Em104P-i2904

PC/104-Plus CPU Module

User's Manual

Version 1.0

2012.11

This page is intentionally left blank.

Table of Contents

Chapter 1 - Introduction 1
1.1 Copyright Notice 2
1.2 Declaration of Conformity 2
1.3 About This User's Manual 4
1.4 Warning 4
1.5 Replacing the Lithium Battery 4
1.6 Technical Support 4
1.7 Warranty 5
1.8 Packing List 6
1.9 Ordering Information 6
1.10 Specifications 7
1.11 Board Dimensions 8
Chapter 2 - Installation 9
2.1 Block Diagrams 10
2.2 Jumpers and Connectors 11
2.3 The Installation Paths of CD Driver 16
Chapter 3 - BIOS 17
3.1 BIOS Main Setup 18
3.2 Advanced Settings 19
3.2.1 CPU Configuration 21
3.2.2 IDE Configuration 22
3.2.3 Super IO Configuration 23
3.2.4 Hardware Health Configuration 24
3.2.5 AHCI Configuration 25
3.2.6 USB Configuration 26
3.3 Chipset 27
3.3.1 North Bridge Configuration 28
3.3.2 South Bridge Configuration 29
3.4 PCIPnP 30
3.5 Boot Settings 31
3.5.1 Boot Settings Configuration 32
3.5.2 Boot Device Priority 33

3.6 Security.....34
3.7 Save & Exit.....35
Chapter 4 - Appendix.....37
4.1 I/O Port Address Map.....38
4.2 Memory Address Map.....38
4.3 Interrupt Request Lines (IRQ).....39
4.4 DMA Map.....39

Chapter 1

Introduction

1.1 Copyright Notice

All Rights Reserved.

The information in this document is subject to change without prior notice in order to improve the reliability, design and function. It does not represent a commitment on the part of the manufacturer.

Under no circumstances will the manufacturer be liable for any direct, indirect, special, incidental, or consequential damages arising from the use or inability to use the product or documentation, even if advised of the possibility of such damages.

This document contains proprietary information protected by copyright. All rights are reserved. No part of this manual may be reproduced by any mechanical, electronic, or other means in any form without prior written permission of the manufacturer.

1.2 Declaration of Conformity

CE

The CE symbol on your product indicates that it is in compliance with the directives of the Union European (EU). A Certificate of Compliance is available by contacting Technical Support.

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from ARBOR. Please contact your local supplier for ordering information.

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

> Warning
>
> This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Class A

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.

NOTE:

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.

RoHS

ARBOR Technology Corp. certifies that all components in its products are in compliance and conform to the European Union's Restriction of Use of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2002/95/EC.

The above mentioned directive was published on 2/13/2003. The main purpose of the directive is to prohibit the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) in electrical and electronic products. Member states of the EU are to enforce by 7/1/2006.

ARBOR Technology Corp. hereby states that the listed products do not contain unintentional additions of lead, mercury, hex chrome, PBB or PBDB that exceed a maximum concentration value of 0.1% by weight or for cadmium exceed 0.01% by weight, per homogenous material. Homogenous material is defined as a substance or mixture of substances with uniform composition (such as solders, resins, plating, etc.). Lead-free solder is used for all terminations (Sn(96-96.5%), Ag(3.0-3.5%) and Cu(0.5%)).

SVHC / REACH

To minimize the environmental impact and take more responsibility to the earth we live, Arbor hereby confirms all products comply with the restriction of SVHC (Substances of Very High Concern) in (EC) 1907/2006 (REACH --Registration, Evaluation, Authorization, and Restriction of Chemicals) regulated by the European Union.

All substances listed in SVHC < 0.1 % by weight (1000 ppm)

1.3 About This User's Manual

This user's manual provides general information and installation instructions about the product. This User's Manual is intended for experienced users and integrators with hardware knowledge of personal computers. If you are not sure about any description in this booklet. please consult your vendor before further handling.

1.4 Warning

Single Board Computers and their components contain very delicate Integrated Circuits (IC). To protect the Single Board Computer and its components against damage from static electricity, you should always follow the following precautions when handling it :

1. Disconnect your Single Board Computer from the power source when you want to work on the inside.

2. Hold the board by the edges and try not to touch the IC chips, leads or circuitry.

3. Use a grounded wrist strap when handling computer components.

4. Place components on a grounded antistatic pad or on the bag that comes with the Single Board Computer, whenever components are separated from the system.

1.5 Replacing the Lithium Battery

Incorrect replacement of the lithium battery may lead to a risk of explosion.

The lithium battery must be replaced with an identical battery or a battery type recommended by the manufacturer.

Do not throw lithium batteries into the trash-can. It must be disposed of in accordance with local regulations concerning special waste.

1.6 Technical Support

If you have any technical difficulties, please do not hesitate to call or e-mail our customer service.

http://www.arbor.com.tw

E-mail:info@arbor.com.tw

1.7 Warranty

This product is warranted to be in good working order for a period of two years from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster.

Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, or inability to use this product. Vendor will not be liable for any claim made by any other related party.

Vendors disclaim all other warranties, either expressed or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose, with respect to the hardware, the accompanying product's manual(s) and written materials, and any accompanying hardware. This limited warranty gives you specific legal rights.

Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.

1.8 Packing List

Before you begin installing your single board, please make sure that the following materials have been shipped:

1 x Em104P-i2904-N4

1 x Driver CD

1 x Quick Installation Guide

If any of the above items is damaged or missing, contact your vendor immediately.

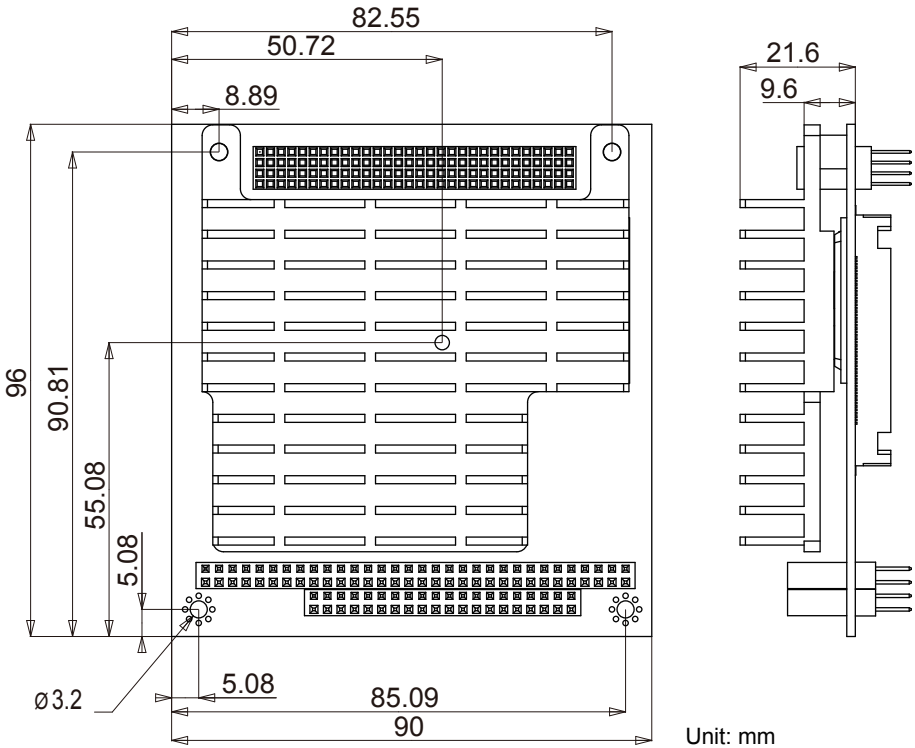
1.9 Ordering Information

Em104P-i2904-N4-TW	Intel® Atom™ N455 PC/104-Plus CPU Module
CBK-09-2904-00	Cable kit 1 x SATA cable 1 x KB & MS Y-cable 1 x USB cable 2 x Ethernet cables 1 x VGA cable 1 x COM cable 2 x Power cables

