

# MS-98G7

*Industrial Computer Board*



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## Trademarks

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## Revision History

Revision	Date
V1.0	2014/10

## Technical Support

If a problem arises with your system and no solution can be obtained from the user's manual, please contact your place of purchase or local distributor. Alternatively, please try the following help resources for further guidance.

Visit the MSI website for technical guide, BIOS updates, driver updates and other information, or contact our technical staff via <http://www.msi.com/support/>

# Safety Instructions

- Always read the safety instructions carefully.
- Keep this User's Manual for future reference.
- Keep this equipment away from humidity.
- Lay this equipment on a reliable flat surface before setting it up.
- The openings on the enclosure are for air convection hence protects the equipment from overheating. **DO NOT COVER THE OPENINGS.**
- Make sure the voltage of the power source and adjust properly 110/220V before connecting the equipment to the power inlet.
- Place the power cord such a way that people can not step on it. Do not place anything over the power cord.
- Always Unplug the Power Cord before inserting any add-on card or module.
- All cautions and warnings on the equipment should be noted.
- Never pour any liquid into the opening that could damage or cause electrical shock.
- If any of the following situations arises, get the equipment checked by service personnel:
  - The power cord or plug is damaged.
  - Liquid has penetrated into the equipment.
  - The equipment has been exposed to moisture.
  - The equipment does not work well or you can not get it work according to User's Manual.
  - The equipment has dropped and damaged.
  - The equipment has obvious sign of breakage.
- **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT UNCONDITIONED, STORAGE TEMPERATURE ABOVE 60°C (140°F), IT MAY DAMAGE THE EQUIPMENT.**

**CAUTION:** Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.

警告使用者：

這是甲類資訊產品，在居住的環境中使用時，可能會造成無線電干擾，在這種情況下，使用者會被要求採取某些適當的對策。

## Chemical Substances Information

In compliance with chemical substances regulations, such as the EU REACH Regulation (Regulation EC No. 1907/2006 of the European Parliament and the Council), MSI provides the information of chemical substances in products at:

[http://www.msi.com/html/popup/csr/evmtprrt\\_pcm.html](http://www.msi.com/html/popup/csr/evmtprrt_pcm.html)

## Battery Information

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European Union:

Batteries, battery packs, and accumulators should not be disposed of as unsorted household waste. Please use the public collection system to return, recycle, or treat them in compliance with the local regulations.

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Taiwan:

For better environmental protection, waste batteries should be collected separately for recycling or special disposal.

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廢電池請回收



California, USA:

The button cell battery may contain perchlorate material and requires special handling when recycled or disposed of in California.

For further information please visit:

<http://www.dtsc.ca.gov/hazardouswaste/perchlorate/>

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Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.

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## CE Conformity

Hereby, Micro-Star International CO., LTD declares that this device is in compliance with the essential safety requirements and other relevant provisions set out in the European Directive.



## FCC-A Radio Frequency Interference Statement



This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

### Notice 1

The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### Notice 2

Shielded interface cables and AC power cord, if any, must be used in order to comply with the emission limits.

### VOIR LA NOTICE D'INSTALLATION AVANT DE RACCORDER AU RESEAU.

This device complies with Part 15 of the 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.

## WEEE Statement

Under the European Union ("EU") Directive on Waste Electrical and Electronic Equipment, Directive 2002/96/EC, which takes effect on August 13, 2005, products of "electrical and electronic equipment" cannot be discarded as municipal waste anymore and manufacturers of covered electronic equipment will be obligated to take back such products at the end of their useful life. MSI will comply with the product take back requirements at the end of life of MSI-branded products that are sold into the EU. You can return these products to local collection points.



## Japan JIS C 0950 Material Declaration

A Japanese regulatory requirement, defined by specification JIS C 0950, mandates that manufacturers provide material declarations for certain categories of electronic products offered for sale after July 1, 2006.

[http://www.msi.com/html/popup/csr/cemm\\_jp.html](http://www.msi.com/html/popup/csr/cemm_jp.html)

[http://tw.msi.com/html/popup/csr\\_tw/cemm\\_jp.html](http://tw.msi.com/html/popup/csr_tw/cemm_jp.html)

日本JIS C 0950材質宣言

日本工業規格JIS C 0950により、2006年7月1日以降に販売される特定分野の電気および電子機器について、製造者による含有物質の表示が義務付けられません。

[http://www.msi.com/html/popup/csr/cemm\\_jp.html](http://www.msi.com/html/popup/csr/cemm_jp.html)

[http://tw.msi.com/html/popup/csr\\_tw/cemm\\_jp.html](http://tw.msi.com/html/popup/csr_tw/cemm_jp.html)

## India RoHS

This product complies with the “India E-waste (Management and Handling) Rule 2011” and prohibits use of lead, mercury, hexavalent chromium, polybrominated biphenyls or polybrominated diphenyl ethers in concentrations exceeding 0.1 weight % and 0.01 weight % for cadmium, except for the exemptions set in Schedule 2 of the Rule.

## Turkey EEE Regulation

Conforms to the EEE Regulations of the Republic Of Turkey

Türkiye EEE yönetmeliği

Türkiye Cumhuriyeti: EEE Yönetmeliğine Uygundur

## Ukraine Restriction of Hazardous Substances

The equipment complies with requirements of the Technical Regulation, approved by the Resolution of Cabinet of Ministry of Ukraine as of December 3, 2008 № 1057, in terms of restrictions for the use of certain dangerous substances in electrical and electronic equipment.

Україна обмеження на наявність небезпечних речовин

Обладнання відповідає вимогам Технічного регламенту щодо обмеження використання деяких небезпечних речовин в електричному та електронному обладнанні, затвердженого постановою Кабінету Міністрів України від 3 грудня 2008 № 1057.

## **Vietnam RoHS**

As from December 1, 2012, all products manufactured by MSI comply with Circular 30/2011/TT-BCT temporarily regulating the permitted limits for a number of hazardous substances in electronic and electric products.

Việt Nam RoHS

Kể từ ngày 01/12/2012, tất cả các sản phẩm do công ty MSI sản xuất tuân thủ Thông tư số 30/2011/TT-BCT quy định tạm thời về giới hạn hàm lượng cho phép của một số hóa chất độc hại có trong các sản phẩm điện, điện tử”

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# 1 Overview

Thank you for choosing the MS-98G7, an excellent PCI/ISA Single Board Computer.

Based on the innovative Intel® H81 chipset for optimal system efficiency, the MS-98G7 accommodates the Intel® Core i7/ i5/ i3, Pentium, Celeron processor and supports 2 DDR3/ DDR3L 1333/ 1600 UDIMM slots to provide the maximum of 16GB memory capacity.

This PCI/ISA SBC is more maintainable than a conventional motherboard system and has a much lower mean time to repair (MTTR). It's easily upgradeable and provides configuration control for longer product lifetime.

