JN440BX Motherboard
Technical Product Specification

April, 1998

Order Number 699414-001

The JN440BX motherboard may contain design defects or errors known as errata. Characterized errata that may cause the JN440BX motherboard's behavior to deviate from published specifications are documented in the JN440BX Motherboard Specification Update.

Revision History

Revision	Revision History	Date
-001	First released version	April 1998

This product specification applies only to standard JN440BX motherboards with BIOS identifier 4J4NB0X1

Changes to this specification will be published in the JN440BX Motherboard Specification Update before being incorporated into a revision of this document.

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1 Motherboard Description

1.1 Overview

The JN440BX motherboard is a versatile platform that offers a wide variety of features. Some of the options, however, are implemented – at least in part – on the riser. Throughout this manual, the ‡ symbol is used to indicate such an option. Because there is no standard riser, no detailed description of an implementation can be given. See Section 6.1 to obtain the reference design for the NLX riser.

Microprocessor

- Single Pentium® II processor
- 66 MHz and 100 MHz host bus speeds
- Integrated 512 KB or 1 MB of second level cache
- Slot 1 connector

NOTE

Pentium II processors with 100 MHz front-side bus should be paired only with 100 MHz SDRAM. Processors with 66 MHz front side bus can be paired with either 66 MHz or 100 MHz SDRAM.

The motherboard features:

- NLX v1.2 form factor
- Minimal jumper design

Main Memory

- Three 168-pin DIMM sockets
- Support for up to 384 MB of synchronous DRAM (SDRAM)
- Support for 66 MHz and 100 MHz SDRAM
- Support for ECC and non-ECC memory

Chipset and PCI/IDE Interface

- Intel® 82440BX AGPset PCI/A.G.P. Controller (PAC)
- Integrated PCI bus mastering controller using PIIX4E
- Dual channel EIDE interface‡
- Real-time clock
- PCI Slots‡
- Automatic detection of Host Bus speed

I/O Features

- SMC FDC37C777 I/O controller
- Single diskette drive interface
- Integrates standard I/O functions: one multi-mode parallel port, two FIFO serial ports, and keyboard and mouse controller
- Support for one Universal Serial Bus (USB) interface on the motherboard and another on the riser‡
- Support for consumer infrared in place of COM2‡

Audio Subsystem

- Crystal Audio 4235 controller
- Sound Blaster† compatible
- Full-duplex audio functionality providing simultaneous record and playback under Windows†
- Back panel connectors (3.5 mm mini jacks)
  - Line-in
  - Line-out
  - Mic-in
- BIOS setup-based software enable/disable/configure
- Telephony audio support‡
- PC ’97 compliant
- Circuit to support an external speaker‡
- Support for the auxiliary Audio NLX connector

Graphics Subsystem

- ATI RAGE† PRO TURBO† integrated 64-bit A.G.P. graphics accelerator with support for 3D and motion video
  - 4 MB of 100 MHz SGRAM
  - 2D acceleration in 8/16/24/32 bpp modes
  - 3D acceleration with compressed texture modes: YUV 4:2:2, CLUT 4 (C14), and CLUT 8 (C18)
- A.G.P. connector support for 66 MHz and 133 MHz fully pipelined operation and sideband support

Local Area Network (LAN) Subsystem

- 10/100 Mbit/sec LAN hardware
- Remote wakeup controller

Other features

- Plug and Play compatible
- Support for Advanced Power Management (APM)
- Advanced Configuration and Power Management Interface (ACPI) ready
- Support for Wired for Management (WfM) 1.1
- Support for Management Level 4.0

1.2 Motherboard Layout

Figure 1 is a block diagram showing the relationship among the major components.

