MI-960

Mini-ITX Industrial Motherboard with
Intel® Q965 Chipset

User's Manual



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Recycled Paper

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Revision History

Revision	Release Date	Description of Change(s)
2.00	2008/11/18	Initial Release
2.01	2009/04/14	Correct graphics spec, GbE pin/LED def'n

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Preface

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Using this Manual

Audience and Scope

The MI-960 User's Manual is intended for hardware technicians and systems operators with knowledge of installing, configuring and operating industrial grade computers.

Manual Organization

This manual is organized as follows:

Preface: Presents copyright notifications, disclaimers, trademarks, and associated information on the proper usage of this document and its associated product(s).

Chapter 1, Introduction: Introduces the MI-960, its features, applications, and specifications, including functional descriptions and board layout.

Chapter 2, Connectors & Jumpers: Provides technical information on connectors and jumpers as well as pin assignments for configuring the MI-960 and any attached external devices.

Chapter 3, Getting Started: Describes how to install components on the MI-960: CPU, memory modules, and drivers.

Chapter 4, BIOS Setup: Presents information and illustrations to help understand and configure the system BIOS.

Chapter 5, POST Codes: Presents POST information and detailed descriptions for users.

Appendix A, Watchdog Timer: Presents information on understanding and configuring the embedded Watchdog timer.

Appendix B, System Resources: Presents information on I/O mapping, IRQ routing, and resource allocation.

Important Safety Instructions: Presents safety instructions all users must follow for the proper setup, installation and usage of equipment and/or software.

Getting Service: Contact information for ADLINK's worldwide offices.

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Conventions

Take note of the following conventions used throughout this manual to make sure that users perform certain tasks and instructions properly.



NOTE: Additional information, aids, and tips that help users perform tasks.



CAUTION: Information to prevent ***minor*** physical injury, component damage, data loss, and/or program corruption when trying to complete a task.



WARNING: Information to prevent ***serious*** physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.

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1 Introduction

This chapter will introduce the MI-960, its features, specifications, functional description, and mechanical layout.

1.1 Package Contents

Please check that your package contains the items below. If you discover damaged or missing items, please contact your vendor.

- MI-960 Industrial Mini-ITX Motherboard
- I/O shield x1
- SATA cable x2
- SATA power cable x1
- IDE cable x1
- COM cable x1
- 2-port USB cable with bracket x1
- Driver DVD
- User's Manual



DO NOT install or apply power to equipment that is damaged or if there is missing/incomplete equipment. Retain the shipping carton and packing materials for inspection. Please contact your ADLINK dealer/vendor immediately for assistance. Obtain authorization from your dealer before returning any product to ADLINK.

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1.2 Overview

The ADLINK MI-960 is a Mini-ITX industrial motherboard supporting the Intel® Core™2 Quad/Duo, Intel® Pentium® Dual-Core, Intel® Pentium® 4, Intel® Celeron®, and Intel® Celeron® D processors in the LGA775 package to deliver a high performance and space-saving platform for a wide array of embedded computing applications. With a compact footprint, the MI-960 supports a broad range of processing speeds and high-bandwidth network connectivity with dual Gigabit Ethernet.

These advanced features, coupled with a dual-channel DDR2 system memory architecture, diverse I/O, storage, and audio interfaces make the MI-960 suitable for multimedia, automation control, transportation, POS/POI, and medical applications requiring a compact, easy-to-deploy, and cost-effective mainboard.

1.3 Features

- Mini-ITX form factor (170 x 170 mm)
- Supports the following CPUs in the LGA775 package:
  - Intel® Core™2 Quad/Duo (Q6600, Q6700)
  - Intel® Core™2 Duo (E6400, E4300)
  - Intel® Pentium® Dual-Core (E2160)
  - Intel® Pentium® 4 (651, 551, 531)
  - Intel® Celeron® (440)
  - Intel® Celeron® D (352, 341)
- Integrated graphics controller, supports dual independent display
- Single channel 24-bit LVDS up to 1600 x 1200 resolution
- Two SATA ports 300 MB/s, two RS-232 serial ports
- Dual GbE, 8 USB 2.0, HD audio codec
- Onboard CompactFlash socket, PCI expansion slot
- RoHS compliant

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1.4 Specifications

System	
CPU/Cache	• Intel® Core™2 Quad Processor Q6700, 65nm, 2x 4MB L2, 2.66 GHz, 1066 MHz • Intel® Core™2 Quad Processor Q6600, 65nm, 2x 4MB L2, 2.4 GHz, 1066 MHz • Intel® Core™2 Duo Processor E6400, 65nm, 2 MB L2, 2.13 GHz, 1066 MHz • Intel® Core™2 Duo Processor E4300, 65nm, 2 MB L2, 1.8 GHz, 800 MHz • Intel® Pentium ® Dual Core Processor E2160, 65nm, 1 MB L2, 1.8 GHz, 800 MHz • Intel® Pentium ® 4 Processor 651, 65nm, 2 MB L2, 3.4 GHz, 800 MHz • Intel® Pentium ® 4 Processor 551, 90nm, 1 MB L2, 3.4 GHz, 800 MHz • Intel® Pentium ® 4 Processor 531, 90nm, 1 MB L2, 3.0 GHz, 800 MHz • Intel® Celeron ® Processor 440, 65nm, 512KB L2, 2.0 GHz, 800 MHz • Intel® Celeron ®D Processor 352, 65nm, 512KB L2, 3.2 GHz, 533 MHz • Intel® Celeron ®D Processor 341, 90nm, 512KB L2, 2.93 GHz, 533 MHz
FSB	• 533/800/1066 MHz
Chipset	• North Bridge: Intel® Q965 chipset • South Bridge: Intel® ICH8 chipset
Memory	• DDR2 533/667/800 SDRAM (4GB max.) • 2x 240-pin DDR2 DIMM slots
BIOS	• AMI BIOS with 16 Mb Flash ROM
Audio	• HDA Codec by Realtek ALC262 • supports line-in, line-out and mic-in
Watch Dog Timer	• 1-255 second/minute programmable
Hardware Monitor	• CPU/System temperature, fan speed and onboard DC voltage
Operating System	• Microsoft® Windows® XP Professional • Microsoft® Windows® Vista Enterprise (32/64-bit) • Fedora Core 7 (i386, x86_64) • Fedora Core 8 (i386)

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I/O Interfaces	
IDE	• 1 IDE port by PCIe (JMB363) • Supports UltraATA 66/100/133 mode
CompactFlash	• CompactFlash type II socket by SATA (JM20330)
Serial ATA	• Two serial ATA ports with 300 MB/s data transfer
Onboard I/O	• 2 USB 2.0 pin headers (4 ports) • 1 LVDS connector • 1 serial port connector • 1 front panel connector
Rear I/O	• 2 RJ-45 LAN • 4 USB 2.0 ports • 1 D-Sub VGA connector • 1 serial port • 2 PS2 keyboard/mouse ports • 3 audio jacks
Expansion Slots	• 1 32-bit/33MHz PCI slot • 1 CompactFlash socket
Display	
VGA	• GMA 3000 integrated in Q965 GMCH
VRAM	• Shared system memory up to 256 MB
CRT	• Dsub-15 connector, up to 2048x1536 @ 75 Hz
LVDS	• Internal 24-bit header, supports dual independent display
Ethernet	
Controller	• Intel® 82566DM, Marvell® 88E8053
Ports	• Two RJ-45 Ethernet ports
Mechanical and Environment	
Form Factor	• Mini-ITX Industrial Motherboard
Dimensions	• 170 mm x 170 mm (L x W)
Operating Temp.	• 0°C to 55°C
Storage Temp.	• -20ºC to 60ºC
Safety	• CE, FCC Class A

Table 1-1: MI-960 General Specifications

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1.5 Power Consumption

Test Configuration	
CPU	Intel® Core 2 Quad processor Q6600 2.40 GHz
Memory	TRANSCEND DDR2 800 2GB
Graphics	Intel® Q965 Graphics Memory controller
SATA Channel	Seagate ST3160812AS Barracuda 7200.9 160GB
Power Supply	COOLMAX FL-480ATX 450W

DOS (idle)					
Power Req.	+3.3V	+5V	+12V	CPU +12V	Total
Current (A)	1.77	3.27	0.338	3.12	8.50
Watts (W)	5.841	16.34	4.06	37.46	63.67
Linux, Idle					
Power Req.	+3.3V	+5V	+12V	CPU +12V	Total
Current (A)	1.74	3.12	0.32	1.26	6.44
Watts (W)	5.75	15.58	3.89	15.14	40.35
Windows XP, Idle					
Power Req.	+3.3V	+5V	+12V	CPU +12V	Total
Current (A)	1.803	3.12	0.28	1.31	6.52
Watts (W)	5.95	15.62	3.42	15.72	40.71
Windows XP, CPU 100% Usage					
Power Req.	+3.3V	+5V	+12V	CPU +12V	Total
Current (A)	1.79	3.15	0.43	5.21	10.59
Watts (W)	5.91	15.77	5.22	62.58	89.47

Table 1-2: MI-960 Power Consumption

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1.6 Block Diagram

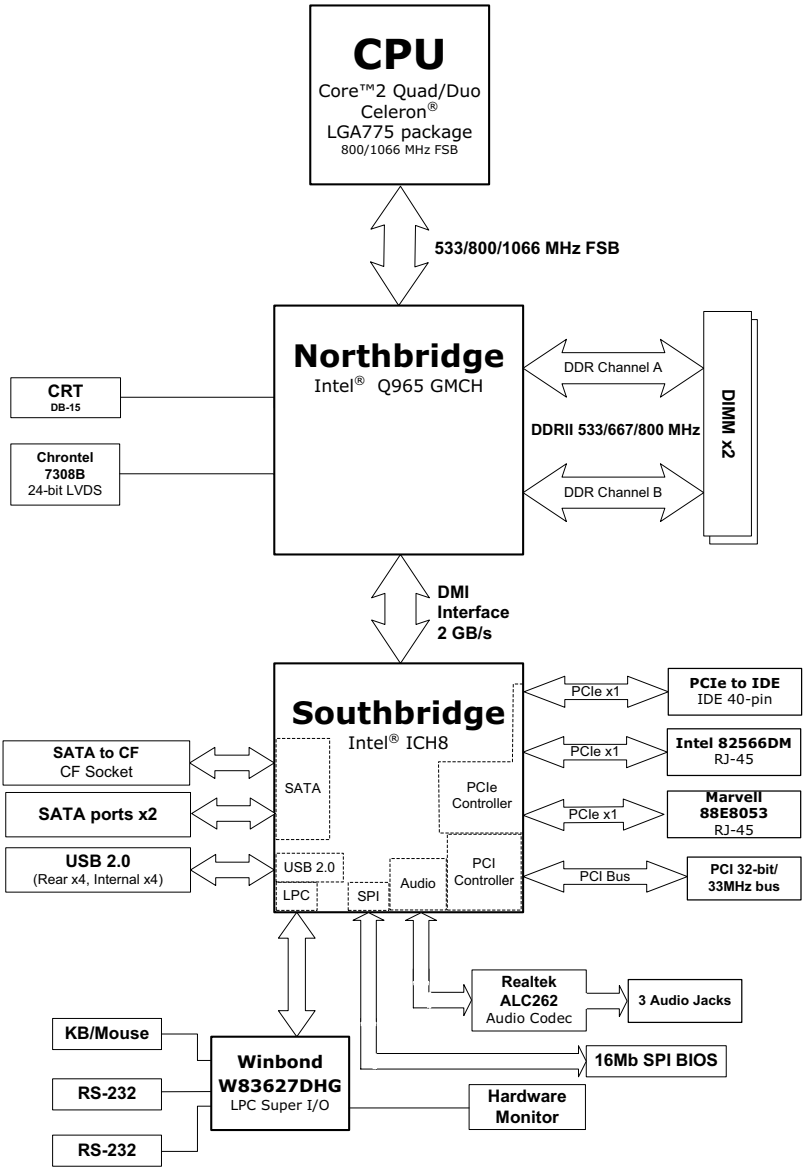


Figure 1-1: MI-960 Block Diagram

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1.7 Functional Description

Processor Support

The MI-960 motherboard supports Intel processors in the LGA775 package in a range of 533/800/1066 MHz Front Side Bus (FSB).

Providing high-performance computing and energy-efficiency, the MI-960 is designed for Intel® Core™2 Quad/Duo, Intel® Pentium® Dual-Core, Intel® Pentium® 4, Intel® Celeron®, and Intel® Celeron® D processors. The MI-960 supports dual/quad-core processors containing multiple physical cores and dedicated L2 caches to meet the ever-increasing demands of industrial computing.

Intel® Q965 Express chipset

The Intel® Q965 Express chipset, featuring the Intel® Q965 graphics memory controller hub (GMCH) and the Intel® ICH8 I/O controller hub, provides the vital interfaces for the motherboard. The Intel® Q965 comes with the Intel® Graphics Media Accelerator 3000, an integrated graphics engine with enhanced 3D/2D graphics rendering and video capabilities. The GMCH also provides the interface for the processor and system memory.

The Intel® ICH8-M Southbridge is the eighth generation of Intel I/O controller hub that provides key interfaces such as PCI Express®, USB 2.0, and SATA II.

Dual-channel DDR2 memory

To meet the requirements of memory-intensive applications, the MI-960 has a dual-channel memory architecture supporting DDR2 533/667/800 MHz DIMMs. The high-bandwidth memory specification, meets the requirements of the latest 3D graphics, multimedia, and network application, and boosts system performance by eliminating bottlenecks.

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Intel® Graphics Media Accelerator 3000

The Intel® Graphics Media Accelerator (GMA) 3000 revolutionizes integrated graphics with new capabilities that provide significant increase in graphics performance. With support for DirectX 9 hardware acceleration, 333 MHz display clock, and up to 256 MB of video memory, the Intel GMA 3000 provides a cost-effective and high-performance graphics solution. The MI-960 comes with the dual-independent display technology, enabling different contents to be displayed on two separate display terminals or a single content stretched across two display devices for expanded workspace.

Gigabit Ethernet

The motherboard is equipped with the Intel® 82566DM and Marvell® 88E8053 controllers.

Serial ATA

Storage is efficient and secure with the Serial ATA interface. Utilizing the Intel® ICH8, the MI-960 supports up to two Serial ATA devices capable of reading/writing data at up to 3 Gbps. The SATA specification improves chassis airflow via thinner and more flexible cables with lower pin count.