# Specifications

## CPU Support

- 4th Generation Intel® Core™ i7 / Core™ i5 / Core™ i3 / Pentium® / Celeron® processors for LGA 1150 socket

## Chipset

- Intel H81 Express Chipset

## Memory Support

- 2x DDR3 memory slots supporting up to 16GB
- Supports DDR3/ DDR3L 1333/ 1600 MHz
- Dual channel memory architecture
- Supports non-ECC memory

## Onboard Graphics

- 1x VGA port
- 1x DVI-D internal wafer connector

## Storage

- 2x SATA 6Gb/s ports
- 1x SATA 3Gb/s port
- 1x mSATA slot full size, share Mini-PCIe slot

## Audio

- Realtek ALC887 audio codec
- 1x audio wafer connector

## LAN

- 1x Intel 217-LM GbE LAN PHY
- 1x Intel 210-AT GbE LAN Controller

## Rear Panel I/O

- 1x VGA port
- 2x Gigabit LAN jacks
- 2x USB 3.0 ports

### Onboard Pin Headers/ Connectors/ Jumpers

- 1x front panel connector
- 2x USB2.0 connectors
- 2x serial port connectors
- 1x parallel port connector
- 2x SATA 6Gb/s ports
- 1x SATA 3Gb/s port
- 1x 4-pin power connector
- 1x TPM expansion connector
- 1x PS/2 wafer connector
- 1x GPIO connector
- 1x 4-pin CPU fan connector
- 1x 3-pin system fan connector
- 1x clear CMOS jumper
- 2x COM port power jumpers
- 1x AT/ATX select jumper
- 1x SIM holder

### Expansion Slots

- 1x Mini-PCIe slot, share mSATA slot

### Golden Finger

- Supports ISA & PCI

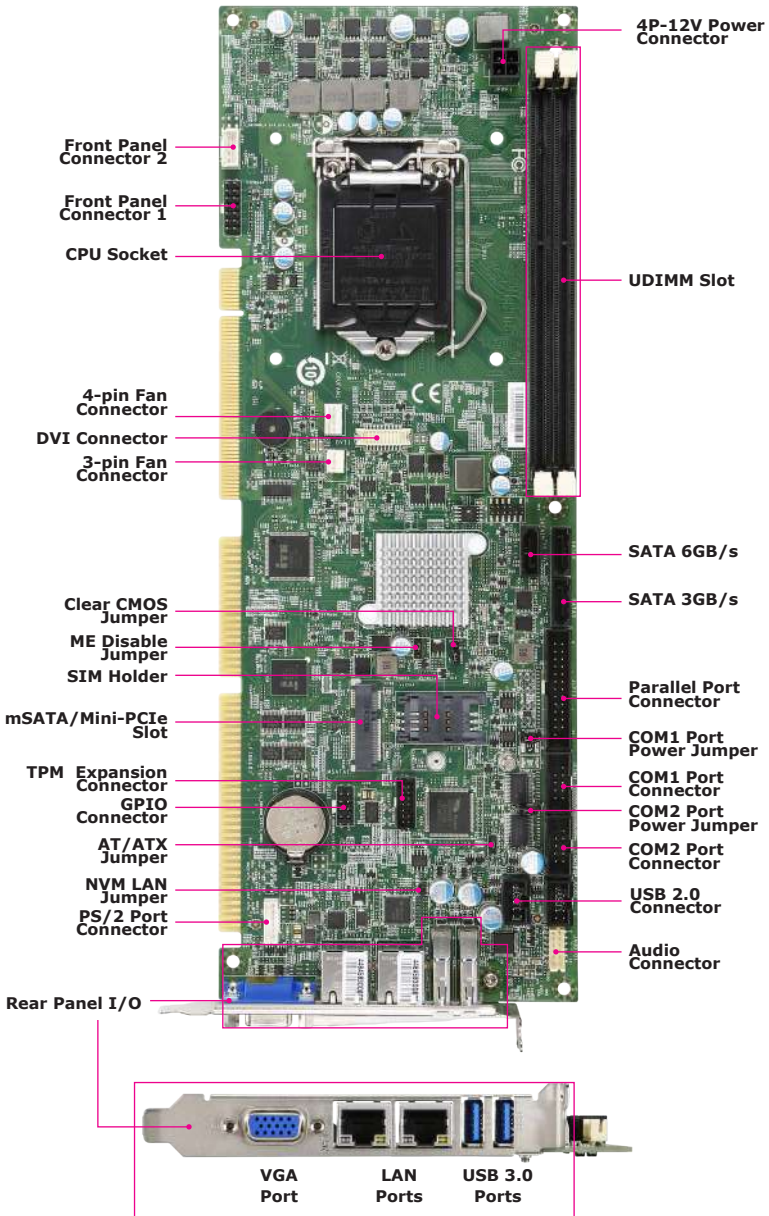
### Form Factor

- SBC (Single Board Computer): 338 mm x 122 mm

### Environmental

- Operating Temperature: 0°C ~ 60°C
- Storage Temperature: -20°C ~ 80°C
- Humidity: 10% ~ 90% RH, Non-Condensing

# Board Layout



# 2 Hardware Setup

This chapter provides you with the information about hardware setup procedures. While doing the installation, be careful in holding the components and follow the installation procedures. For some components, if you install in the wrong orientation, the components will not work properly.

Use a grounded wrist strap before handling computer components. Static electricity may damage the components.

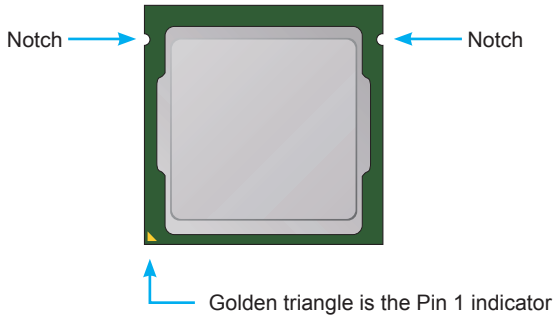
# Components Reference Guide

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# CPU (Central Processing Unit)

## Introduction to the LGA 1150 CPU

The surface of the LGA 1150 CPU has two notches and a golden triangle to assist in correctly lining up the CPU for board placement. The golden triangle is the Pin 1 indicator.



### **Important**

#### **Overheating**

Overheating can seriously damage the CPU and board. Always make sure the cooling fans work properly to protect the CPU from overheating. Be sure to apply an even layer of thermal paste (or thermal tape) between the CPU and the heat-sink to enhance heat dissipation.

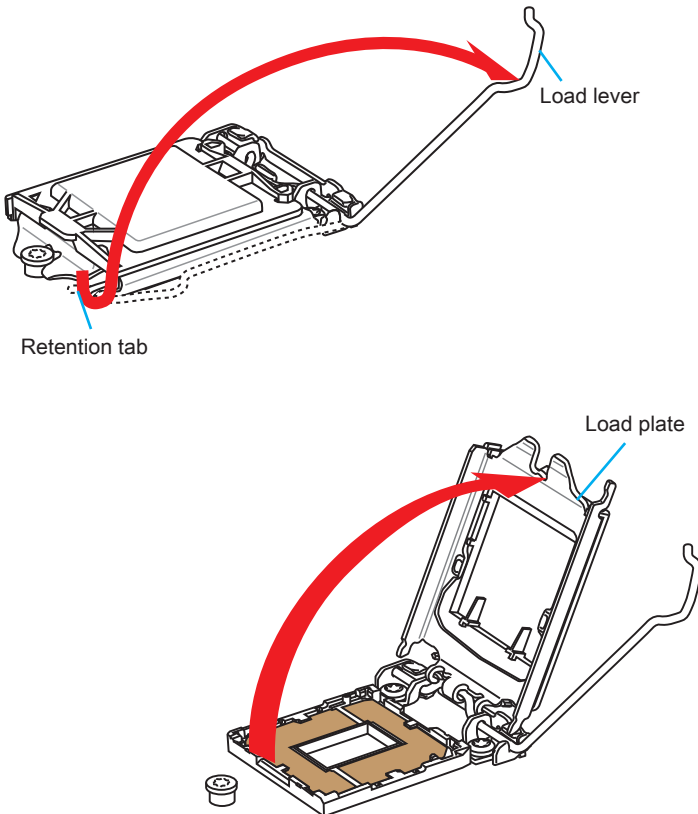
#### **Replacing the CPU**

When replacing the CPU, always turn off the system's power supply and unplug the power supply's power cord to ensure the safety of the CPU.

