M-321

FlexATX Industrial Motherboard with
Intel® Q45 Chipset

User's Manual

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Revision History

Revision	Release Date	Description of Change(s)
2.00	2010/05/12	Initial Release

Preface

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ADLINK is committed to fulfill its social responsibility to global environmental preservation through compliance with the European Union's Restriction of Hazardous Substances (RoHS) directive and Waste Electrical and Electronic Equipment (WEEE) directive. Environmental protection is a top priority for ADLINK. We have enforced measures to ensure that our products, manufacturing processes, components, and raw materials have as little impact on the environment as possible. When products are at their end of life, our customers are encouraged to dispose of them in accordance with the product disposal and/or recovery programs prescribed by their nation or company.

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Using this Manual

Audience and Scope

The M-321 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 M-321, its features, applications, and specifications, including functional descriptions and board layout.

Chapter 2, Connectors & Jumpers: Provides technical information on connectors, jumpers and pin assignments for configuring the M-321.

Chapter 3, Getting Started: Describes how to install components and drivers on the M-321.

Chapter 4, BIOS Setup: Presents information aid in configuring the system BIOS.

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

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 M-321, 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.

- ▶ M-321 Industrial FlexATX Motherboard
- ▶ I/O shield
- ▶ 2x SATA cable
- ▶ 1x dual-plug SATA power cable
- ▶ 1x COM port cable with bracket
- ▶ Driver DVD
- ▶ User's Manual

⚠ WARNING: **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.

1.2 Overview

The ADLINK M-321 is a FlexATX industrial motherboard supporting the next-generation Intel® Core™2 Quad/Duo, Pentium® Dual Core and Celeron® processors in the LGA775 package to deliver a high performance platform for a wide array of industrial applications. The M-321 supports 45nm process CPUs at up to 3.00GHz and 1333 MHz Front Side Bus (FSB). Dual channel DDR3 800/1066 MHz memory is supported up to a maximum of 4GB in two DIMM slots. The M-321 supports a broad range of processor frequencies, high-speed data transfer rates, diverse I/O functions, and high-bandwidth network connectivity.

These advanced features, coupled with a dual-channel DDR3 system memory architecture, integrated graphics supporting VGA/DVI/LVDS, one PCI Express® x4, one PCI slot, and audio interfaces make the M-321 suitable for automation control, medical, test & measurement, and telecom applications requiring an easy-to-deploy and reliable mainboard.

1.3 Features

- ▶ FlexATX form factor (229 mm x 191 mm)
- ▶ Supports Intel® Core™2 Quad/Duo, Pentium® Dual Core and Celeron® processors in LGA775 package
- ▶ Dual 10/100/1000Mbps Ethernet
- ▶ 8x USB 2.0 ports (4x faceplate, 4x onboard pin header)
- ▶ 4x SATA 3 Gbps ports
- ▶ Integrated graphic supports VGA, DVI, LVDS
- ▶ One PCI Express® x4 and one PCI slot
- ▶ Watchdog Timer, Hardware Monitor
- ▶ Realtek ALC262 HD audio codec
- ▶ TPM hardware security chip
- ▶ RoHS compliant

1.4   Specifications

System	
CPU/Cache	• IIntel® Core™2 Quad Q9400, 2.66GHz, 1333MHz FSB, 6MB L2 Cache, 45nm • Intel® Core™2 Duo E8400, 3.0GHz, 1333MHz FSB, 6MB L2 Cache, 45nm • Intel® Core™2 Duo E7400, 2.8GHz, 1066MHz FSB, 3MB L2 Cache, 45nm • Intel® Core™2 Duo E6400, 2.13GHz, 1066MHz FSB, 2MB L2 Cache, 65nm • Intel® Pentium® Dual Core E5300, 2.6GHz, 800MHz FSB, 2MB L2 Cache, 45nm • Intel® Core™2 Duo E4300, 1.8GHz, 800MHz FSB, 2MB L2 Cache, 65nm • Intel® Pentium® Dual Core E2160, 1.8GHz, 800MHz FSB, 1MB L2 Cache, 65nm • Intel® Celeron® 440, 2.0GHz, 800MHz FSB, 512KB L2 Cache, 65nm
FSB	• 800/1066/1333 MHz
Chipset	• Intel® 82Q45 Graphics Memory Controller Hub • Intel® ICH10 I/O Controller Hub
Memory	• Two 240-pin DIMM sockets support 800/1066MHz DDR3 (up to 4GB)
BIOS	• AMI BIOS with 8 Mb Flash ROM
TPM	• Infneon® SLB9635 TT1.2
Audio	• Realtek ALC262 HD codec • Supports line-in, line-out and mic-in
Watchdog Timer	• 1-255 second/minute programmable
Hardware Monitor	• CPU/System temperature, fan speed and onboard DC voltage
Operating System	• Windows® XP/Vista • Windows® Vista 64-bit • Fedora™ 10

I/O Interfaces	
Serial ATA	• 4x Serial ATA ports with 300 MB/s data transfer
Onboard I/O	• 2x USB 2.0 pin headers (4 ports) • 1x RS-232 serial port connector • 1x front panel pin header
Rear I/O	• 2x RJ-45 LAN port • 4x USB 2.0 ports • 1x D-Sub VGA connector • 1x DVI-D connector • 2x PS2 keyboard/mouse ports • 3x audio jacks (line-in, line-out and mic-in)
Expansion Slots	• 1x PCIe x4 slot • 1x PCI slot
Display	
VGA	• GMA 4500 integrated in Q45 GMCH
VRAM	• Shared system memory up to 512 MB
CRT	• Dsub-15 connector, up to 2048x1536 @ 75 Hz
DVI	• DVI-D interface, resolution up to UXGA (1600 x 1200)
LVDS	• Single channel 24-bit LVDS
Ethernet	
Controller	• Dual Intel® 82574L PCIe network controllers • 10/100/1000Base-T dual-Gigabit Ethernet • Wake on LAN supported
Ports	• 2x RJ-45 Ethernet port
Mechanical and Environment	
Form Factor	• FlexATX Industrial Motherboard
Dimensions	• 229 mm x 191 mm (L x W)
Operating Temp.	• 0°C to 60°C
Storage Temp.	• -20ºC to 80ºC
Rel. Humidity	• 10 - 90% RH
Safety	• CE, FCC Class A

Table 1-1: M-321 General Specifications

1.5 Power Consumption

Intel® Core™2 Quad Processor Q9400

Test Configuration	
CPU	Intel® Core™2 Quad Processor Q9400 2.66 GHz
Memory	Transcend 1GB DDR3 1066DIMM CL7 x2
Graphics	Intel ® 82Q45 Graphics Memory controller
SATA Channel 1	Seagate ST3160815AS Barracuda 7200.10 160GB
Power Supply	MSI AL-B450E 450W

DOS (idle)					
Power Req.	+5V	+12V	CPU +12V	+3.3V	Total
Current (A)	0.768	0.805	1.714	1.298	—
Watts (W)	—	—	—	—	38.35
Windows XP, Idle					
Power Req.	+5V	+12V	CPU +12V	+3.3V	Total
Current (A)	0.703	0.777	0.667	1.319	—
Watts (W)	—	—	—	—	25.20
Windows XP, KPower					
Power Req.	+5V	+12V	CPU +12V	+3.3V	Total
Current (A)	0.705	0.918	5.011	1.322	—
Watts (W)	—	—	—	—	79.04
Windows XP, BurnIn Test 6.0					
Power Req.	+5V	+12V	CPU +12V	+3.3V	Total
Current (A)	0.878	0.968	3.570	1.324	—
Watts (W)	—	—	—	—	63.21

Intel® Core™2 Duo Processor E8400

Test Configuration	
CPU	Intel® Core™2 Duo Processor E8400 3.00 GHz
Memory	Transcend 1GB DDR3 1066DIMM CL7 x2
Graphics	Intel ® 82Q45 Graphics Memory controller
SATA Channel 1	Seagate ST3160815AS Barracuda 7200.10 160GB
Power Supply	MSI AL-B450E 450W

DOS (idle)					
Power Req.	+5V	+12V	CPU +12V	+3.3V	Total
Current (A)	0.756	0.873	2.906	1.283	—
Watts (W)	—	—	—	—	53.36
Windows XP, Idle					
Power Req.	+5V	+12V	CPU +12V	+3.3V	Total
Current (A)	0.704	0.798	0.826	1.297	—
Watts (W)	—	—	—	—	27.29
Windows XP, KPower					
Power Req.	+5V	+12V	CPU +12V	+3.3V	Total
Current (A)	0.709	0.950	4.651	1.303	—
Watts (W)	—	—	—	—	75.06
Windows XP, BurnIn Test 6.0					
Power Req.	+5V	+12V	CPU +12V	+3.3V	Total
Current (A)	0.830	1.013	4.037	1.303	—
Watts (W)	—	—	—	—	69.05

1.6 Block Diagram
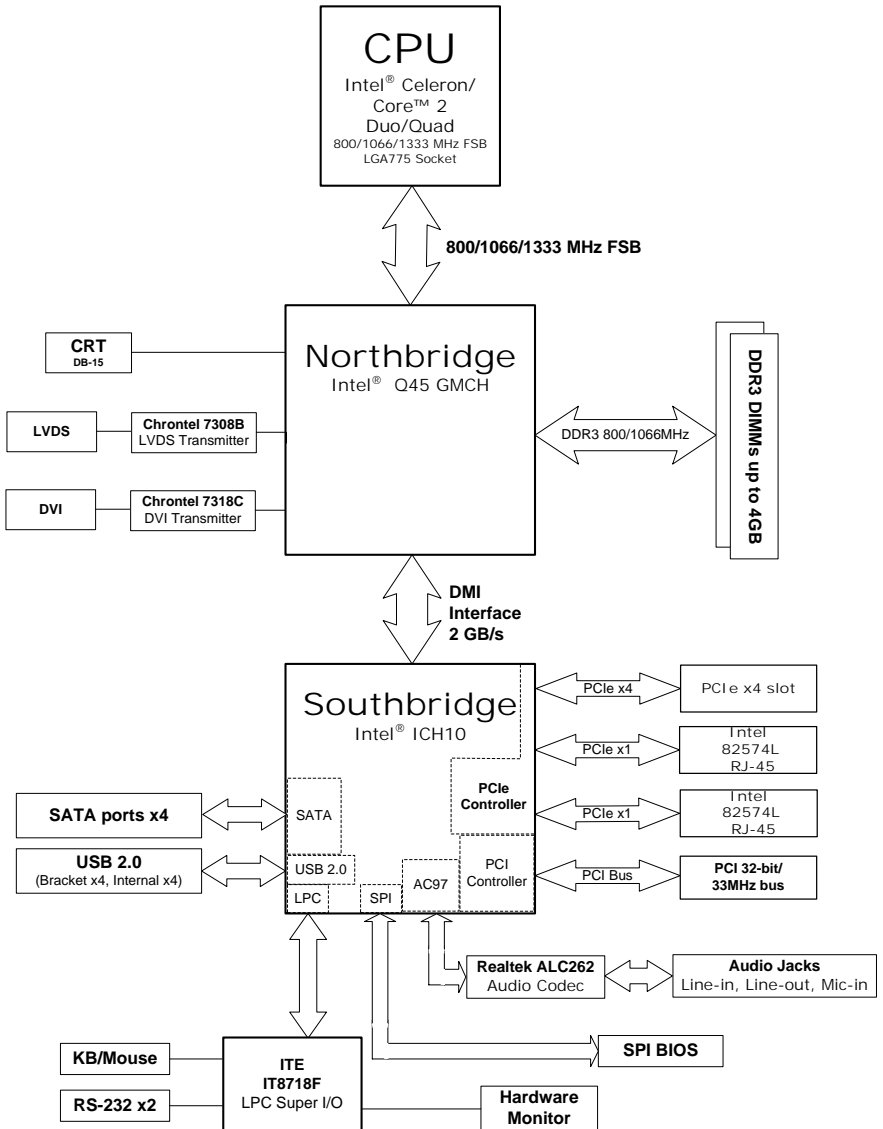
Figure 1-1: M-321 Block Diagram

1.7 Functional Description

Processor Support

The M-321 is a single processor design for the latest Intel York-field/Wolfdale/Conroe Processor family, starting from 1.8 GHz core frequency up to 3.0 GHz. With one LGA775 socket, the CPU connects with the Intel® Q45 MCH through the 800/1066/1333 MHz Front Side Bus (FSB).

