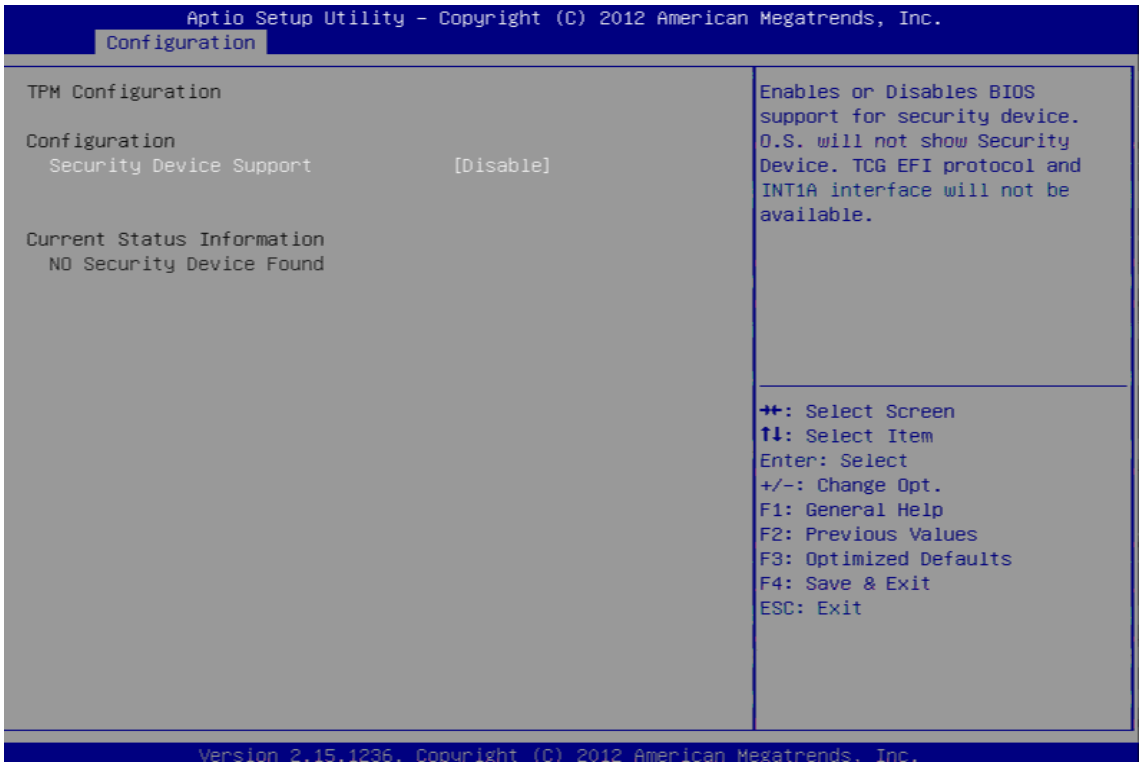
### Wake system with Fixed Time

Enable or disable system wake on alarm event.
Choices: Disable, Enable.

### Wake on Ring

Enable or disable wake on ring from S5.
Choices: Disable, Enable.