## CPU & Heatsink Installation

When installing a CPU, always remember to install a CPU heatsink. A CPU heatsink is necessary to prevent overheating and maintain system stability. Follow the steps below to ensure correct CPU and heatsink installation. Wrong installation can damage both the CPU and the board.

1. Push the load lever down to unclip it and lift to the fully open position.
2. The load plate will automatically lift up as the load lever is pushed to the fully open position.

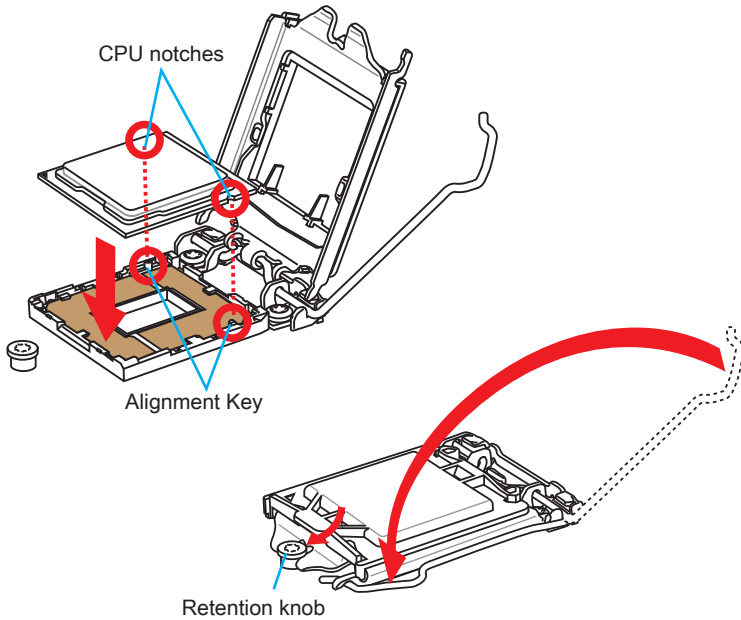


### **Important**

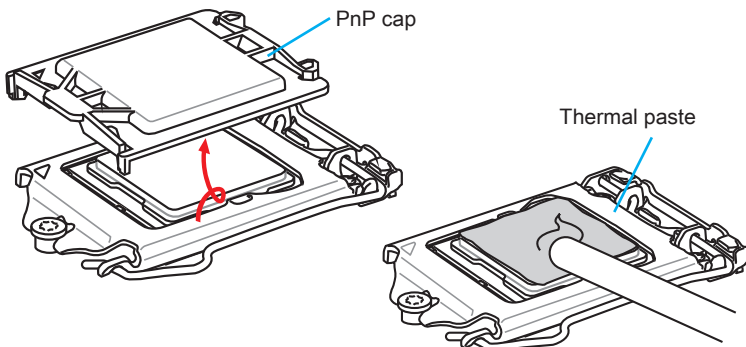
*Do not touch the socket contacts or the bottom of the CPU.*



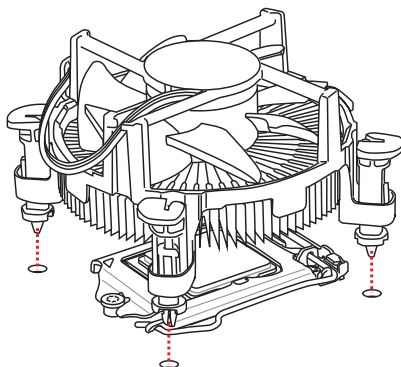
- Align the notches with the socket alignment keys. Lower the CPU straight down, without tilting or sliding the CPU in the socket. Inspect the CPU to check if it is properly seated in the socket.
- Close and slide the load plate under the retention knob. Close and engage the load lever.



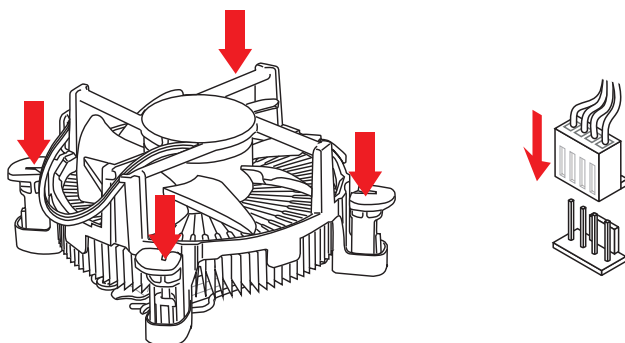
- When you press down the load lever the PnP cap will automatically pop up from the CPU socket. Do not discard the PnP cap. Always replace the PnP cap if the CPU is removed from the socket.
- Evenly spread a thin layer of thermal paste (or thermal tape) on the top of the CPU. This will help in heat dissipation and prevent CPU overheating.



7. Locate the CPU fan connector on the board.
8. Place the heatsink on the board with the fan's cable facing towards the fan connector and the fasteners matching the holes on the board.



9. Push down the heatsink until the four fasteners get wedged into the holes on the board. Press the four fasteners down to fasten the heatsink. As each fastener locks into position a click should be heard.
10. Inspect the board to ensure that the fastener-ends have been properly locked in place.
11. Finally, attach the CPU fan cable to the CPU fan connector on the board.

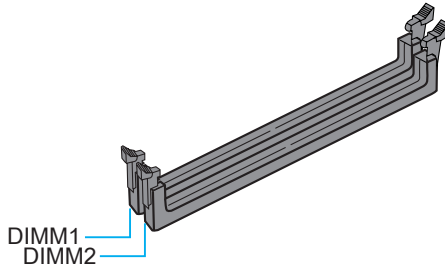


**Important**

- Confirm that the CPU heatsink has formed a tight seal with the CPU before booting your system.
- Whenever the CPU is not installed, always protect the CPU socket pins by covering the socket with the plastic cap.
- If you purchased a separate CPU and heatsink/ cooler, Please refer to the documentation in the heatsink/ cooler package for more details about installation.

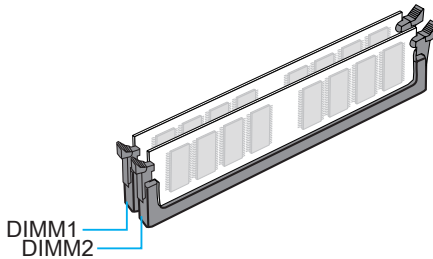
# Memory

These DIMM slots are used for installing memory modules.



## Dual-Channel mode Population Rule

In Dual-Channel mode, the memory modules can transmit and receive data with two data bus channels simultaneously. Enabling Dual-Channel mode can enhance system performance. The following illustrations explain the population rules for Dual-Channel mode.



### **Important**

- *DDR3 memory modules are not interchangeable with DDR2, and the DDR3 standard is not backward compatible. Always install DDR3 memory modules in DDR3 DIMM slots.*
- *To ensure system stability, memory modules must be of the same type and density in Dual-Channel mode.*
- *Due to chipset resource usage, the system will only detect up to 15+ GB of memory (not full 16 GB) when all DIMM slots have 8GB memory modules installed.*

## Rear Panel I/O

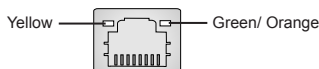


### ► VGA Port

The DB15-pin female connector is provided for monitor.

### ► LAN Port

The standard RJ-45 LAN jack is for connection to the Local Area Network (LAN). You can connect a network cable to it.



LED	Color	LED State	Condition
Left	Yellow	Off	LAN link is not established.
		On (steady state)	LAN link is established.
		On (blinking)	The computer is communicating with another computer on the LAN.
Right	Green	Off	10 Mbit/sec data rate is selected.
		On	100 Mbit/sec data rate is selected.
	Orange	On	1000 Mbit/sec data rate is selected.