Intel® Q45 + ICH10 Express Chipset

The Intel® Q45 Express chipset provides the vital interfaces for the SHB. The Intel® Q45 comes with purpose-built capabilities designed specifically to address the key needs of the industrial computing environment and delivers improved system performance and comes with the integrated Intel® Graphics Media Accelerator 4500 engine for cost-effective system building. The chipset also supports high-bandwidth interfaces including PCI Express, Serial ATA, and USB 2.0, as well as dual-channel DDR3 system memory.

Intel® Graphics Media Accelerator 4500

The Intel® Graphics Media Accelerator (GMA) 4500 revolutionizes integrated graphics with new capabilities that provide significant increase in graphics performance. With support for DirectX 10 hardware acceleration, Shader Model 4.0 and OpenGL 2.0, the Intel GMA 4500 delivers excellent video and 3D graphics for a cost-effective and high-performance graphics solution.

Dual-Channel DDR3 Memory

To meet the requirements of memory-intensive applications, the M-321 has a dual-channel memory architecture supporting DDR3 800/1066 MHz DIMMs. The key advantages of DDR3 are the higher bandwidth and the increase in performance at lower power than DDR2. DDR3 memory technology meets the requirements of the latest 3D graphics, multimedia, and network application, and boosts system performance by eliminating bottlenecks.

Gigabit Ethernet

The M-321 uses two Intel® 82574L Gigabit Ethernet controllers connected to the PCI-E x1 bus of the ICH10. Operation at data rates of 10/100/1000 Mbps, wake on LAN and PXE are supported.

Serial ATA Technology

Storage is efficient and secure with the Serial ATA interface. Utilizing the Intel® ICH10, the M-321 supports up to four 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 2.0

The M-321 incorporates the Universal Serial Bus (USB) 2.0 specification that increases peripheral connection speed from 12 Mbps (USB 1.1) to 480 Mbps.

Hardware Monitoring

A built-in, proactive hardware monitoring system 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 components.

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.

Trusted Platform Module

The M-321 supports TPM ver. 1.2 (Trusted Platform Module) for secure storage of keys, passwords and digital certificates. Systems supporting TPM offer improved hardware-based security in numerous applications, such as file and folder encryption, local password management, S-MIME e-mail, VPN and PKI authentication and wireless authentication for 802.1x and LEAP.

1.8 Board Layout
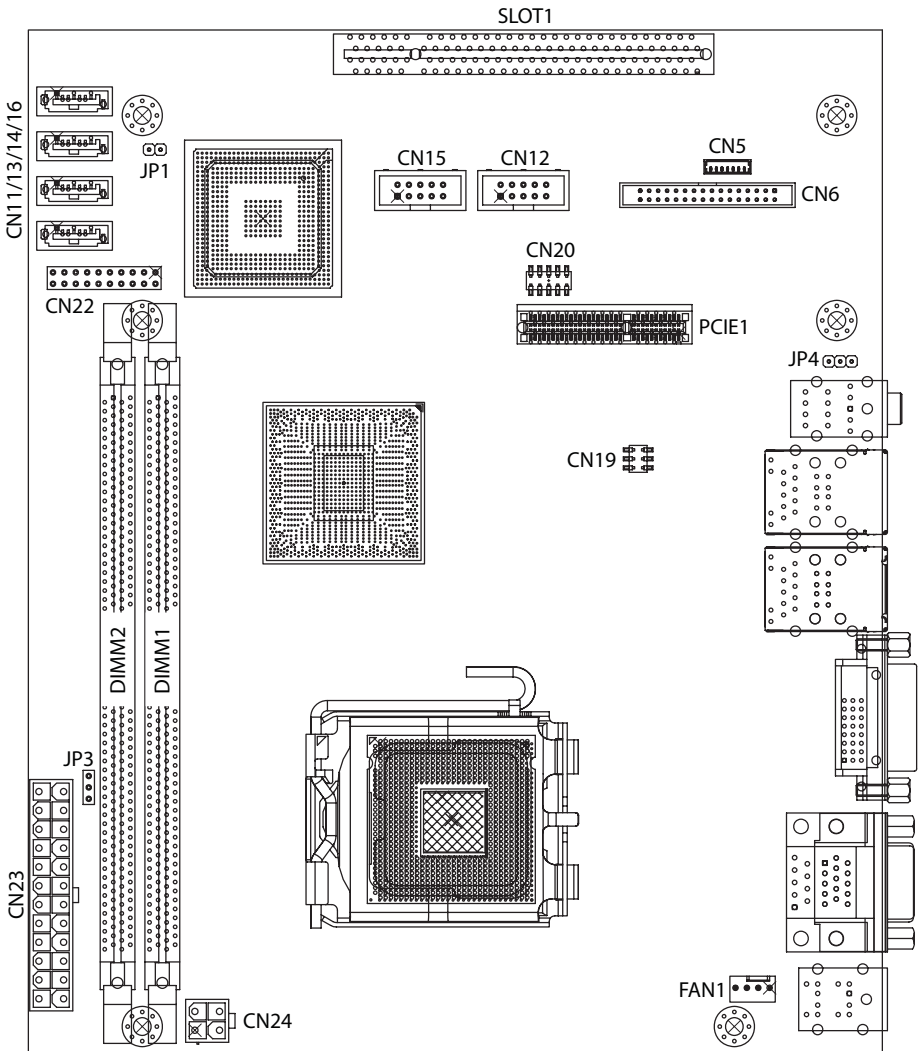
Figure 1-2: M-321 Board Layout

CN5	LVDS Inverter connector	CN24	ATX12V power connector
CN6	LVDS connector	FAN1	CPU Fan connector
CN11/13/14/16	SATA connectors	DIMM1/2	Memory slots
CN12/15	USB pin headers	JP1	Chassis Intrusion pin header
CN19	LAN LED pin header	JP3	Clear CMOS jumper
CN20	COM2 connector	JP4	Audio Line-Out pin Header
CN22	System Panel connector	PCIE1	PCIe x4 slot
CN23	ATX power connector	Slot1	PCI slot

Table 1-2: M-321 Board Layout Legend
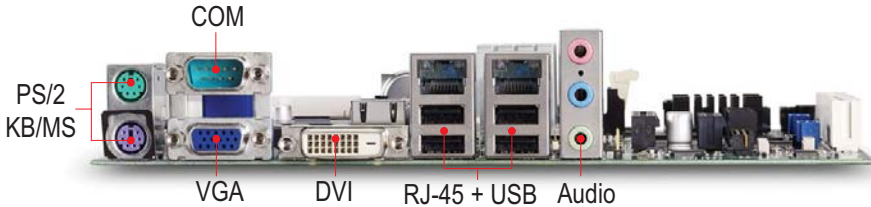
Figure 1-3: M-321 Rear I/O Layout

1.9 Mechanical Drawings
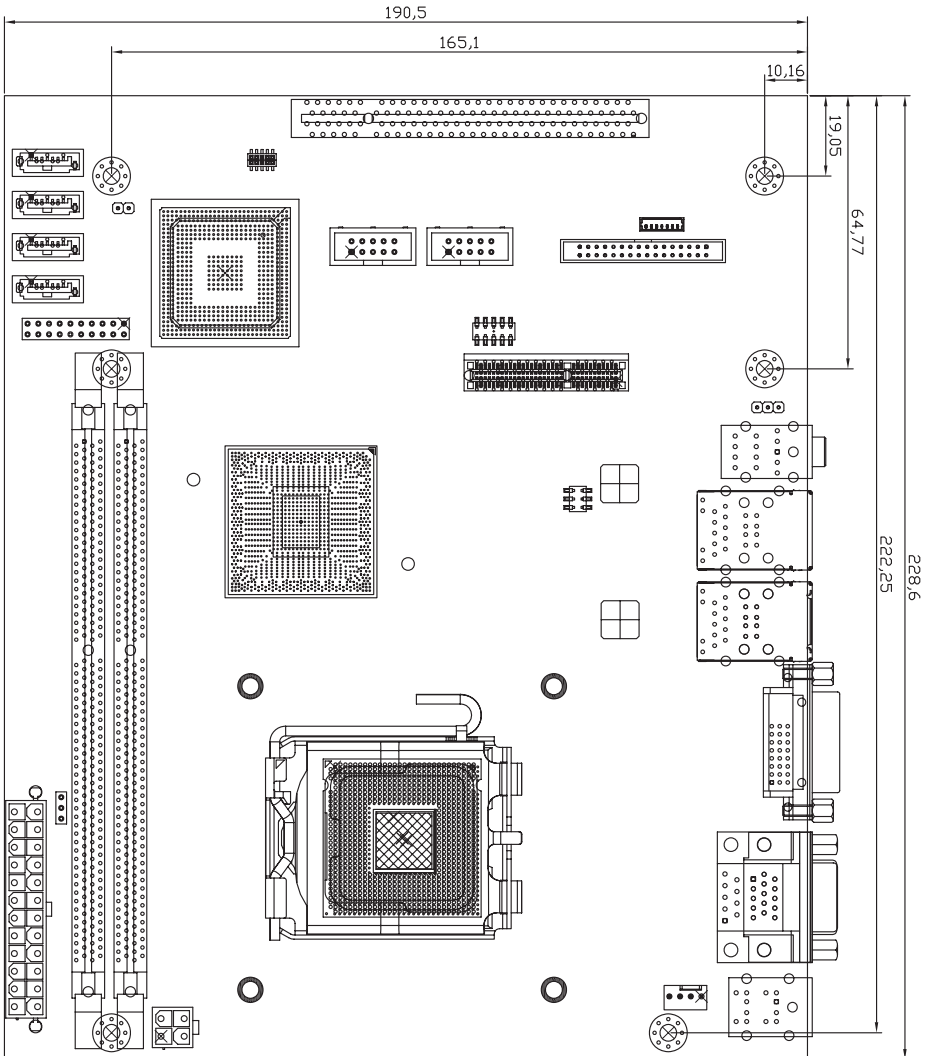
Dimensions in mm

Figure 1-4: M-321 Board Dimensions

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2 Connectors & Jumpers

The connectors and jumpers on the M-321 allow you to connect and configure external devices. The following specify the pin assignments for connectors and jumper on the M-321. Refer to **Figure 1-2: M-321 Board Layout** and **Figure 1-3: M-321 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
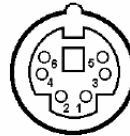
PS/2 Keyboard Port (purple)