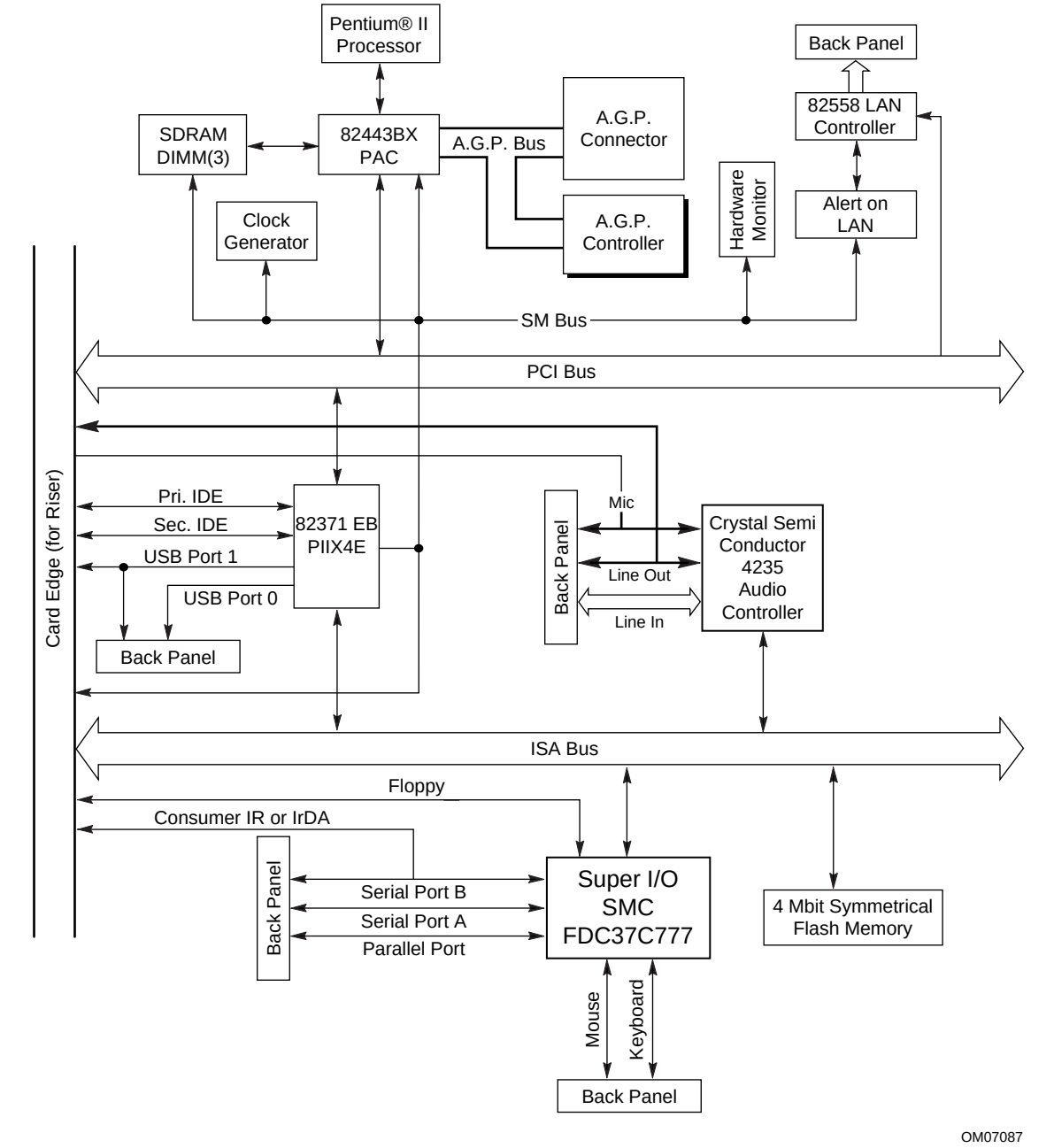
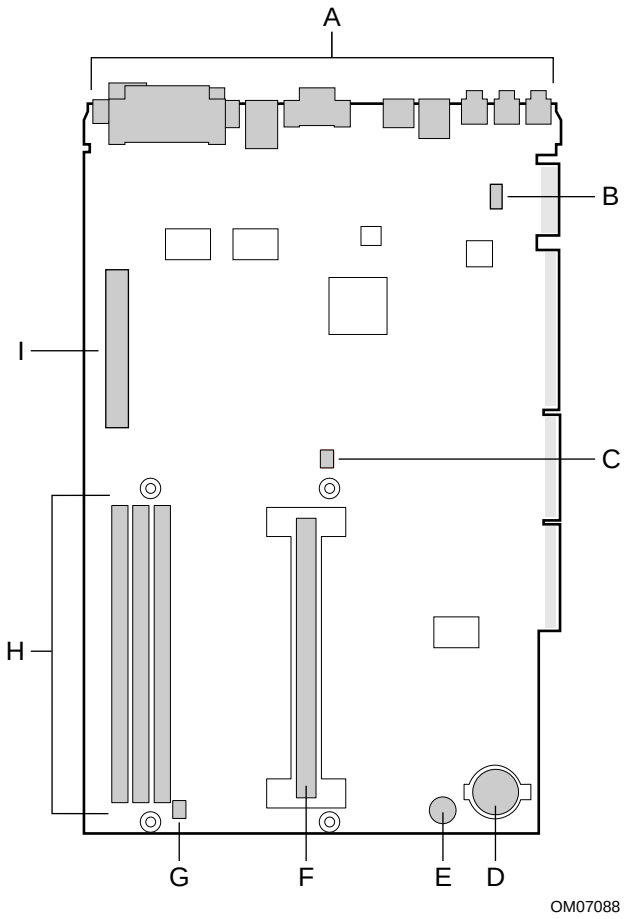


Figure 1. Motherboard Block Diagram

Figure 2 shows the location of the major components on the motherboard.



A	Back panel connectors	F	Slot 1 connector
B	CD-ROM header	G	Fan connector
C	Configuration jumper	H	DIMM sockets
D	Battery	I	A.G.P. connector
E	Piezoelectric speaker		

Figure 2. Motherboard Components

1.3 Form Factor

The motherboard is designed to fit into a standard NLX form factor chassis. Figure 3 illustrates the mechanical form factor for the motherboard. Location of the I/O connectors, riser slot, and mounting holes are in strict compliance with the NLX specification (see Section 6.2). Dimensions are given in inches.