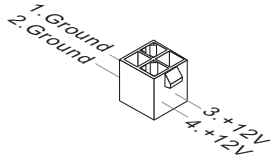
### ► USB 3.0 Port

The USB 3.0 port is backward-compatible with USB 2.0 devices and supports data transfer rate up to 5 Gbit/s (SuperSpeed).

# Connector

## CPU Power Connector: JPWR1

This connector is used to provide power to the CPU.



### **Important**

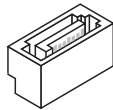
*Make sure that all power connectors are connected to the power supply to ensure stable operation of the board.*

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## Serial ATA Connector: SATA1 ~ SATA3

SATA1 and SATA2 are SATA 6GB/s ports.

SATA3 is SATA 3GB/s port.

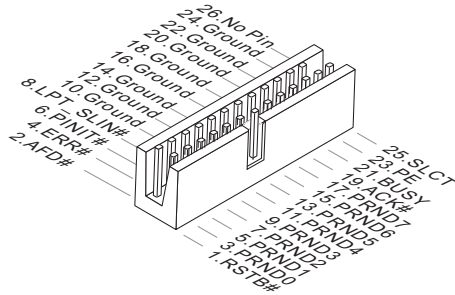


### **Important**

*Please do not fold the SATA cable into a 90-degree angle. Otherwise, data loss may occur during transmission.*

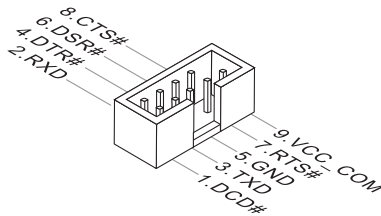
### Parallel Port Connector: JLPT1

The mainboard provides a 26-pin header for connection to an optional parallel port bracket. The parallel port is a standard printer port that supports Enhanced Parallel Port (EPP) and Extended Capabilities Parallel Port (ECP) mode.



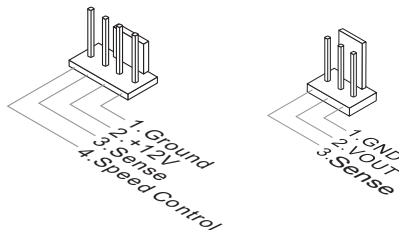
### Serial Port Connector: JCOM1, JCOM2

This connector is a 16550A high speed communications port that sends/receives 16 bytes FIFOs. You can attach a serial device to it.



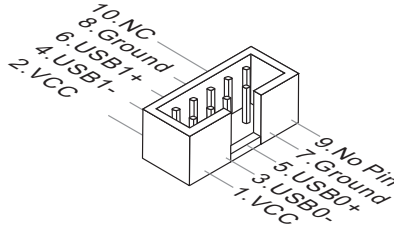
### Fan Power Connectors: CPUFAN1, SYSFAN1

The fan power connectors support system cooling fan with +12V. When connecting the wire to the connectors, always note that the red wire is the positive and should be connected to the +12V; the black wire is Ground and should be connected to GND.



## USB 2.0 Connector: JUSB1,JUB2

This connector, compliant with Intel I/O Connectivity Design Guide, is ideal for connecting high-speed USB interface peripherals such as USB HDD, digital cameras, MP3 players, printers, modems and the like.

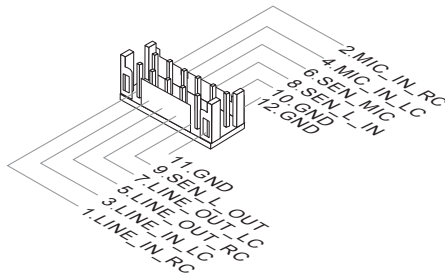


### Important

Note that the pins of VCC and GND must be connected correctly to avoid possible damage.

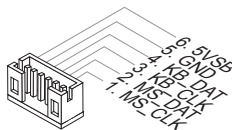
## Front Audio Connector: JAUD1

This connector allows you to connect the front panel audio and is compliant with Intel Front Panel I/O Connectivity Design Guide.



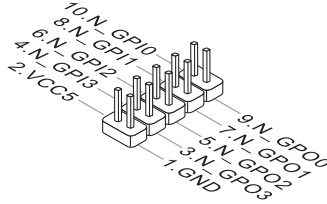
## PS/2 Port Connector: JPS1

This connector is provided to connect a keyboard and a mouse.



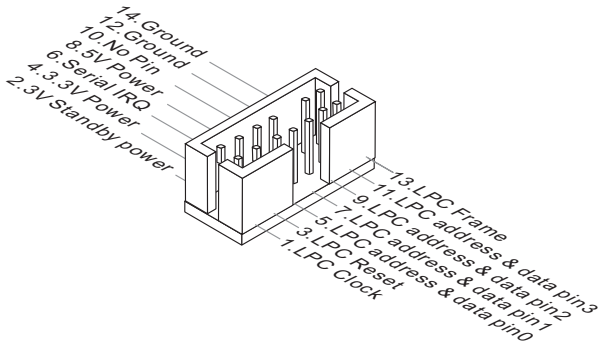
### GPIO Pin Header: JGPIO1

This connector is provided for the General-Purpose Input/Output (GPIO) peripheral module.



### TPM Module Connector: JTPM1

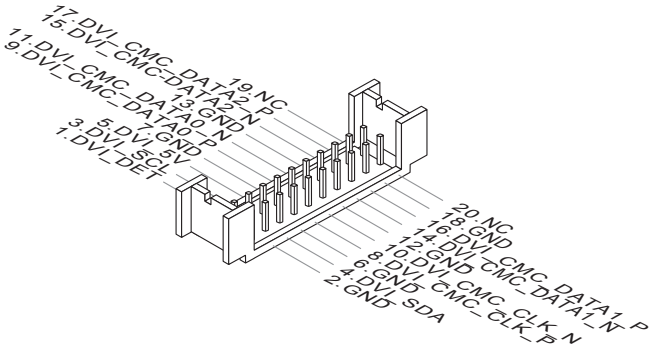
This connector connects to a TPM (Trusted Platform Module) module (optional). Please refer to the TPM security platform manual for more details.





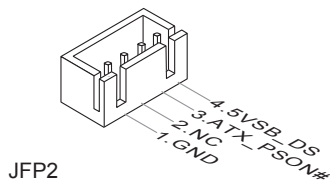
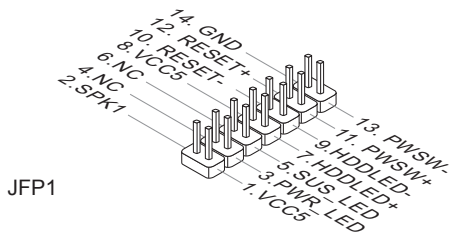
## DVI Connector: DVI1

This connector is a DVI port pinheader.



## Front Panel Connectors: JFP1, JFP2

These front panel connectors are provided for electrical connection to the front panel switches & LEDs.



# Jumper

## **Important**

Avoid adjusting jumpers when the system is on; it will damage the board.

---

### Clear CMOS Jumper: JCMOS1

There is a CMOS RAM onboard that has a power supply from an external battery to keep the data of system configuration. With the CMOS RAM, the system can automatically boot OS every time it is turned on. If you want to clear the system configuration, set the jumper to clear data.



Normal



Clear CMOS

## **Important**

You can clear CMOS by shorting 2-3 pin while the system is off. Then return to 1-2 pin position. Avoid clearing the CMOS while the system is on; it will damage the board.

---

### ME Dsiable Jumper: JIAMT1

This jumper allows users to disable ME.



Normal  
(Default)



ME disable

### AT/ATX Select Jumper: JAT1

This jumper allows users to select between AT and ATX power.