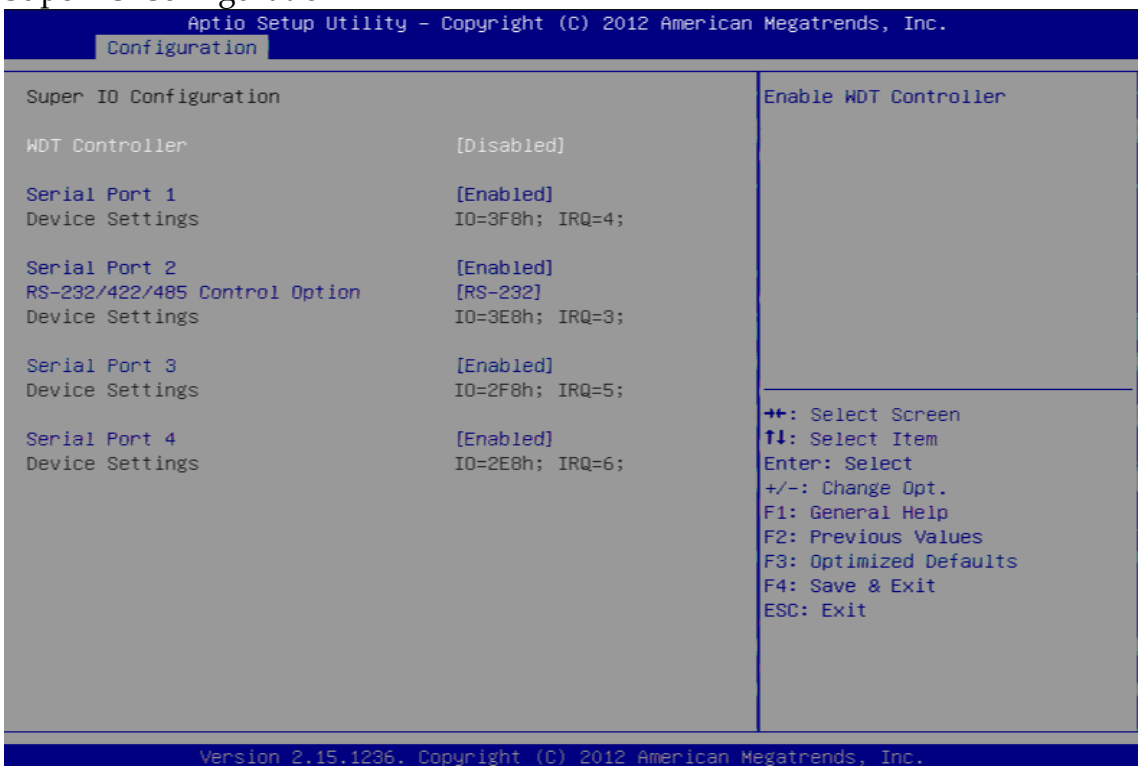
## TPM Configuration




### Security device support

Enable or disable BIOS support for security device.
Choices: Disable, Enable.