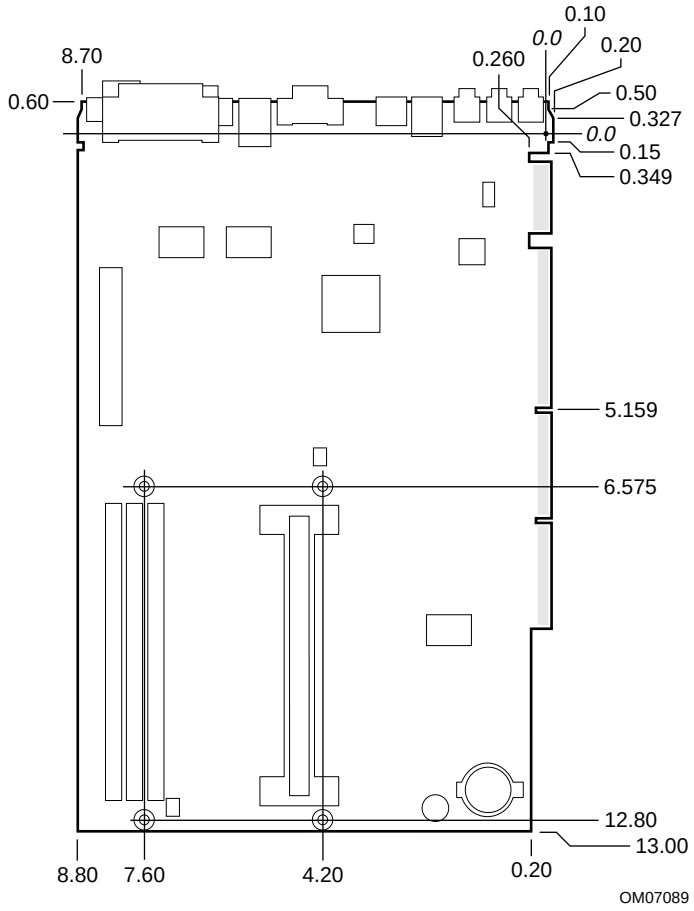


Figure 3. Motherboard Dimensions

1.4 I/O Shield

The back panel I/O shield for the JN440BX motherboard must meet specific dimensional and material requirements. Systems based on this motherboard need the back panel I/O shield in order to pass emission certification testing. Figure 4 shows the critical dimensions of the I/O shield, and indicates the position of each cutout. Dimensions are given in inches.

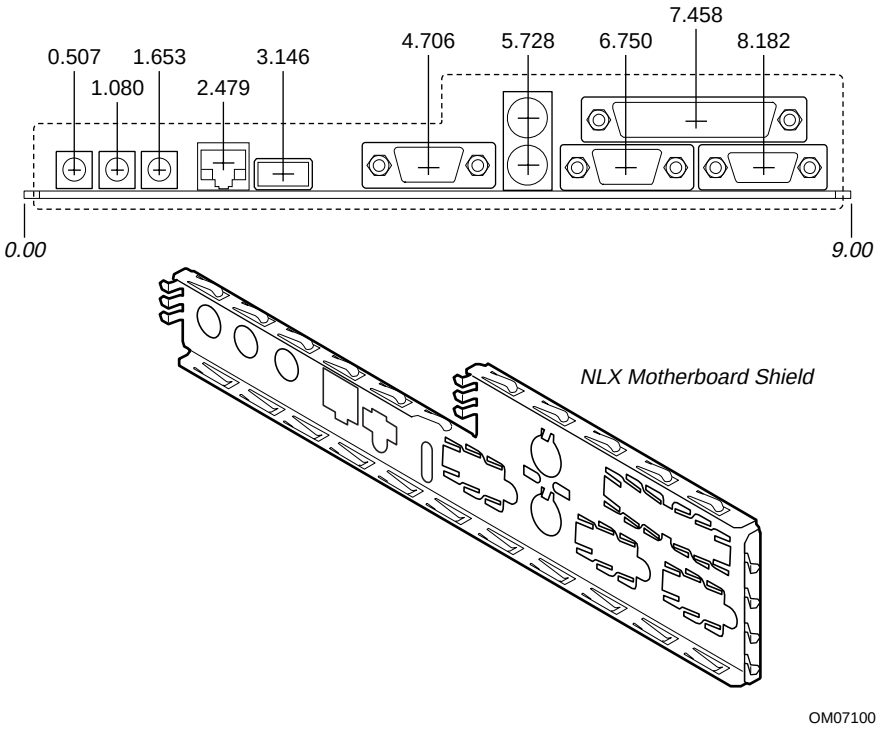


Figure 4. Back Panel I/O Shield Dimensions

1.5 Microprocessor

The motherboard supports a single Pentium II processor. The processor's VID pins automatically program the motherboard's voltage regulator to the required processor voltage. In addition, the host bus speeds (66 MHz and 100 MHz) is automatically selected. The motherboard supports all current processor speeds, voltages, and bus frequencies.

1.5.1 Microprocessor Packaging

The processor is packaged in a Single Edge Contact (S.E.C.) cartridge. The S.E.C. cartridge includes the processor core, the second-level cache, a thermal plate, and a back cover.

The processor connects to the motherboard through the Slot 1 processor connector, a 242-pin edge connector. When the processor is mounted in Slot 1, it is secured by a retention mechanism attached to the motherboard. The processor's heatsink is stabilized by a heatsink support that is attached to the motherboard.