1.10 Specifications

Form Factor	PC/104-Plus CPU module
Processor	Soldered onboard Intel® Atom™ N455 1.6GHz processor
Chipset	Intel® ICH8M
BIOS	AMI PnP Flash BIOS
System Memory	Soldered onboard DDR3 1GB SDRAM
VGA/ LCD Controller	Integrated Intel® Graphics Media Accelerator 3150
	Analog RGB supports resolution up to 2048 x 1536
	LCD: Single channel 18-bit LVDS
Ethernet	2 x Intel® 82583V PCIe Gigabit Ethernet controllers
Storage	1 x Serial ATA port with 300MB/s HDD transfer rate
	1 x CompactFlash Type II Socket
Serial Port	2 x RS-232 ports (TX/RX only)
KB/MS	One 6-pin connector (PS/2 interface for Keyboard and Mouse)
USB Port	2 x USB 2.0 ports
Expansion Bus	PC/104-Plus interface
Power Requirement	+5V, +12V (only for LCD)
Power Consumption	2.4A@+5V (Typical)
Certification	CE/FCC class A
Operation Temp.	-20 ~ 70ºC (-4 ~ 158ºF)
Watchdog Timer	1 ~ 255 levels reset
Dimension (L x W)	96 x 90 mm (3.8" x 3.5")

1.11 Board Dimensions

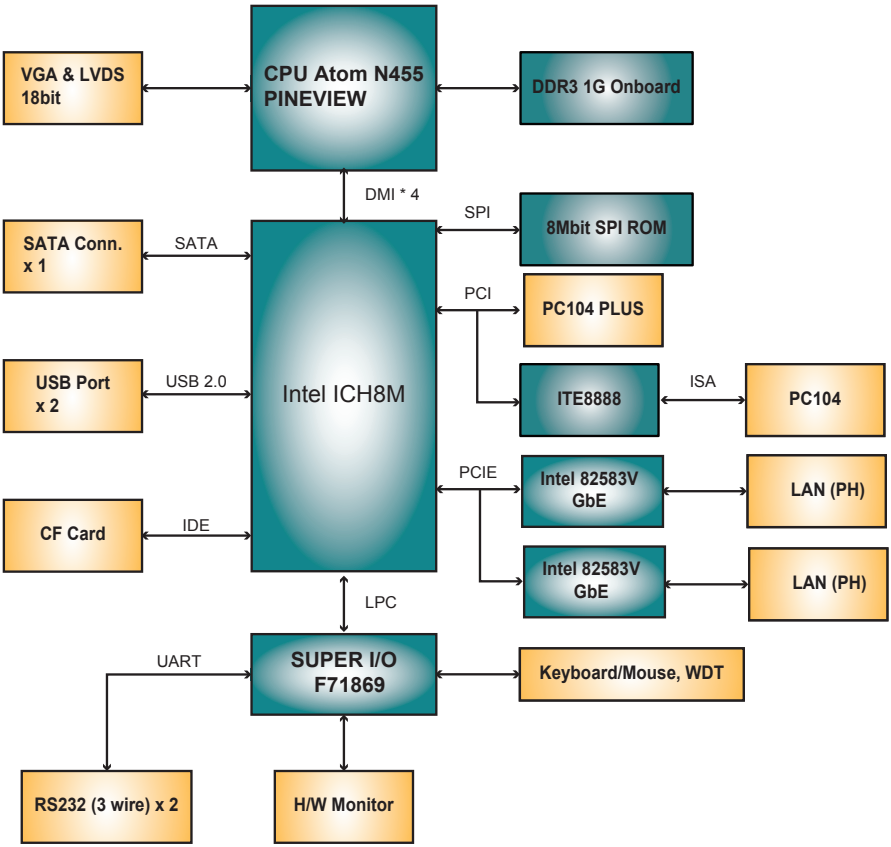


Unit: mm

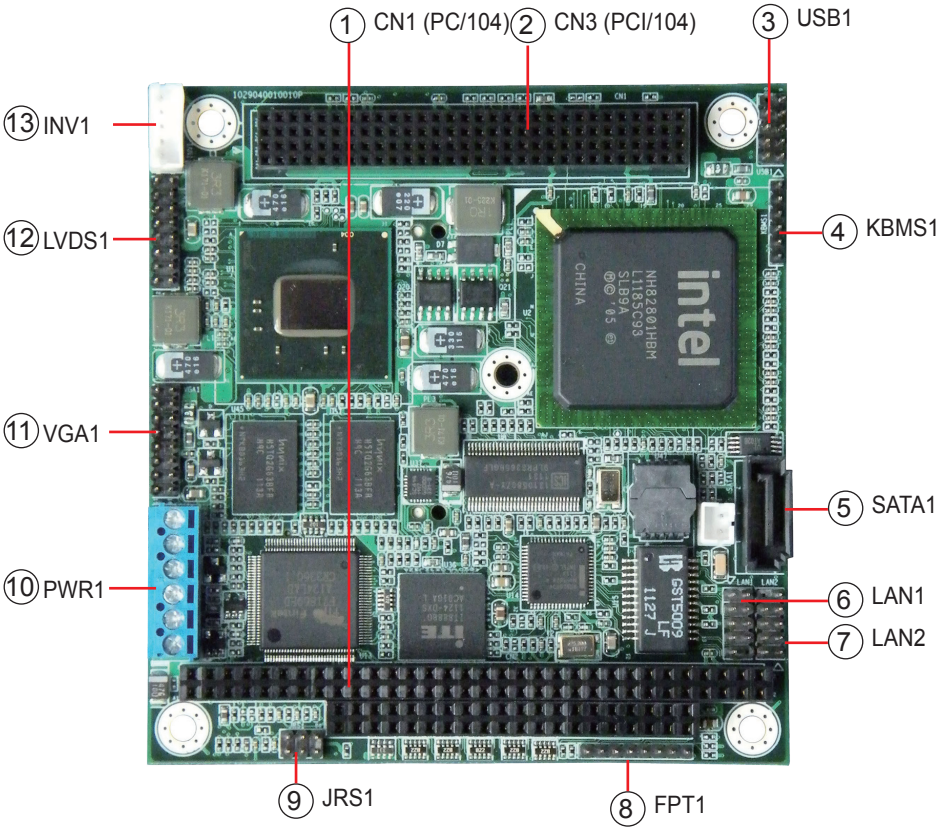
Chapter 2

Installation

2.1 Block Diagrams



2.2 Jumpers and Connectors



Connectors Quick Reference

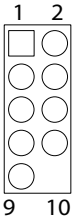
Label	Function
CN1	PC/104 Connector
CN3	PCI/104 Connector
USB1	USB 0, 1 Connector
SATA1	Serial ATA Connector
VGA1	Analog RGB Display Connector
KBMS1	PS/2 interface Keyboard and Mouse Connector
JRS1	COM1,COM2
FPT1	Reset/Power LED/HDD LED/Speaker
INV1	Inverter Power Output
PWR1	12V/5V Power Input
LVDS1	LVDS LCD Panel Connector
LAN1, 2	Ethernet Connectors

Connectors

USB1: USB Connector (3)

Connector type: 2.00mm pitch 2x5-pin header

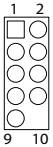
Pin	Desc.	Pin	Desc.
1	+5V	2	+5V-
3	USBP0-	4	USBP1-
5	USBP0+	6	USBP1+
7	GND	8	GND
9	GND	10	N/C (Key)



LAN1, 2: GbE Connector (6, 7)

Connector type: 2.00mm pitch 2x5-pin headers

Pin	Desc.	Pin	Desc.
1	TX_MDI0+	2	TX_MDI0-
3	RX_MDI1+	4	MDI2+
5	MDI2-	6	RX_MDI1-
7	MDI3+	8	MDI3-
9	N/C	10	N/C (Key)



KBMS1: Keyboard & Mouse Connector (4)

Connector type: 2.0mm pitch 1x6-pin header

Pin	Description
1	KB_DATA
2	GND
3	MS_DATA
4	KB_CLK
5	PS2_VCC
6	MS_CLK

SATA1: Serial ATA Connector (5)

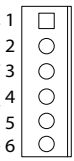
High speed transfer rates (300MB/s).