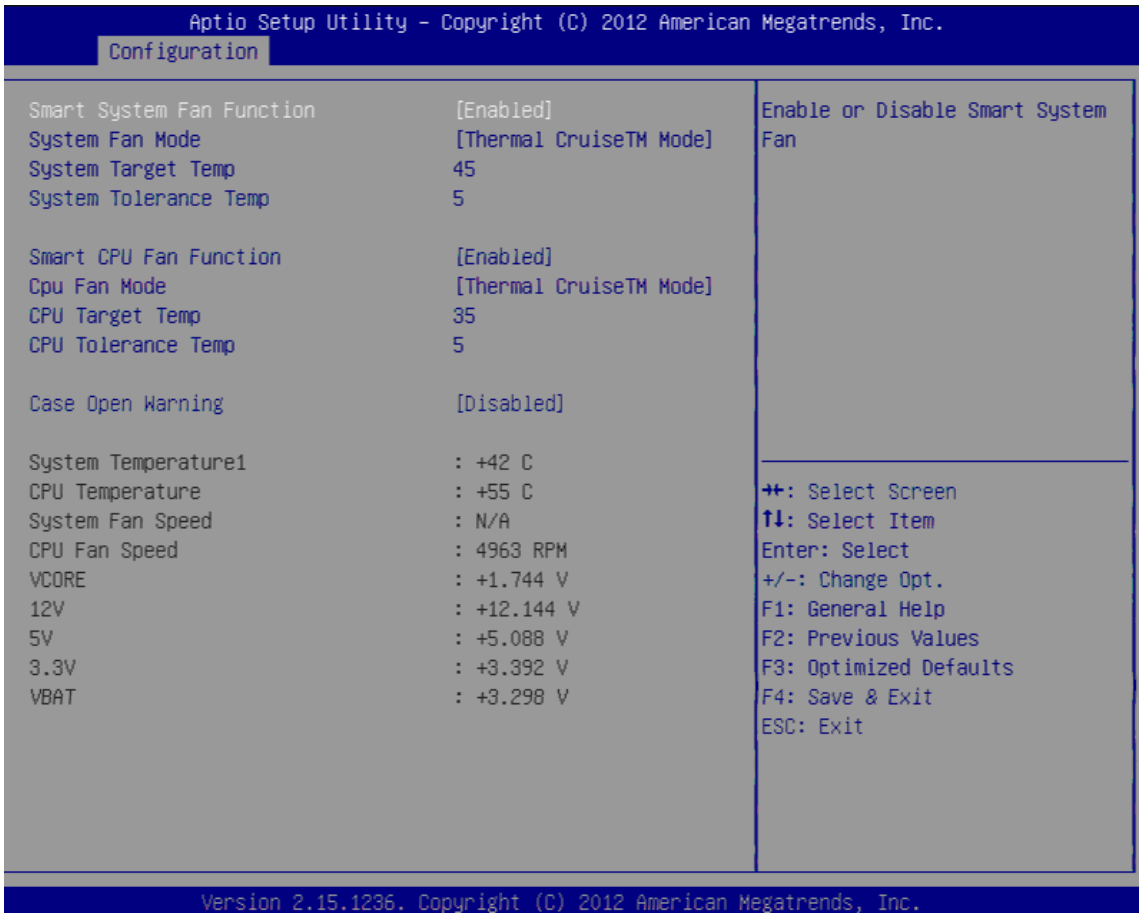
Super IO Configuration



**WDT controller**
Enable WDT configuration
Choices: Disable, Enable.

**Serial Port #1~#4**
Choices: Disable, Enable.

**H/W Monitor**




**Smart system fan function**
Choices: Disable, Enable.

**System fan mode**
Smart fan mode select
Choices: Thermal CruiseTM Mode, Fan Speed CruiseTM Mode

**System Target Temp**
System fan target temperature range =0~127

**System Tolerance Temp**
System fan Tolerance temperature range = 0~15

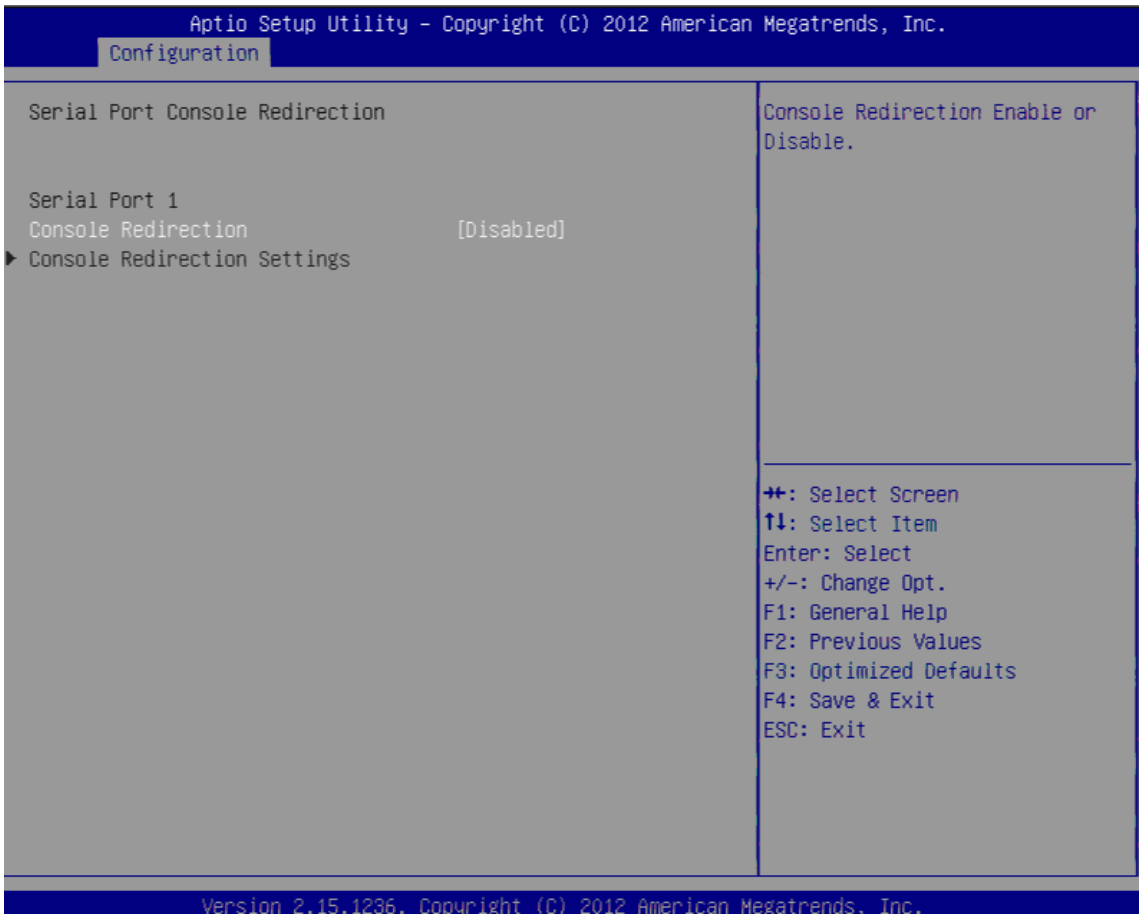
**Smart CPU fan function**
Choices: Disable, Enable.