Pin #	Signal	Function
1	KBDATA	Keyboard Data
2	NC	not connected
3	GND	Ground
4	+5V	Power
5	CLK	Clock
6	NC	not connected
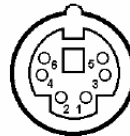
COM DB-9 Serial Port Connector

Pin #	RS-232
1	DCD, Data carrier detect
2	RXD, Receive data
3	TXD, Transmit data
4	DTR, Data terminal ready
5	IsoGND, Isolated ground
6	DSR, Data set ready
7	RTS, Request to send
8	CTS, Clear to send
9	RI, Ring indicator
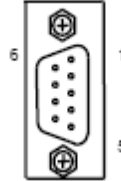
Table 2-1: COM Serial Port Connector Pin Definition

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		
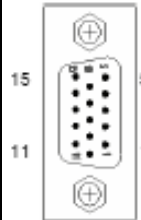
DVI-D Connector)
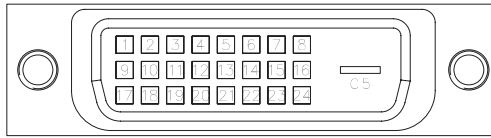
Pin #	Signal	Pin #	Signal
1	TMDS Data2-	13	TMDS Data3+
2	TMDS Data2+	14	+5 V Power
3	TMDS Data2/4 Shield	15	GND
4	TMDS Data4-	16	Hot Plug Detect
5	TMDS Data4+	17	TMDS Data0-
6	DDC Clock [SCL]	18	TMDSData0+
7	DDC Data [SDA]	19	TMDS Data0/5 Shield
8	Analog vertical sync	20	TMDS Data5-
9	TMDS Data1-	21	TMDS Data5+
10	TMDS Data1+	22	TMDS Clock Shield
11	TMDS Data1/3 Shield	23	TMDS Clock +
12	TMDS Data3-	24	TMDS Clock -

Table 2-2: DVI-D Connector Pin Definition

USB Connectors

Pin #	Signal Name
1	Vcc
2	USB-
3	USB+
4	GND
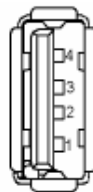
LAN (RJ-45) Ports

Pin #	10BASE-T/ 100BASE-TX	1000BASE-T
1	TX+	BI_DA+
2	TX-	BI_DA-
3	RX+	BI_DB+
4	--	BI_DC+
5	--	BI_DC-
6	RX-	BI_DB-
7	--	BI_DD+
8	--	BI_DD-
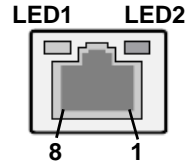
Refer to the table below for the LAN port LED definitions.

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

Audio I/O port

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

2.2 Onboard Connectors

ATX Power Connector (CN23)

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
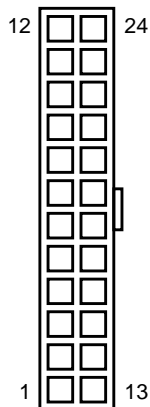
ATX 12V Power Connector (CN24)

Pin #	Signal
1	GND
2	GND
3	+12V DC
4	+12V DC
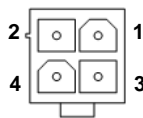
CPU Fan Connector (CPU_FAN)

Pin #	Signal
1	GND
2	VCC
3	FAN_SENSE
4	FAN_CONTROL
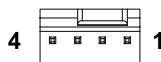
LVDS Connector (CN6)

Pin #	Signal Name	Signal Description
1	CLK2M	Channel B clock port output -
2	CLK2P	Channel B clock port output +
3	SHGND	Shield GND
4	B3M	Channel B data port output -
5	B3P	Channel B data port output +
6	B2M	Channel B data port output -
7	B2P	Channel B data port output +
8	SHGND	Shield GND
9	B1M	Channel B data port output -
10	B1P	Channel B data port output +
11	B0M	Channel B data port output -
12	B0P	Channel B data port output +
13	SHGND	Shield GND
14	A3M	Channel A data port output -
15	A3P	Channel A data port output +
16	SHGND	Shield GND
17	CLK1M	Channel A clock port output -
18	CLK1P	Channel A clock port output +
19	SHGND	Shield GND
20	A2M	Channel A data port output -
21	A2P	Channel A data port output +
22	SHGND	Shield GND
23	A1M	Channel A data port output -
24	A1P	Channel A data port output +
25	SHGND	Shield GND
26	A0M	Channel A data port output -
27	A0P	Channel A data port output +
28	Reserved	
29	Reserved	
30	DDC_SCL	Disp Data Channel Clock
31	DDC_SDA	Disp Data Channel Data
32	DDC_PWR	Disp Data Channel power
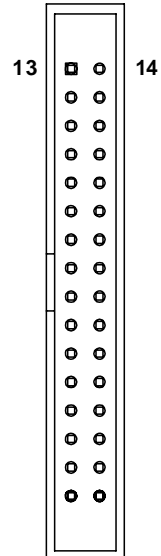
Pin #	Signal Name	Signal Description
33	VSS	Return GND
34	VSS	Return GND
35	VDD 3.3V	FPD VDD power
36	VDD 3.3V	FPD VDD power
37	VDD 3.3V	FPD VDD power
38	INV_EN	Inverter Enable output
39	INV_V/R_Bright	10~3V / 0~50k. Brightness Output (set via resistor selection)
40	INV_Rbrightness	0~50k Brightness Output (set via resistor selection)
41	VEE	Return GND
42	VEE	Return GND
43	VCC_10.8~13.2V	Inverter Power
44	VCC_10.8~13.2V	Inverter Power

NOTE: The standard 32-pin connector consists of pins 13 to 44. Pins 1-12 are reserved for future use with a 42-pin connector to provide dual channel LVDS support.

LVDS Inverter Connector (CN5)

Pin #	Signal
1	VCC_BKL
2	VCC_BKL
3	GND
4	GND
5	INV_EN
6	INV_BRI1
7	INV_BRI2

SATA Connectors (CN11/13/14/16)

Pin #	Signal
1	GND
2	TXP
3	TXN
4	GND
5	RXN
6	RXP
7	GND
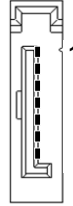
USB Pin Headers (CN12/15)

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

COM2 Connector (CN20)

Pin #	Signal	Functions
1	DCD	Data Carrier Detect
2	TXD	Transmit Data
3	GND	Ground
4	RTS	Request to Send
5	RI	Ring Indicate
6	RXD	Receive Data
7	DTR	Data Terminal Ready
8	DSR	Data Set Ready
9	CTS	Clear to Send
10	NC	Not Connect
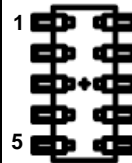
LAN LED Pin Header (CN19)

Pin #	Signal
1	ACTLEDP
2	NIN_ACTLED#
3	NIN_LINKLED1#
4	R_NIN_LINKLED2#
5	R_NIN_LINKLED2#
	NIN_LINKLED1#
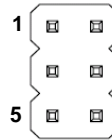
Audio Line-Out Pine Header (JP4)

Pin #	Signal
1	LINE-OUT-L
2	GND
3	LINE-OUT-R

System Panel Connector (CN22)

Pin #	Signal	Function	Pin Group
1	WDSPK/ MONO_OUT	Speaker signal/ Audio signal	Chassis Speaker
2	HEADPHONE-L	Audio signal	
3	AGND		
4	P5V	Power	
5	HEADPHONE-R	Audio signal	
6	GND	Ground	Key Lock
7	KEYLOCK	Keyboard lock	
8	PLED	Power LED signal	Power LED
9	HEADPHONE-JD	Audio sense	
10	P5V	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	P3V3	Hard Disk LED pull-up	
20	NC		
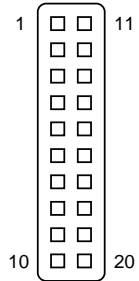
Chassis Intrusion Connector (JP1)

Pin #	Signal Name
1	INTRUSION
2	GND
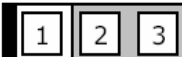
2.3 Jumpers

Clear CMOS Jumper (JP3)

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 M-321

2. Short the JP3 pins 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	CLRTC
Normal	1 – 2	1 2 3
Clear CMOS	2 – 3	1 2 3

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3 Getting Started

This chapter provides information on how to install components to the M-321 motherboard.

3.1 Installing the CPU

The M-321 Supports the Intel® Core™2 Duo/Quad, Intel® Pentium® Dual-Core, and Intel® Celeron® 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.
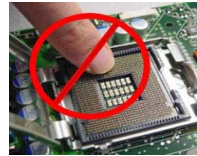
To install the CPU:

1. Press the load lever (A), then disengage it from the retention tab (B).
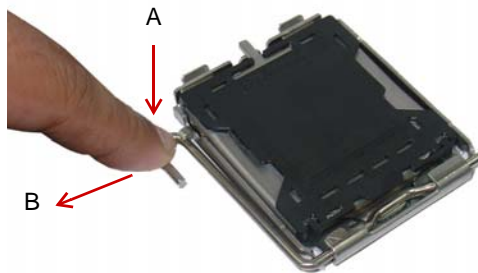
2. Lift and rotate the load lever to a 135° angle

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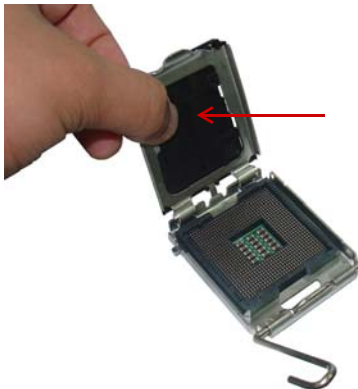
5. Position the CPU over the socket, then match the notches on the CPU side with the alignment keys on the socket. The golden triangle on the CPU must be positioned on the bottom-left corner of the socket .