Pin	Description
1	GND
2	TX+
3	TX-
4	GND
5	RX-
6	RX+
7	GND

PWR1: 12V/5V Power Input (10)

Connector type: 1x6-pin terminal

Pin	Description
1	VCC 12V
2	VCC 12V
3	GND
4	GND
5	VCC 5V
6	VCC 5V



JRS1: COM1, 2 (9)

Pin 1, 3, 5: COM1
PIn 2, 4, 6: COM2
Connector type: 2.00mm pitch 2x3-pin dip

Pin	Desc.	Pin	Desc.
1	RXD1	2	RXD2
3	TXD1	4	TXD2
5	GND	6	GND

FPT1: Reset/Power LED/HDD LED/Speaker (8)

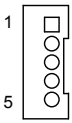
Connector type: 2.00mm pitch 1x8-pin header

Pin	Description
1	RESET
2	GND
3	PWR LED+
4	GND
5	HDD LED+
6	HDD LED-
7	SPKOUT+
8	SPKOUT-

INV1: LCD Inverter Connector (13)

Connector type: 2.00mm pitch 1x5-pin box wafer connector

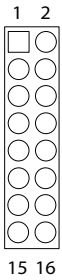
Pin	Description
1	Vin
2	GND
3	on/off
4	Brightness control
5	GND



VGA1: Analog RGB Output Connector (11)

Connector type: 2.00mm pitch 2x8-pin header

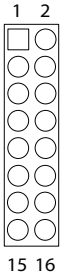
Pin	Description	Pin	Description
1	CRT_RED	2	CRT_GREEN
3	CRT_BLUE	4	N/C
5	GND	6	GND
7	GND	8	GND
9	CRT_VCC5	10	CRT_EN
11	N/C (key)	12	CRT_DDCDATA
13	CRT_HSYNC	14	CRT_VSYNC
15	DDC_CLK	16	N/C



LVDS1: LVDS LCD Panel Connector (12)

Supports single channel 18-bit LVDS

Pin	Description	Pin	Description
1	LCD_POWER	2	LCD_POWER
3	GND	4	GND
5	DATA0-	6	DATA0+
7	DATA1-	8	DATA1+
9	DATA2-	10	DATA2+
11	GND	12	GND
13	CLK-	14	CLK+
15	LDDC_CLK	16	LDDC_DATA



2.3 The Installation Paths of CD Driver

Windows XP

Driver	Path
CHIPSET	\Em104P-i2904\CHIPSET\INF9.2.0.1009
VGA	\Em104P-i2904\GRAPHICS\WIN_XP_GMA3150
LAN	\Em104P-i2904\ETHERNET\WIN_allos_Ver16.3
ISA	\Em104P-i2904\ISA\ITE8888

Windows 7

Driver	Path
CHIPSET	\Em104P-i2904\CHIPSET\INF9.2.0.1009
VGA	\Em104P-i2904\GRAPHICS\WIN_7_GMA3150_32
	\Em104P-i2904\GRAPHICS\WIN_7_GMA3150_64
LAN	\Em104P-i2904\ETHERNET\WIN_allos_Ver16.3
ISA	\Em104P-i2904\ISA\ITE8888

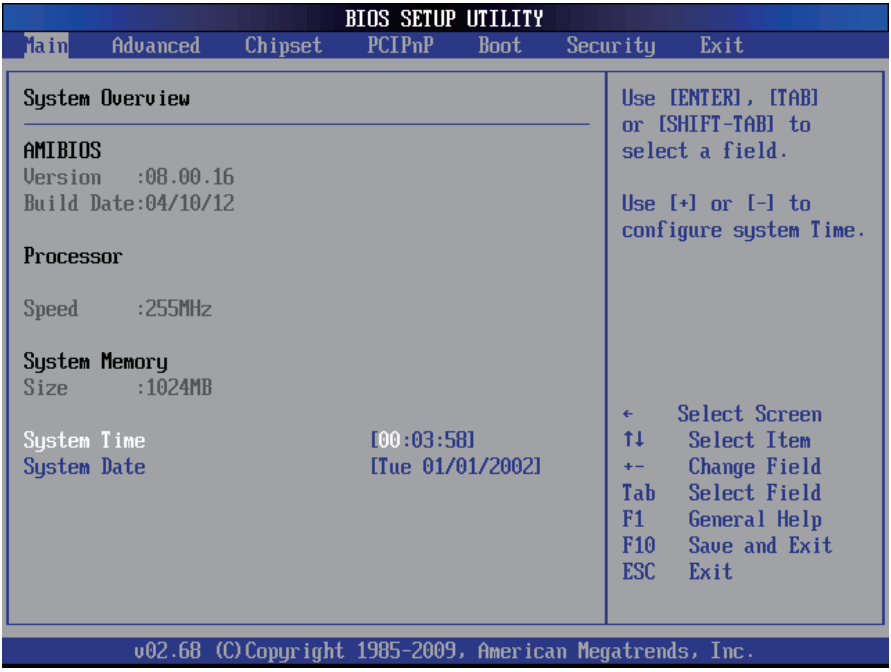
Chapter 3

BIOS

3.1 BIOS Main Setup

The AMI BIOS provides a setup utility program for specifying the system configurations and settings which are stored in the BIOS ROM of the system. When you turn on the computer, the AMI BIOS is immediately activated. After you have entered the setup utility, use the left/right arrow keys to highlight a particular configuration screen from the top menu bar or use the down arrow key to access and configure the information below.

NOTE: In order to increase system stability and performance, our engineering staff are constantly improving the BIOS menu. The BIOS setup screens and descriptions illustrated in this manual are for your reference only, and may not completely match what you see on your screen.



BIOS Information

Display the BIOS information.

System Date

Set the system date. Note that the 'Day' automatically changes when you set the date.

The date format is:

Day : Sun to Sat
Month : 1 to 12
Date : 1 to 31
Year : 1999 to 2099

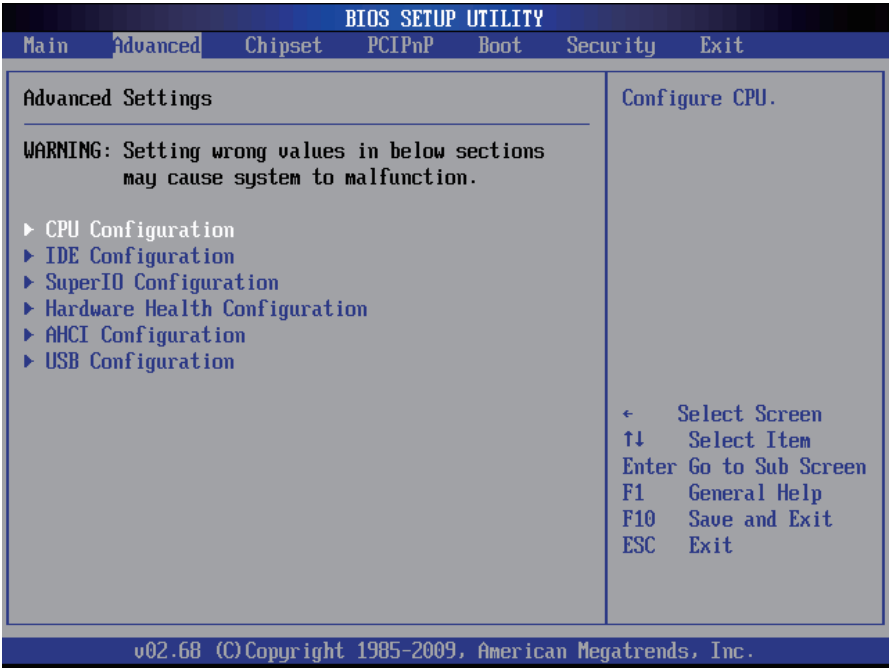
System Time

Set the system time.