**CPU fan Mode**
Smart fan mode select
Choices: Thermal CruiseTM Mode, Fan Speed CruiseTM Mode

**CPU Target Temp**
System fan target temperature range =0~127
CPU Tolerance Temp
System fan Tolerance temperature range = 0~15

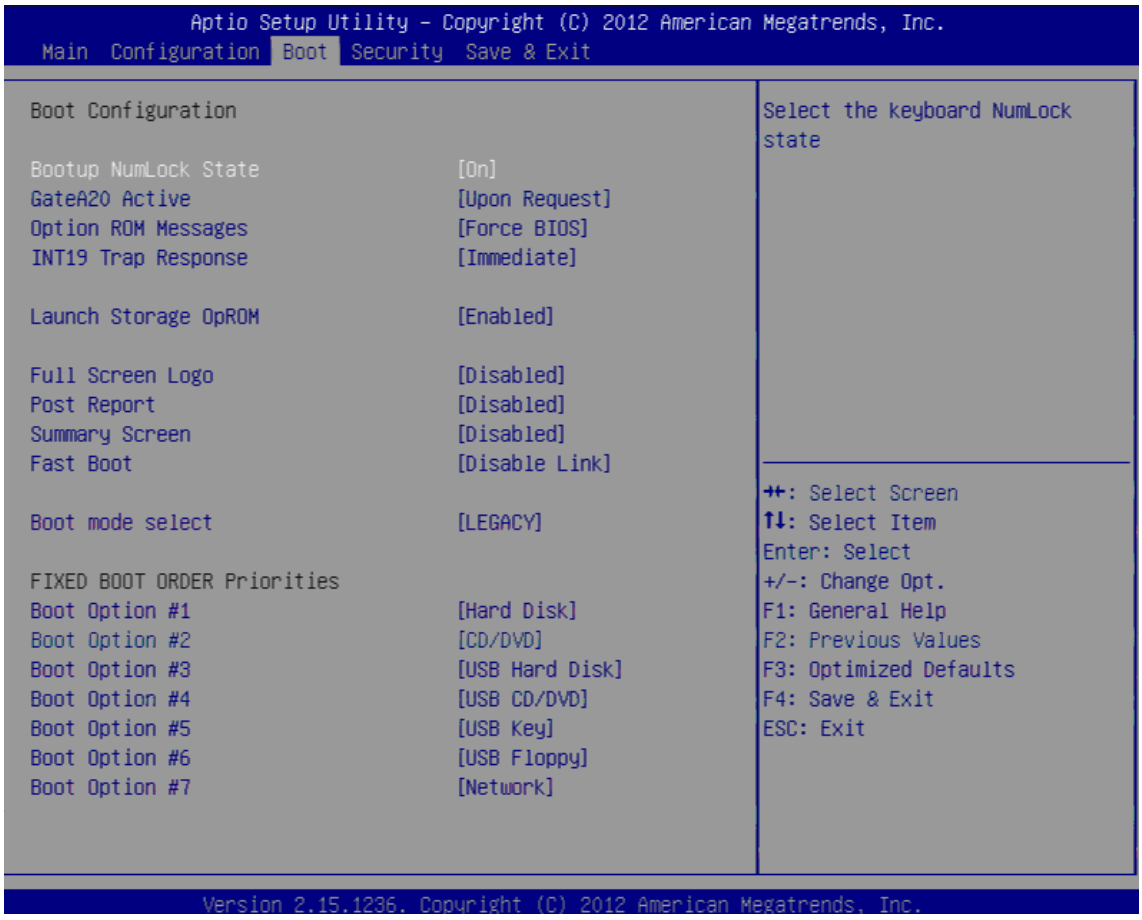
**Case Open Warning**
Support case open warning beep
Choices: Disable, Enable.