ATX



AT

## COM Port Power Jumper: JCOMP1, JCOMP2

These jumpers specify the operation voltage of the onboard serial ports.



VCC5



+12V

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## NVM LAN Jumper: JNVM1

Use this jumper to specify the operation for LAN.



On: Enable security  
and the INVM lock.

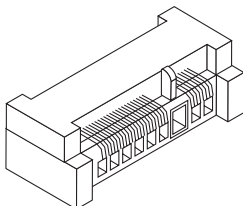


Off: Disable security  
and the INVM lock.  
(non-secure mode)

## Slot

### mSATA/ Mini-PCle Slot

The mSATA/ Mini-PCle slot is provided for mSATA NAND Flash SDD cards and Mini-PCle cards.



### Important

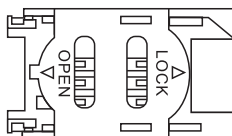
*When adding or removing expansion cards, make sure that you unplug the power supply first. Meanwhile, read the documentation for the expansion card to configure any necessary hardware or software settings for the expansion card, such as jumpers, switches or BIOS configuration.*

### SIM Card Holder

The holder is provided for SIM card.



SIM card



Holder

# 3 BIOS Setup

This chapter provides information on the BIOS Setup program and allows users to configure the system for optimal use.

Users may need to run the Setup program when:

- An error message appears on the screen at system startup and requests users to run SETUP.
- Users want to change the default settings for customized features.

## **Important**

- *Please note that BIOS update assumes technician-level experience.*
- *As the system BIOS is under continuous update for better system performance, the illustrations in this chapter should be held for reference only.*

## 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 to enter Setup.

Press <DEL> to enter SETUP

If the message disappears before you respond and you still wish to enter Setup, restart the system by turning it OFF and On or pressing the RESET button. You may also restart the system by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys.

### **Important**

*The items under each BIOS category described in this chapter are under continuous update for better system performance. Therefore, the description may be slightly different from the latest BIOS and should be held for reference only.*

## Control Keys

← →	Select Screen
↑ ↓	Select Item
Enter	Select
+ -	Change Option
F1	General Help
F7	Previous Values
F9	Optimized Defaults
F10	Save & Exit
Esc	Exit

## Getting Help

After entering the Setup menu, the first menu you will see is the Main Menu.

### Main Menu

The main menu lists the setup functions you can make changes to. You can use the arrow keys ( ↑ ↓ ) to select the item. The on-line description of the highlighted setup function is displayed at the bottom of the screen.

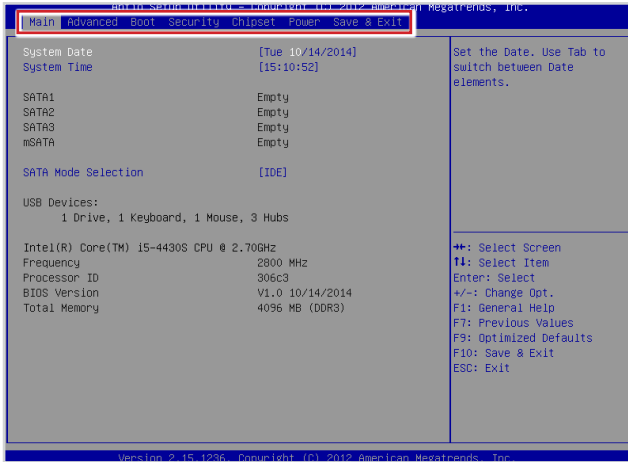
### Sub-Menu

If you find a right pointer symbol appears to the left of certain fields that means a sub-menu can be launched from this field. A sub-menu contains additional options for a field parameter. You can use arrow keys ( ↑ ↓ ) to highlight the field and press <Enter> to call up the sub-menu. Then you can use the control keys to enter values and move from field to field within a sub-menu. If you want to return to the main menu, just press the <Esc >.

### General Help <F1>

The BIOS setup program provides a General Help screen. You can call up this screen from any menu by simply pressing <F1>. The Help screen lists the appropriate keys to use and the possible selections for the highlighted item. Press <Esc> to exit the Help screen.

# The Menu Bar



► **Main**

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

► **Advanced**

Use this menu to set up the items of special enhanced features.

► **Boot**

Use this menu to specify the priority of boot devices.

► **Security**

Use this menu to set supervisor and user passwords.

► **Chipset**

This menu controls the advanced features of the onboard chipsets.

► **Power**

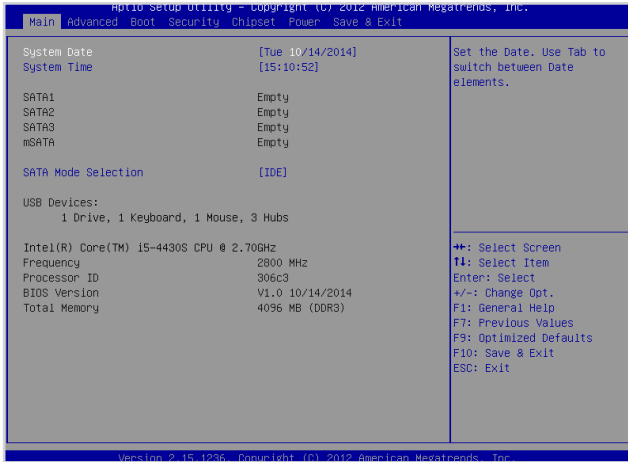
Use this menu to specify your settings for power management.

► **Save & Exit**

This menu allows you to load the BIOS default values or factory default settings into the BIOS and exit the BIOS setup utility with or without changes.



# Main



## ► System Date

This setting allows you to set the system date. The date format is <Day>, <Month> <Date> <Year>.

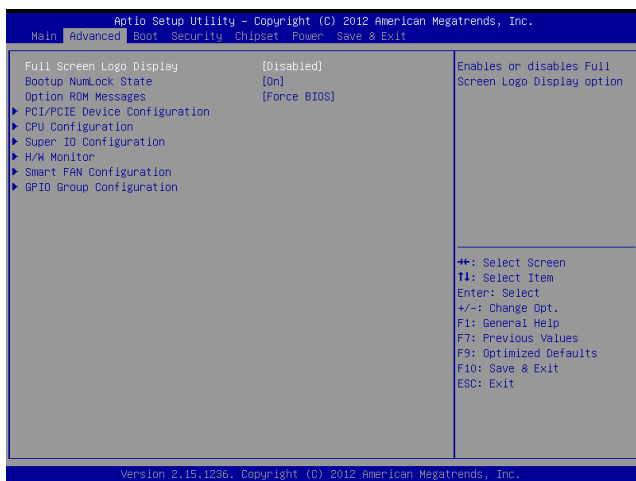
## ► System Time

This setting allows you to set the system time. The time format is <Hour> <Minute> <Second>.

## ► SATA Mode Selection

This setting specifies the SATA controller mode.

## Advanced



### ► Full Screen Logo Display

This BIOS feature determines if the BIOS should hide the normal POST messages with the motherboard or system manufacturer's full-screen logo.

When it is enabled, the BIOS will display the full-screen logo during the boot-up sequence, hiding normal POST messages.

When it is disabled, the BIOS will display the normal POST messages, instead of the full-screen logo.

Please note that enabling this BIOS feature often adds 2-3 seconds of delay to the booting sequence. This delay ensures that the logo is displayed for a sufficient amount of time. Therefore, it is recommended that you disable this BIOS feature for a faster boot-up time.

### ► Bootup NumLock State

This setting is to set the Num Lock status when the system is powered on. Setting to [On] will turn on the Num Lock key when the system is powered on. Setting to [Off] will allow users to use the arrow keys on the numeric keypad.