The time format is:

Hour : 00 to 23
Minute : 00 to 59
Second : 00 to 59

3.2 Advanced Settings



CPU Configuration

This section is used to configure the CPU. It will also display detected CPU information.

IDE Configuration

This section is used to configure the IDE drives.

Super IO Configuration

This section is used to configure the I/O functions supported by the onboard Super I/O chip.

Hardware Health Configuration

This section is used to configure the hardware monitoring events, such as temperature, fan speed and voltages.

ACPI Configuration

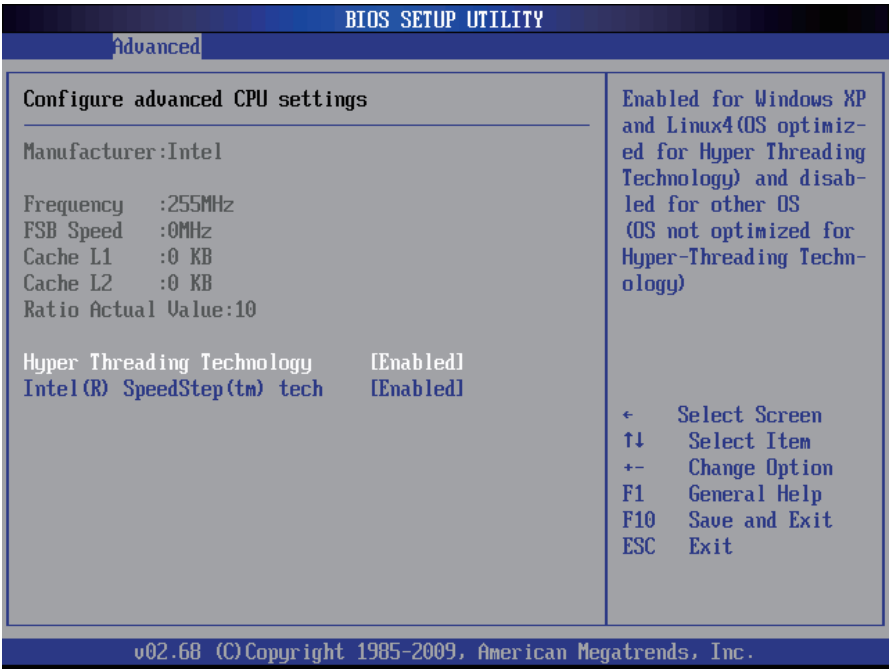
Enable/disable the Advanced Configuration and Power Interface (ACPI).

USB Configuration

Configure the USB devices.

3.2.1 CPU Configuration

The CPU Configuration setup screen varies depending on the installed processor.



Hyper Threading Technology

This item is used to enable or disable the processor's Hyper-threading feature.

Enabled for Windows XP and Linux4 (OS optimized for Hyper-threading Technology) and disabled for other OS (OS not optimized for Hyper-threading Technology).

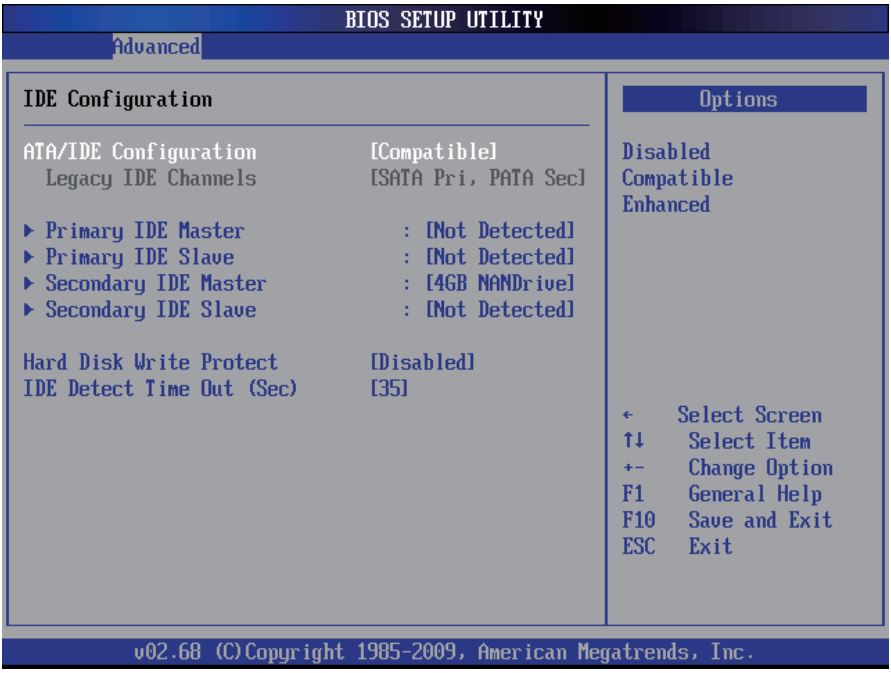
When disabled, only one thread per enabled core is enabled.

Intel(R) SpeedStep(tm) tech

This item allows you to enable SpeedStep technology for better power saving. SpeedStep is a technology built into some Intel processors that allows the clock speed of the processor to be dynamically changed by software.

The choice: Enabled (Default), Disabled

3.2.2 IDE Configuration



ATA/IDE Configuration

The choice: Disabled; Compatible; Enhanced

Legacy IDE Channels

When **ATA/IDE Configuration** is set to *Enhanced* mode, you can select IDE or AHCI mode in this item. When select *Compatible* mode you can select SATA only / SATA pri, PATA sec.
The choice: SATA Only; SATA Pri, PATA Sec

Primary/Secondary IDE Master/Slave

Select one of the hard disk drives to configure it. Press <Enter> to access its the sub menu.

Hard Disk Write Protect

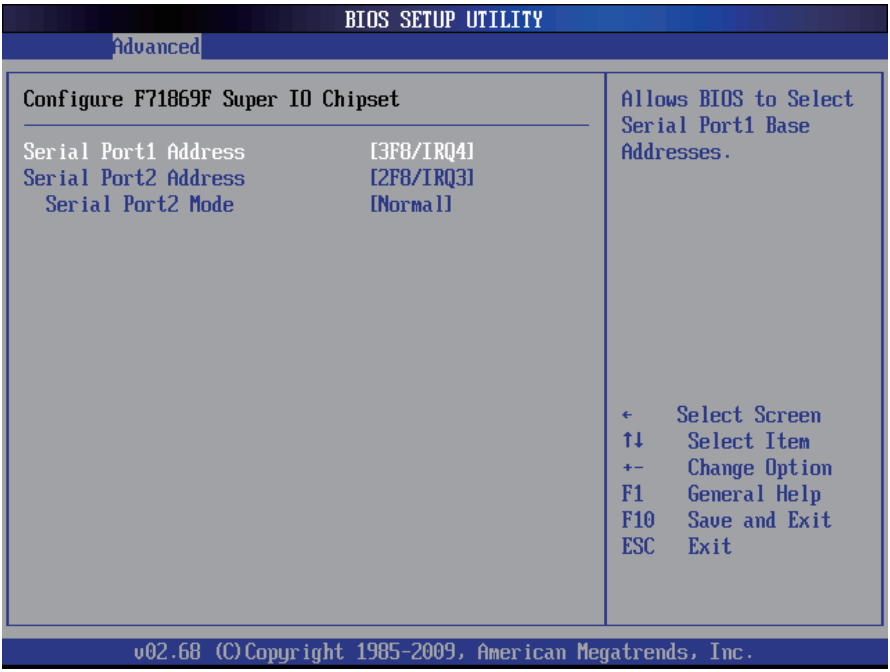
The choice: Disabled; Enabled

IDE Detect Time Out (Sec)

This item allows you to select the time out value.
The choice: 0, 5, 10, 15, 20, 25, 30, 35

3.2.3 Super IO Configuration

You can use this item to set up or change the Super IO configuration for serial ports.