Universal Serial Bus (USB) 2.0

The MI-960 incorporates the Universal Serial Bus (USB) 2.0 specification that increases peripheral connection speed from 12 Mbps (USB 1.1) to 480 Mbps. USB 2.0 is backward compatible with USB 1.1.

Hardware monitoring

A built-in, proactive hardware monitoring system in the ASIC monitors the CPU temperature, system fan rotations, and voltage levels to prevent overheating and/or component damage, effect timely failure detection, and ensure stable supply of current for critical motherboard components.

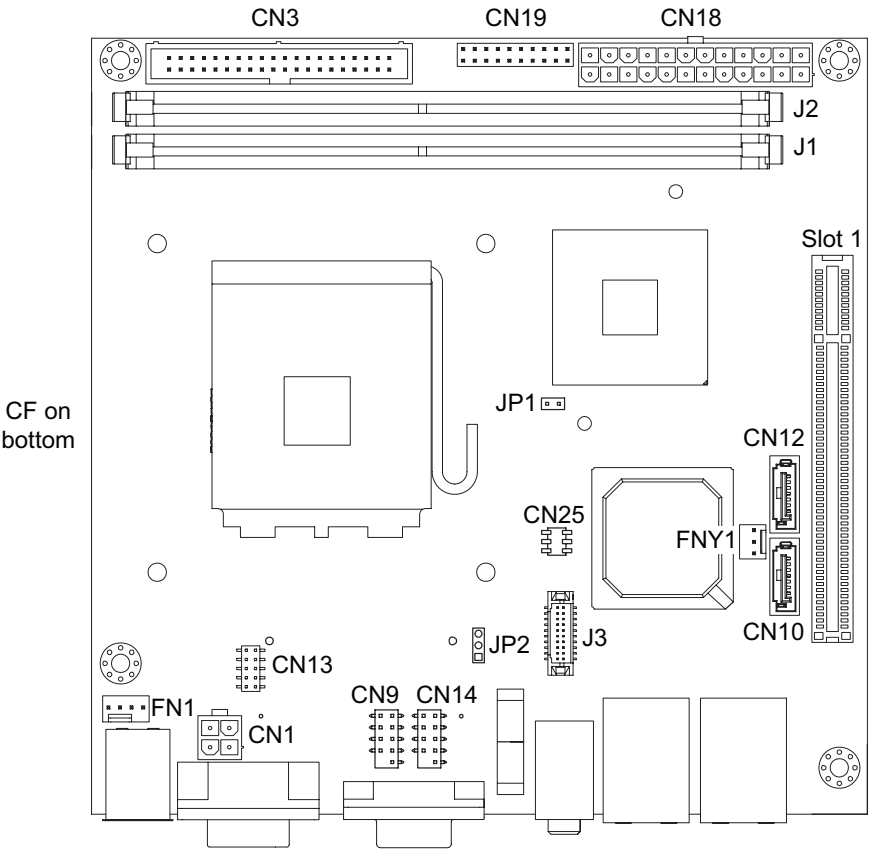
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Watchdog Timer

The watchdog timer (WDT) monitors system operations based on user-defined configurations. The WDT can be programmed for different time-out periods, such as from 1 to 255 seconds or from 1 to 255 minutes. The WDT generates a reset signal, then a reset request, after failure to strobe it within the programmed time period. A register bit may be enabled to indicate if the watchdog timer caused the reset event. The WDT register is cleared during the power-on sequence to enable the operating system to take appropriate action when the watchdog generates a reboot.

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1.8 Board Layout



CN1	ATX 12V connector	**CN25**	RSVD
CN3	IDE connector	**FN1**	CPU Fan connector
CN9	USB4/5 pin header	**FNY1**	System Fan connector
CN10	SATA0 connector	**J1/2**	DIMM1/2 slot
CN12	SATA1 connector	**J3**	LVDS connector
CN13	COM1 connector	**JP1**	Case open (RSVD)
CN14	USB6/7 pin header	**JP2**	Clear CMOS jumper
CN18	ATX power connector	**Slot 1**	PCI slot
CN19	System Panel connector		

Figure 1-2: MI-960 Board Layout

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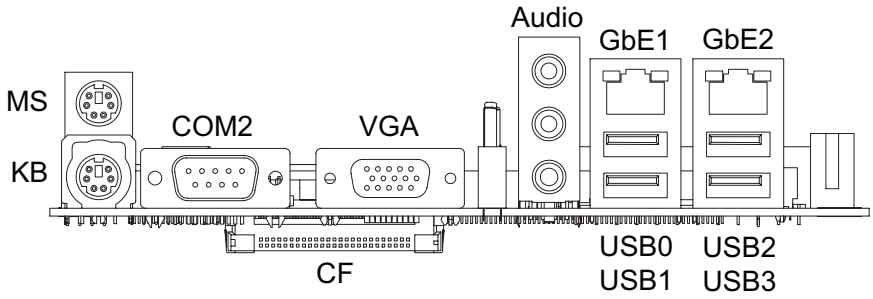
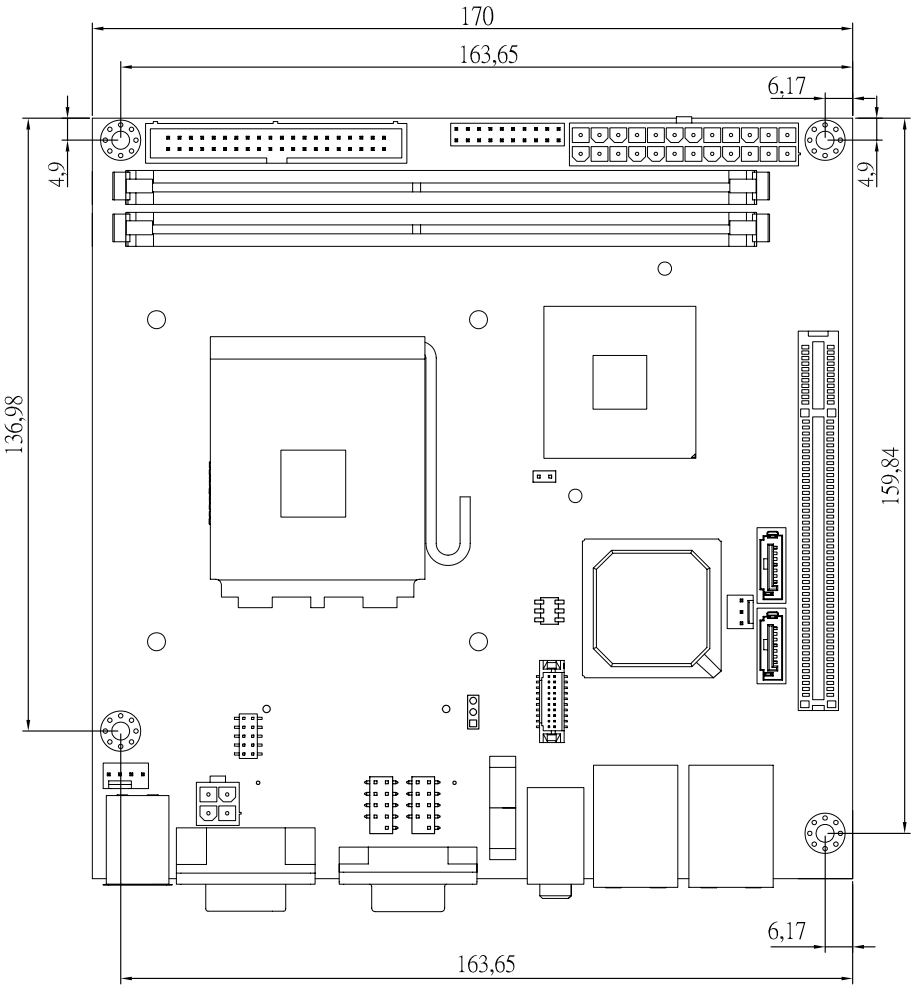


Figure 1-3: MI-960 Rear I/O Layout

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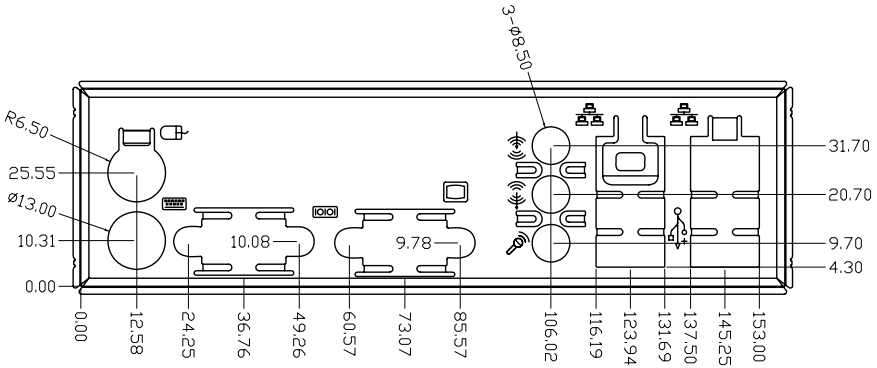
1.9 Mechanical Drawings



Dimensions in mm

Figure 1-4: MI-960 Board Dimensions (top view)

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Dimensions in mm

Figure 1-5: MI-960 Rear I/O Dimensions

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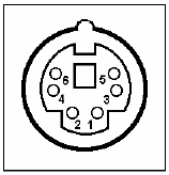
2 Connectors & Jumpers

The connectors and jumpers on the MI-960 allow you to connect and configure external devices. The following specify the pin assignments for connectors and jumper on the MI-960. Refer to **Figure 1-2: MI-960 Board Layout** and **Figure 1-3: MI-960 Rear I/O Layout** for connector and jumper locations.

2.1 Rear I/O Connectors

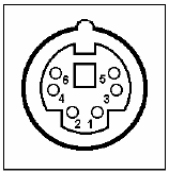
PS/2 Mouse Port (green)

Pin #	Signal	Function
1	MSDATA	Mouse Data
2	NC	not connected
3	GND	Ground
4	+5V	Power
5	CLK	Clock
6	NC	not connected



PS/2 Keyboard Port (purple)

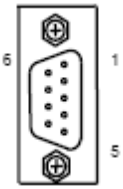
Pin #	Signal	Function
1	KBDATA	Keyboard Data
2	NC	not connected
3	GND	Ground
4	+5V	Power
5	CLK	Clock
6	NC	not connected



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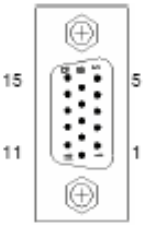
Serial Port Connector (COM2)

Pin #	RS-232
1	DCD, Data Carrier Detect
2	RXD, Receive Data
3	TXD, Transmit Data
4	DTR, Data Terminal Ready
5	GND, ground
6	DSR, Data Set Ready
7	RTS, Request to Send
8	CTS, Clear to Send
9	RI, Ring Indicator



VGA Connector.

Signal Name	Pin #	Pin #	Signal Name
Red	1	2	Green
Blue	3	4	VCC pull-up
GND	5	6	GND
GND	7	8	GND
VCC	9	10	GND
VCC pull-up	11	12	DDC2B DATA
HSYNC	13	14	VSYNC
DDC2B CLK	15		



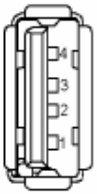
Audio I/O port

The three-jack audio I/O supports Line-In, Line-Out, and Mic-In functions. The Line-In jack (blue) connects to an audio source such as tape recorders, etc. The green Line-Out port connects a speaker or headphone, while the pink Mic-In jack connects a microphone.

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USB Connectors

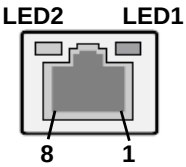
Pin #	Signal Name
1	Vcc
2	USB-
3	USB+
4	GND



LAN Port (RJ-45)

This port allows gigabit connection to a Local Area Network (LAN) using a network hub. The LAN port comes with two LEDs to indicate link, activity and speed. Refer to the tables below for the LAN port pin and LED definitions .

Pin #	Signal Name
1	MDI1 +
2	MDI1 -
3	MDI2 +
4	MDI2 -
5	MDI3 +
6	MDI3 -
7	MDI4 +
8	MDI4 -



Refer to the table below for the LAN port LED definitions.

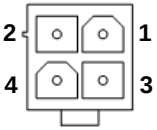
LED1		LED2	
Status	**Description**	**Status**	**Description**
Off	No Link	Off	10 Mb connection
On	Linked	Green	100 Mb connection
Blinking	Data Activity	Amber	1 Gb connection

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2.2 Onboard Connectors

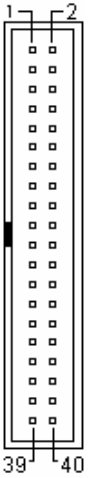
ATX 12V Power Connector (CN1)

Pin #	Signal
1	GND
2	GND
3	+12V DC
4	+12V DC



IDE Connector (CN3)

Pin #	Signal	Pin #	Signal
1	Reset	2	Ground
3	Data 7	4	Data 8
5	Data 6	6	Data 9
7	Data 5	8	Data 10
9	Data 4	10	Data 11
11	Data 3	12	Data 12
13	Data 2	14	Data 13
15	Data 1	16	Data 14
17	Data 0	18	Data 15
19	Ground	20	-
21	Request	22	Ground
23	I/O Write	24	Ground
25	I/O Read	26	Ground
27	I/O Ready	28	Cable Select
29	DMA Ack	30	Ground
31	Interrupt Request	32	No Connect
33	Device Address 1	34	ATA 66/100 Detect
35	Device Address 0	36	Device Address 2
37	Chip Select 1	38	Chip Select 3
39	Device Active	40	Ground



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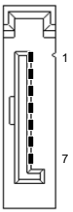
USB 2.0 Connector (CN9/14)

Pin #	Signal	Pin #	Signal
1	+5V	2	+5V
3	USB0-	4	USB1-
5	USB0+	6	USB01+
7	GND	8	GND
9	Key	10	NC



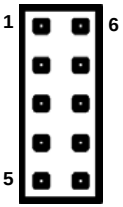
SATA0/1 Connectors (CN10/12)

Pin #	Signal
1	GND
2	TXP
3	TXN
4	GND
5	RXN
6	RXP
7	GND



COM1 Connector (CN13)

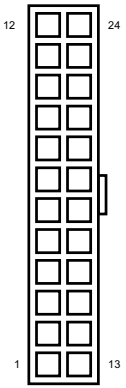
Pin #	Signal	Functions
1	DCD	Data Carrier Detect
2	RXD	Data Set Ready
3	TXD	Receive Data
4	DTR	Request to Send
5	Ground	Transmit Data
6	DSR	Clear to Send
7	RTS	Data Terminal Ready
8	CTS	Ring Indicate
9	RI	Ground
10	NC	No Connect