Notch

Golden triangle

Alignment key
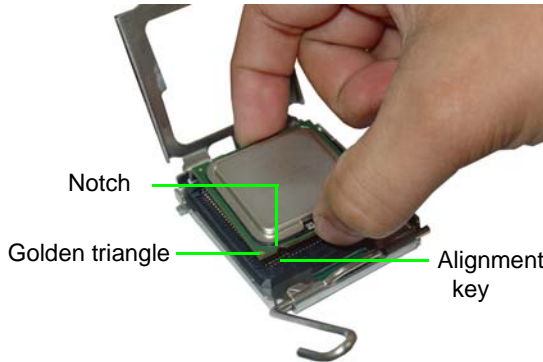
⚠ WARNING:	The CPU fits the socket in only one orientation. DO NOT force it into the socket to avoid damaging it.

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

Socket tab
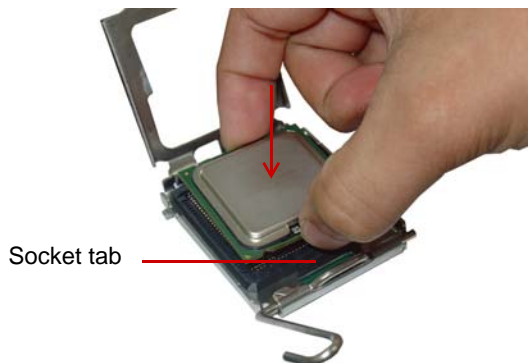
7. Close the load plate (A), then fasten the load lever on the retention tab (B) .
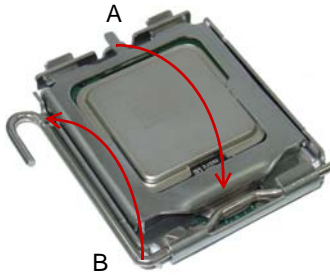
3.2 Installing the CPU Fan and Heatsink

⚠️ CAUTION:	The CPU requires a chassis with an airflow inlet and maximum internal ambient temperature of 60° C. A specially-designed CPU fan and heatsink must be installed before using the motherboard. Failure to install a CPU fan and heatsink may damage the motherboard and/or the CPU.

The following CPU fan and heatsink assemblies are recommended for use with the M-321:
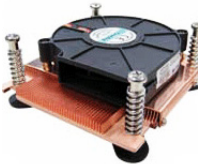
	1U LGA 775 CPU Cooler Dimensions: • Heatsink: 92 x 87.6 x 28 mm • Fan: 75 x 75 x 15 mm Heatsink: Copper base + copper skived fin Fan speed: 5500 RPM Fan airflow: 10.48 CFM Noise level: 51 dBA Part number: 32-20065-0000
	3U LGA 775 CPU Cooler Dimensions: • Heatsink: 100 x 100 x 70 mm • Fan: 90 x 90 x 25 mm Heatsink: Aluminum extrusion Fan speed: 4500 RPM Fan airflow: 57.7 CFM Noise level: 47.5 dBA Part number: 32-20058-0000 + 34-30381-0000
	Copper-Core Cooler Dimensions: 115 x 115 x 61.4 mm Heatsink: Aluminum extrusion+copper core Fan speed: 4500 RPM Fan airflow: 76.9 CFM Noise level: 49 dBA Part number: 32-20086-0000

When the CPU fan installation procedures presented here are inconsistent with the installation procedures you obtained from the CPU fan and heatsink package, follow the latter.

To install the CPU fan:

1. Apply thermal grease evenly on top of the installed CPU.

2. Lower the CPU fan to the CPU, then secure it using the provided attachments or screws.

Connect the CPU fan cable to the CPU fan connector on the motherboard labeled FAN1 (see Figure 1-2 on page 11).

3.3   System Memory

The M-321 supports up to 4 GB of DDR3 800/1066 MHz memory modules via two DDR3 DIMM sockets. DDR3 modules are notched to facilitate correct installation in the DIMM sockets. See Figure 1-2 on page 11 for DIMM socket locations.

Memory Configurations

Dual channel configuration is supported by the M-321 as follows:

Channel A: DIMM1
Channel B: DIMM2

Unbuffered non-ECC DDR3 DIMMs with capacities of 512 MB, 1GB, and 2GB can be installed into the DIMM sockets as follows:

▶ For dual-channel configuration, the size of memory module installed per channel must be the same (DIMM1 = DIMM2).

▶ 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.

Memory Module Installation

The DDR3 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 .

To install a memory module:

1. Locate the DIMM sockets 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.

Notch

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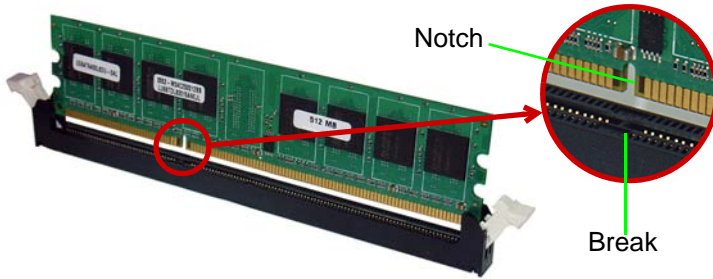
4. Insert the module firmly into the slot until the retaining clips snap back inwards and the module is securely seated.
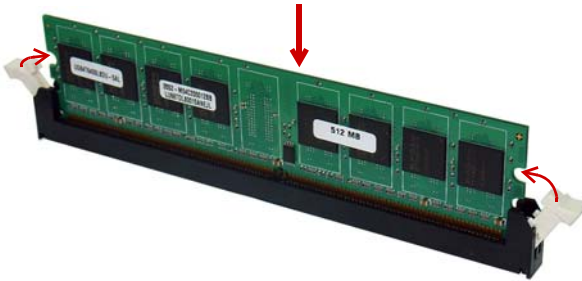
3.4 Driver Installation

The M-321 drivers for **Windows XP 32-bit** are located in the following directories on the Driver DVD, or can be downloaded from the ADLINK website (**http://www.adlinktech.com**):

Chipset	X:\Industrial Motherboard\M-321\Chipset\infinst_autol.exe
Display	X:\Industrial Motherboard\M-321\VGA\win2k_xp\setup.exe
LAN	X:\Industrial Motherboard\M-321\Ethernet\PRO2KXP_v14_0.exe
Audio	X:\Industrial Motherboard\M-321\Audio\WDM_R207\setup.exe

Follow the instructions below to install the required M-321 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 **infinst_autol.exe**. Follow the instructions given and reboot when instructed.

3. Install the **Display driver** and utilities by running the program **setup.exe**. Follow the instructions given and reboot when instructed.

4. Install the **LAN driver** by running the program **PRO2KXP_v14_0.exe**. Follow the instructions given and reboot if required.

5. Install the Audio driver by running the program **setup.exe**. Follow the instructions given and reboot if required.

This page intentionally left blank.

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.

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.

```
                        BIOS SETUP UTILITY
  Main    Advanced    PCIPnP    Boot    Security    Chipset    Exit

  System Overview                              Use [ENTER], [TAB]
  ─────────────────────────────────           or [SHIFT-TAB] to
  AMIBIOS                                      select a field.
  Version    :08.00.15
  Build Date:04/23/10                          Use [+] or [-] to
  ID         :M321MA10                         configure system Time.

  Processor

  Speed      :255MHz
  Count      :255

  System Memory                                ←     Select Screen
  Size       :987MB                            ↑↓    Select Item
                                               +-    Change Field
  System Time           [16:10:59]             Tab   Select Field
  System Date           [Mon 04/26/2010]       F1    General Help
                                               F10   Save and Exit
                                               ESC   Exit

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```

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.

These keys include < F1 >, < F10 >, < Enter >, < ESC >, < Arrow > keys, and so on. .
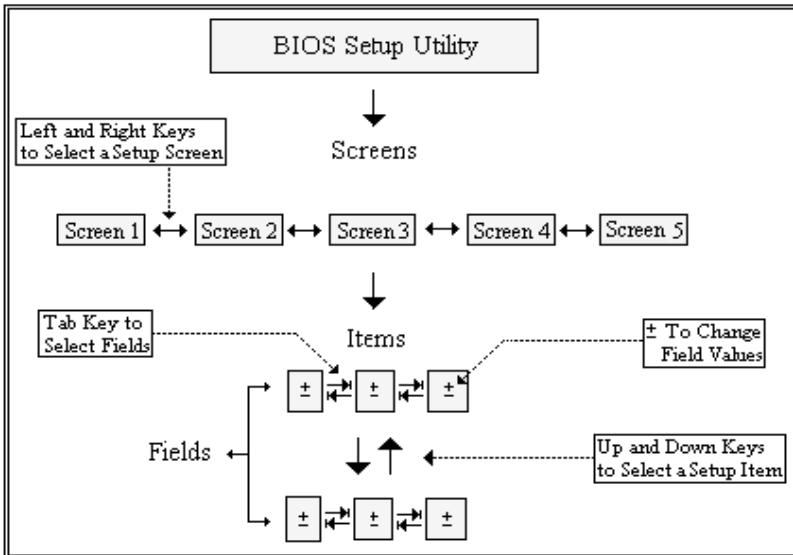
Note: There is a hot key legend located in the right frame on most setup screens.

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.

```
General Help
↔        Select Screen              ↓↑       Select Item
+ −      Change Screen              Enter    Go to Sub Screen
PGDN     Next Page                  PGUP     Previous Page
Home     Go to Top of the Screen    End      Go to Bottom of Screen
F2/F3    Change Colors              F7       Discard Changes
F8       Load Failsafe Defaults     F9       Load Optimal Defaults
F10      Save and Exit              ESC      Exit

                          [Ok]
```

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:


```
Save configuration changes and exit now?

        [Ok]              [Cancel]
```

 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:


```
Discard changes and exit setup now?

        [Ok]              [Cancel]
```

 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.

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.
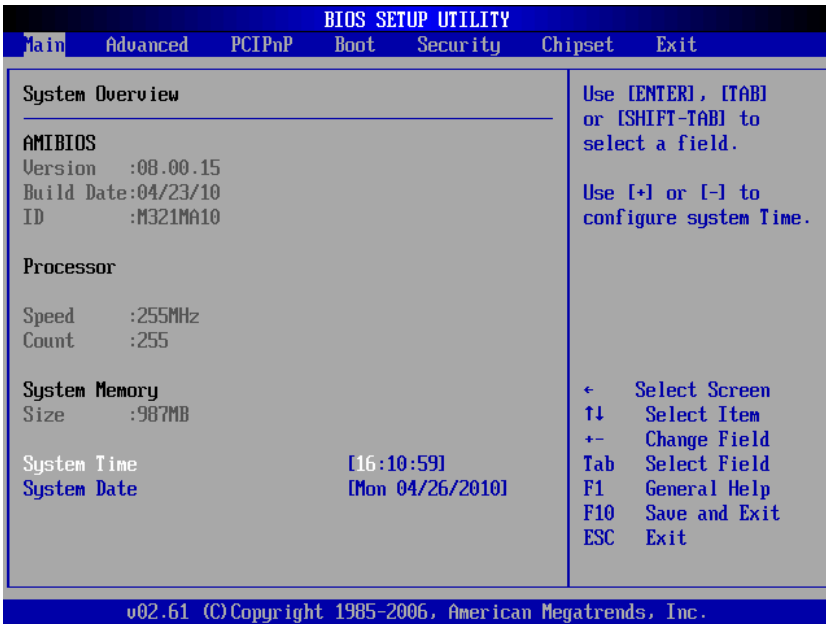
System Time/System Date

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.

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.