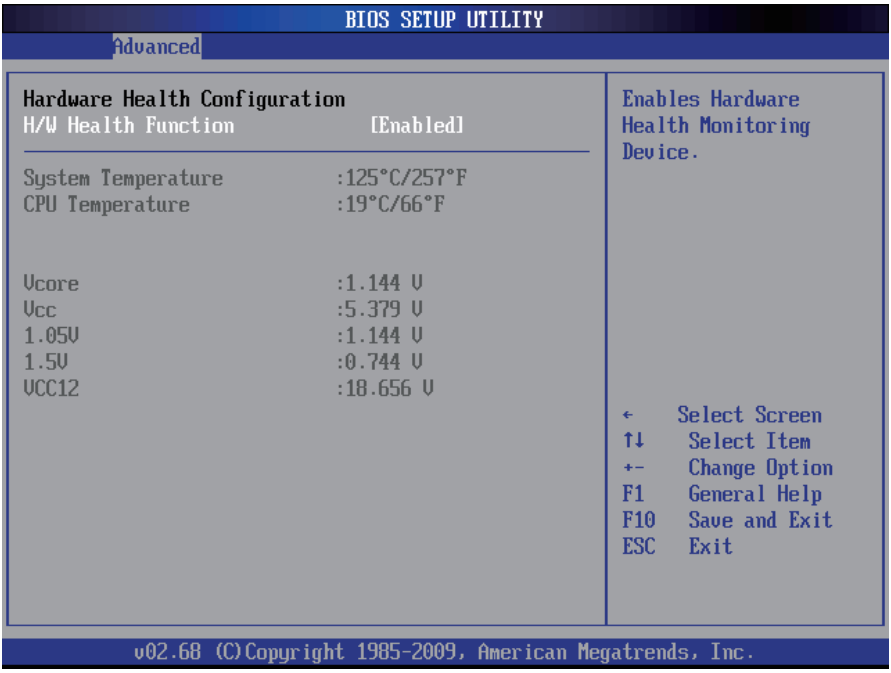
Serial Port1~2 Address

Select an address for the serial port.

Serial Port Mode

The choice: Normal; IrDA(1.6us); IrDA(31/16bit)

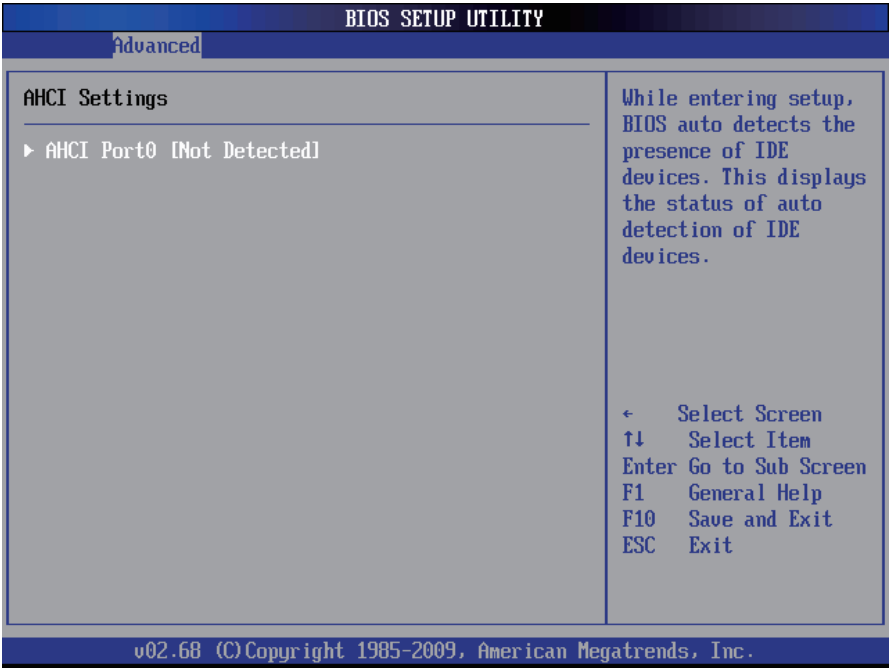
3.2.4 Hardware Health Configuration



H/W Health Function

This item allows you to control H/W monitor display.

3.2.5 AHCI Configuration



AHCI Port0

It shows the status of auto detection of IDE device.

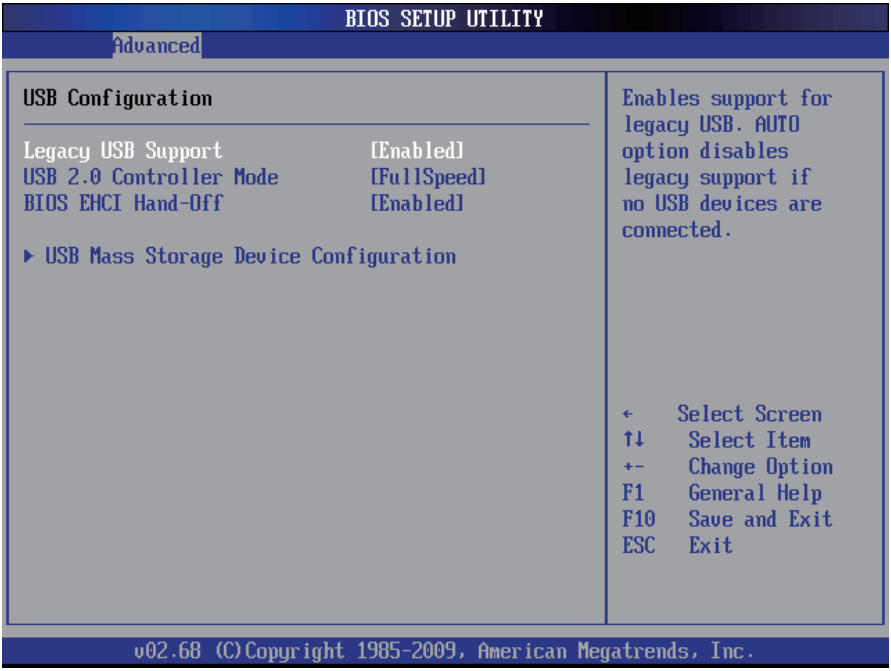
SATA Port0

Select the type of device connected to the system.
The choice: Not Installed; Auto

SMART

Stands for self-monitoring Analysis and Reporting Technology.
The choice: Enable; Disabled

3.2.6 USB Configuration



Legacy USB Support

Enabled option supports for legacy USB. Auto option disables legacy support if no USB devices are connected.
The choice: Enabled (Default); Auto; Disabled

USB 2.0 Controller Mode

Configures the USB 2.0 controller in High Speed (480Mbps) or Full Speed (12MBPS).