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ATX Power Connector (CN18)

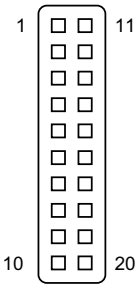
Pin #	Signal	Pin #	Signal
1	+3.3V	13	+3.3V
2	+3.3V	14	-12V
3	GND	15	GND
4	+5V	16	PS-ON#
5	GND	17	GND
6	+5V	18	GND
7	GND	19	GND
8	PWRGD	20	NC
9	+5VSB	21	+5V
10	+12V	22	+5V
11	+12V	23	+5V
12	24-pin detection	24	GND



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System Panel Connector (CN19)

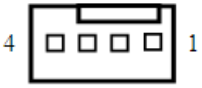
Pin #	Signal	Function	Pin Group
1	WDSPK	Speaker signal	Chassis Speaker
2	NC		
3	NC		
4	+5V	Power	
5	NC		
6	GND	Ground	Key Lock
7	KEYLOCK	Keyboard lock	
8	PLED	Power LED signal	Power LED
9	NC		
10	+5V	Power LED pull-up	
11	GND	Ground	RESET button
12	RESETBT	RESET signal	
13	NC		
14	GND	Ground	Power on button
15	POWERBT	Power-on signal	
16	NC		
17	NC		
18	HDDLED	Hard Disk LED signal	Hard Disk LED
19	+5V	Hard Disk LED pull-up	
20	NC		



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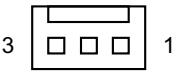
CPU Fan Connector (FN1)

Pin #	Signal
1	GND
2	Fan Power (+12V)
3	Fan Tachometer
4	NC



System Fan Connector (FNY1)

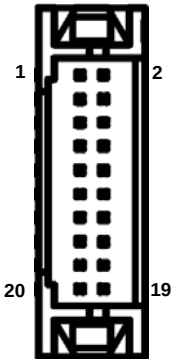
Pin #	Signal
1	GND
2	Fan Power (+12V)
3	Fan Tachometer



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LVDS Connector (J3)

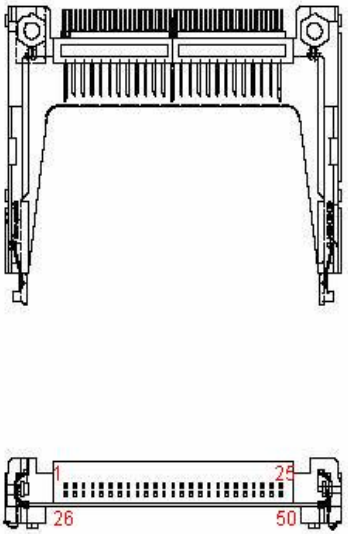
Pin #	Signal	Description
1	SHGND	Shield GND
2	VDD_PANEL	Disp Data Channel power
3	SHGND	Shield GND
4	VDD_PANEL	Disp Data Channel power
5	LVDS_D3N	Data port output
6	SHGND	Shield GND
7	LVDS_D3P	Data port output
8	SHGND	Shield GND
9	SHGND	Shield GND
10	LVDS_D0N	Data port output
11	LVDS_CLK1P	Clock port output
12	LVDS_D0P	Data port output
13	LVDS_CLK1N	Clock port output
14	SHGND	Shield GND
15	SHGND	Shield GND
16	LVDS_D1N	Data port output
17	LVDS_D2P	Data port output
18	LVDS_D1P	Data port output
19	LVDS_D2N	Data port output
20	SHGND	Shield GND



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CompactFlash Connector (CN4 on bottom side)

Signal Name	Pin#	Pin#	Signal Name
GND	1	26	CD1
CF_D3	2	27	CF_D11
CF_D4	3	28	CF_D12
CF_D5	4	29	CF_D13
CF_D6	5	30	CF_D14
CF_D7	6	31	CF_D15
CF_CS0	7	32	CF_CS1
GND	8	33	GND
GND	9	34	CF_DIOR-L
GND	10	35	CF_DIOW-L
GND	11	36	P3V3
GND	12	37	CNCF_IORDY
P3V3	13	38	P3V3
GND	14	39	PCSEL
GND	15	40	NC
GND	16	41	CF_RESET
GND	17	42	N/C
CF_A2	18	43	N/C
CF_A1	19	44	P3V3
CF_A0	20	45	N/C
CF_D0	21	46	N/C
CF_D1	22	47	CF_D8
CF_D2	23	48	CF_D9
N/C	24	49	CF_D10
CD2	25	50	GND



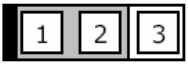
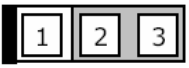
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2.3 Jumpers

Clear CMOS Jumper (JP2)

The CMOS RAM data contains the date / time and BIOS setting information. CMOS is powered by the onboard button cell battery. To erase the CMOS RAM data:

1. Unplug the MI-960
2. Short the JP1 pin 2-3
3. Turn the power on. After power on, remove the jumper cap from pins 2-3 and reinstall it to pins 1-2.

RTC status	Connection	JP2
Normal	1 – 2	
Clear CMOS	2 – 3	

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3 Getting Started

This chapter provides information on how to install components to the MI-960 SBC. Specifically, the installation of CPU, memory modules, and operating system are explained.

3.1 Installing the CPU

The MI-960 Supports the Intel® Core™2 Quad/Duo, Intel® Pentium® Dual-Core, Intel® Pentium® 4, Intel® Celeron®, and Intel® Celeron® D processors via the surface mount LGA775 socket (Socket T).

WARNING:

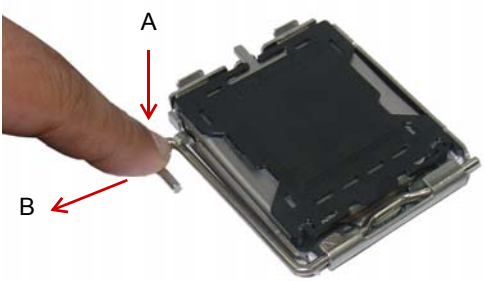
Disconnect all power supply to the board before installing a CPU to prevent damaging the board and CPU.

Do not touch socket contacts. Damaging the contacts voids the product warranty. Follow the installation instructions carefully to avoid damaging to motherboard components.



To install the CPU:

1. Press the load lever (A), then disengage it from the retention tab (B).



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2. Lift and rotate the load lever to a 135° angle



3. Lift the load plate to a 100° angle using your thumb and forefinger

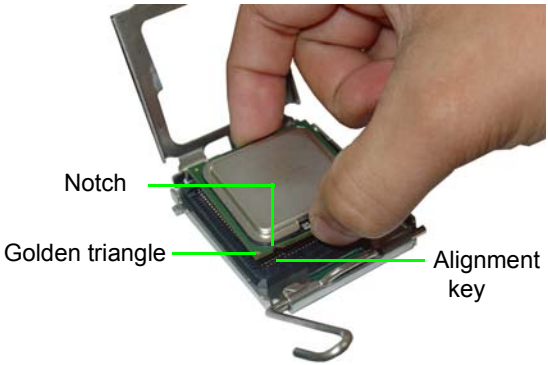


4. Use your thumb to push and remove the protective socket cover (plastic) from the load plate



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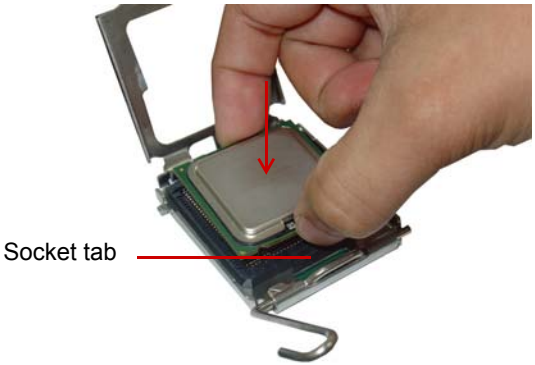
5. Position the CPU over the socket, then match the notches on the CPU side with the alignment keys on the socket. The golden triangle on the CPU must be positioned on the bottom-left corner of the socket .



WARNING:

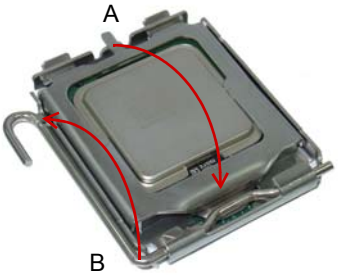
The CPU fits the socket in only one orientation. DO NOT force it into the socket to avoid damaging it.

6. Carefully place the CPU on the socket in a vertical motion. The socket has tabs that accommodate your fingers during installation .



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7. Close the load plate (A), then fasten the load lever on the retention tab (B) .



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3.2 Memory Module Installation

The MI-960 supports up to 4 GB of DDR2 533/667/800 SDRAM in two 240-pin DIMM sockets. The DDR2 memory modules are notched to facilitate correct installation in the DIMM sockets.

WARNING:

Disconnect all power supply to the board before installing a memory module to prevent damaging the board and memory module .

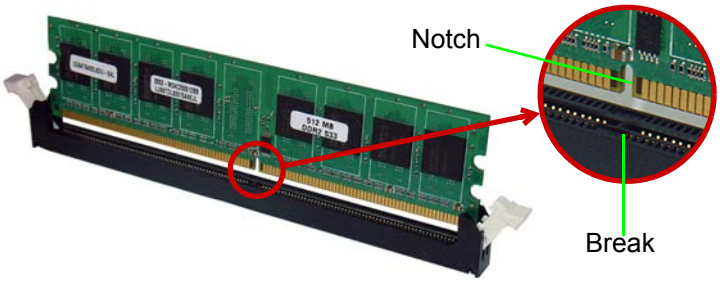
- It is recommended that you install DIMMs with the same CAS latency. For maximum compatibility, install memory modules with the same brand, model, and/or rating.

To install a memory module:

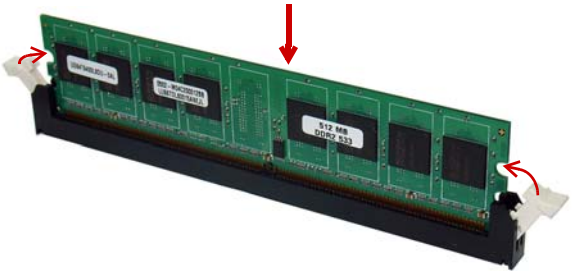
1. Locate the DIMM slots on the motherboard.
2. Press the socket's retaining clips outward to unlock.



3. Align the memory module on the socket making sure that the notch matches the break on the socket.



4. Insert the module firmly into the slot until the retaining clips snap back inwards and the module is securely seated.



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3.3 Driver Installation

The MI-960 drivers are located in the following directories on the Driver DVD, or can be downloaded from the ADLINK website (**http://www.adlinktech.com**):

Chipset driver	X:\Industrial Motherboard\MI-960\Chipset
Display driver	X:\Industrial Motherboard\MI-960\VGA\Windows XP
LAN1 (Intel)	X:\Industrial Motherboard\MI-960\Ethernet\Intel\Windows XP
LAN2 (Marvell)	X:\Industrial Motherboard\MI-960\Ethernet\Marvel\Windows XP
Audio driver	X:\Industrial Motherboard\MI-960\Audio\Windows XP

Follow the instructions below to install the required MI-960 drivers:

1. Install the Windows operating system before installing any driver. Most standard I/O device drivers are installed during Windows installation.
2. Install the **Chipset driver** by running the program **X:\Industrial Motherboard\MI-960\Chipset\infinst_autol.exe**. Follow the instructions given and reboot when instructed.
3. Install the **Display driver** and utilities by running the program **X:\Industrial Motherboard\MI-960\VGA\Windows XP\winxp_14331.exe**. Follow the instructions given and reboot when instructed.
4. Install the **LAN1 driver (Intel)** by running the program **X:\Industrial Motherboard\MI-960\Ethernet\Intel\Windows XP\PRO2KXP.exe**. Follow the instructions given and reboot if required.
5. Install the **LAN2 driver (Marvell)** by running the program **X:\Industrial Motherboard\MI-960\Ethernet\Marvel\setup.exe** . Follow the instructions given and reboot if required.
6. Install the Audio driver by running the program **X:\Industrial Motherboard\MI-960\Audio\Windows XP\WDM_R193.exe**. Follow the instructions given and reboot if required.

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4 BIOS Setup

The following chapter describes basic navigation for the AMIBIOS®8 BIOS setup utility.

4.1 Starting the BIOS

To enter the setup screen, follow these steps:

1. Power on the motherboard
2. Press the < Delete > key on your keyboard when you see the following text prompt:
   < Press DEL to run Setup >
3. After you press the < Delete > key, the main BIOS setup menu displays. You can access the other setup screens from the main BIOS setup menu, such as Chipset and Power menus.



Note: In most cases, the < Delete > key is used to invoke the setup screen. There are several cases that use other keys, such as < F1 >, < F2 >, and so on.

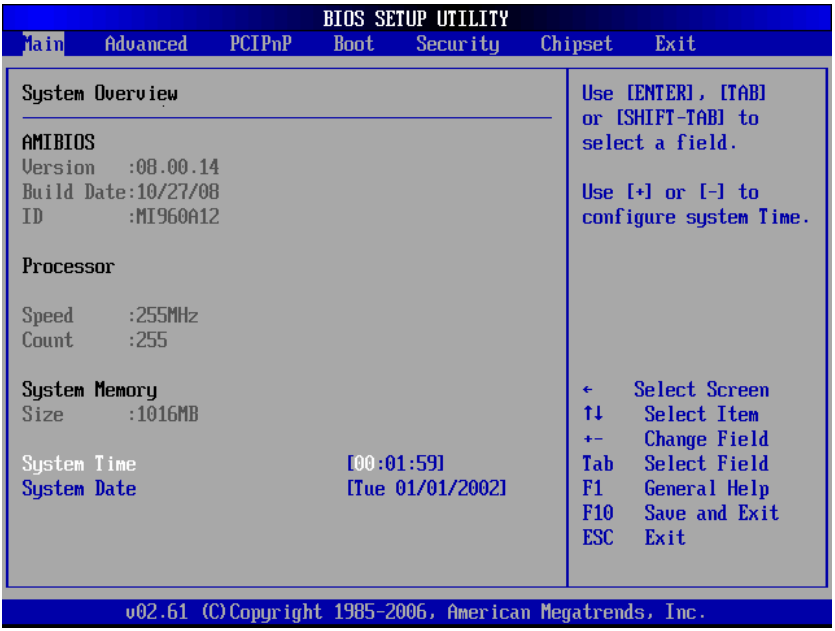
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Setup Menu

The main BIOS setup menu is the first screen that you can navigate. Each main BIOS setup menu option is described in this user's guide.