**Serial Port Console Redirection**




**Console redirection**
Choices: Disable, Enable.

## 4.4 Boot




**Bootup NumLock State**
Select the keyboard numlock state
Choices: On, off

**GateA20 Active**
UPON REQUEST- GA20 can be disabled using BIOS servies.
Choices: Upon Request, Always

**Option ROM Messages**
Set display mode for option ROM
Choices: Force BIOS, Keep Current

**INT19 Trap Response**
Bios reaction on INT19 trapping by option ROM: IMMEDIATE-execute the trap right away; POSTPONED-execute the trap during legacy boot.
Choices: IMMEDIATE, POSTPONED.

**Launch Storage OpROM**
Control the of storage oprom enable/ disable
Choices: Disable, Enable.

**Full Screen Logo**
Enable or disable quiet boot option and full screen logo
Choices: Disable, Enable.

**Post Report**
Post report support enabled/disabled
Choices: Disable, Enable.

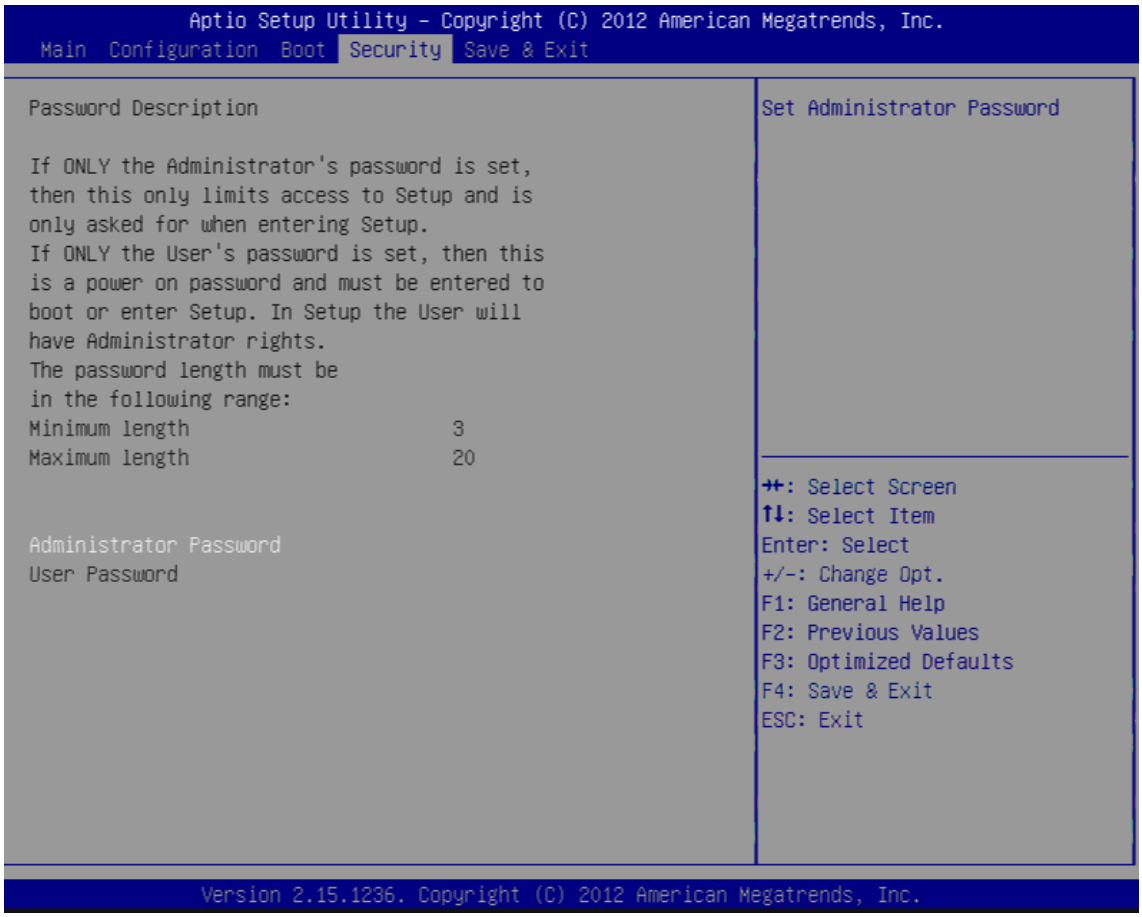
**Summary screen**
Summary screen support enabled/disabled
Choices: Disable, Enable.