```
  Main   Advanced   PCIPnP   Boot   Security   Chipset   Exit
┌──────────────────────────────────────┬────────────────────────┐
│                                       │ Configure CPU.         │
│  ▶ CPU Configuration                  │                        │
│  ▶ IDE Configuration                  │                        │
│  ▶ SuperIO Configuration              │                        │
│  ▶ Hardware Health Configuration      │                        │
│  ▶ Remote Access Configuration        │                        │
│  ▶ USB Configuration                  │                        │
│  ▶ Trusted Computing                  │                        │
│                                       │                        │
│                                       │ ←     Select Screen    │
│                                       │ ↑↓    Select Item      │
│                                       │ Enter Go to Sub Screen │
│                                       │ F1    General Help     │
│                                       │ F10   Save and Exit    │
│                                       │ ESC   Exit             │
│                                       │                        │
└──────────────────────────────────────┴────────────────────────┘
        v02.61 (C)Copyright 1985-2006, American Megatrends, Inc.
```
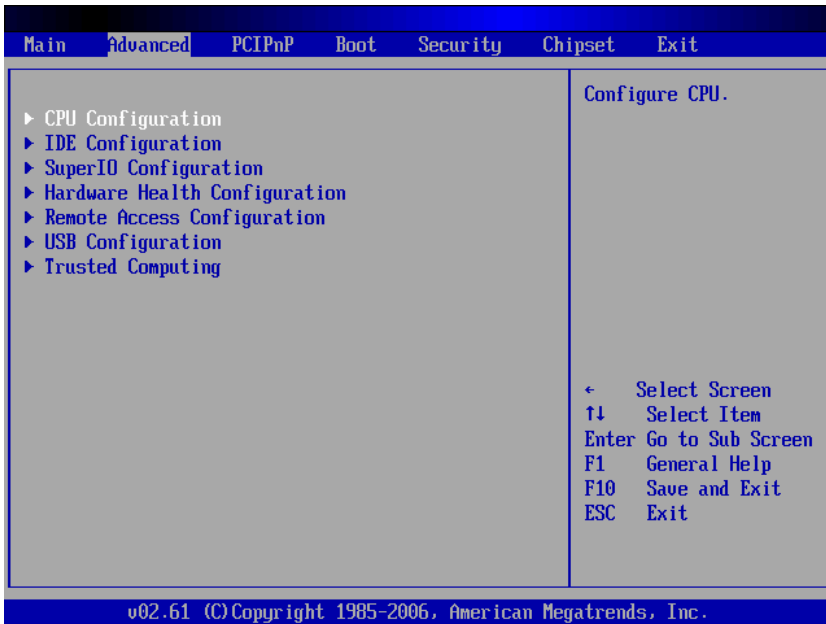
4.3.1   CPU Configuration

You can use this screen to select options for the CPU 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 CPU Configuration screen is shown below.

```
                      BIOS SETUP UTILITY
     Advanced
 Configure advanced CPU settings            Disabled for WindowsXP
 Module Version:3F.15

 Manufacturer:Intel

 Frequency   :255MHz
 FSB Speed   :800MHz
 Cache L1    :0 KB
 Cache L2    :0 KB
 Ratio Actual Value:10

 Max CPUID Value Limit        [Disabled]
                                         ←    Select Screen
                                         ↑↓   Select Item
                                         +-   Change Option
                                         F1   General Help
                                         F10  Save and Exit
                                         ESC  Exit

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```
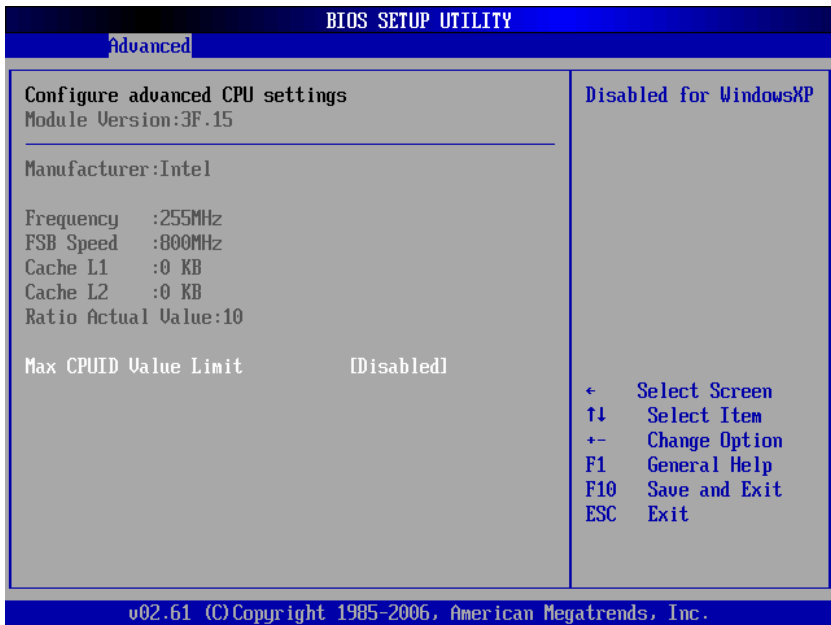
Max CPUID Value Limit

Enable this option to allow compatibility with older operating systems.

4.3.2   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.

```
                         BIOS SETUP UTILITY
         Advanced

 IDE Configuration                              While entering setup,
                                                BIOS auto detects the
                                                presence of IDE
 ▶ Primary IDE Master      : [Not Detected]     devices. This displays
 ▶ Primary IDE Slave       : [Not Detected]     the status of auto
 ▶ Secondary IDE Master    : [Not Detected]     detection of IDE
 ▶ Secondary IDE Slave     : [Not Detected]     devices.
 ▶ Third IDE Master        : [Not Detected]
 ▶ Fourth IDE Master       : [Not Detected]



                                                ←     Select Screen
                                                ↑↓    Select Item
                                                Enter Go to Sub Screen
                                                F1    General Help
                                                F10   Save and Exit
                                                ESC   Exit


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```

IDE Master/Slave

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

4.3.3 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.

```
┌─────────────────────────────────────────────────────────────┐
│ Advanced                                                     │
├─────────────────────────────────────────────────────────────┤
│ Serial Port1 Address      [3F8/IRQ4]    Allows BIOS to Select│
│ Serial Port2 Address      [2F8/IRQ3]    Serial Port1 Base    │
│                                         Addresses.           │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                         ←    Select Screen   │
│                                         ↑↓   Select Item     │
│                                         +-   Change Option   │
│                                         F1   General Help    │
│                                         F10  Save and Exit   │
│                                         ESC  Exit            │
│                                                              │
├─────────────────────────────────────────────────────────────┤
│      v02.61 (C)Copyright 1985-2006, American Megatrends, Inc.│
└─────────────────────────────────────────────────────────────┘
```
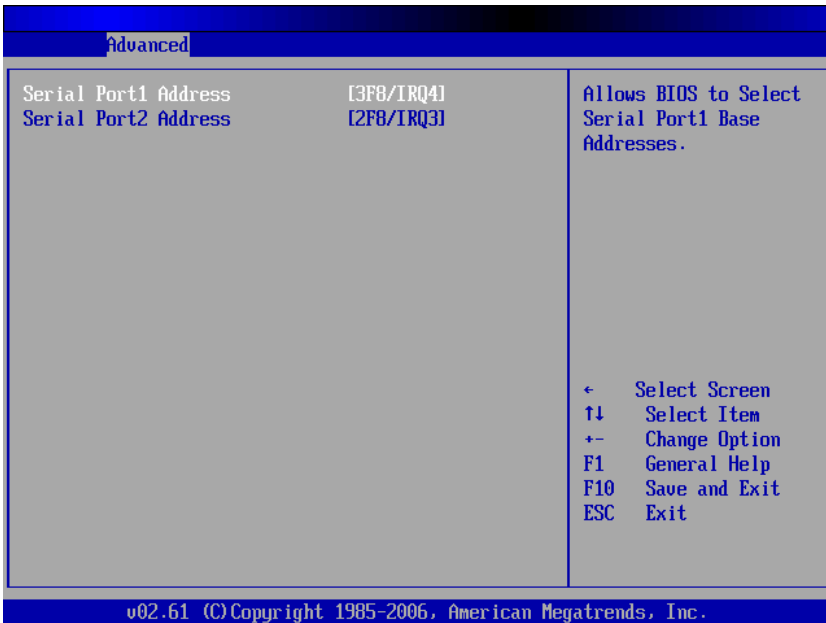
Serial Port1 Address

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.

4.3.4 Hardware Health Configuration

This option displays the current status of all of the monitored hardware devices/components such as voltages and temperatures. The options are Enabled and Disabled.

Three modes are provided for the CPU Fan (Fan1): Full On mode, Automatic mode, and PWM Manually mode. Full On mode runs the fan at full speed. Automatic mode is Smart Fan mode. PWM Manually mode runs the fan at the set speed.

Full On mode

```
                        BIOS SETUP UTILITY
        Advanced

  Hardware Health Configuration                        Fan confiruration
                                                       mode setting
  H/W Health Function           [Enabled]
  FAN 1 Mode Setting            [Full On mode]

  System Temperature            :29°C/84°F
  CPU Temperature               :25°C/77°F

  Fan1 Speed                    :1231 RPM

  CPU Core                      :1.152 V
  +3.30V                        :3.392 V
  +5.00V                        :5.107 V          ←     Select Screen
  +12.0V                        :12.032 V         ↑↓    Select Item
  VBAT                          :3.792 V          +-    Change Option
                                                  F1    General Help
                                                  F10   Save and Exit
                                                  ESC   Exit



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```

Automatic mode

```
                        BIOS SETUP UTILITY
   Advanced

 Hardware Health Configuration                        Enables Hardware
                                                      Health Monitoring
 H/W Health Function         [Enabled]                Device.
 FAN 1 Mode Setting          [Automatic mode]
   Temperature 1 Limit of OFF    [000]
   Temperature 1 Limit of Start  [020]
   Fan 1 Start PWM               [070]
   Slope PWM 1                   [0.5   PWM]

 System Temperature          :43°C/109°F
 CPU Temperature             :37°C/98°F

 Fan1 Speed                  :1300 RPM                ←    Select Screen
                                                      ↑↓   Select Item
 CPU Core                    :1.056 V                 +-   Change Option
 +3.30V                      :3.376 V                 F1   General Help
 +5.00V                      :5.107 V                 F10  Save and Exit
 +12.0V                      :12.096 V                ESC  Exit
 VBAT                        :3.376 V


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```

Temperature 1 Limit of OFF

When the temperature (°C) is higher than the set value, Fan1 will run at Start PWM speed. When the temperature is lower than the set value, Fan1 will stop.

Temperature 1 Limit of Start

When the temperature (°C) is higher than the set value, Fan1 will increase its speed by Slope PWM 1 value.

Fan 1 Start PWM

Sets a value to control the fan speed between Limit of OFF and Limit of Start. Minimum is 0 and Maximum is 127.

Slope PWM 1

The Slope PWM Value sets the rate of increase the fan speed when the temperature is above Limit of Start.

PWM Manually mode