1.5.2 Second-Level Cache

The second-level cache is located on the substrate of the S.E.C. cartridge. The cache includes pipelined burst synchronous static RAM (PBSRAM) and tag RAM. There can be two or four PBSRAM components totaling 512 KB or 1024 KB in size. All supported onboard memory can be cached.

1.5.3 Microprocessor Upgrades

The motherboard can be upgraded with Pentium II processors that run at higher processor speeds. After upgrading the processor, use the BIOS configuration mode to set the proper speed for the processor. See Section 1.15.2 for information about configuration mode.

1.6 Main Memory

The motherboard has three, dual inline memory module (DIMM) sockets. Minimum memory size is 16 MB; maximum memory size is 384 MB. The BIOS automatically detects memory type, size, and speed.

The motherboard supports the following memory features:

- 168-pin DIMMs with gold-plated contacts
- 66 and 100 MHz (matching Host Bus speed) unbuffered SDRAM only
- Non-ECC (64-bit) and ECC (72-bit) memory
- 3.3 V memory only
- Single- or double-sided DIMMs in the following sizes:

DIMM Size	Non-ECC Configuration	ECC Configuration
16 MB	2 Mbit x 64	2 Mbit x 72
32 MB	4 Mbit x 64	4 Mbit x 72
64 MB	8 Mbit x 64	8 Mbit x 72
128 MB	16 Mbit x 64	16 Mbit x 72

Memory can be installed in one, two, or three sockets. Memory size can vary between sockets.

1.6.1 SDRAM

Synchronous DRAM (SDRAM) improves memory performance through memory access that is synchronous with the memory clock. This simplifies the timing design and increases memory speed because all timing is dependent on the number of memory clock cycles.

NOTE

All memory components and DIMMs used with the JN440BX motherboard must comply with the PC SDRAM Specifications. These include: the PC SDRAM Specification (memory component specific), the PC unbuffered SDRAM Specifications, and the PC Serial Presence Detect Specification. Customers can access these document through the Internet at:

http://www.intel.com/design/pcisets/memory

See Section 6.2 for information about these specifications.

1.6.2 ECC Memory

Error checking and correcting (ECC) memory detects multiple-bit errors and corrects single-bit errors. When ECC memory is installed, the BIOS supports both ECC and non-ECC mode. ECC mode is enabled in the Setup program. The BIOS automatically detects if ECC memory is installed and provides the Setup option for selecting ECC mode. If non-ECC memory is installed, the Setup option for ECC mode does not appear.

The following table describes the effect of using Setup to put each memory type in each supported mode. Whenever ECC mode is selected in Setup, some performance loss occurs.

	Memory Error Detection Mode Established in Setup Program	
	ECC Disabled	**ECC Enabled**
Non-ECC DIMM	No error detection	N/A
ECC DIMM	No error detection	Single-bit error correction, multiple-bit error detection

1.7 Chipset

The Intel 440BX AGPset includes a Host-PCI bridge integrated with both an optimized DRAM controller and an Accelerated Graphics Port (A.G.P.) interface. The I/O subsystem of the 440BX is based on the PIIX4E, which is a highly integrated PCI-ISA/IDE Accelerator Bridge. This chipset consists of the Intel® 82443BX PCI/A.G.P. controller (PAC) and the Intel® 82371EB PCI/ISA IDE Xccelerator (PIIX4E) bridge chip.

1.7.1 Intel® 82443BX PCI/A.G.P. Controller (PAC)

The PAC provides bus-control signals, address paths, and data paths for transfers between the processor's host bus, PCI bus, the A.G.P., and main memory. The PAC features:

- Processor interface control
  - Support for processor host bus frequencies of 100 MHz or 66 MHz
  - 32-bit addressing
  - Desktop Optimized GTL+ compliant host bus interface
- Integrated DRAM controller, with support for:
  - +3.3 V only DIMM DRAM configurations
  - Up to three double sided DIMMs
  - Synchronous 100-MHz or 66-MHz SDRAM
  - DIMM serial presence detect via SMBus interface
  - 16- and 64-Mbit devices with 2 K, 4 K, and 8 K page sizes
  - x 4, x 8, x 16, and x 32 DRAM widths
  - SDRAM 64-bit data interface with ECC support
  - Symmetrical and asymmetrical DRAM addressing
- A.G.P. interface
  - Complies with the A.G.P. specification (see Section 6.2 for specification information)
  - Support for +3.3 V A.G.P. 66/133 devices
  - Synchronous coupling to the host-bus frequency
- PCI bus interface
  - Complies with the PCI specification, +5 V 33 MHz interface (see Section 6.2 for specification information)
  - Asynchronous coupling to the host-bus frequency
  - PCI parity generation support
  - Data streaming support from PCI-to-DRAM
  - Support for four PCI bus masters in addition to the host and PCI-to-ISA I/O bridge
  - Support for concurrent host, A.G.P., and PCI transactions to main memory