**Fast Boot**
Enabled or disabled boot with initialization of a minimal set of devices requires to launch active boot option.
Choices: Disable, Enable.

**Boot mode select**
Select boot mode legacy/UEFI
Choices: Legacy/UEFI

**Boot Option #1~#7**
Select the system boot order
Choices: Hard Disk, CD/DVD, USB Hard Disk, USB CD/DVD, USB Key, USB

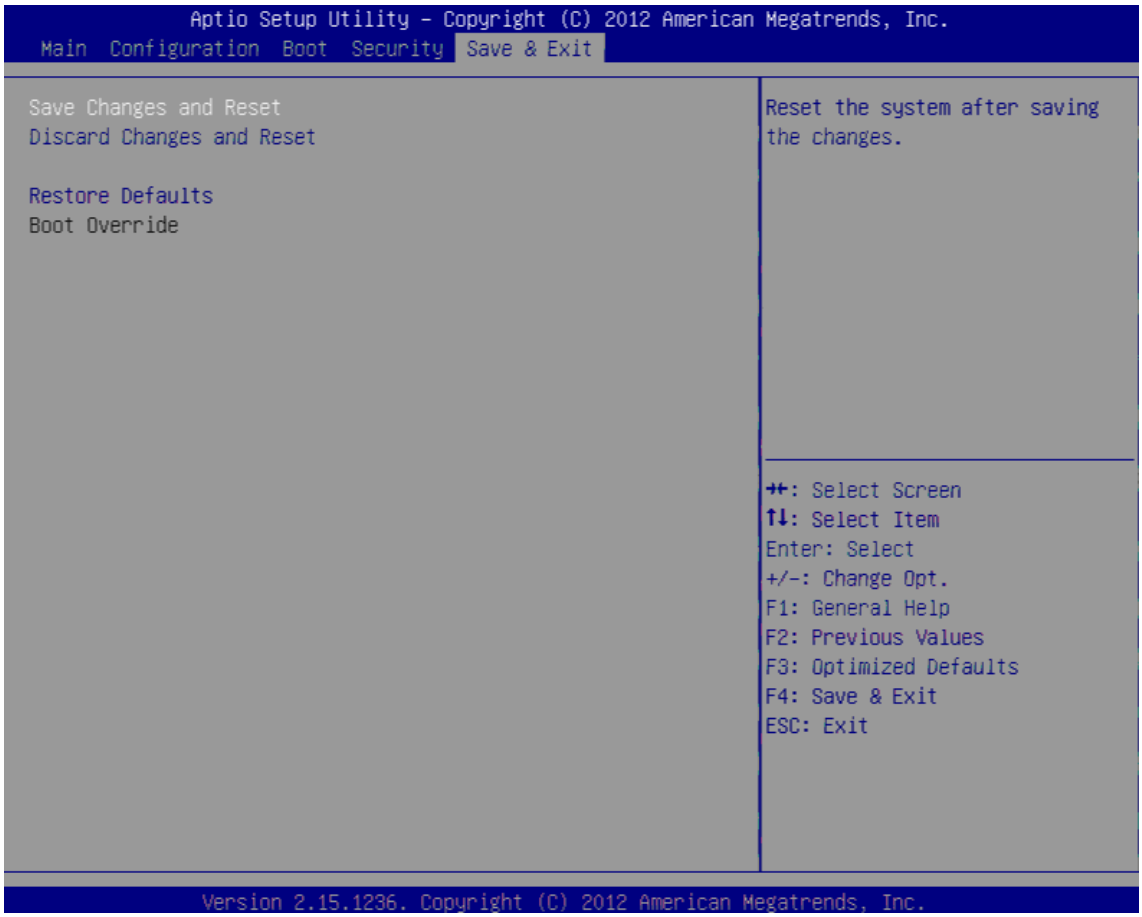
## 4.5 Security




**Administrator Password**
Set administrator password

**User password**

## 4.6 Save & Exit




**Save Changes and reset**
Reset the system after saving the changes

**Disable changes and reset**
Reset system setup without saving any changes