EHCI Hand-Off

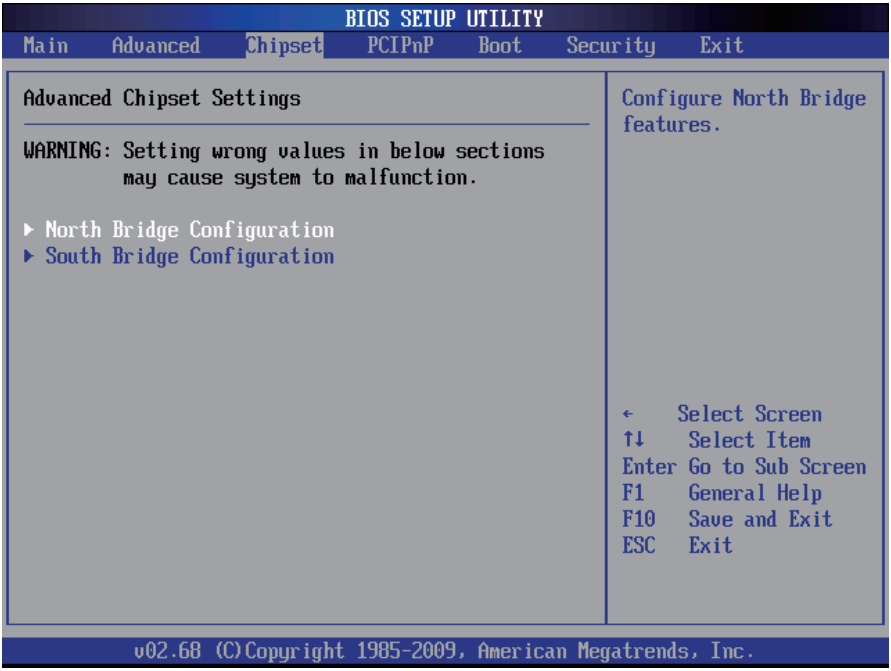
Allow you to enable support for operating systems without an EHCI hand-off feature. Do not disable the BIOS EHCI Hand-Off option if you are running a Windows® operating system with USB device.
The choice: Enabled (Default); Disabled

USB Mass Storage Device Configuration

This item displays information when USB devices are detected.

3.3 Chipset

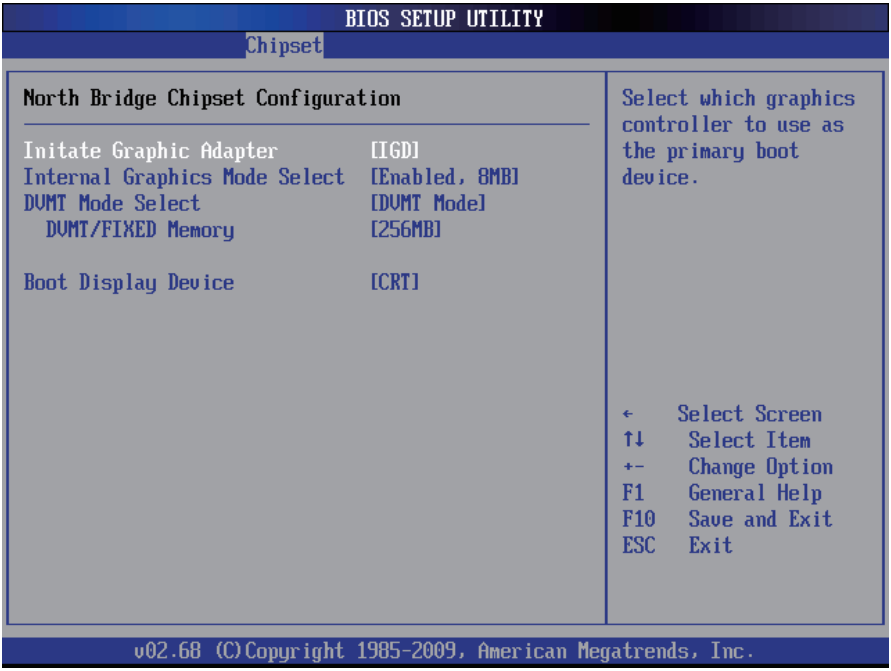
This submenu allows you to configure the specific features of the chipset installed on your system. The chipset manages bus speed and the access to system memory resources, such as DRAM. It also coordinates communications with the PCI bus.



Notice:

Beware of that inappropriate setting values in items of this menu may cause system malfunction.

3.3.1 North Bridge Configuration



Initiate Graphic Adapter

This item allows you to select which graphics controller to use as the primary boot device.

Internal Graphics Mode Select

Select the amount of system memory used by the Internal graphics device.

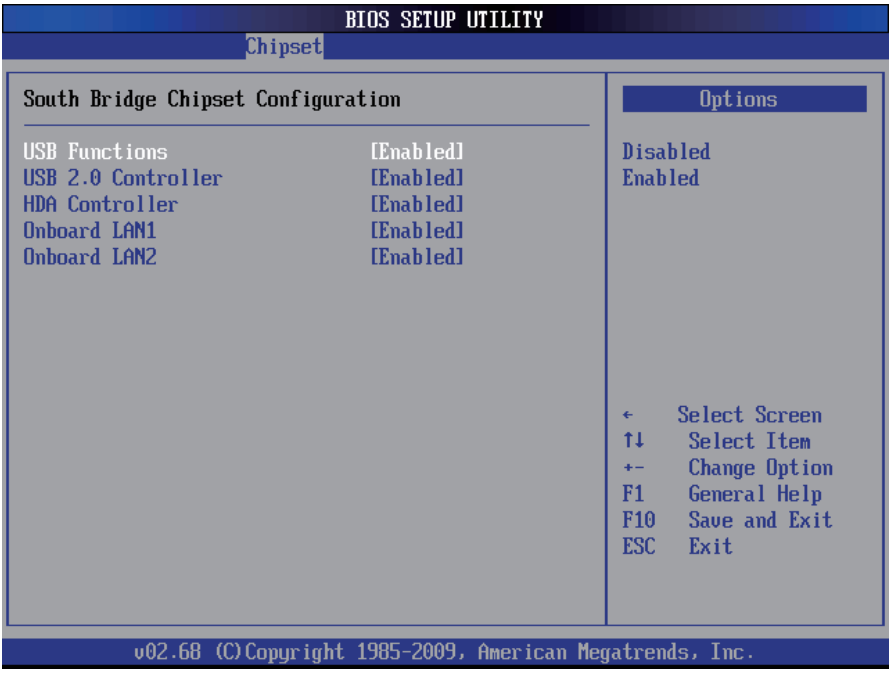
DVMT Mode Select

Use the DVMT Mode Select option to select the Intel Dynamic Video Memory Technology (DVMT) operating mode.
Fixed Mode: A fixed portion of graphics memory is reserved as graphics memory.
DVMT Mode (Default): Graphics memory is dynamically allocated according to the system and graphics needs.

Boot Display Device

Select the boot display device.
The choice: CRT, LVDS, CRT+LVDS

3.3.2 South Bridge Configuration



USB Functions

This item allows you to active USB ports.
The choice: Disabled, 2 USB Ports, 4 USB Ports, 6 USB Ports, 8 USB Ports, 10 USB Ports

USB 2.0 Controller

Use the option to enable or disable the USB 2.0 controller.

HDA Controller

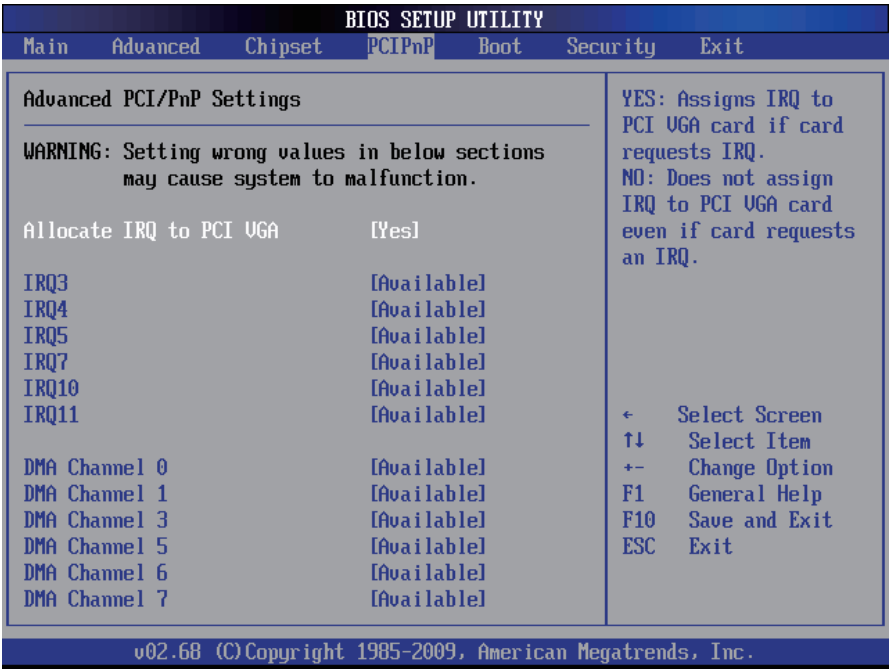
This item allows you to select the chipset family to support High Definition Audio Controller.
The choice: Enabled, Disabled.