The Main BIOS setup menu screen has two main frames. The left frame displays all the options that can be configured. "Grayed" options cannot be configured, "Blue" options can be.

The right frame displays the key legend. Above the key legend is an area reserved for a text message. When an option is selected in the left frame, it is highlighted in white. Often a text message will accompany it.

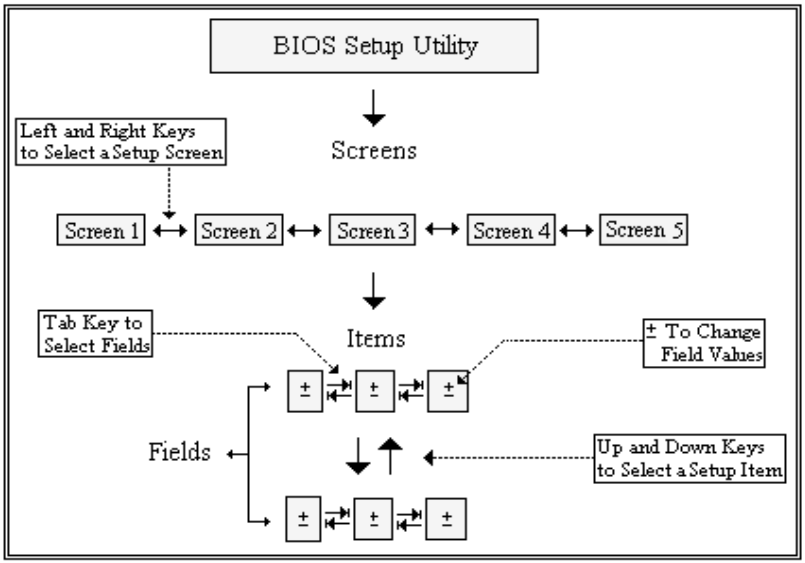


Navigation

The BIOS setup/utility uses a key-based navigation system called hot keys. Most of the BIOS setup utility hot keys can be used at any time during the setup navigation process.

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These keys include < F1 >, < F10 >, < Enter >, < ESC >, < Arrow > keys, and so on. .



Note: There is a hot key legend located in the right frame on most setup screens.

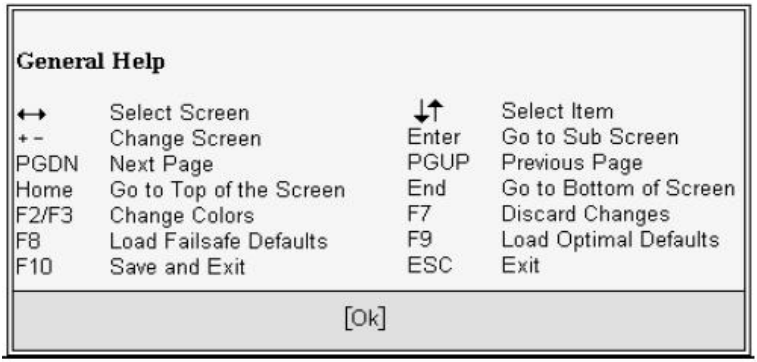
The < F8 > key on your keyboard is the Fail-Safe key. It is not displayed on the key legend by default. To set the Fail-Safe settings of the BIOS, press the < F8 > key on your keyboard. It is located on the upper row of a standard 101 keyboard. The Fail-Safe settings allow the motherboard to boot up with the least amount of options set. This can lessen the probability of conflicting settings.

Hotkey Descriptions

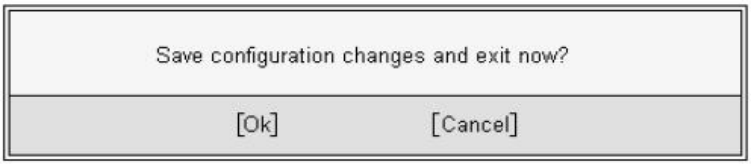
F1 The < F1 > key allows you to display the General Help screen.

Press the < F1 > key to open the General Help screen.

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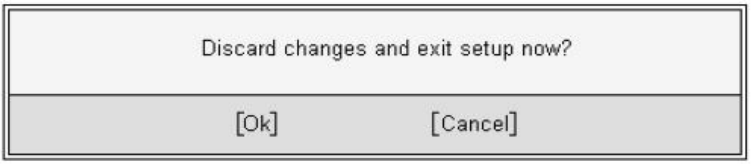


F10 The < F10 > key allows you to save any changes you have made and exit Setup. Press the < F10 > key to save your changes. The following screen will appear:



Press the < Enter > key to save the configuration and exit. You can also use the < Arrow > key to select Cancel and then press the < Enter > key to abort this function and return to the previous screen.

ESC The < Esc > key allows you to discard any changes you have made and exit the Setup. Press the < Esc > key to exit the setup without saving your changes. The following screen will appear:



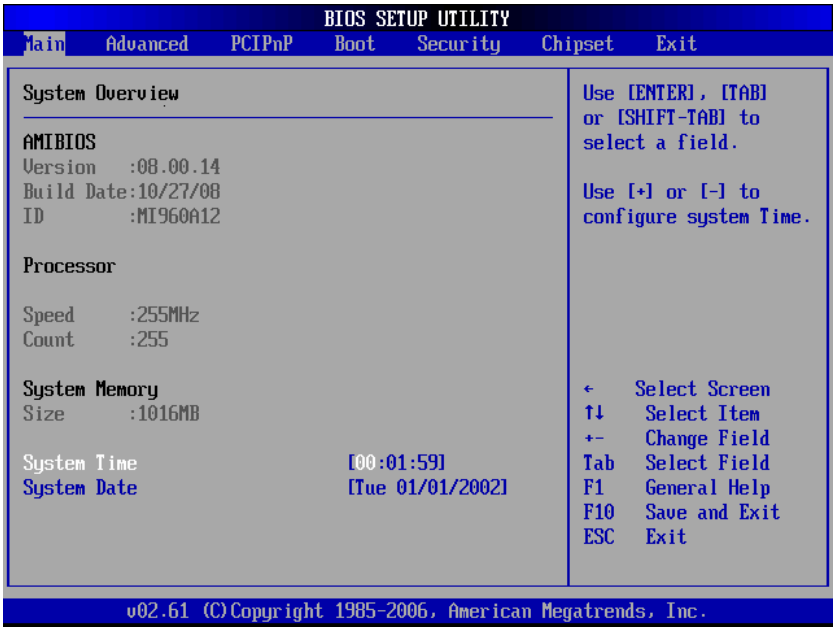
Press the < Enter > key to discard changes and exit. You can also use the < Arrow > key to select Cancel and then press the < Enter > key to abort this function and return to the previous screen.

Enter The < Enter > key allows you to display or change the setup option listed for a particular setup item. The < Enter > key can also allow you to display the setup sub-screens.

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4.2 Main Setup

When you first enter the Setup Utility, you will enter the Main setup screen. You can always return to the Main setup screen by selecting the Main tab. There are two Main Setup options. They are described in this section. The Main BIOS Setup screen is shown below.



System Time/System Date

Use this option to change the system time and date. Highlight System Time or System Date using the < Arrow > keys. Enter new values using the keyboard. Press the < Tab > key or the < Arrow > keys to move between fields. The date must be entered in MM/DD/YY format. The time is entered in HH:MM:SS format.

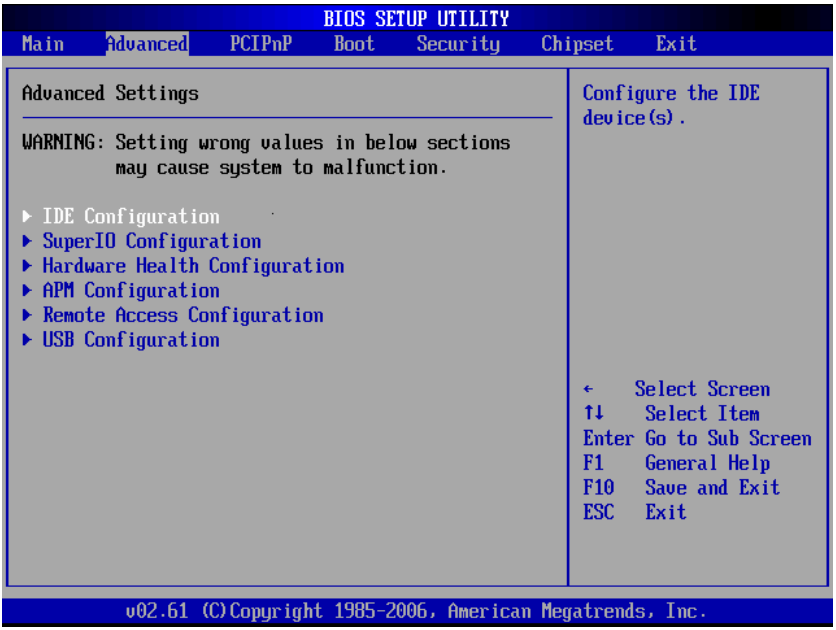
Note: The time is in 24-hour format. For example, 5:30 A.M. appears as 05:30:00, and 5:30 P.M. as 17:30:00.

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4.3 Advanced BIOS Setup

Select the Advanced tab from the setup screen to enter the Advanced BIOS Setup screen. You can select any of the items in the left frame of the screen, such as SuperIO Configuration, to go to the sub menu for that item. You can display an Advanced BIOS Setup option by highlighting it using the < Arrow > keys. The Advanced BIOS Setup screen is shown below.

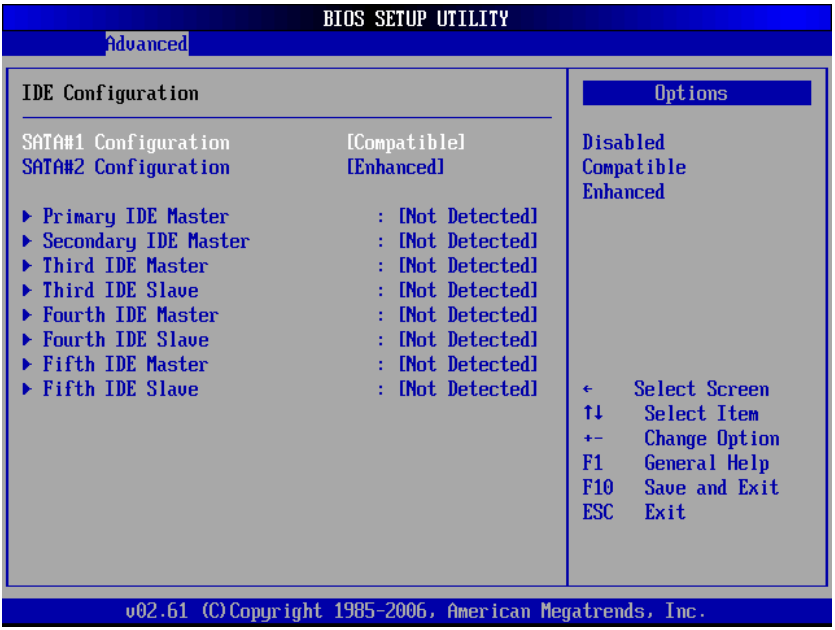
The sub menus are described on the following pages.



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4.3.1 IDE Configuration

You can use this screen to select options for the IDE Configuration Settings. Use the up and down < Arrow > keys to select an item. Use the < + > and < - > keys to change the value of the selected option. A description of the selected item appears on the right side of the screen. The settings are described on the following pages. An example of the IDE Configuration screen is shown below.



SATA Configuration

This item specifies which mode the SATA channels should be initialized in. The settings are **Disabled**, **Compatible** and **Enhanced**. When running in Compatible mode, SATA channel can be configured as a legacy IDE channel.

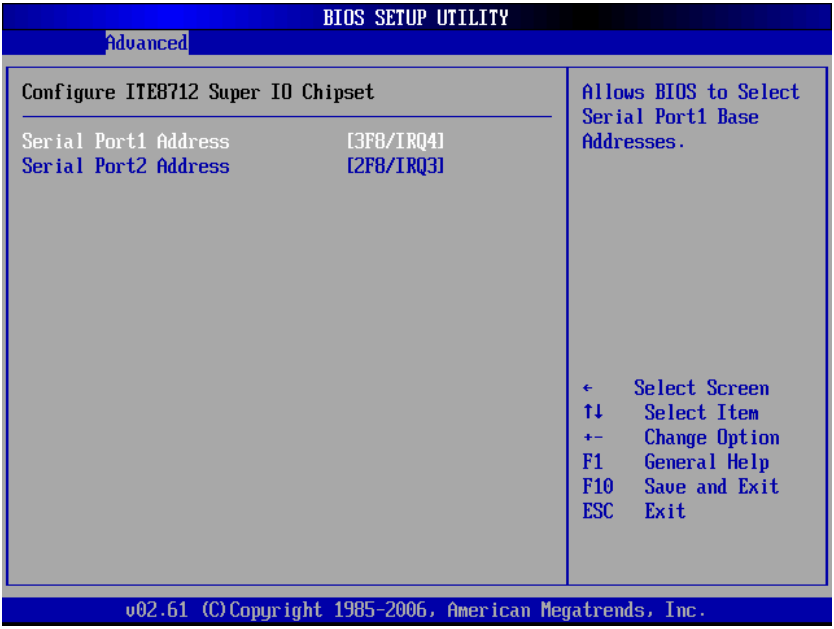
IDE Master/Slave

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

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4.3.2 Super IO Configuration

You can use this screen to select options for the Super IO settings. Use the up and down < Arrow > keys to select an item. Use the < + > and < - > keys to change the value of the selected option. The settings are described on the following pages. The screen is shown below.



Serial Port1 Address

Select an address and a corresponding interrupt for Serial Port1.

Options: 3F8/IRQ4, 3E8/IRQ4, 2F8/IRQ3, 2E8/IRQ3.