- Data buffering
  - DRAM write buffer with read-around-write capability
  - Dedicated host-to-DRAM, PCI0-to-DRAM, and PCI1/A.G.P.-to-DRAM read buffers
  - A.G.P. dedicated inbound/outbound FIFOs (133/66 MHz), used for temporary data storage
- Power management functions
  - Support for system suspend/resume (DRAM and power-on suspend)
  - Compliant with ACPI power management
- SMBus support for desktop management functions
- Support for system management mode (SMM)

1.7.2 Intel® 82371EB PCI ISA IDE Xcelerator (PIIX4E)

The PIIX4E is a multifunction PCI device implementing the PCI-to-ISA bridge, PCI IDE functionality, Universal Serial Bus (USB) host/hub functionality, and enhanced power management. The PIIX4E features:

- Multifunction PCI-to-ISA bridge
  - Support for the PCI bus at 33 MHz
  - Complies with the PCI specification (see Section 6.2 for specification information)
  - Full ISA bus support
- USB controller
  - Two USB ports (see Section 6.2 for specification information)
  - Support for legacy keyboard and mouse
  - Support for UHCI interface
- Integrated dual-channel enhanced IDE interface
  - Support for up to four IDE devices
  - PIO Mode 4 transfers at up to 16 MB/sec
  - Support for Ultra DMA/33 synchronous DMA mode transfers up to 33 MB/sec
  - Bus master mode with an 8 x 32-bit buffer for bus master PCI IDE burst transfers
- Enhanced DMA controller
  - Two 8237-based DMA controllers
  - Support for PCI DMA with three PC/PCI channels and distributed DMA protocols
  - Fast type-F DMA for reduced PCI bus usage
- Interrupt controller based on 82C59
  - Support for 15 interrupts
  - Programmable for edge/level sensitivity
- Power management logic
  - Sleep/resume logic
  - Support for wake on modem and Wake on LAN† technology
  - Support for ACPI (see Section 6.2 for specification information)
- Real-Time Clock
  - 256-byte battery-backed CMOS SRAM
  - Includes date alarm
- 16-bit counters/timers based on 82C54

1.7.3 Accelerated Graphics Port (A.G.P.)

The Accelerated Graphics Port (A.G.P.) is a high-performance interconnect for graphic-intensive applications, such as 3D applications. A.G.P. is independent of the PCI bus and is intended for exclusive use with graphical-display devices. A.G.P. provides these performance features:

- Pipelined-memory read and write operations that hide memory access latency
- Demultiplexing of address and data on the bus for near 100 percent bus efficiency
- AC timing for 133 MHz data transfer rates, allowing data throughput of 500 MB/sec

A.G.P. complies with the 66 MHz PCI specification. See Section 6.2 for information about the A.G.P. and PCI specifications.

NOTE

Only half-length NLX A.G.P. cards are supported.

1.7.4 Universal Serial Bus (USB)

The motherboard can support two‡ USB ports; however, it is shipped with only one port installed. The second port must be supported through the NLX riser. If you need to connect more than one USB device, you can connect an external hub to the USB port. The motherboard fully supports the universal host controller interface (UHCI) and uses UHCI-compatible software drivers. See Section 6.2 for information about the USB specification. USB features include:

- Self-identifying peripherals that can be plugged in while the computer is running
- Automatic mapping of function to driver and configuration
- Supports isochronous and asynchronous transfer types over the same set of wires
- Bandwidth and low latencies appropriate for telephony, audio, and other applications
- Error-handling and fault-recovery mechanisms built into the protocol

NOTE

Computer systems that have an unshielded cable attached to a USB port may not meet FCC Class B or other regulatory EMI requirements, even if no device or a low-speed USB device is attached to the cable. Use shielded cable that meets the requirements for full-speed devices.

1.7.5 IDE Support

The motherboard has two independent bus-mastering capable PCI IDE interfaces. These interfaces support PIO Mode 3, PIO Mode 4, ATAPI devices (such as CD-ROM), and Ultra DMA/33 synchronous-DMA mode transfers. The BIOS supports logical block addressing (LBA) and extended cylinder head sector (ECHS) translation modes. The BIOS automatically detects the IDE device transfer rate.

The motherboard also supports laser servo (LS-120) drives. LS-120 technology allows the user to perform read/write operations to LS-120 (120 MB) and conventional 1.44 MB and 720 KB diskettes. LS-120 drives are ATAPI-compatible and connect to the motherboard's IDE interface. Some versions of Windows 95 and Windows NT† operating systems recognize the LS-120 drive as a bootable device in both 120 MB and 1.44 MB mode.

Connection of an LS-120 drive and a standard 3.5-inch diskette drive is allowed. The LS-120 drive can be configured as a boot device if selected in the Setup program.

Bus master IDE drivers are available from Intel at the following web location:

http://developer.intel.com/design/pcisets/busmastr/

1.7.6 Real-Time Clock, CMOS SRAM, and Battery

The real-time clock is compatible with DS1287 and MC146818 components. The clock provides a time-of-day clock and a multicentury calendar with alarm features and century rollover. The real-time clock supports 256 bytes of battery-backed SRAM in two banks that are reserved for BIOS use.

The time, date, and SRAM values can be specified in the Setup program. The SRAM values can be returned to their defaults by using the Setup program.