**Restore defaults**
Restore/load default values for all the setup option

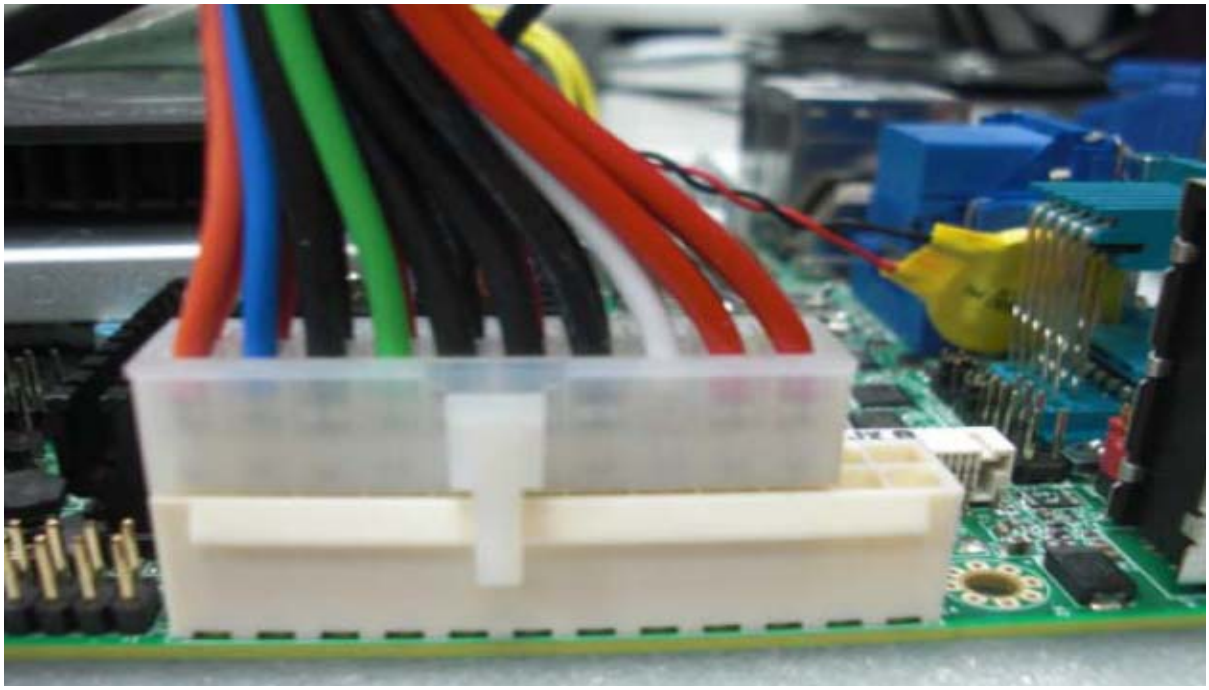
# Chapter 5
# Troubleshooting

This chapter provides a few useful tips to quickly get WADE-8016 running with success. As basic hardware installation has been addressed in Chapter 2, this chapter will primarily focus on system integration issues, in terms of BIOS setting, and OS diagnostics.

## 5.1 Hardware Quick Installation

**ATX Power Setting**

Unlike other Mini-ITX board computer, WADE-8016 supports ATX only. Therefore, there is no other setting that really needs to be set up. However, there are only two connectors that must be connected—J17 (24pins ATX Power Connector) Fighre.