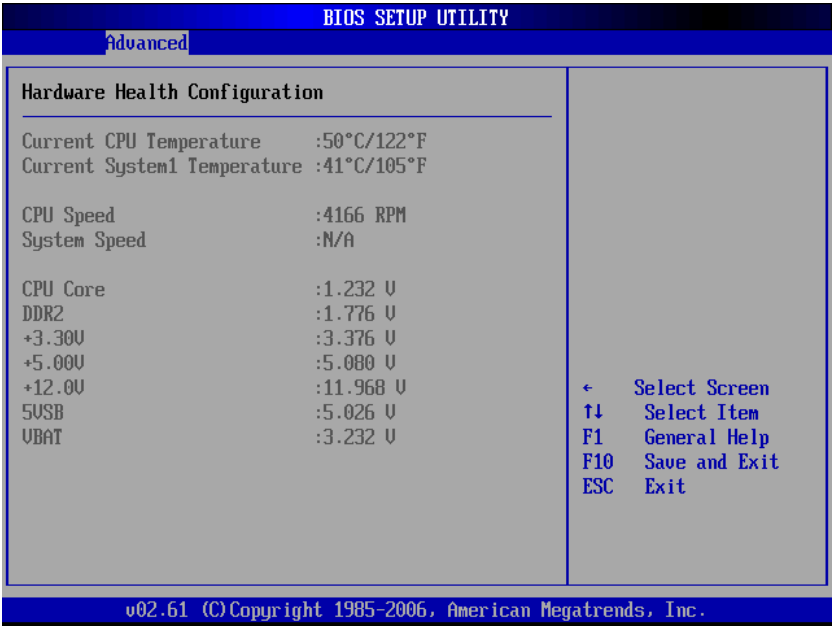
Serial Port2 Address

This option specifies the base I/O port address and Interrupt Request address of Serial Port2. The settings of Serial Port2 are the same as Serial Port1. However, the setting used by Serial Port1 will not be available for Serial Port2. For example, if Serial Port1 uses 3F8/IRQ4, the option, the 3F8/IRQ4 will not appear in the options of Serial Port2.

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4.3.3 Hardware Health Configuration

This option displays the current status of all of the monitored hardware devices / components such as voltages and temperatures.



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4.3.4 APM / Resume Event Configuration

You can use this screen to select options for APM/Resume Event Configuration. Use the up and down < Arrow > keys to select an item. Use the < + > and < - > keys to change the value of the selected option.

APM Configuration

Power Button Mode

This option specifies the effect when the power button pressed (On, Off, or Suspend).

- **On/Off:** System go into power down mode when power button pressed.
- **Suspend:** System go into suspend mode when power button pressed.

Advanced Resume Event Controls

Resume On PME#

This field specifies if a RI/PCI PME# event will generate a system wake event. The options are Enabled and Disabled.

Resume On RTC Alarm

Allows you to enable or disabled the RTC to generate a wake event. When this item is set to Enabled, the item RTC Alarm Date, RTC Alarm Hour, RTC Alarm Minute, and RTC Alarm Second appear with set values.

Restore on AC Power Loss

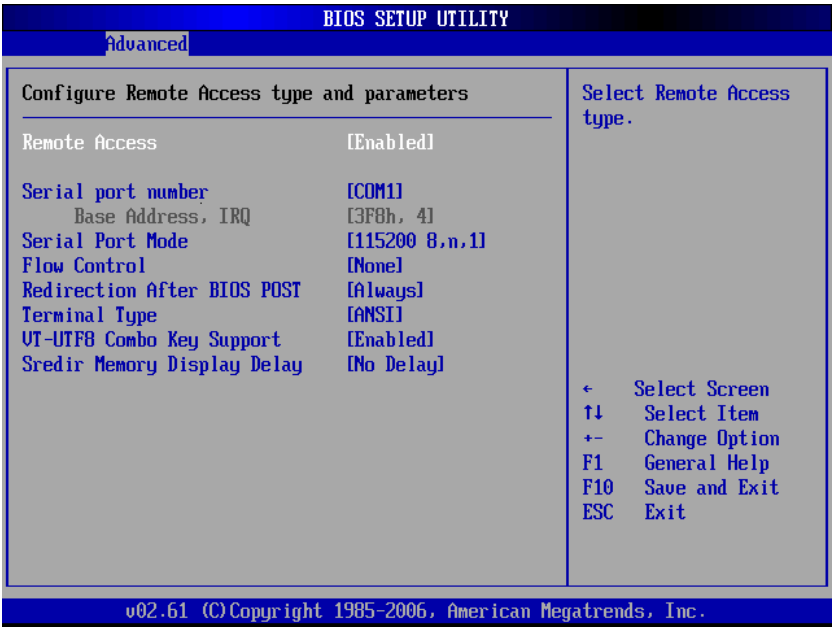
Determines which state the computer enters when AC power is restored after a power loss. The options for this value are Last State, Power On and Power Off.

- **Power Off:** Set this value to always power off the system while AC power is restored.
- **Power On:** Set this value to always power on the system while AC power is restored.
- **Last State:** Set this value to power off/on the system depending on the last system power state while AC power is restored.

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4.3.5 Remote Access Configuration

Remote access configuration provides the settings to allow remote access by another computer to get POST messages and send commands through serial port access.



Remote Access

Select this option to Enable or Disable the BIOS remote access feature.

Note: Enabling Remote Access requires a dedicated serial port connection. Once both serial ports are configured to disabled, you should set this value to Disabled or it may cause abnormal boot.

Serial Port Number

Select the serial port you want to use for the remote access interface. You can set the value for this option to COM1 or COM2.

Note: If you have changed the resource assignment of the serial ports in Advanced> SuperIO Configuration, you must Save Changes and Exit, reboot the system, and enter the setup menu again in order to see those changes reflected in the available Remote Access options.

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Serial Port Mode

Select the baud rate you want the serial port to use for console redirection. The options are **115200 8,n,1**; **57600 8,n,1**; **19200 8,n,1**; and **09600 8,n,1**.

Flow Control

Set this option to select Flow Control for console redirection. The settings for this value are None, Hardware, or Software.

Redirection After BIOS POST

This option allows you to set Redirection configuration after BIOS POST. The settings for this value are Disabled, Boot Loader, or Always.

- **Disabled:** Set this value to turn off the redirection after POST
- **Boot Loader:** Set this value to allow the redirection to be active during POST and Boot Loader.
- **Always:** Set this value to allow the redirection to be always active.

Terminal Type

This option is used to select either VT100/VT-UTF8 or ANSI terminal type. The settings for this value are **ANSI**, **VT100**, or **VT-UTF8**.

VT-UTF8 Combo Key Support

This option enables VT-UTF8 Combination Key Support for ANSI/VT100 terminals. The settings for this value are Enabled or Disabled.

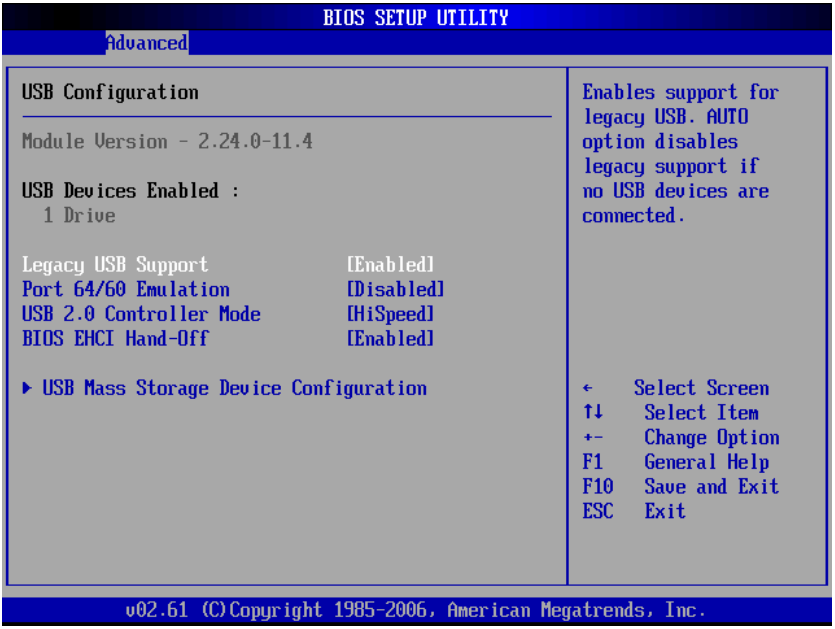
Sredir Memory Display Delay

This option gives the delay in seconds to display memory information. The options for this value are **No Delay**, **Delay 1 Sec**, **Delay 2 Sec**, or **Delay 4 Sec**.

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4.3.6 USB Configuration

You can use this screen to select options for the USB Configuration. Use the up and down < Arrow > keys to select an item. Use the < + > and < - > keys to change the value of the selected option. The settings are described on the following pages. The screen is shown below.



Legacy USB Support

Legacy USB Support refers to USB mouse and keyboard support. Normally if this option is not enabled, any attached USB mouse or USB keyboard will not become available until a USB compatible operating system is fully booted with all USB drivers loaded. When this option is enabled, any attached USB mouse or USB keyboard can control the system even when there are no USB drivers loaded on the system. Set this value to enable or disable the Legacy USB Support.

- **Disabled:** Set this value to prevent the use of any USB device in DOS or during system boot.

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- **Enabled:** Set this value to allow the use of USB devices during boot and while using DOS.
- **Auto:** This option auto detects USB Keyboards or Mice and if found, allows them to be utilized during boot and while using DOS.

Port 64/60 Emulation

This option uses USB to receive the IO port 64/60 trap to emulate the legacy keyboard controller.

USB 2.0 Controller Mode

The USB 2.0 Controller Mode configures the data rate of the USB port. The options are FullSpeed (12 Mbps) and HiSpeed (480 Mbps).

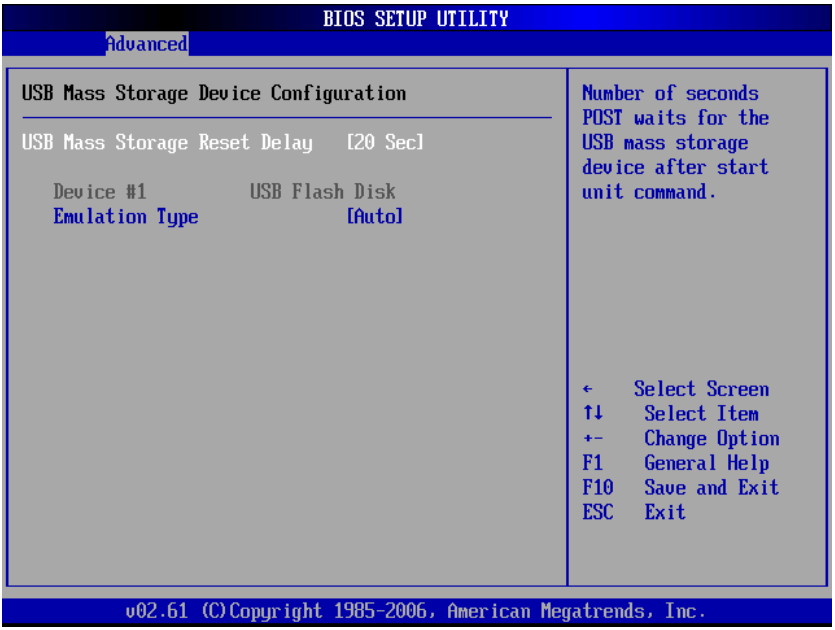
BIOS EHCI hand-off

This option provides a workaround for operating systems without ECHI hand-off support. The EHCI ownership change should claim by EHCI driver.

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USB Mass Storage Device Configuration

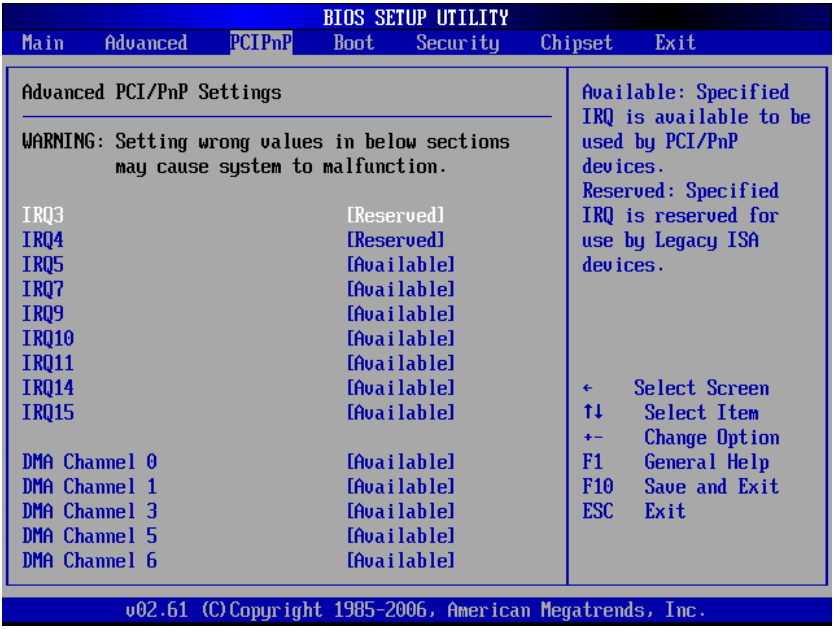
This is a submenu for configuring the USB Mass Storage Class Devices when BIOS finds they are in use on USB ports. Emulation Type can be set according to the type of attached USB mass storage device(s). If set to Auto, USB devices less than 530MB will be emulated as Floppy and those greater than 530MB will remain as hard drive. The Forced FDD option can be used to force a hard disk type drive (such as a Zip drive) to boot as FDD.



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4.4 Advanced PCI/PnP Settings

Select the PCI/PnP tab from the setup screen to enter the Plug and Play BIOS Setup screen. You can display a Plug and Play BIOS Setup option by highlighting it using the < Arrow > keys. The Plug and Play BIOS Setup screen is shown below.



4.4.1 IRQ/DMA

Set this value to allow the IRQ settings to be modified.