An external coin-cell battery powers the real-time clock and SRAM. When the computer is not plugged into a wall socket, the battery has an estimated life of three years. When the computer is plugged in, the 5 V standby current from the power supply extends the life of the battery. The clock is accurate to ± 13 minutes/year at 25 ºC with 5 V applied.

NOTE

The recommended method of accessing the date in systems with Intel motherboards is indirectly from the Real Time Clock (RTC) via the BIOS. The BIOS on Intel motherboards and baseboards contains a century checking and maintenance feature that checks the least two significant digits of the year stored in the RTC during each BIOS request (INT 1Ah) to read the date and, if less than 80 (i.e., 1980 is the first year supported by the PC), updates the century byte to 20. This feature enables operating systems and applications using the BIOS date/time services to reliably manipulate the year as a four-digit value.

For more information on proper date access in systems with Intel motherboards please see http://support.intel.com/procs/support/year2000/status/motherboard paper.htm

1.8 I/O Controller

The motherboard uses the SMC FDC37C777 I/O controller which features:

- 5 Volt operation
- ISA Plug-and-Play compatible register set
- Two serial ports or one serial port and one infrared port‡
- Single diskette drive interface
- FIFO support on both serial and diskette interfaces
- One parallel port with ECP and EPP support
- PS/2† style mouse and keyboard interfaces
- Intelligent auto power management, including:
  - — Shadowed write-only registers for ACPI compliance
  - — Programmable wake-up event interface

The Setup program provides configuration options for the I/O controller.

1.8.1 Keyboard and Mouse Interface

PS/2 keyboard and mouse connectors are located on the back panel of the motherboard. The +5 V lines to these connectors are protected with a PolySwitch† circuit that, like a self-healing fuse, reestablishes the connection after an over-current condition is removed. While this device eliminates the possibility of having to replace a fuse, power to the computer should be turned off before connecting or disconnecting a keyboard or mouse.

NOTE

You can plug a mouse or keyboard into either connector.

The keyboard controller contains code which provides the traditional keyboard and mouse control functions, and also supports Power On/Reset password protection. A Power On/Reset password can be specified in the Setup program.

The controller supports the <Ctrl><Alt><Del> key sequence to reset the computer's software by jumping to the beginning of the BIOS code and running the Power-On Self Test (POST).

1.8.2 Parallel Port

The connector for the multimode bi-directional parallel port is a 25-pin D-Sub connector located on the back panel of the motherboard. In the Setup program, there are four options for parallel port operation:

- Compatible (standard mode)
- Bi-directional (PS/2 compatible)
- Bi-directional Enhanced Parallel Port (EPP). A driver from the peripheral manufacturer is required for operation. See Section 6.2 for EPP compatibility
- Bi-directional high-speed Extended Capabilities Port (ECP)

1.8.3 Diskette Drive Controller

The I/O controller is software compatible with the 82077 diskette drive controller. The diskette drive connector is located on the riser card. In the Setup program, the interface can be configured for the following drive capacities and sizes:

- 1.2 MB, 5.25-inch
- 1.2 MB, 3.5-inch (Mode 3 diskette support, driver required)
- 1.44 MB, 3.5-inch
- 2.88 MB, 3.5-inch

1.8.4 Serial Ports

The motherboard has two 9-pin D-Sub serial port connectors located on the back panel. The NS16C550-compatible UARTs allow data transfers at speeds up to 115.2 Kbits/sec using BIOS support.

1.8.5 Optional Infrared

There is no infrared header on the motherboard; however, the edge connector does accommodate infrared signals from the riser. If an IrDA† connector is available on the riser, use the BIOS Peripheral Configuration Submenu to change the mode for Serial Port B from COM2 to infrared applications. You will no longer be able to use Serial Port B.

1.9 Audio Subsystem

The audio subsystem consists of the following:

- Crystal Semiconductor CS4235 audio codec
- Back panel and onboard audio connectors

1.9.1 Crystal Semiconductor CS4235 Audio Codec

The CS4235 audio codec's features include:

- Compatibility with Sound Blaster, Sound Blaster Pro†, and Windows Sound System
- MPU-401 compatible MIDI and joystick interfaces
- Advanced MPC3-compliant input and output mixer

1.9.2 Audio Connectors

The audio connectors include the following:

- Back panel connectors: stereo line-level output (Line-out), stereo line-level input (Line-in), and Mic-in
- CD-ROM audio header (Creative Labs style)

⚠ CAUTION

The LINE-OUT connector, following convention, is designed to power headphones or amplified speakers ONLY. Do not connect passive (non-amplified) speakers to this output, as poor audio quality and/or damage to the motherboard may occur.

1.9.3 Audio Drivers and Utilities

Audio software and utilities are available from Intel's World Wide Web site (see Section 6.1). Audio driver support is provided for Microsoft Windows 3.1, Microsoft Windows 95, and Microsoft Windows NT operating systems.

1.10 Graphics Subsystem

The graphics subsystem features the ATI Rage† Pro Turbo 2X graphics controller. See Intel's World Wide Web site (see Section 6.1) for graphics drivers.