```
                        BIOS SETUP UTILITY
        Advanced

   Hardware Health Configuration                    Fan confiruration
  ─────────────────────────────────────            mode setting
   H/W Health Function         [Enabled]
   FAN 1 Mode Setting          [PWM Manually mode]
     Fan 1 PWM Control         [100]
  ─────────────────────────────────────

   System Temperature          :30°C/86°F
   CPU Temperature             :25°C/77°F

   Fan1 Speed                  :1220 RPM

   CPU Core                    :1.152 U
   +3.30U                      :3.392 U           ←    Select Screen
   +5.00U                      :5.107 U           ↑↓   Select Item
   +12.0U                      :12.032 U          +-   Change Option
   UBAT                        :3.792 U           F1   General Help
                                                  F10  Save and Exit
                                                  ESC  Exit


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```

Fan 1 PWM Control

Sets a value to control the fan speed. Minimum is 0 and Maximum is 127.

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.

```
                         BIOS SETUP UTILITY
       Advanced

  Configure Remote Access type and parameters       Select Remote Access
                                                     type.
  Remote Access              [Enabled]

  Serial port number         [COM1]
      Base Address, IRQ      [3F8h, 4]
  Serial Port Mode           [115200 8,n,1]
  Flow Control               [None]
  Redirection After BIOS POST  [Always]
  Terminal Type              [ANSI]
  VT-UTF8 Combo Key Support  [Enabled]
  Sredir Memory Display Delay  [No Delay]
                                                 ←    Select Screen
                                                 ↑↓   Select Item
                                                 +-   Change Option
                                                 F1   General Help
                                                 F10  Save and Exit
                                                 ESC  Exit


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```

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.

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.

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.

```
                        BIOS SETUP UTILITY
       Advanced

   USB Configuration                                Enables support for
                                                    legacy USB. AUTO
   Module Version - 2.24.3-13.4                     option disables
                                                    legacy support if
   USB Devices Enabled :                            no USB devices are
     1 Drive                                        connected.

   Legacy USB Support              [Enabled]
   USB Functions                   [8 USB Ports]
   USB 2.0 Controller              [Enabled]
   USB 2.0 Controller Mode         [HiSpeed]

   ▶ USB Mass Storage Device Configuration
                                                 ←    Select Screen
                                                 ↑↓   Select Item
                                                 +-   Change Option
                                                 F1   General Help
                                                 F10  Save and Exit
                                                 ESC  Exit


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```
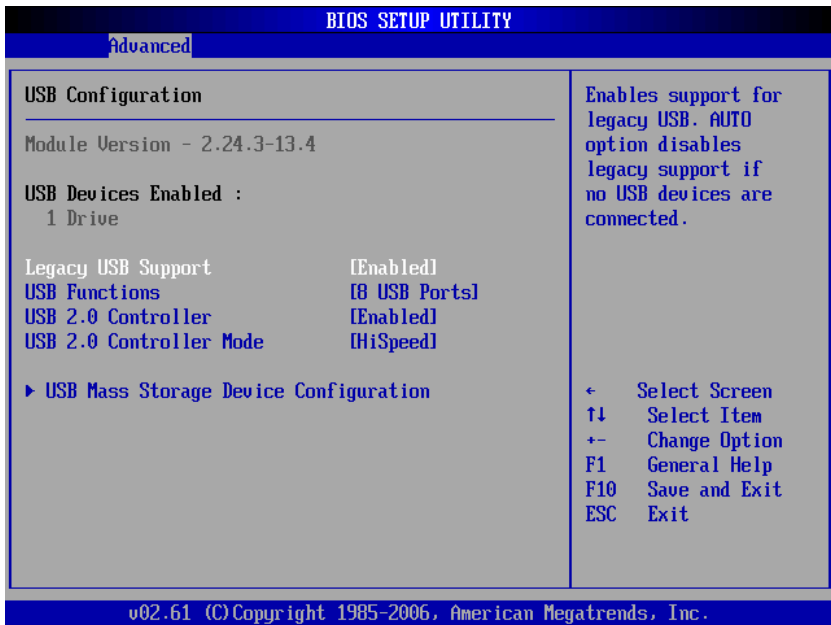
Legacy USB Support

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.

▶ **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.

USB Functions

Set this value to allow the system to Disable or select the number of onboard USB ports.

USB 2.0 Controller

Enables/disables USB 2.0 functionality to all USB ports. If USB Function is set to Disabled, this option has no effect.

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).

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.

4.3.7   Trusted Computing

Trusted computing is an industry standard to make personal computers more secure through a dedicated hardware chip, called a Trusted Platform Module (TPM). This option enables or disables the TPM support.

```
                        BIOS SETUP UTILITY
  Advanced

  Trusted Computing                             Enable/Disable TPM
                                                TCG (TPM 1.1/1.2) supp
  TCG/TPM SUPPORT              [No]             in BIOS




                                                ←     Select Screen
                                                ↑↓    Select Item
                                                +-    Change Option
                                                F1    General Help
                                                F10   Save and Exit
                                                ESC   Exit


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```
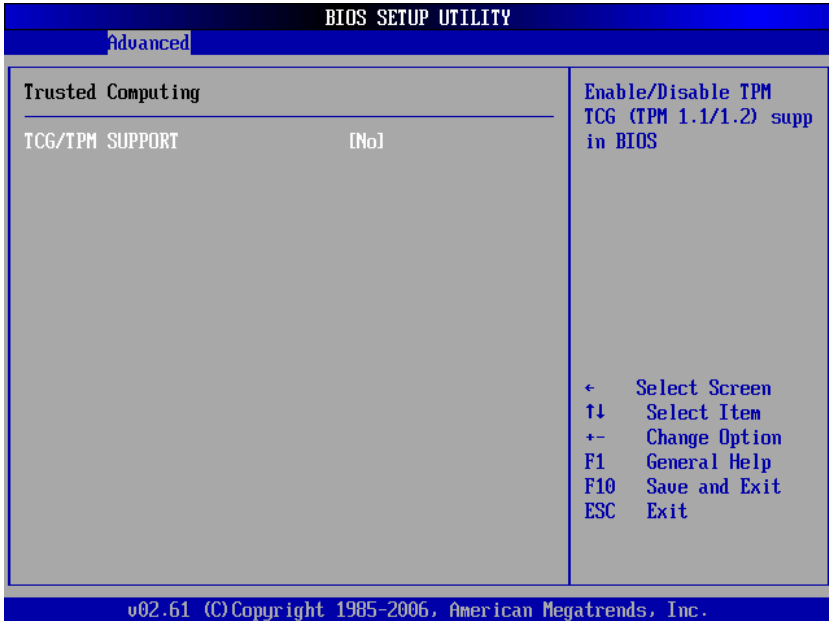
4.4 PCI/PnP Settings

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.

```
 Main    Advanced    PCIPnP    Boot    Security    Chipset    Exit

                                                Available: Specified
   IRQ3                   [Reserved]            IRQ is available to be
   IRQ4                   [Reserved]            used by PCI/PnP
   IRQ5                   [Available]           devices.
   IRQ7                   [Available]           Reserved: Specified
   IRQ9                   [Available]           IRQ is reserved for
   IRQ10                  [Available]           use by Legacy ISA
   IRQ11                  [Available]           devices.
   IRQ14                  [Available]
   IRQ15                  [Available]

   DMA Channel 0          [Available]
   DMA Channel 1          [Available]           ←    Select Screen
   DMA Channel 3          [Available]           ↑↓   Select Item
   DMA Channel 5          [Available]           +-   Change Option
   DMA Channel 6          [Available]           F1   General Help
   DMA Channel 7          [Available]           F10  Save and Exit
                                                ESC  Exit



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```

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.

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:

```
                    BIOS SETUP UTILITY
  Main    Advanced    PCIPnP    Boot    Security    Chipset    Exit

  Boot Settings                              Configure Settings
  ─────────────────────                      during System Boot.
  ▶ Boot Settings Configuration

  ▶ Boot Device Priority
  ▶ Hard Disk Drives


                                             ←     Select Screen
                                             ↑↓    Select Item
                                             Enter Go to Sub Screen
                                             F1    General Help
                                             F10   Save and Exit
                                             ESC   Exit


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```
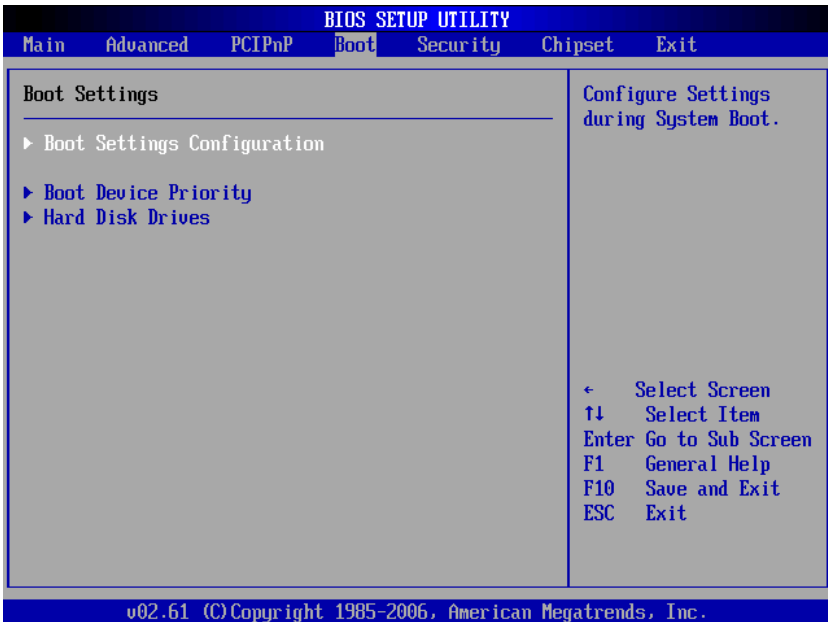
4.5.1 Boot Settings Configuration

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

```
                         BIOS SETUP UTILITY
                         Boot

Boot Settings Configuration                        Allows BIOS to skip
─────────────────────────────────                  certain tests while
Quick Boot               [Disabled]                booting. This will
Quiet Boot               [Enabled]                 decrease the time
Bootup Num-Lock          [On]                       needed to boot the
                                                    system.