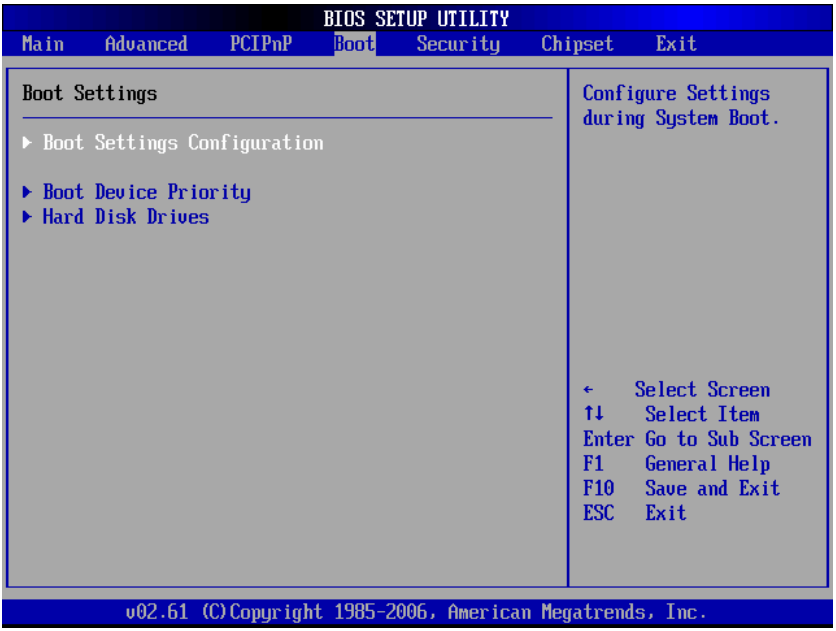
Available – This setting allows the specified IRQ/DMA to be used by a PCI/PnP device.

Reserved – This setting allows the specified IRQ/DMA to be used by a legacy ISA device.

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4.5 Boot Settings

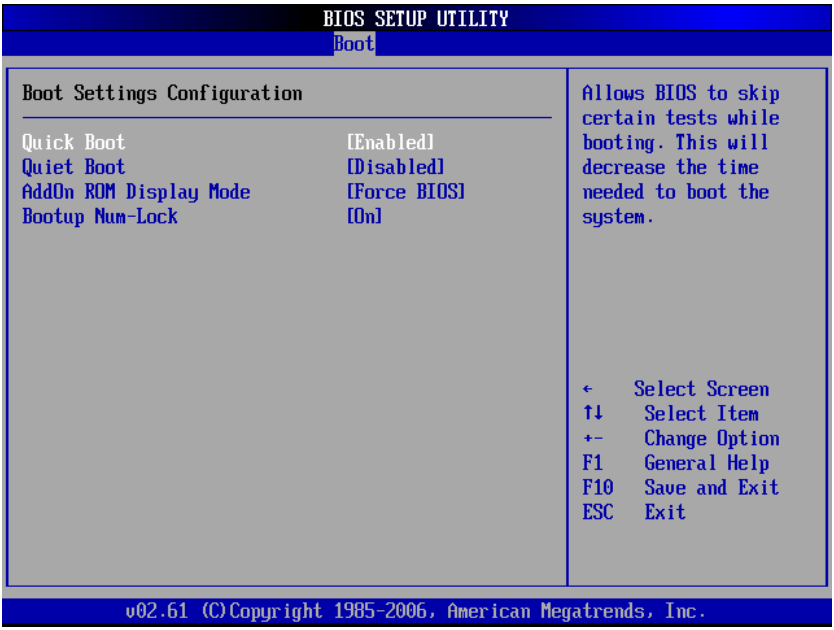
Select the Boot tab from the setup screen to enter the Boot BIOS Setup screen. You can select any of the items in the left frame of the screen, such as Boot Device Priority, to go to the sub menu for that item. You can display a Boot BIOS Setup option by highlighting it using the < Arrow > keys. The Boot Settings screen is shown below:



4.5.1 Boot Settings Configuration

Use this screen to select options for the Boot Settings Configuration. Use the up and down <Arrow> keys to select an item. Use the < + > and < - > keys to change the value of the selected option. The settings are described on the following pages. The screen is shown below.

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Quick Boot

Enabling this setting will cause the BIOS power-on self test routine to skip some of its tests during bootup for faster system boot.

Quiet Boot

When this feature 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.

AddOn ROM Display Mode

This BIOS feature controls the display of ROM messages from the BIOS of add-on devices like the graphics cards or the SATA controllers during the boot sequence.

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When set to **Force BIOS**, AddOn ROM messages will be forced to display during the boot sequence.

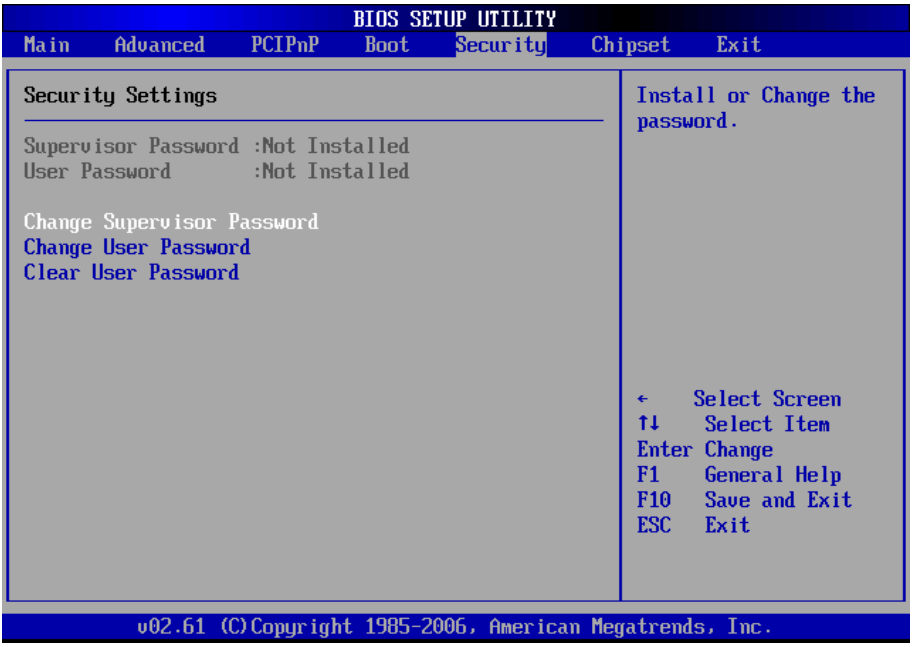
When set to **Keep Current**, AddOn ROM messages will only be displayed if the third-party manufacturer had set the add-on device to do so.

Bootup Num-Lock

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.

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4.6 Security Setup



Password Support

Two Levels of Password Protection

Provides both a Supervisor and a User password. If you use both passwords, the Supervisor password must be set first.

The system can be configured so that all users must enter a password every time the system boots or when Setup is executed, using either or either the Supervisor password or User password.

The Supervisor and User passwords activate two different levels of password security. If you select password support, you are prompted for a one to six character password. Type the password on the keyboard. The password does not appear on the screen when typed. Make sure you write it down. If you forget it, you must drain NVRAM and re-configure.

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Remember the Password

Keep a record of the new password when the password is changed. If you forget the password, you must erase the system configuration information in NVRAM.

To access the sub menu for the following items, select the item and press < Enter >:

- Change Supervisor Password
- Change User Password
- Clear User Password

Supervisor Password

Indicates whether a supervisor password has been set.

User Password

Indicates whether a user password has been set.

Change Supervisor Password

Select this option and press < Enter > to access the sub menu. You can use the sub menu to change the supervisor password.

Change User Password

Select this option and press < Enter > to access the sub menu. You can use the sub menu to change the user password.

Clear User Password

Select this option and press < Enter > to access the sub menu. You can use the sub menu to clear the user password.

Change Supervisor Password

Select Change Supervisor Password from the Security Setup menu and press < Enter >.

Enter New Password:

Type the password and press < Enter >. The screen does not display the characters entered. Retype the password as prompted

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and press < Enter >. If the password confirmation is incorrect, an error message appears. The password is stored in NVRAM after completes.

Change User Password

Select Change User Password from the Security Setup menu and press < Enter >.

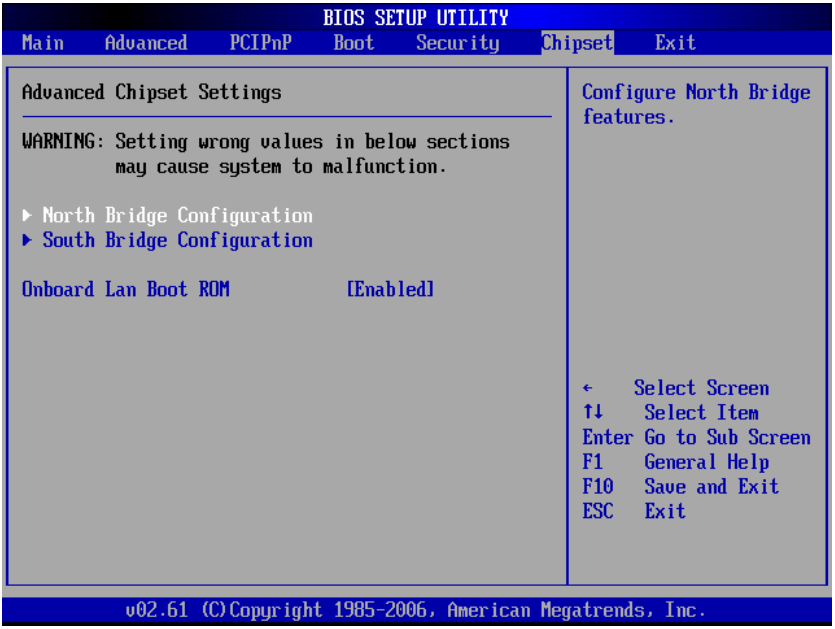
Enter New Password:

Type the password and press < Enter >. The screen does not display the characters entered. Retype the password as prompted and press < Enter >. If the password confirmation is incorrect, an error message appears. The password is stored in NVRAM after completes.

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4.7 Chipset Setup

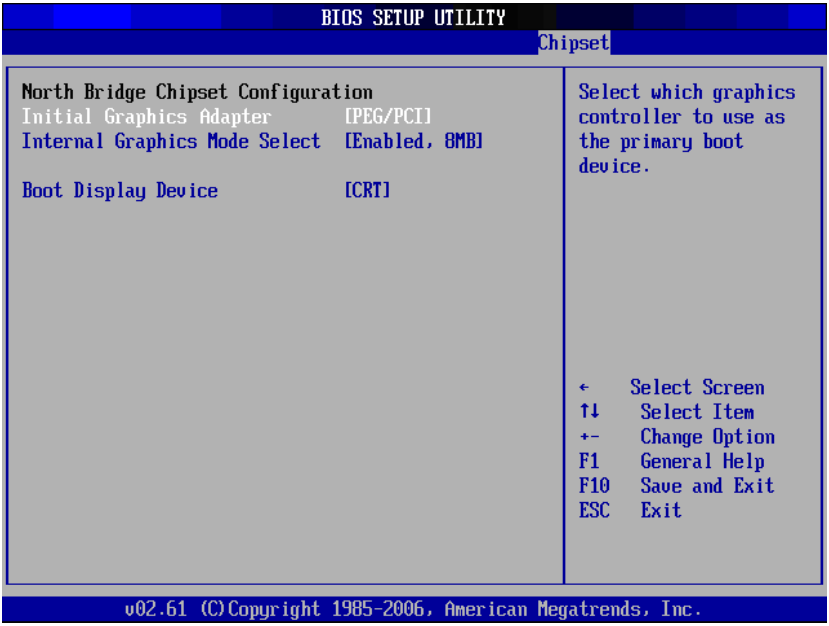
Select the Chipset tab from the setup screen to enter the Chipset BIOS Setup screen. You can select any of the items in the left frame of the screen to go to the sub menu for that item. The Chipset BIOS Setup screen is shown below.



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4.7.1 North Bridge Configuration

You can use this screen to select options for the North Bridge Configuration. Use the up and down <Arrow> keys to select an item. Use the < + > and < - > keys to change the value of the selected option.



Initial Graphics Adapter

This item is select which graphics controller to use as the primary boot device. Options:

IGD: Use north bridge Internal Graphics Devices (IGD).

PCI/IGD: First use PCI display card, if not present, then use IGD.

PCI/PEG: First use PCI display card, if not present then use PCIe display card.

PEG/IGD: First use PCIe display card, if not present then use IGD.

PEG/PCI: First use PCIe display card, if not present then use PCI display card.

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Internal Graphics Mode Select

This item specifies the amount of system memory used by the Internal Graphics Device. Options: **Enabled 8M**, **Enabled 1M** and **Disabled**.

Boot Display Device

This item specifies which display port will turn on at bootup. Options:

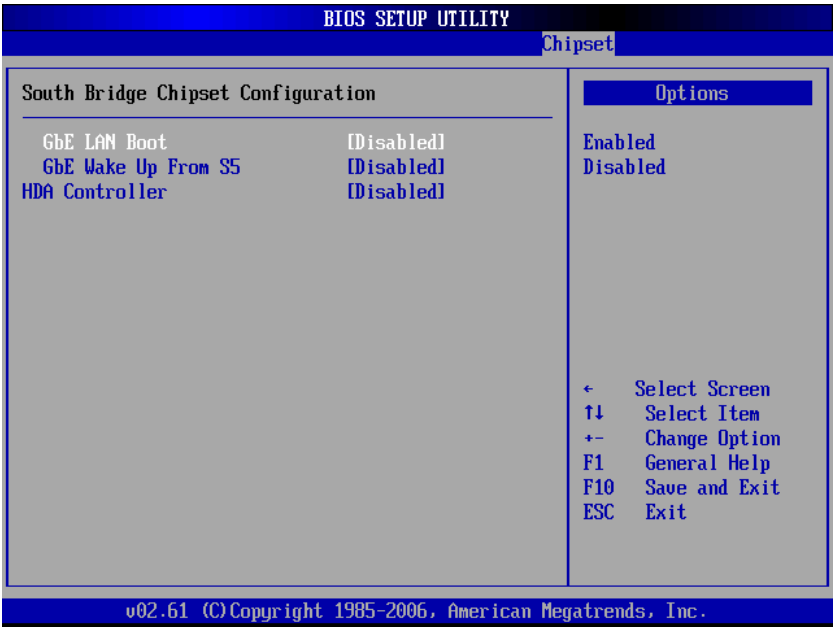
CRT: Turn on CRT.

CRT & LFP: Turn on CRT and LFP.

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4.7.2 South Bridge Configuration

You can use this screen to select options for the South Bridge Configuration. Use the up and down <Arrow> keys to select an item. Use the < + > and < - > keys to change the value of the selected option.



GbE LAN Boot

Invoke the onboard LAN's PXE ROM to enable boot from LAN. The options are Enabled and Disabled.

GbE Wake Up From S5

Set onboard LAN boot wake up from power down mode. The options are Enabled and Disabled.