1.10.1 ATI Rage Pro Turbo 2X Graphics Controller

The ATI Rage Pro Turbo 2X Graphics Controller provides the following features:

- Comprehensive A.G.P. support, including 1X (66 MHz) and 2X (133 MHz) fully pipelined operation and sideband support
- Full bus mastering support
- Triple 8-bit palette DAC with gamma correction. Pixel rates up to 230 MHz
- Supports DDC1 and DDC2B+ for Plug and Play monitors
- Game acceleration including support for Microsoft's DirectDraw†: double buffering, virtual sprites, transparent blit, masked blit, and context chaining
- 4 KB on-chip texture cache
- Direct3D† texture lighting
- 4 MB of 100 MHz SGRAM on the motherboard

1.10.1.1 Motion Video Acceleration

The ATI Rage Pro Turbo 2X supports motion video acceleration by providing:

- Multistream video for video conferencing
- Filtered horizontal/vertical, up/down, scaling enhances playback quality
- Enhanced line buffer allows vertical filtering of native MPEG-2 size (720 x 480) images
- DVD/MPEG-2 decode assist
- Filter circuitry that eliminates video artifacts caused by displaying interlaced video on noninterlaced displays
- Hardware mirroring for flipping video images in video conferencing systems
- Bidirectional bus mastering engine with planar YUV-to-packed format converter
- YUV to RGB color space converter with support for both packed and planar YUV:
  - YUV 4:2:2, YUV 4:1:0, and YUV 4:2:0
  - RGB 32, RGB 16/15, RGB 8, and monochrome

1.10.1.2 Disabling On-Board A.G.P.

To provide an upgrade path, the on-board A.G.P. is disabled if an A.G.P. add-in card is used. Only half-length NLX A.G.P. cards can be used with this motherboard.

1.11 Hardware Monitor

The management extension hardware provides low-cost instrumentation capabilities on a chip. The features include:

- Integrated temperature sensor
- Fan speed sensors
- Power supply voltage monitoring to detect levels above or below acceptable values
- Remote reset capabilities from a remote peer or server through LANDesk® Client Manager, Version 3.3 and service layers

1.12 Onboard Networking

The onboard networking subsystem is an Ethernet† LAN interface that provides both 10Base-T and 100Base-TX connectivity. Onboard LAN can be enabled or disabled in the Setup program. Features include:

- 32-bit direct bus mastering on the PCI bus
- Shared memory structure in the host memory that copies data directly to/from host memory
- 10Base-T and 100Base-TX capability using a single RJ-45 connector
- IEEE 802.3μ Auto-Negotiation for the fastest available connection
- Jumperless configuration; the LAN subsystem is completely software configurable
- Remote wake up controller

1.12.1 Intel® 82558 LAN Controller

This device is the heart of the LAN subsystem. It provides the following functions:

- CSMA/CD protocol engine
- PCI compatibility
- DMA engine for movement of commands, status, and network data across the PCI bus
- Standard MII interface for access to IEEE 802.3μ -compliant physical layer devices

1.12.2 Alert On LAN Component

The Alert on LAN component is a companion device to the Intel® 82558 LAN controller. Together, these devices provide a management interface between a remote management console (or management server) and a client system monitoring instrumentation. When an alert input is asserted, the Alert on LAN component transmits Ethernet packets to the 82558 through an 8-bit dedicated data path. Examples of events that can trigger alert messages to a management server include:

- Chassis intrusion
- System BIOS hang (transmits POST code error)
- LAN leash (transmits an alert that the LAN cable was disconnected)
- Processor missing signal
- Sensing an interrupt from the hardware monitor

1.12.3 LAN Software

The software for the LAN subsystem, including setup/diagnostic software and a readme file viewer that lists supported drivers, is available on the Intel web site. See Section 6.1.

1.13 Motherboard Connectors

Figure 5 shows the connectors on the motherboard.