                                                    ←     Select Screen
                                                    ↑↓    Select Item
                                                    +-    Change Option
                                                    F1    General Help
                                                    F10   Save and Exit
                                                    ESC   Exit


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```
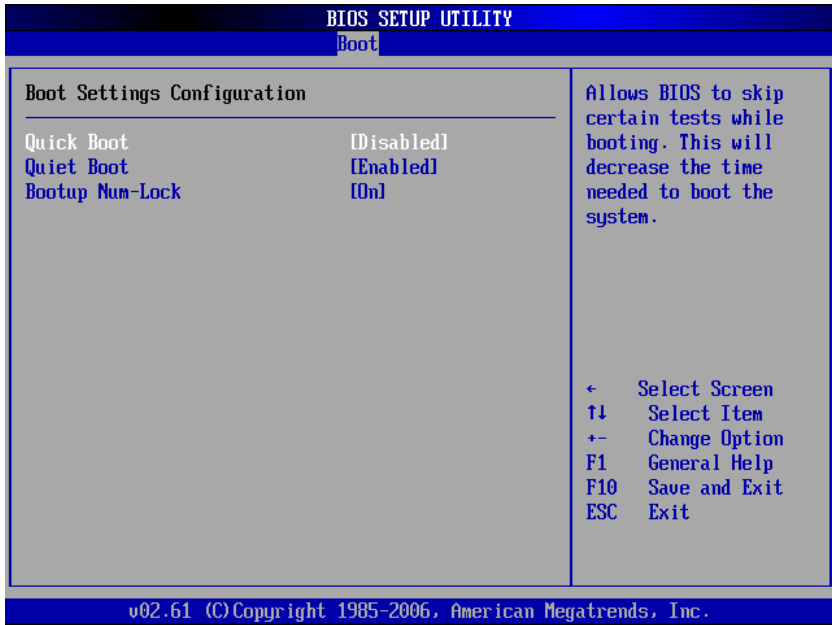
Quick Boot

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.

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.

4.5.2   Boot Device Priority

The items allow you to set the sequence of boot devices where BIOS attempts to load the disk operating system. First press <Enter> to enter the sub-menu. Then you may use the arrow keys to select the desired device, then press <+>, <-> or <PageUp>, <PageDown> key to move it up/down in the priority list.

4.5.3   Boot Device Groups

The Boot devices are listed in groups by device type. First press <Enter> to enter the sub-menu. Then you may use the arrow keys to select the desired device, then press <+>, <-> or <PageUp>, <PageDown> key to move it up/down in the priority list. Only the first device in each device group will be available for selection in the Boot Device Priority option.

4.6 Security Setup

```
                    BIOS SETUP UTILITY
  Main     Advanced    PCIPnP    Boot    Security    Chipset    Exit

  Security Settings                             Install or Change the
  ───────────────────────                       password.
  Supervisor Password :Not Installed
  User Password       :Not Installed

  Change Supervisor Password
  Change User Password
  Clear User Password

  Boot Sector Virus Protection   [Disabled]


                                                ←     Select Screen
                                                ↑↓    Select Item
                                                Enter Change
                                                F1    General Help
                                                F10   Save and Exit
                                                ESC   Exit


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```

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.

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

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.

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.

```
                    BIOS SETUP UTILITY
  Main    Advanced   PCIPnP    Boot    Security   Chipset   Exit

  Advanced Chipset Settings                   Configure North Bridge
                                              features.
  WARNING: Setting wrong values in below sections
           may cause system to malfunction.

  ▶ North Bridge Configuration
  ▶ South Bridge Configuration
  Onboard LAN ROM Init          [Disabled]
  Resume On PME#                [Disabled]
  Power Button Mode             [On/Off]
  LAN1 Control                  [Enabled]
  LAN2 Control                  [Enabled]
  Onboard VGA Function          [Enabled]

                                              ←     Select Screen
                                              ↑↓    Select Item
                                              Enter Go to Sub Screen
                                              F1    General Help
                                              F10   Save and Exit
                                              ESC   Exit

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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 < Plus > and < Minus > keys to change the value of the selected option.

```
                        BIOS SETUP UTILITY
                                              Chipset

 North Bridge Chipset Configuration                    Options
 Initial Graphic Adapter      [IGD]
 Boot Display Device          [CRT + LVDS]     CRT
 Flat Panel Type              [1024x768    ]   DVI
                                               CRT + DVI
                                               LVDS
                                               CRT + LVDS
```
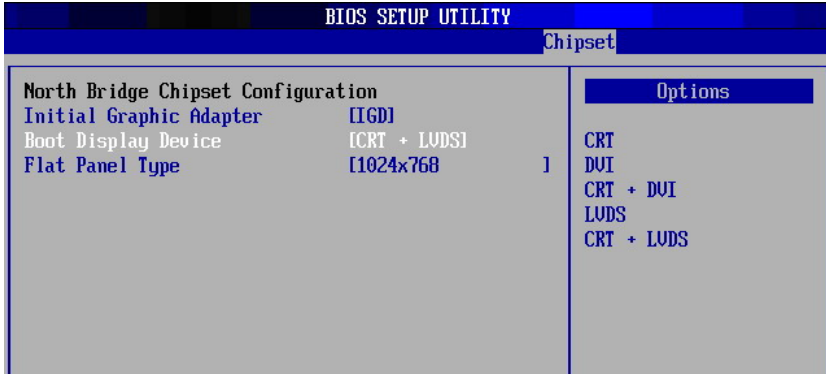
Initial Graphic Adapter

Select which graphics controller to use as the primary boot device.

▶ **IGD:** Integrated graphics only.

▶ **PCI/IGD:** Detect PCI graphics first, then integrated graphics (PCI includes PCI slot and PCI Express x1/x4 slot, PCI will be first).
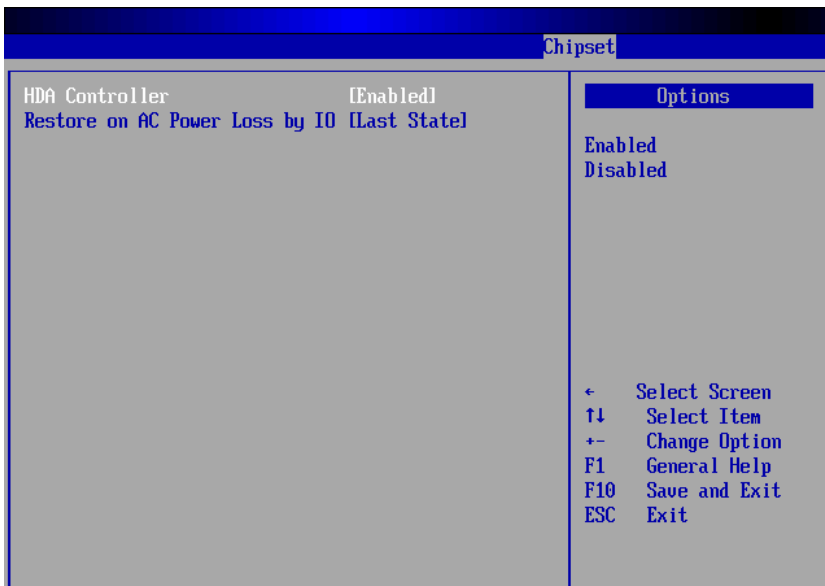
Boot Display Device

This item allows you to select the boot display device. The options are CRT, DVI, CRT+DVI, LVDS, and CRT+LVDS

Flat Panel Type

When LVDS is selected from Boot Display Device, this option allows you to set the resolution of the LVDS interface. The options are 640x480, 800x600, 1024x768, 1280x1024.

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 <Plus> and <Minus> keys to change the value of the selected option.

```
                                                     Chipset

 HDA Controller              [Enabled]                      Options

 Restore on AC Power Loss by IO [Last State]
                                                     Enabled
                                                     Disabled




                                                     ←    Select Screen
                                                     ↑↓    Select Item
                                                     +-    Change Option
                                                     F1    General Help
                                                     F10   Save and Exit
                                                     ESC   Exit

```

HDA Controller

Set this value to Enable/Disable the HDA Controller.

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.

4.7.3 Advanced Chipset Settings

You can use this screen to select options for Chipset Configuration. Use the up and down < Arrow > keys to select an item. Use the < Plus > and < Minus > keys to change the value of the selected option.

Onboard LAN ROM Init

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

Resume On PME#

This option specifies if the PME#. event will generate a system wake event. The options are Enabled and Disabled.

Power Button Mode

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

▶ **On/Off:** The system is powered down immediately if the power button is pressed.

▶ **Suspend:** The system is powered down if the power button is pressed for more than four seconds. Pressing the button momentarily (for less than 4 seconds) will put the system in "suspend" mode.
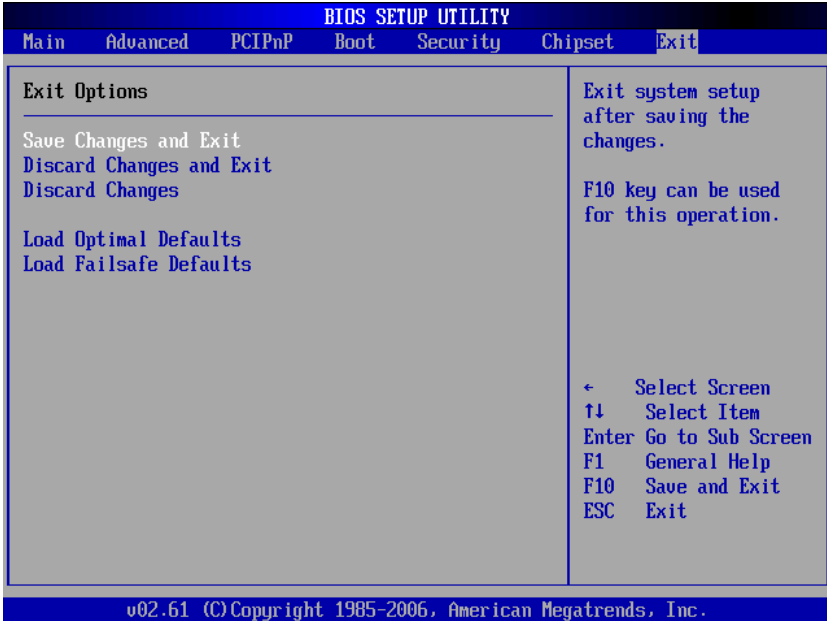
LAN1/2 Control

This item allows the user to enable/disable the onboard LAN.

On Board VGA Function

This item allows the user to enable/disable the built-in graphics.