### ► Option ROM Messages

This item is used to determine the display mode when an optional ROM is initialized during POST. When set to [Force BIOS], the display mode used by AMI BIOS is used. Select [Keep Current] if you want to use the display mode of optional ROM.

## ► PCI/PCIE Device Configuration

Advanced	
EHCI	[Enabled]
XHCI Mode	[Enabled]
Legacy USB Support	[Enabled]
Audio Controller	[Enabled]
Launch OnBoard Lan OpROM	[Disabled]
Launch OnBoard Lan OpROM	[Disabled]

### ► EHCI

This setting disables/enables the USB EHCI controller. The Enhanced Host Controller Interface (EHCI) specification describes the register-level interface for a Host Controller for the Universal Serial Bus (USB) Revision 2.0.

### ► XHCI Mode

This setting disables/enables the USB XHCI controller. The eXtensible Host Controller Interface (XHCI) is a computer interface specification that defines a register-level description of a Host Controller for Universal Serial bus (USB), which is capable of interfacing to USB 1.0, 2.0, and 3.0 compatible devices. The specification is also referred to as the USB 3.0 Host Controller specification.

### ► Legacy USB Support

Set to [Enabled] if you need to use any USB 1.1/2.0 device in the operating system that does not support or have any USB 1.1/2.0 driver installed, such as DOS and SCO Unix.

### ► Audio Controller

This setting enables/disables the onboard audio controller.

### ► Launch Onboard Lan OpROM

This setting enables/disables the initialization of the specified LAN Boot ROM during bootup. Selecting [Disabled] will speed up the boot process.

► CPU Configuration



► Active Processor Cores

This setting specifies the number of active processor cores.

► Execute Disable Bit

Intel's Execute Disable Bit functionality can prevent certain classes of malicious "buffer overflow" attacks when combined with a supporting operating system. This functionality allows the processor to classify areas in memory by where application code can execute and where it cannot. When a malicious worm attempts to insert code in the buffer, the processor disables code execution, preventing damage or worm propagation.

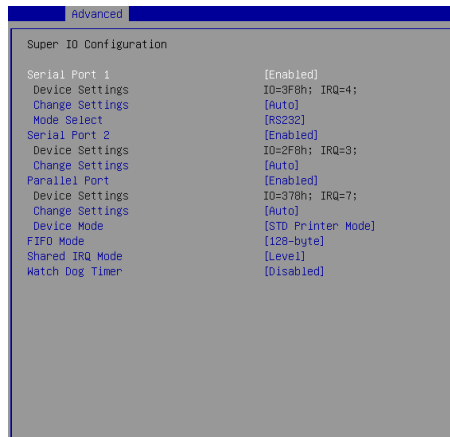
► Intel Virtualization Technology

Virtualization enhanced by Intel Virtualization Technology will allow a platform to run multiple operating systems and applications in independent partitions. With virtualization, one computer system can function as multiple "Virtual" systems.

► EIST

EIST (Enhanced Intel SpeedStep Technology) allows the system to dynamically adjust processor voltage and core frequency, which can result in decreased average power consumption and decreased average heat production. When disabled, the processor will return the actual maximum CPUID input value of the processor when queried.

## ► Super IO Configuration



### ► Serial Port 1, Serial Port 2

This setting enables/disables the specified serial port.

#### ► Change Settings

This setting is used to change the address & IRQ settings of the specified serial port.

#### ► Mode Select

Select an operation mode for the serial port 1.

### ► Parallel Port

This setting enables/disables the parallel port.

#### ► Change Settings

This setting is used to change the address & IRQ settings of the parallel port.

#### ► Device Mode

Select an operation mode for the parallel port.

### ► FIFO Mode

This setting controls the FIFO data transfer mode.

### ► Shared IRQ Mode

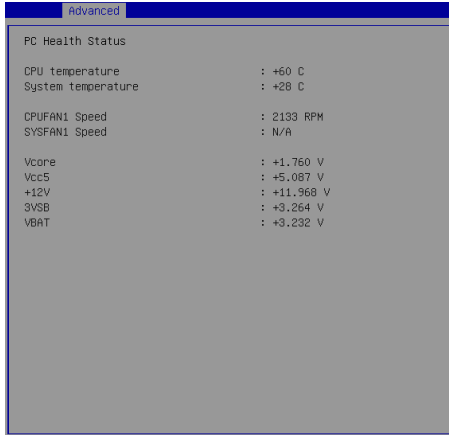
This setting provides the system with the ability to share interrupts among its serial ports.

### ► Watch Dog Timer

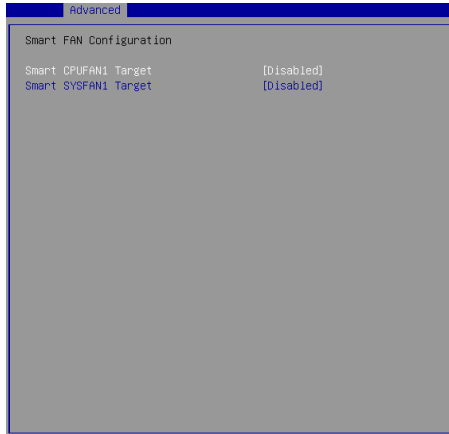
You can enable the system watch-dog timer, a hardware timer that generates a reset when the software that it monitors does not respond as expected each time the watch dog polls it.

► **H/W Monitor**

These items display the current status of all monitored hardware devices/ components such as voltages, temperatures and all fans' speeds.



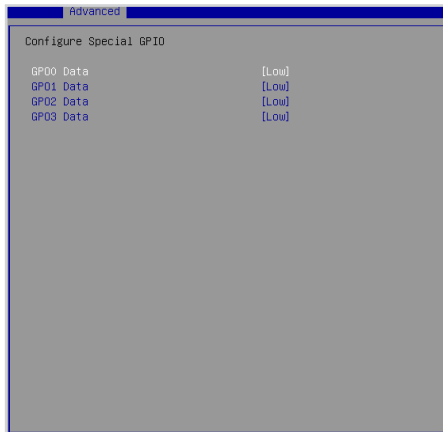
► **Smart Fan Configuration**



► **Smart CPUFAN1, SYSFAN1 Target**

These settings enable/disable the Smart Fan function. Smart Fan is an excellent feature which will adjust the CPU/system fan speed automatically depending on the current CPU/system temperature, avoiding the overheating to damage your system.

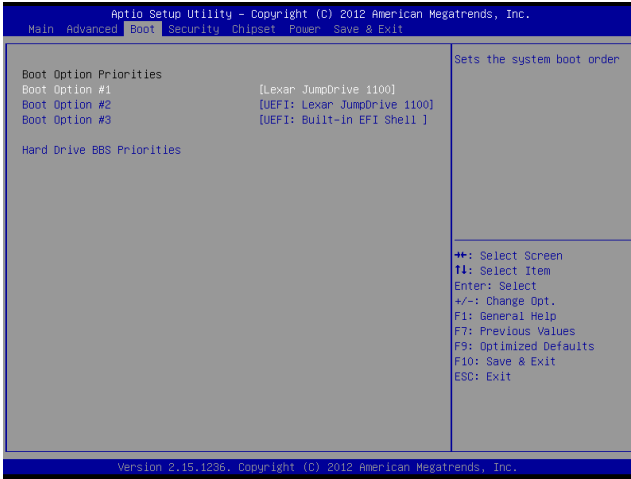
### ▶ GPIO Group Configuration



### ▶ GPO0 ~ GPO3

These settings control the operation mode of the specified GPIO.