Onboard LAN1~2

Select “Enabled” if your system contains a LAN1 or LAN2 port.

3.4 PCIPnP

The **PCIPnP** screen provides advanced setting options for your PCI or PnP (plug and play) peripherals.



Allocate IRQ to PCI VGA

Yes: Assigns IRQ to PCI VGA card if card requests IRQ.
No: Does not assign IRQ to PCI VGA card even if card requests an IRQ.
[Available]: if an item is specified “Available”, the particular item can be used by PCI or PnP peripherals/devices
[Reserved]: if an item is specified as “Reserved”, the particular item can only be used by legacy ISA peripherals/devices
Note: please pay attention to the “WARNING” part at the left frame before you decide to configure any setting of an item.

IRQ3 - IRQ11

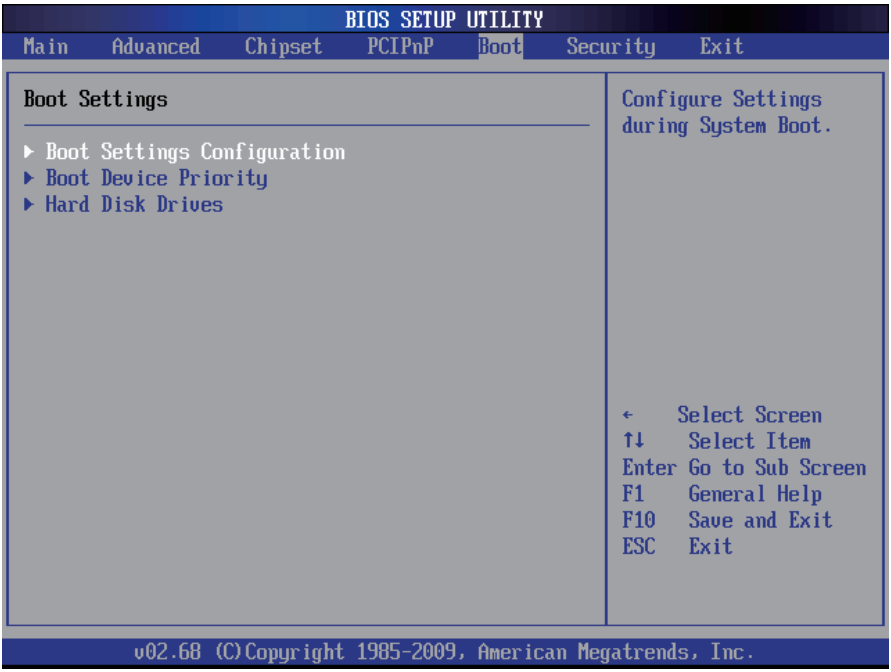
Available: Specified IRQ is available to be used by PCI/PnP devices.
Reserved: Specified IRQ is reserved for use by Legacy ISA devices.

DMA Channel 0 - DMA Channel 7

Available: Specified DMA is available to be used by PCI/PnP devices.
Reserved: Specified DMA is reserved for use by Legacy ISA devices.

3.5 Boot Settings

The Boot menu items allow you to change the system boot options.

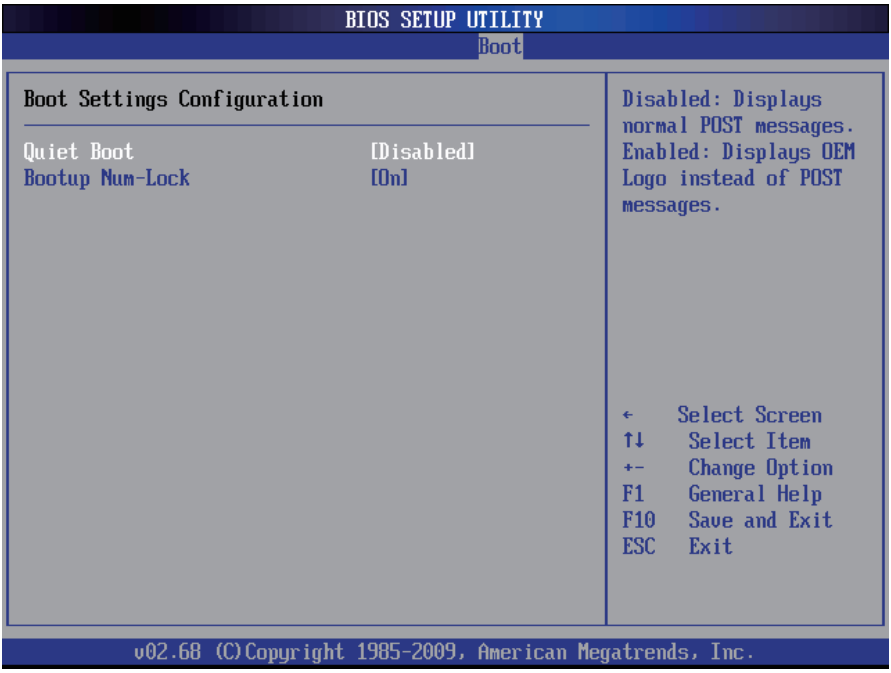


Hard Disk Drives

1st Drive

Select the type of device connected to the system.
The choice: SATA: SM-4GB Compact; Disabled

3.5.1 Boot Settings Configuration



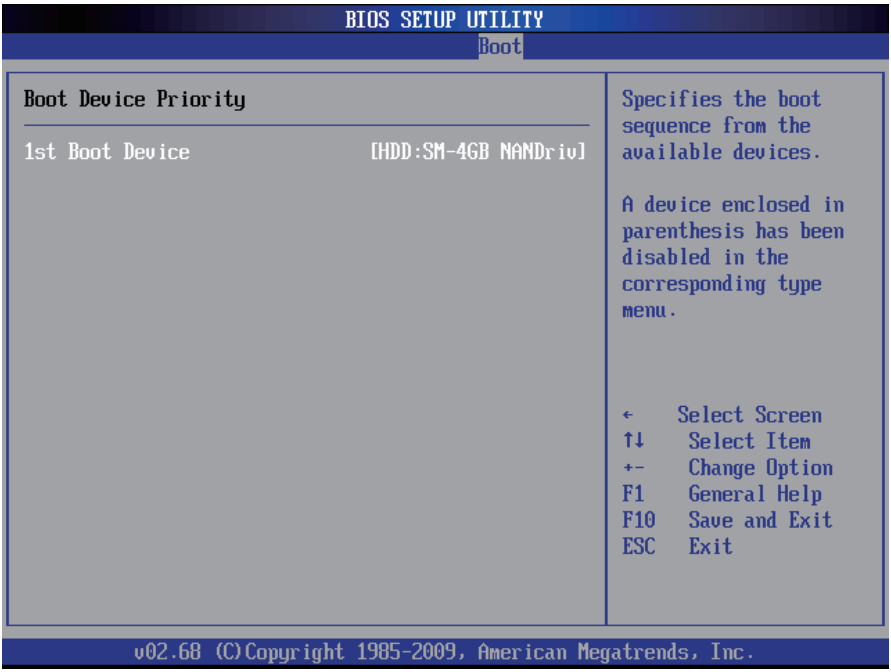
Quiet Boot

Displays normal POST messages when it's selected as "Disabled".
When it is set as "Enabled", OEM messages will be displayed instead of POST messages. The default is "Disabled".