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 highlighting it using the < Arrow > keys. The Exit BIOS Setup screen is shown below.

```
                        BIOS SETUP UTILITY
   Main    Advanced    PCIPnP    Boot    Security    Chipset    Exit

   Exit Options                                  Exit system setup
   ───────────────────────                       after saving the
   Save Changes and Exit                         changes.
   Discard Changes and Exit
   Discard Changes                               F10 key can be used
                                                 for this operation.
   Load Optimal Defaults
   Load Failsafe Defaults




                                                 ←    Select Screen
                                                 ↑↓   Select Item
                                                 Enter Go to Sub Screen
                                                 F1   General Help
                                                 F10  Save and Exit
                                                 ESC  Exit

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```

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.

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.

Appendix A - Watchdog Timer

The following is a sample program for configuring the M-321's watchdog timer.

A.1 Sample Code

```
static unsigned int IT8718_ioPort = 0x2e;

void Enter_IT8718_Config(unsigned int flag)
{
   if(flag) IT8718_ioPort = 0x4e;

   switch(IT8718_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_IT8718_Config(unsigned int flag)
{
   if(flag) IT8718_ioPort = 0x4e;

   outportb(IT8718_ioPort, 0x02);
   outportb(IT8718_ioPort+1, 0x02);
}

void Get_IT8718_ID(unsigned int &ID1, unsigned int &ID2)
```

```
{
   outportb(IT8718_ioPort, 0x20);
   ID1 = inportb(IT8718_ioPort+1);
   outportb(IT8718_ioPort, 0x21);
   ID2 = inportb(IT8718_ioPort+1);
}

void IT8718_WDTRun(unsigned long count_value)
{
   unsigned long tempCount;
   unsigned int registerValue;

   outportb(IT8718_ioPort, 0x07);
   outportb(IT8718_ioPort+1, 0x07);// Device 7

   if(count_value >= 60)
   {
      outportb(IT8718_ioPort, 0x72);
      registerValue = inportb(IT8718_ioPort+1);
      registerValue &= 0x7f;
      registerValue |= 0x40; //enable WDT output through
      KBRST
      outportb(IT8718_ioPort+1, registerValue); // set
      WDT count is minute

      tempCount = count_value / 60;
      if((count_value%60) > 30)
         tempCount++;
      if(tempCount > 65535)
         tempCount = 65535;
      printf("WDT timeout in %d minutes.\n", tempCount);
   }
   else
   {
      outportb(IT8718_ioPort, 0x72);
      registerValue = inportb(IT8718_ioPort+1);
      registerValue |= 0x80;

      tempCount = count_value;
      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(IT8718_ioPort+1, registerValue); // set
   WDT count is second
   }

   outportb(IT8718_ioPort, 0x71);
   registerValue = inportb(IT8718_ioPort + 1);
   registerValue |= 0x60;// set Mouse & Keyboard
      interrupt Enable
   outportb(IT8718_ioPort+1, registerValue);

   outportb(IT8718_ioPort, 0x73);
   outportb(IT8718_ioPort+1, tempCount); // set WDT count
      LSB
   tempCount = tempCount >> 8;
   outportb(IT8718_ioPort, 0x74);
   outportb(IT8718_ioPort+1, tempCount); // set WDT count
      MSB
}
```

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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
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 – CBFFF: Onboard VGA BIOS CC000 – CCFFF: Intel PXE 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

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.

B.3 I/O Map

Hex Range	Device
000-00F, 081-09F, 0C0-0DF	DMA controller 1, 8237A-5 equivalent
020-021, 0A0-0A1	Interrupt controller 1, 8259 equivalent
040-043	Timer, 8254-2 equivalent
060, 062, 064, 066, 068-06F	8042 Keyboard
061	System Speaker
070-071	Real Time Clock Controller (bit 7 - NMI mask)
0F0-0FF	Co-processor error register
2F8-2FF	Serial port 2
1F0-1F7, 3F6	Primary IDE Controller (AT Drive)
378-37F	Parallel port
3F0-3F7	Alt. Floppy Disk Controller
3B0-3BB	Mono/VGA mode video
3C0-3DF	VGA registers
3F8-3FF	Serial port 1
170-177, 376	Secondary IDE Channel
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
400-41F	SMBUS
500-57F	GPIO
800-87F	SB_PM_BASE_ADDRESS
A00-A3F	SIO_PME_BASE_ADDRESS

Table B-3: I/O Map

B.4 Interrupt Request (IRQ) Lines

IRQ Lines PIC Mode

IRQ#	Typical Interrupt Resource	Connected to Pin	Available
0	Counter 0	N/A	No
1	Keyboard controller	N/A	No
2	No	N/A	No
3	Serial Port 1 (COM1)	IRQ3 via SERIRQ	No
4	Serial Port 2 (COM2) / PCI	IRQ4 via SERIRQ	Note (1)
5	Serial Port 6 (COM6)	IRQ5 via SERIRQ	No
6	N/A	IRQ6 via SERIRQ	No
7	N/A	IRQ7 via SERIRQ	No
8	Real-time clock	N/A	No
9	SCI / PCI	IRQ9 via SERIRQ	Note (1)
10	N/A	N/A	No
11	N/A	N/A	No
12	PS/2 Mouse / PCI	IRQ12 via SERIRQ	Note (1)
13	Math Processor	N/A	No
14	Primary IDE controller / PCI	IRQ14 via SERIRQ	Note (1)
15	Secondary IDE controller / PCI	IRQ15 via SERIRQ	Note (1)

Table B-4: IRQ Lines PIC Mode

Note(1): These IRQs can be used for PCI devices when onboard device is disabled.

IRQ Lines APIC Mode

IRQ#	Typical Interrupt Resource	Connected to Pin	Available
0	Counter 0	N/A	No
1	Keyboard controller	N/A	No
2	No	N/A	No
3	Serial Port 1 (COM1)	N/A	No
4	Serial Port 2 (COM2) / PCI	IRQ4 via SERIRQ	Note (1)
5	Serial Port 6 (COM6)	IRQ5 via SERIRQ	No
6	N/A	IRQ6 via SERIRQ	No
7	N/A	IRQ7 via SERIRQ	No
8	Real-time clock	N/A	No
9	SCI / PCI	IRQ9 via SERIRQ	Note (1)
10	N/A	N/A	No
11	N/A	N/A	No
12	PS/2 Mouse / PCI	IRQ12 via SERIRQ	Note (1)
13	Math Processor	N/A	No
14	Primary IDE controller / PCI	IRQ14 via SERIRQ	Note (1)
15	Secondary IDE controller / PCI / ISA	IRQ15 via SERIRQ	Note (1)
16	N/A	PCIE Port 0/4, UHCI Controller 4/6, P.E.G Root Port, I.G.D, HECI Host 1/2, NET 2280 , PCI Slot 1	Yes
17	N/A	PCIE Port 1/5, KT Controller, PCI Slot 2	Yes
18	N/A	PCIE Port 2, UHCI Controller 3, EHCI Controller 2, SATA Host controller, SMBus Controller, Thermal Controller, IDER Controller, PCI Slot 3	Yes

IRQ#	Typical Interrupt Resource	Connected to Pin	Available
19	N/A	PCIE Port 3, UHCI Controller 2/7, SATA Host controller#1	Yes
20	N/A	GBE controller	No
21	N/A	UHCI Controller 5	No
22	N/A	High Definition Audio Controller	No
23	N/A	UHCI Controller 1, EHCI Controller 1	No

Table B-5: IRQ Lines APIC Mode

Note (1): These IRQs can be used for PCI devices when onboard device is disabled.

B.5 PCI Configuration Space Map

Bus #	Device #	Function #	Routing	Description
00h	00h	00h	N/A	Intel Q45 GMCH Host Hub Interface Bridge
00h	01H	00h	Internal	P.E.G. Root Port
02h	00H	FFh	N/A	P.E.G. Port
00h	02h	00h	Internal	Intel Integrated Graphics Device
00h	02h	01h	Internal	I.G.D., Fun#1
00h	06h	00h	Internal	P.E.G. #1 Root Port
03h	00h	FFh	Internal	P.E.G. #1 Port
00h	04h	00h	Internal	P.E.G. #4 Root Port
00h	03h	00h	Internal	HECI Host #1
00h	03h	01h	Internal	HECI Host #2
00h	03h	02h	Internal	IDER Controller
00h	03h	03h	Internal	KT Controller
00h	16h	00h	Internal	VE AHCI Controller
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	02h	Internal	Intel USB UHCI Controller #7
00h	1Ah	07h	Internal	Intel USB EHCI Controller #2
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	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 #1
00h	1Dh	01h	Internal	Intel USB UHCI Controller #2
00h	1Dh	02h	Internal	Intel USB UHCI Controller #3
00h	1Dh	03h	Internal	Intel USB UHCI Controller #6
00h	1Dh	07h	Internal	Intel USB EHCI Controller #1
00h	1Eh	00h	N/A	Intel Hub Interface to PCI Bridge
00h	1Fh	00h	N/A	Intel LPC Interface Bridge

Bus #	Device #	Function #	Routing	Description
00h	1Fh	02h	Internal	Intel SATA Host /Raid controller
00h	1Fh	03h	Internal	Intel SMBus Controller
00h	1Fh	05h	Internal	Intel Host SATA controller1
00h	1Fh	06h	Internal	Thermal Controller
04h	00h	FFH	Internal	PCIE Port #0
05h	00h	FFh	Internal	PCIE Port #1
06h	00h	FFh	Internal	PCIE Port #2
07h	00h	FFh	Internal	PCIE Port #3
08h	00h	FFh	Internal	PCIE Port #4
09h	00h	FFh	Internal	PCIE Port #5
01h	0Fh	FFh	Slot	PCI Slot 1
01h	0Eh	FFh	Slot	PCI Slot 2
01h	0Dh	FFh	Slot	PCI Slot 3
01h	0Ch	FFh	Slot	NET 2288

Table B-6: PCI Configuration Space Map

B.6 PCI Interrupt Routing Map

PIRQ	A	B	C	D	E	F	G	H
P.E.G Root Port	INTA	INTB	INTC	INTD				
P.E.G Root Port 1	INTA	INTB	INTC	INTD				
IGD	X							
SATA Controller			X	X				
SATA Controller1				X				
SMBUS controller			X					
Thermal Controller			X					
HDA Controller							X	
GbE Controller					X			
VE AHCI Controller			X	X				
HECI Host #1	X							
HECI Host #2	X							
IDER Controller			X					
KT Controller		X						
PCIE port 0	INTA	INTB	INTC	INTD				
PCIE port 1	INTB	INTC	INTD	INTA				
PCIE port 2	INTC	INTD	INTA	INTB				
PCIE port 3	INTD	INTA	INTB	INTC				
PCIE port 4	INTA	INTB	INTC	INTD				
PCIE port 5	INTB	INTC	INTD	INTA				
PCI slot 1	INTA	INTB	INTC	INTD				
PCI slot 2	INTB	INTC	INTD	INTA				
PCI slot 3	INTC	INTD	INTA	INTB				

Table B-7: PCI Interrupt Routing Map

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.

► 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.

WARNING: 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.

Getting Service

Contact us should you require any service or assistance.

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