# Boot



### ► Boot Option Priorities

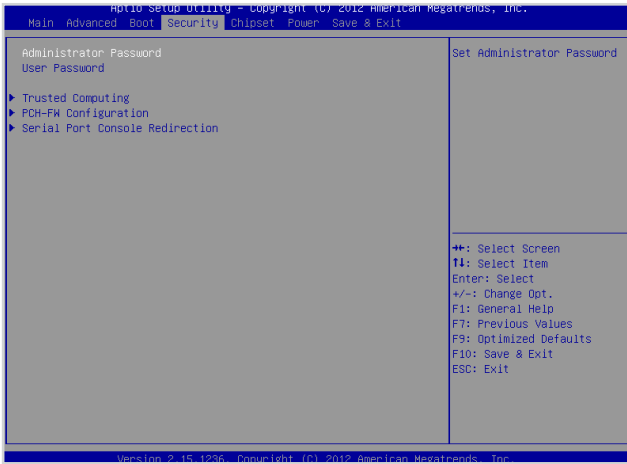
This setting allows users to set the sequence of boot devices where BIOS attempts to load the disk operating system.

### ► Hard Drive BBS Priorities

This setting allows users to set the priority of the specified devices. First press <Enter> to enter the sub-menu. Then you may use the arrow keys ( ↑ ↓ ) to select the desired device, then press <+>, <-> or <PageUp>, <PageDown> key to move it up/down in the priority list.



# Security



## ► Administrator Password

Administrator Password controls access to the BIOS Setup utility.

## ► User Password

User Password controls access to the system at boot and to the BIOS Setup utility.

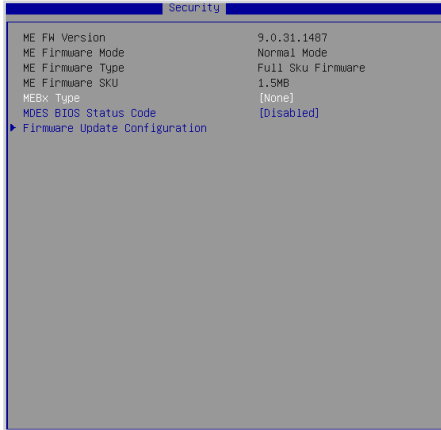
## ► Trusted Computing



► **Security Device Support**

This setting enables/disables BIOS support for security device. When set to [Disable], the OS will not show security device. TCG EFI protocol and INT1A interface will not be available.

► **PCH-FW Configuration**



► **ME FW Version, ME Firmware Mode/ Type/ SKU**

These settings show the firmware information of the Intel ME (Management Engine).

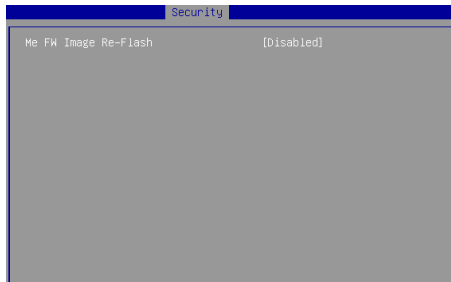
► **MEBx Type**

This setting enables/disables the MDES BIOS status code.

► **MDES BIOS Status Code**

This setting enables/disables the MDES BIOS status code.

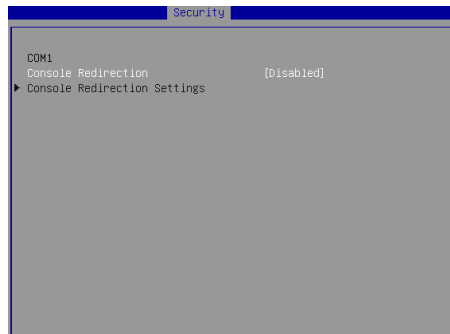
► **Firmware Update Configuration**



► **ME FW Image Re-Flash**

This setting enables/disables the ME FW image reflash.

## ► Serial Port Console Redirection



### ► Console Redirection

Console Redirection operates in host systems that do not have a monitor and keyboard attached. This setting enables/disables the operation of console redirection. When set to [Enabled], BIOS redirects and sends all contents that should be displayed on the screen to the serial COM port for display on the terminal screen. Besides, all data received from the serial port is interpreted as keystrokes from a local keyboard.

### ► Console Redirection Settings



### ► Terminal Type

To operate the system's console redirection, you need a terminal supporting ANSI terminal protocol and a RS-232 null modem cable connected between the host system and terminal(s). This setting specifies the type of terminal device for console redirection.

► **Bits per second, Data Bits, Parity, Stop Bits**

This setting specifies the transfer rate (bits per second, data bits, parity, stop bits) of Console Redirection.

► **Flow Control**

Flow control is the process of managing the rate of data transmission between two nodes. It's the process of adjusting the flow of data from one device to another to ensure that the receiving device can handle all of the incoming data. This is particularly important where the sending device is capable of sending data much faster than the receiving device can receive it.

► **VT-UTF8 Combo Key Support**

This setting enables/disables the VT-UTF8 combination key support for ANSI/VT100 terminals.

► **Recorder Mode, Resolution 100x31**

These settings enable/disable the recorder mode and the resolution 100x31.

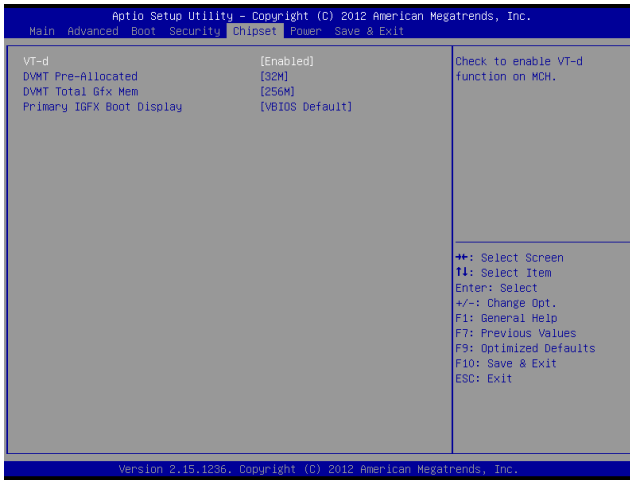
► **Legacy OS Redirection Resolution**

This setting specifies the redirection resolution of legacy OS.

► **Putty Keypad**

PuTTY is a terminal emulator for Windows. This setting controls the numeric keypad for use in PuTTY.

# Chipset



## ► VT-d

Intel Virtualization Technology for Directed I/O (Intel VT-d) provides the capability to ensure improved isolation of I/O resources for greater reliability, security, and availability.

## ► DVMT Pre-Allocated

This setting defines the DVMT pre-allocated memory. Pre-allocated memory is the small amount of system memory made available at boot time by the system BIOS for video. Pre-allocated memory is also known as locked memory. This is because it is "locked" for video use only and as such, is invisible and unable to be used by the operating system.

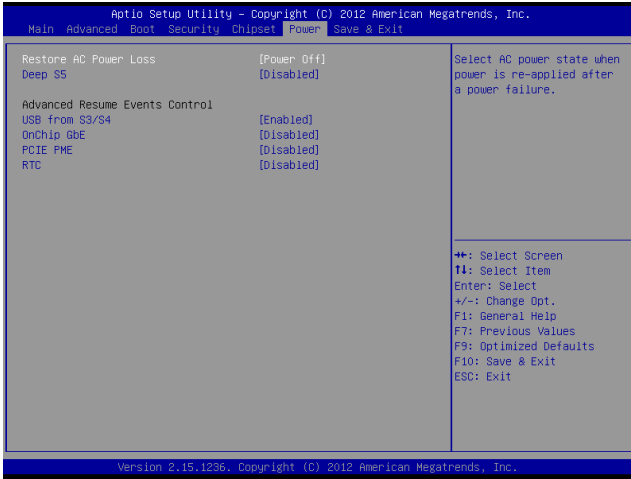
## ► DVMT Total Gfx Mem

This setting specifies the memory size for DVMT.