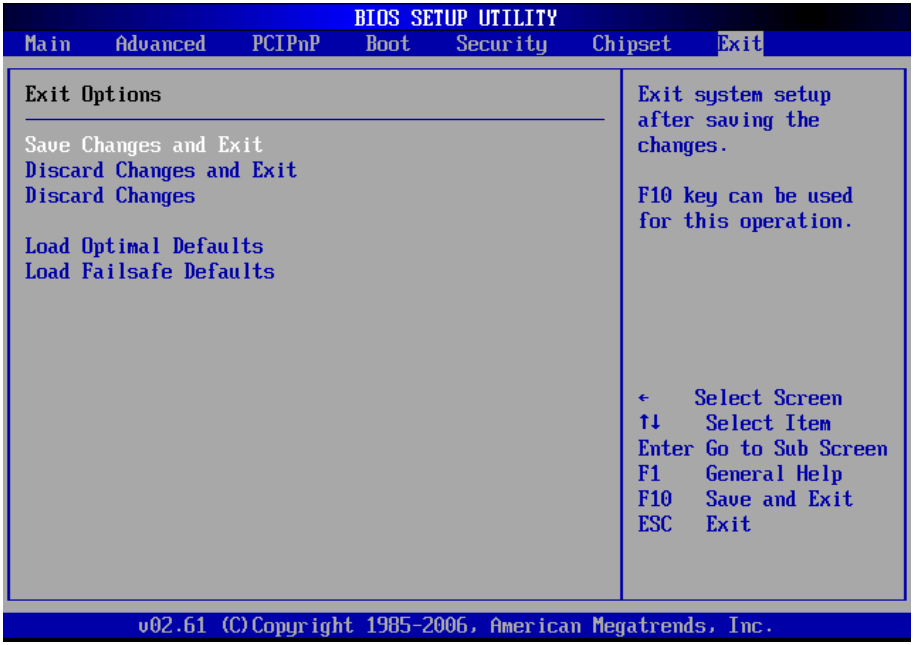
HDA Controller

Set this value to Enable/Disable the HDA Controller.

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4.8 Exit Menu

Select the Exit tab from the setup screen to enter the Exit BIOS Setup screen. You can display an Exit BIOS Setup option by high-lighting it using the < Arrow > keys. The Exit BIOS Setup screen is shown below.



Save Changes and Exit

When you have completed the system configuration changes, select this option to leave Setup and reboot the computer so the new system configuration parameters can take effect.

Save Configuration Changes and Exit Now?

[Ok] [Cancel]

appears in the window. Select Ok to save changes and exit.

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Discard Changes and Exit

Select this option to quit Setup without making any permanent changes to the system configuration.

Discard Changes and Exit Setup Now?

[Ok] [Cancel]

appears in the window. Select Ok to discard changes and exit.

Discard Changes

Select Discard Changes from the Exit menu and press < Enter >.

Select Ok to discard changes.

Load Optimal Defaults

Automatically sets all Setup options to a complete set of default settings when you select this option. The Optimal settings are designed for maximum system performance, but may not work best for all computer applications. In particular, do not use the Optimal Setup options if your computer is experiencing system configuration problems.

Select Load Optimal Defaults from the Exit menu and press < Enter >.

Select Ok to load optimal defaults.

Load Failsafe Defaults

Automatically sets all Setup options to a complete set of default settings when you select this option. The Failsafe settings are designed for maximum system stability, but not maximum performance. Select the FailSafe Setup options if your computer is experiencing system configuration problems.

Select Load Fail-Safe Defaults from the Exit menu and press < Enter >.

Load FailSafe Defaults?

[Ok] [Cancel]

appears in the window. Select Ok to load FailSafe defaults.

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5 POST Codes

The POST code checkpoints are the largest set of checkpoints during the BIOS pre-boot process. The following table describes the type of checkpoints that may occur during the POST portion of the BIOS.

Note that checkpoints may differ between different platforms based on system configuration. Checkpoints may change due to vendor requirements, system chipset or option ROMs from add-in PCI devices.

5.1 Post Code Checkpoints

Checkpoint	Description
03	Disable NMI, Parity, video for EGA, and DMA controllers. Initialize BIOS, POST, Runtime data area. Also initialize BIOS modules on POST entry and GPNV area. Initialized CMOS as mentioned in the Kernel Variable "wCMOSFlags."
04	Check CMOS diagnostic byte to determine if battery power is OK and CMOS checksum is OK. Verify CMOS checksum manually by reading storage area. If the CMOS checksum is bad, update CMOS with power-on default values and clear passwords. Initialize status register A. Initializes data variables that are based on CMOS setup questions. Initializes both the 8259 compatible PICs in the system
05	Initializes the interrupt controlling hardware (generally PIC) and interrupt vector table.
06	Do R/W test to CH-2 count reg. Initialize CH-0 as system timer. Install the POSTINT1Ch handler. Enable IRQ-0 in PIC for system timer interrupt. Traps INT1Ch vector to "POSTINT1ChHandlerBlock."
07	Fixes CPU POST interface calling pointer.
08	Initializes the CPU. The BAT test is being done on KBC.Program the keyboard controller command byte is being done after Auto detection of KB/MS using AMI KB-5.
C0	Early CPU Init Start -- Disable Cache – Init Local APIC
C1	Set up boot strap processor Information
C2	Set up boot strap processor for POST
C5	Enumerate and set up application processors

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Checkpoint	Description
C6	Re-enable cache for boot strap processor
C7	Early CPU Init Exit
0A	Initializes the 8042 compatible Key Board Controller.
0B	Detects the presence of PS/2 mouse.
0C	Detects the presence of Keyboard in KBC port.
0E	Testing and initialization of different Input Devices. Also, update the Kernel Variables. Traps the INT09h vector, so that the POST INT09h handler gets control for IRQ1. Uncompress all available language, BIOS logo, and Silent logo modules.
13	Early POST initialization of chipset registers.
20	Relocate System Management Interrupt vector for all CPU in the system.
24	Uncompress and initialize any platform specific BIOS modules. GPNV is initialized at this checkpoint.
2A	Initializes different devices through DIM. See *DIM Code Checkpoints* section of document for more information.
2C	Initializes different devices. Detects and initializes the video adapter installed in the system that have optional ROMs.
2E	Initializes all the output devices.
31	Allocate memory for ADM module and uncompress it. Give control to ADM module for initialization. Initialize language and font modules for ADM. Activate ADM module.
33	Initializes the silent boot module. Set the window for displaying text information.
37	Displaying sign-on message, CPU information, setup key message, and any OEM specific information.
38	Initializes different devices through DIM. See *DIM Code Checkpoints* section of document for more information. USB controllers are initialized at this point.
39	Initializes DMAC-1 & DMAC-2.
3A	Initialize RTC date/time.
3B	Test for total memory installed in the system. Also, Check for DEL or ESC keys to limit memory test. Display total memory in the system.
3C	Mid POST initialization of chipset registers.

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Checkpoint	Description
40	Detect different devices (Parallel ports, serial ports, and coprocessor in CPU, … etc.) successfully installed in the system and update the BDA, EBDA…etc.
52	Updates CMOS memory size from memory found in memory test. Allocates memory for Extended BIOS Data Area from base memory. Programming the memory hole or any kind of implementation that needs an adjustment in system RAM size if needed.
60	Initializes NUM-LOCK status and programs the KBD typematic rate.
75	Initialize Int-13 and prepare for IPL detection.
78	Initializes IPL devices controlled by BIOS and option ROMs.
7C	Generate and write contents of ESCD in NVRam.
84	Log errors encountered during POST.
85	Display errors to the user and gets the user response for error.
87	Execute BIOS setup if needed / requested. Check boot password if installed.
8C	Late POST initialization of chipset registers.
8D	Build ACPI tables (if ACPI is supported)
8E	Program the peripheral parameters. Enable/Disable NMI as selected
90	Initialization of system management interrupt by invoking all handlers. Please note this checkpoint comes right after checkpoint 20h
A1	Clean-up work needed before booting to OS.
A2	Takes care of runtime image preparation for different BIOS modules. Fill the free area in F000h segment with 0FFh. Initializes the Microsoft IRQ Routing Table. Prepares the runtime language module. Disables the system configuration display if needed.
A4	Initialize runtime language module. Display boot option popup menu.
A7	Displays the system configuration screen if enabled. Initialize the CPU's before boot, which includes the programming of the MTRR's.
A9	Wait for user input at config display if needed.
AA	Uninstall POST INT1Ch vector and INT09h vector.

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Checkpoint	Description
AB	Prepare BBS for Int 19 boot. Init MP tables.
AC	End of POST initialization of chipset registers. De-initializes the ADM module.
B1	Save system context for ACPI. Prepare CPU for OS boot including final MTRR values.
00	Passes control to OS Loader (typically INT19h).

Table 5-1: POST Code Checkpoints

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Appendix A - Watchdog Timer

The following is a sample program for configuring the MI-960's watchdog timer.

A.1 Sample Code

```
#include<stdio.h>
#include<dos.h>

static unsigned int IT8712_ioPort = 0x2e;

void Enter_IT8712_Config(unsigned int flag)
{
     if(flag) IT8712_ioPort = 0x4e;
     else IT8712_ioPort = 0x2e;

     switch(IT8712_ioPort)
     {
          case 0x2E:  //Address port = 0x2E,
          enter keys = 0x87, 0x01, 0x55, 0x55
               outportb(0x2E, 0x87);
               outportb(0x2E, 0x01);
               outportb(0x2E, 0x55);
               outportb(0x2E, 0x55);
               break;
          case 0x4E:  //Address port = 0x4E,
          enter keys = 0x87, 0x01, 0x55, 0xAA
               outportb(0x4E, 0x87);
               outportb(0x4E, 0x01);
               outportb(0x4E, 0x55);
               outportb(0x4E, 0xAA);
               break;
          default:
               break;
        }
}

void Exit_IT8712_Config(unsigned int flag)
{
     if(flag) IT8712_ioPort = 0x4e;

     outportb(IT8712_ioPort, 0x02);
```

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```
        outportb(IT8712_ioPort+1, 0x02);
}

void Get_IT8712_ID(unsigned int &ID1, unsigned int &ID2)
{
        outportb(IT8712_ioPort, 0x20);
        ID1 = inportb(IT8712_ioPort+1);
        outportb(IT8712_ioPort, 0x21);
        ID2 = inportb(IT8712_ioPort+1);
}

void IT8712_WDTRun(unsigned int count_value)
{
        unsigned int tempCount, registerValue;

        outportb(IT8712_ioPort, 0x07);
        outportb(IT8712_ioPort+1, 0x07);// Device 7

        if(count_value >= 60)
        {
                outportb(IT8712_ioPort, 0x72);
                registerValue = inportb(IT8712_ioPort+1);
                registerValue &= 0x7f;
                registerValue |= 0x40; //enable WDT output
                        through KBRST
                outportb(IT8712_ioPort+1, registerValue);
                        // set WDT count is minute

                tempCount = count_value / 60;
                if((count_value%60) > 30)
                        tempCount++;
                if(tempCount > 255)
                        tempCount = 255;
                printf("WDT timeout in %d minutes.\n",
                        tempCount);
        }
        else
        {
                outportb(IT8712_ioPort, 0x72);
                registerValue = inportb(IT8712_ioPort+1);
                registerValue |= 0x80;

                tempCount = count_value;
```

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```
            if(tempCount != 0)
            {
                  printf("WDT timeout in %d seconds.\n",
                        tempCount);
                  registerValue |= 0x40; //Enable WDT
                        output through KBRST
            }
            else
            {
                  printf("WDT is Disabled.\n");
                  registerValue &= 0xbf; //Disable WDT
                        output through KBRST
            }

            outportb(IT8712_ioPort+1, registerValue);
                  // set WDT count is second
      }

      outportb(IT8712_ioPort, 0x71);
      registerValue = inportb(IT8712_ioPort + 1);
      registerValue |= 0x60;// set Mouse & Keyboard
      interrupt Enable
      outportb(IT8712_ioPort+1, registerValue);

      outportb(IT8712_ioPort, 0x73);
      outportb(IT8712_ioPort+1, tempCount);
}
```

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Appendix B - System Resources

B.1 System Memory Map

Address Range (decimal)	Address Range (hex)	Size	Description
(4GB-2MB)	FFE00000 – FFFFFFFF	2 MB	High BIOS Area
(4GB-18MB) – (4GB-17MB-1)	FEE00000 – FEEFFFFF	1 MB	FSB Interrupt Memory Space
(4GB-20MB) – (4GB-19MB-1)	FEC00000 – FECFFFFF	1 MB	APIC Configuration Space
15MB – 16MB	F00000 – FFFFFF	1 MB	ISA Hole
960 K – 1024 K	F0000 – FFFFF	64 KB	System BIOS Area
896 K – 960 K	E0000 – EFFFF	64 KB	Extended System BIOS Area
768 K – 896 K	C0000 – DFFFF	128 KB	PCI expansion ROM area C0000 – C7FFF: Onboard VGA BIOS CB800 – CC7FFF: Intel 82566DM PXE option ROM when onboard LAN boot ROM is enabled. CC800 – CD7FFF: Marvell 88E8053 option ROM when onboard LAN boot ROM is enabled.
640 K – 768 K	A0000 – BFFFF	128 KB	Video Buffer & SMM space
0 K – 640 K	00000 – 9FFFF	640 KB	DOS Area

Table B-1: System Memory Map

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B.2 Direct Memory Access Channels

Channel Number	Data Width	System Resource
0	8-bits	Parallel port(1)
1	8-bits	Parallel port(1)
2	8-bits	Diskette drive(1)
3	8-bits	Parallel port(1)
4		Reserved - cascade channel
5	16-bits	Open
6	16-bits	Open
7	16-bits	Open

Table B-2: Direct Memory Access Channels

Note(1): DMA channel 0/1/3 is selected when using parallel port. Floppy and parallel port cannot be used at the same time.