Bootup Num-Lock

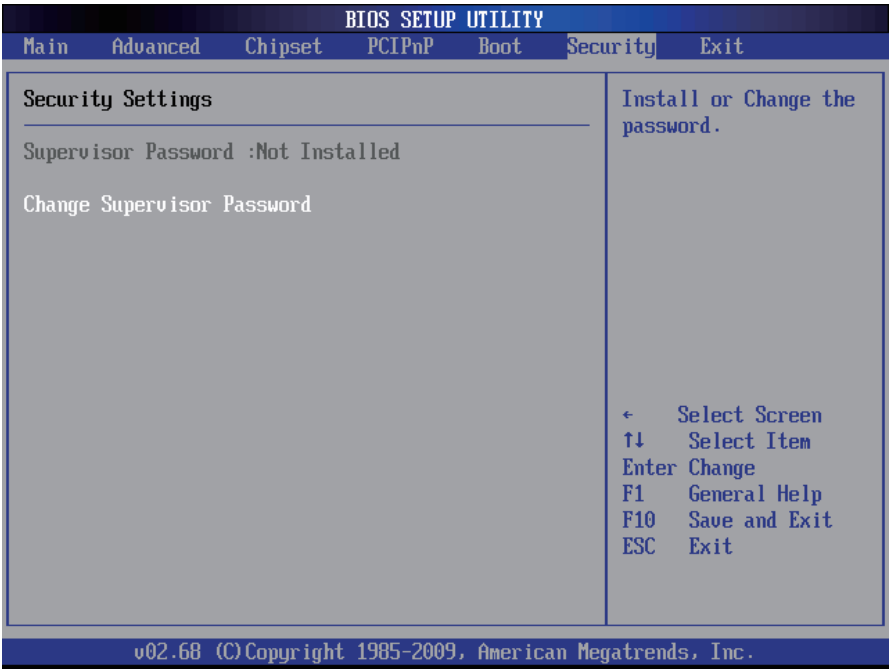
Modifies Number Lock setting when the system boots up. Select "On" to automatically enable the Number Lock on keyboard when the system is booting up.

3.5.2 Boot Device Priority



Press Enter and it shows Bootable add-in devices. Items in this sub-menu specify the boot sequence from the available devices.

3.6 Security



Change Supervisor Password

This item allows you to install or change supervisor password.

ENTER PASSWORD

Type the password, up to eight characters in length, and press <Enter>. The password typed now will clear any previously entered password from CMOS memory. You will be asked to confirm the password. Type the password again and press <Enter>. You may also press <ESC> to abort the selection and not enter a password.

To disable a password, just press <Enter> when you are prompted to enter the password. A message will confirm the password will be disabled. Once the password is disabled, the system will boot and you can enter Setup freely.

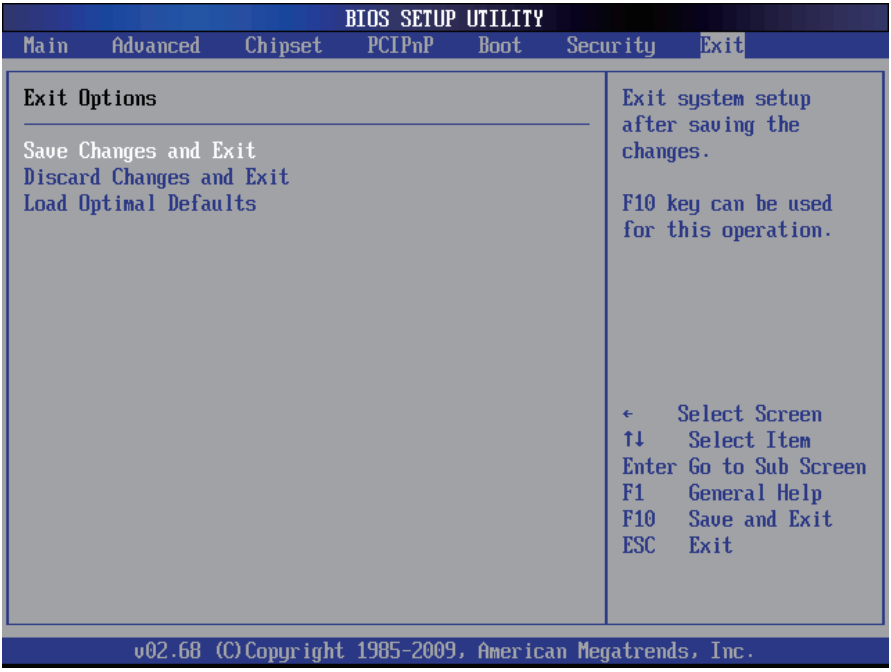
PASSWORD DISABLED

When a password has been enabled, you will be prompted to enter it every time you try to enter Setup. This prevents an unauthorized person from changing any part of your system configuration.

Additionally, when a password is enabled, you can also require the BIOS to request a password every time your system is rebooted. This would prevent unauthorized use of your computer.

You can determine when the password is required within the BIOS Features Setup Menu and its Security option. If the Security option is set to “System”, the password will be required both at boot and at entry to Setup. If it’s set to “Setup”, prompting only occurs when trying to enter Setup.

3.7 Save & Exit



Save Changes and Exit

Pressing <Enter> on this item and it asks for confirmation:

Save configuration changes and exit setup?

Pressing <OK> stores the selection made in the menus in CMOS - a special section of memory that stays on after you turn your system off. The next time you boot your computer, the BIOS configures your system according to the Setup selections stored in CMOS. After saving the values, the system is restarted again.

Discard Changes and Exit

Exit system setup without saving any changes.
<ESC> key can be used for this operation.

Load Optimal Defaults

When you press <Enter> on this item, you get a confirmation dialog box with a message:

Load Optimal Defaults?
[OK] [Cancel]

Pressing [OK] loads the BIOS Optimal Default values for all the setup questions.

<F9> key can be used for this operation.

Chapter 4

Appendix

4.1 I/O Port Address Map

Each peripheral device in the system is assigned a set of I/O port addresses which also becomes the identity of the device.
The following table lists the I/O port addresses used.

Address	Device Description
00000000-0000001F	DMA Controller
0000020h-000002Dh	Interrupt Controller
0000050h-0000052h	Timer/Counter
00000060-0000006F	8042 (keyboard controller)
00000070-0000007F	Real-time clock, non-maskable interrupt (NMI) mask
00000080-0000009F	DMA page register
000000A0-000000BF	0A0-0BF
000000C0-000000DF	DMA controller
0000170h-0000177h	IDE Controller
00001F0h-00001F7h	IDE Controller
000002F8-000002FF	Serial port 2
000003F8-000003FF	Serial port 1

4.2 Memory Address Map

Address	Device Description
F0000h - FFFFFh	System ROM
*CC000h - EFFFFh	Unused (reserved for Ethernet ROM)
C0000h - CBFFFh	Expansion ROM (for VGA BIOS)
B8000h - BFFFFh	CGA/EGA/VGA text
B0000h - B7FFFh	Unused
A0000h - AFFFFh	EGA/VGA graphics
00000h - 9FFFFh	Base memory

4.3 Interrupt Request Lines (IRQ)

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

Level	Function
IRQ0	Interval timer
IRQ1	Keyboard
IRQ2	Interrupt from controller 2 (cascade)
IRQ3	COM2
IRQ4	COM1
IRQ5	Reserved
IRQ6	Reserved
IRQ7	Reserved
IRQ8	RTC
IRQ9	Reserved
IRQ10	Reserved
IRQ11	Reserved
IRQ12	PS/2 mouse
IRQ13	Math coprocessor
IRQ14	Primary IDE
IRQ15	Secondary IDE

4.4 DMA Map

DMA Channel	Device Description
0	Available
1	Available(audio)
2	Floppy disk(8-bit transfer)
3	Available(parallel port)
4	Cascade for DMA controller 1
5	Available
6	Available
7	Available