It is assumed that users have correctly adopted modules and connected all the devices cables required before turning on ATX power. 240-pin DDR3 Memory, keyboard, mouse, SATA hard disk, VGA connector, power cable of the device, ATX accessories are good examples that deserve attention. With no assurance of properly and correctly accommodating these modules and devices, it is very possible to encounter system failures that result in malfunction of any device.

To make sure that you have a successful start with WADE-8016, it is recommended, when going with the boot-up sequence, to hit "Del" key and enter the BIOS setup menu to tune up a stable BIOS configuration so that you can wake up your system far well.

**Loading the default optimal setting**

When prompted with the main setup menu, please scroll down to "**Load Setup Defaults**", press "**Enter"** and select "**Y"** to load in default optimal BIOS setup. This will force your BIOS setting back to the initial factory configuration. It is recommended to do this so you can be sure the system is running with the BIOS setting that Portwell has highly endorsed. As a matter of fact, users can load the default BIOS setting any time when system appears to be unstable in boot up sequence.

## 5.2 FAQ

**System:** SBC keeps beeping, and no screen has shown.

Solution: In fact, each beep sound represents different definition of error message. Please refer to table as following.

| Beep sounds | Meaning | Action |
|---|---|---|
| One long beep with one short beeps | DRAM error | Change DRAM or reinstall it |
| One long beep constantly | DRAM error | Change DRAM or reinstall it |
| One long beep with two short beeps | Monitor or Display Card error | Please check Monitor connector whether it inserts properly |
| Beep rapidly | Power error warning | Please check Power mode setting |

**Question: I forget my password of system BIOS, what am I supposed to do?**

**Answer:** You can simply short 2-3 pins on JP4 to clean your password.

**Note:**
Please visit our technical web site at
http://www.portwell.com.tw
For additional technical information, which is not covered in this manual, you can mail to tsd@portwell.com.tw or you can also ,ail to our sales, they will be very delighted to forward them to us.

**System memory address map**

Each on-board device in the system is assigned a set of memory addresses, which also can be identical of the device. The following table lists the system memory address used for your reference.

| Memory Area | Size | Description |
|---|---|---|
| 0000 - 003F | 1K | Interrupt Area |
| 0040 - 004F | 0.3K | BIOS Data Area |
| 0050 - 006F | 0.5K | System Data |
| 0070 – 0E2E | 54K | DOS |
| 0E2F – 12BE | 18K | Program Area |
| 12BF – 9D7F | 555K | 【Available】 |
| First Meg -- Conventional memory end at 630K -- | | |
| 9D80 – 9EFF | 6K | Extended BIOS Area |
| 9F00 – 9FFF | 4K | Unused |
| A000 – AFFF | 64K | VGA Graphics |
| B000 – B7FF | 32K | Unused |
| B800 – BFFF | 32K | VGA Text |
| C000 – CEBF | 59K | Video ROM |
| CEC0 -EFFF | 133K | Unused |
| F000-FFFF | 64K | System ROM |
| HMA | 64K | First 64K Extended |

**Interrupt Request Lines (IRQ)**

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

| IRQ# | Current Use | Default Use |
|---|---|---|
| IRQ 0 | System ROM | System Timer |
| IRQ 1 | System ROM | Keyboard Event |
| IRQ 2 | 【Unassigned】 | Usable IRQ |
| IRQ 3 | System ROM | COM2 |
| IRQ 4 | NEWMOUSE | COM1 |
| IRQ 5 | 【Unassigned】 | Usable IRQ |
| IRQ 6 | System ROM | Diskette Event |
| IRQ 7 | 【Unassigned】 | Usable IRQ |
| IRQ 8 | System ROM | Real-Time Clock |
| IRQ 9 | 【Unassigned】 | Usable IRQ |
| IRQ 10 | 【Unassigned】 | Usable IRQ |

| | | |
|---|---|---|
| IRQ 11 | Video ROM | Usable IRQ |
| IRQ 12 | NEWMOUSE | IBM Mouse Event |
| IRQ 13 | System ROM | Coprocessor Error |
| IRQ 14 | System ROM | Hard Disk Event |
| IRQ 15 | 【Unassigned】 | Usable IRQ |