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B.3 IO Map

Hex Range	Device
000-01F	DMA controller 1, 8237A-5 equivalent
020-02D and 030-03F	Interrupt controller 1, 8259 equivalent
02E-02F	LPC SIO (ITE8718) configuration index/data registers
040-05F	Timer, 8254-2 equivalent
060, 062, 064, 066, 068-06F	8742 equivalent (keyboard)
061, 063, 065, 067	NMI control and status
070-07F	Real Time Clock Controller(bit 7 -NMI mask)
080-091	DMA page register
092	Reset (Bit 0)/ Fast Gate A20 (Bit 1)
93-9F	DMA page registers continued
0A0-0B1 and 0B4-0BF	Interrupt controller 2, 8259 equivalent
0B2 and 0B3	APM control and status port respectively
0C0-0DF	DMA controller 2, 8237A-5 equivalent
0E0-0EF	Available
0F0	Co-processor error register
0F1	N/A
0F2-0F3	N/A
0F4	IDE ID port
0F5-0F7	N/A
0F8	IDE Index port
0F9-0FB	N/A
0FC	IDE Data port
0FD-0FF	N/A
100-179	Available
180-181	Default AIM4 SRAM control register (May be remapped)
182-1EF	Available
1F0-1F7	Primary IDE Controller (AT Drive)
1FB-22F	Available
230 -277	Available

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Hex Range	Device
278-27F	Parallel Port 2
280-2F7	Available
2F8-2FF	Serial Port 2
300-36F	Available
370-377	Alt. Floppy Disk Controller
378-37F	Parallel Port 1
380-3AF	Available
3B0-3BB and 3BF	Mono/VGA mode video
3BC-3BE	Reserved for parallel port
3C0-3DF	VGA registers
3E0-3EF	Available
3F0-3F7	Primary Floppy disk controller
3F8-3FF	Serial port 1
4D0	Master PIC Edge/Level Trigger register
4D1	Slave PIC Edge/Level Trigger register
CF8-CFB	PCI configuration address register (32 bit I/O only)
CF9	Reset Control register (8 bit I/O)
CFC-CFF	PCI configuration data register
400	Smbus base address for SB.
480	GPIO Base Address for SB
800	PM (ACPI) Base Address for SB
860	Alias for ICH TCO base address.
0A00~0AFF	Reserved for SIO functions base address (ex: PME / GPIO etc)

Table B-3: IO Map

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B.4 Interrupt Request (IRQ) Lines

IRQ Lines PIC Mode

IRQ#	Typical Intterupt Resource	Connected to Pin	Available
0	Counter 0	N/A	No
1	Keyboard controller	N/A	No
2	Cascade interrupt from slave PIC	N/A	No
3	Serial Port 2 (COM2) / PCI / ISA	IRQ3 via SERIRQ, IRQ3 at ISA bus	Note (1)
4	Serial Port 1 (COM1) / PCI / ISA	IRQ4 via SERIRQ, IRQ4 at ISA bus	Note (1)
5	Parallel Port 2 (LPT2) / PCI / ISA	IRQ5 via SERIRQ, IRQ5 at ISA bus	Note (1)
6	Floppy Drive Controller	IRQ6 via SERIRQ	No
7	Parallel Port 1 (LPT1) / PCI / ISA	IRQ7 via SERIRQ, IRQ7 at ISA bus	Note (1)
8	Real-time clock	N/A	No
9	SCI / PCI	IRQ9 via SERIRQ, IRQ9 at ISA bus	Note (1), (2)
10	PCI / ISA	IRQ10 via SERIRQ, IRQ10 at ISA bus	Note (1)
11	PCI / ISA	IRQ11 via SERIRQ, IRQ11 at ISA bus	Note (1)
12	PS/2 Mouse / PCI / ISA	IRQ12 via SERIRQ, IRQ12 at ISA bus	Note (1)
13	Math Processor	N/A	No
14	Primary IDE controller / PCI / ISA	IRQ14 via SERIRQ, IRQ14 at ISA bus	Note (1)
15	Secondary IDE controller / PCI / ISA	IRQ15 via SERIRQ, IRQ15 at ISA bus	Note (1)

Table B-4: IRQ Lines PIC Mode

Note (1): These IRQs can be used for PCI devices when onboard device is disabled. If IRQ is from ISA, user must reserve IRQ for ISA in BIOS setup menu.

Note (2): BIOS does not open IRQ 9 setting for ISA bus.

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IRQ Lines APIC Mode

IRQ#	Typical Intterupt Resource	Connected to Pin	Available
0	Counter 0	N/A	No
1	Keyboard controller	N/A	No
2	Cascade interrupt from slave PIC	N/A	No
3	Serial Port 2 (COM2) / PCI / ISA	IRQ3 via SERIRQ, IRQ3 at ISA bus	Note (1)
4	Serial Port 1 (COM1) / PCI / ISA	IRQ4 via SERIRQ, IRQ4 at ISA bus	Note (1)
5	Parallel Port 2 (LPT2) / PCI / ISA	IRQ5 via SERIRQ, IRQ5 at ISA bus	Note (1)
6	Floppy Drive Controller	IRQ6 via SERIRQ	No
7	Parallel Port 1 (LPT1) / PCI / ISA	IRQ7 via SERIRQ, IRQ7 at ISA bus	Note (1)
8	Real-time clock	N/A	No
9	SCI / PCI	IRQ9 via SERIRQ, IRQ9 at ISA bus	Note (1), (2)
10	PCI / ISA	IRQ10 via SERIRQ, IRQ10 at ISA bus	Note (1)
11	PCI / ISA	IRQ11 via SERIRQ, IRQ11 at ISA bus	Note (1)
12	PS/2 Mouse / PCI / ISA	IRQ12 via SERIRQ, IRQ12 at ISA bus	Note (1)
13	Math Processor	N/A	No
14	Primary IDE controller / PCI / ISA	IRQ14 via SERIRQ, IRQ14 at ISA bus	Note (1)
15	Secondary IDE controller / PCI / ISA	IRQ15 via SERIRQ, IRQ15 at ISA bus	Note (1)
16	N/A	PCI Slot 1, JM363 Express IDE controller, VGA controller, UHCI Controller 3/4	Yes
17	N/A	PCI Slot INT B	Yes

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IRQ#	Typical Intterupt Resource	Connected to Pin	Available
18	N/A	PCI Slot INT C, UHCI Controller 2, EHCI Controller 1, SMBUS, SATA controller 0	Yes
19	N/A	PCI Slot INT D, UHCI Controller 1, SATA controller1	Yes
20	N/A	ICH8 internal GBE controller	No
21	N/A	UHCI Controller 5	No
22	N/A	ICH8 HDA	No
23	N/A	UHCI Controller 0, EHCI Controller 0	No

Table B-5: IRQ Lines APIC Mode

Note (1): These IRQs can be used for PCI devices when onboard device is disabled. If IRQ is from ISA, user must reserve IRQ for ISA in BIOS setup menu.

Note (2): BIOS does not open IRQ 9 setting for ISA bus.

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B.5 PCI Configuration Space Map

Bus #	Device #	Function #	Routing	Description
00h	00h	00h	N/A	Intel 965 GME GMCH Host-Hub Interface Bridge
00	01H	00H	Internal	P.E.G. Root Port
02	00H	0FFH	N/A	P.E.G. Port
00h	02h	00h	Internal	Intel Integrated Graphics Device
00h	02h	01h	Internal	Intel Integrated Graphics Device (Function 1)
00h	19h	00h	Internal	GbE Controller
00h	1Ah	00h	Internal	Intel USB UHCI Controller 4
00h	1Ah	01h	Internal	Intel USB UHCI Controller 5
00h	1Ah	07h	Internal	Intel USB EHCI Controller 1
00h	1Bh	00h	Internal	High Definition Audio controller
00h	1Ch	00h	Internal	Intel ICH Express Root port 0
00h	1Ch	01h	Internal	Intel ICH Express Root port 1
00h	1Ch	02h	Internal	Intel ICH Express Root port 2
00h	1Ch	03h	Internal	Intel ICH Express Root port 3
00h	1Ch	04h	Internal	Intel ICH Express Root port 4
00h	1Ch	05h	Internal	Intel ICH Express Root port 5
00h	1Dh	00h	Internal	Intel USB UHCI Controller 0
00h	1Dh	01h	Internal	Intel USB UHCI Controller 1
00h	1Dh	02h	Internal	Intel USB UHCI Controller 2
00h	1Dh	03h	Internal	Intel USB UHCI Controller 3
00h	1Dh	07h	Internal	Intel USB EHCI Controller
00h	1Eh	00h	N/A	Intel Hub Interface to PCI Bridge
00h	1Fh	00h	N/A	Intel LPC Interface Bridge
00h	1Fh	01h	Internal	Intel IDE Controller
00h	1Fh	02h	Internal	Intel SATA controller
00h	1Fh	03h	Internal	Intel SMBus Controller
00h	1Fh	05h	Internal	Intel SATA controller1
00h	1Fh	06h	Internal	Thermal Controller
04h	00h	0FFh	Internal	PCIE Port #0
05h	00h	0FFh	Internal	PCIE Port #1

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Bus #	Device #	Function #	Routing	Description
06h	00h	0FFh	Internal	PCIE Port #2
07h	00h	0FFh	Internal	PCIE Port #3
01h	04h	0FFh	PIRQA-PIRQD	External PCI Slot 1
08h	00h	00h	PIRQA-PIRQD	JMicron ATA Controller

Table B-6: PCI Configuration Space Map

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B.6 PCI Interrupt Routing Map

PIRQ	A	B	C	D	E	F	G	H
INT Line	INTA	INTB	INTC	INTD				
PEG Root Port	X	X	X	X				
VGA	X							
SATA Controller			X	X				
SATA Controller1				X				
SMBus			X					
Thermal Controller			X					
UHCI 0								X
UHCI 1				X				
UHCI 2			X					
UHCI 3	X							
EHCI 0								X
UHCI 4	X							
UHCI 5						X		
EHCI 0			X					
HDA							X	
Intel GBE					X			
PCIE port 0	X							
PCIE port 1	X							
PCIE port 2	X							
PCIE port 3	X							
PCI Slot1	INTA	INTB	INTC	INTD				
JM363 Express IDE controller	X							

Table B-7: PCI Interrupt Routing Map

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Important Safety Instructions

For user safety, please read and follow all **instructions**, **WARNINGS**, **CAUTIONS,** and **NOTES** marked in this manual and on the associated equipment before handling/operating the equipment.

- Read these safety instructions carefully.
- Keep this user's manual for future reference.
- Read the specifications section of this manual for detailed information on the operating environment of this equipment.
- When installing/mounting or uninstalling/removing equipment:
  - Turn off power and unplug any power cords/cables.
- To avoid electrical shock and/or damage to equipment:
  - Keep equipment away from water or liquid sources;
  - Keep equipment away from high heat or high humidity;
  - Keep equipment properly ventilated (do not block or cover ventilation openings);
  - Make sure to use recommended voltage and power source settings;
  - Always install and operate equipment near an easily accessible electrical socket-outlet;
  - Secure the power cord (do not place any object on/over the power cord);
  - Only install/attach and operate equipment on stable surfaces and/or recommended mountings; and,
  - If the equipment will not be used for long periods of time, turn off and unplug the equipment from its power source.

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- Never attempt to fix the equipment. Equipment should only be serviced by qualified personnel.

A Lithium-type battery may be provided for uninterrupted, backup or emergency power.



Risk of explosion if battery is replaced with one of an incorrect type. Dispose of used batteries appropriately.

- Equipment must be serviced by authorized technicians when:
  - The power cord or plug is damaged;
  - Liquid has penetrated the equipment;
  - It has been exposed to high humidity/moisture;
  - It is not functioning or does not function according to the user's manual;
  - It has been dropped and/or damaged; and/or,
  - It has an obvious sign of breakage.

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Getting Service

Contact us should you require any service or assistance.

ADLINK Technology Inc.
Address: 9F, No.166 Jian Yi Road, Chungho City,
Taipei County 235, Taiwan
台北縣中和市建一路 166 號 9 樓
Tel: +886-2-8226-5877
Fax: +886-2-8226-5717
Email: service@adlinktech.com

Ampro ADLINK Technology Inc.
Address: 5215 Hellyer Avenue, #110, San Jose, CA 95138, USA
Tel: +1-408-360-0200
Toll Free: +1-800-966-5200 (USA only)
Fax: +1-408-360-0222
Email: info@adlinktech.com

ADLINK Technology Beijing
Address: 北京市海淀区上地东路 1 号盈创动力大厦 E 座 801 室
(100085)
Rm. 801, Power Creative E, No. 1, B/D
Shang Di East Rd., Beijing 100085, China
Tel: +86-10-5885-8666
Fax: +86-10-5885-8625
Email: market@adlinktech.com

ADLINK Technology Shanghai
Address: 上海市漕河泾高科技开发区钦江路 333 号 39 幢 4 层
(200233)
Tel: +86-21-6495-5210
Fax: +86-21-5450-0414
Email: market@adlinktech.com

ADLINK Technology Shenzhen
Address: 深圳市南山区科技园南区高新南七道 数字技术园
A1 栋 2 楼 C 区 (518057)
2F, C Block, Bld. A1, Cyber-Tech Zone,
Gao Xin Ave. Sec 7, High-Tech Industrial Park S.,
Shenzhen, 518054 China
Tel: +86-755-2643-4858
Fax: +86-755-2664-6353
Email: market@adlinktech.com

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

ADLINK Technology Inc. (German Liaison Office)
Address: Nord Carree 3, 40477 Duesseldorf, Germany
Tel: +49-211-495-5552
Fax: +49-211-495-5557
Email: emea@adlinktech.com

ADLINK (French Liaison Office)
Address: 15 rue Emile Baudot, 91300 MASSY Cedex, France
Tel: +33 (0) 1 60 12 35 66
Fax: +33 (0) 1 60 12 35 66
Email: france@adlinktech.com

ADLINK Technology Japan Corporation
Address: 151-0072 東京都渋谷区幡ヶ谷
1-1-2 朝日生命幡ヶ谷ビル 8F
Asahiseimei Hatagaya Bldg. 8F
1-1-2 Hatagaya, Shibuya-ku, Tokyo 151-0072, Japan
Tel: +81-3-4455-3722
Fax: +81-3-5333-6040
Email: japan@adlinktech.com

ADLINK Technology Inc. (Korean Liaison Office)
Address: 서울시 강남구 논현동 60-12 동성빌딩 4 층 402 호
No.402, Dongsung B/D, 60-12, Nonhyeon-Dong
Gangnam-gu, Seoul, 135-010, Korea.
Tel: +82-2-2057-0565
Fax: +82-2-2057-0563
Email: korea@adlinktech.com

ADLINK Technology Singapore Pte Ltd.
Address: 84 Genting Lane #07-02A, Cityneon Design Centre,
Singapore 349584
Tel: +65-6844-2261
Fax: +65-6844-2263
Email: singapore@adlinktech.com

ADLINK Technology Singapore Pte Ltd. (Indian Liaison Office)
Address: No. 1357, "Anupama", Sri Aurobindo Marg, 9th Cross,
JP Nagar Phase I, Bangalore - 560078, India
Tel: +91-80-65605817
Fax: +91-80-22443548
Email: india@adlinktech.com

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