## ► Primary IGFX Boot Display

Use the field to select the type of device you want to use as the display(s) of the system.

# Power



## ► Restore AC Power Loss

This setting specifies whether your system will reboot after a power failure or interrupt occurs. Available settings are:

[Power Off]	Leaves the computer in the power off state.
[Power On]	Leaves the computer in the power on state.
[Last State]	Restores the system to the previous status before power failure or interrupt occurred.

## ► Deep S5

The setting enables/disables the Deep S5 power saving mode. S5 is almost the same as G3 Mechanical Off, except that the PSU still supplies power, at a minimum, to the power button to allow return to S0. A full reboot is required. No previous content is retained. Other components may remain powered so the computer can “wake” on input from the keyboard, clock, modem, LAN, or USB device.

## \*\* Advanced Resume Events Control \*\*

### ► USB from S3/S4

The item allows the activity of the USB device to wake up the system from S3/S4 sleep state.

### ► OnChip GbE

This field specifies whether the system will be awakened from power saving modes when activity or input signal of onchip LAN is detected.

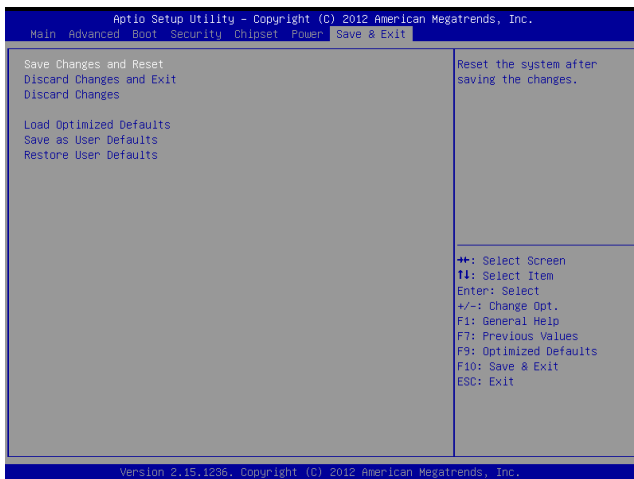
**► PCIE PME**

This field specifies whether the system will be awakened from power saving modes when activity or input signal of onboard PCIE/PCI PME is detected.

**► RTC**

When [Enabled], you can set the date and time at which the RTC (real-time clock) alarm awakens the system from suspend mode.

## Save & Exit



### ► Save Changes and Reset

Save changes to CMOS and reset the system.

### ► Discard Changes and Exit

Abandon all changes and exit the Setup Utility.

### ► Discard Changes

Abandon all changes.

### ► Load Optimized Defaults

Use this menu to load the default values set by the motherboard manufacturer specifically for optimal performance of the motherboard.

### ► Save as User Defaults

Save changes as the user's default profile.

### ► Restore User Defaults

Restore the user's default profile.



# *Appendix*

# WDT & GPIO



This appendix provides the sample codes of WDT (Watch Dog Timer) and GPIO (General Purpose Input/ Output).

## WDT Sample Code

```

SIO_INDEX_Port      equ 04Eh
SIO_DATA_Port       equ 04Fh
SIO_UnLock_Value    equ 087h
SIO_Lock_Value      equ 0AAh
WatchDog_LDN        equ 007h
WDT_UNIT            equ 60h;
60h=second, 68h=minute, 40h=Disabled Watchdog timer
WDT_Timer            equ 30;
ex. 30 seconds

```

### Sample code:

```

;Enable config mode
mov     dx, SIO_INDEX_Port
mov     al, SIO_UnLock_Value
out     dx, al
jmp     short $+2 ;      lo_delay
jmp     short $+2 ;      lo_delay
out     dx, al

;Change to WDT
mov     dx, SIO_INDEX_Port
mov     al, 07h
out     dx, al
mov     dx, SIO_DATA_Port
mov     al, WatchDog_LDN
out     dx, al

;Active WDT
mov     dx, SIO_INDEX_Port
mov     al, 30h
out     dx, al
mov     dx, SIO_DATA_Port
in      al, dx
or      al, 01h
out     dx, al

;set timer
mov     dx, SIO_INDEX_Port
mov     al, 0F6h
out     dx, al
mov     dx, SIO_DATA_Port
mov     al, WDT_Timer
out     dx, al

;set UINT
mov     dx, SIO_INDEX_Port

```

```
    mov    al, 0F5h
    out   dx, al
    mov   dx, SIO_DATA_Port
    mov   al, WDT_UNIT
    out   dx, al
;enable reset
    mov   dx, SIO_INDEX_Port
    mov   al, 0FAh
    out   dx, al
    mov   dx, SIO_DATA_Port
    in    al, dx
    or    al, 01h
    out   dx, al
;close config mode
    mov   dx, SIO_INDEX_Port
    mov   al, SIO_Lock_Value
    out   dx, al
```

## GPIO Sample Code

### GPIO 0 ~ GPI 3

	GPI 0	GPI 1	GPI 2	GPI 3
IO Address				
SIO GPIO Register	A2h	A2h	A2h	A2h
Bit	4	5	6	7
Sample code	#1	#1	#1	#1

### GPO 0 ~ GPO 3

	GPO 0	GPO 1	GPO 2	GPO 3
IO Address				
SIO GPIO Register	A1h	A1h	A1h	A1h
Bit	0	1	2	3
Sample code	#2	#2	#2	#2

```

SIO_INDEX_Port    equ    04Eh
SIO_DATA_Port     equ    04Fh
SIO_UnLock_Value  equ    087h
SIO_Lock_Value    equ    0AAh
SIO_LDN_GPIO      equ    06h
SIO_GPIO_Data     equ    0A1h
SIO_GPIO_Status   equ    0A2h
GPI_0              equ    00010000b
GPO_0              equ    00000001b

```

### Sample Code:

#### #1 : Get GPI 0 status

```

; Enable config mode
mov    dx, SIO_INDEX_Port
mov    al, SIO_UnLock_Value
out    dx, al
jmp    short $+2      ;lo_delay
jmp    short $+2      ;lo_delay
out    dx, al
; Switch GPIO Configuration for SIO LDN 0x06
mov    dx, SIO_INDEX_Port
mov    al, 07h
out    dx, al
mov    dx, SIO_DATA_Port
mov    al, SIO_LDN_GPIO

```

```
    out    dx, al
; Get GPI 0 Pin Status Register
    mov    dx, SIO_INDEX_Port
    mov    al, SIO_GPIO_Status
    out    dx, al
    mov    dx, SIO_DATA_Port
    in     al, dx          ;al bit4 = GPI 0 status
; Exit SIO
    mov    dx, SIO_INDEX_Port
    mov    al, SIO_Lock_Value
    out    dx, al
```

## #2 : Set GPO 0 to high

```
; Enable config mode
    mov    dx, SIO_INDEX_Port
    mov    al, SIO_UnLock_Value
    out    dx, al
    jmp    short $+2      ;lo_delay
    jmp    short $+2      ;lo_delay
    out    dx, al
; Switch GPIO Configuration for SIO LDN 0x06
    mov    dx, SIO_INDEX_Port
    mov    al, 07h
    out    dx, al
    mov    dx, SIO_DATA_Port
    mov    al, SIO_LDN_GPIO
    out    dx, al
; Set GPO 0 Register
    mov    dx, SIO_INDEX_Port
    mov    al, SIO_GPIO_Data
    out    dx, al
    mov    dx, SIO_DATA_Port
    in     al, dx
    and    al, not GPO_0
    or     al, GPO_0
    out    dx, al
; Exit SIO
    mov    dx, SIO_INDEX_Port
    mov    al, SIO_Lock_Value
    out    dx, al
```