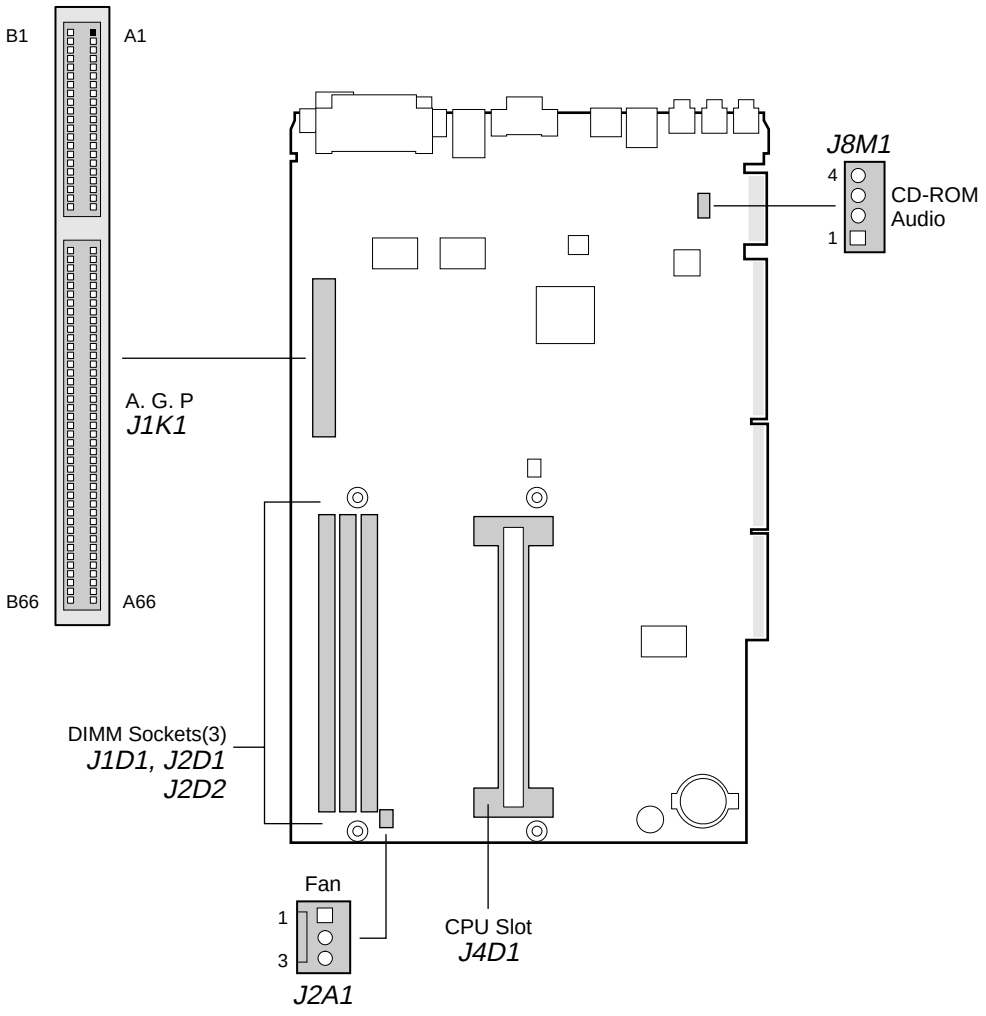


Figure 5. Motherboard Connectors

Table 1. CD-ROM Connector (J8M1)

Pin	Signal Name
1	Ground
2	CD-Left
3	Ground
4	CD-Right

Table 2. Processor Fan (J2A1)

Pin	Signal Name
1	GND
2	FAN_CTL
3	Tachometer

Table 3. Accelerated Graphics Port (J1K1)

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
A1	+12V	B1	No Connect	A34	Vcc3.3	B34	Vcc3.3
A2	No Connect	B2	Vcc	A35	AGP_AD22	B35	AGP_AD21
A3	Reserved	B3	Vcc	A36	AGP_AD20	B36	AGP_AD19
A4	No Connect	B4	No Connect	A37	Ground	B37	Ground
A5	Ground	B5	Ground	A38	AGP_AD18	B38	AGP_AD17
A6	PIRQ0#	B6	PIRQ1#	A39	AGP_AD16	B39	AGP_CBE2
A7	RST#	B7	HCLK_AGP	A40	Vcc3.3	B40	Vcc3.3
A8	AGP_GNT1#	B8	AGP_REQ1	A41	AGP_FRAME#	B41	AGP_IRDY#
A9	Vcc3.3	B9	Vcc3.3	A42	Reserved	B42	PM_3V
A10	AGP_ST1	B10	AGP_ST0	A43	Ground	B43	Ground
A11	Reserved	B11	AGP_ST2	A44	Reserved	B44	Reserved
A12	AGP_PIPE#	B12	AGP_DBF#	A45	Vcc3.3	B45	Vcc3.3
A13	Ground	B13	Ground	A46	AGP_TRDY#	B46	AGP_DEVSEL#
A14	No Connect	B14	No Connect	A47	AGP_STOP#	B47	Vcc3.3
A15	SBA1	B15	SBA0	A48	PCI_PM#	B48	AGP_PERR#
A16	Vcc3.3	B16	Vcc3.3	A49	Ground	B49	Ground
A17	SBA3	B17	SBA2	A50	AGP_PAR	B50	AGP_SERR#
A18	Reserved	B18	SB_STB	A51	AGP_AD15	B51	AGP_CBE1
A19	Ground	B19	Ground	A52	Vcc3.3	B52	Vcc3.3
A20	SBA5	B20	SBA4	A53	AGP_AD13	B53	AGP_AD14
A21	SBA7	B21	SBA6	A54	AGP_AD11	B54	AGP_AD12
A22	Key	B22	Key	A55	Ground	B55	Ground
A23	Key	B23	Key	A56	AGP_AD9	B56	AGP_AD10
A24	Key	B24	Key	A57	AGP_CBE0	B57	AGP_AD8
A25	Key	B25	Key	A58	Vcc3.3	B58	Vcc3.3
A26	AGP_AD30	B26	AGP_AD31	A59	Reserved	B59	AD_STBA
A27	AGP_AD28	B27	AGP_AD29	A60	AGP_AD6	B60	AGP_AD7
A28	Vcc3.3	B28	Vcc3.3	A61	Ground	B61	Ground
A29	AGP_AD26	B29	AGP_AD27	A62	AGP_AD4	B62	AGP_AD5
A30	AGP_AD24	B30	AGP_AD25	A63	AGP_AD2	B63	AGP_AD3
A31	Ground	B31	Ground	A64	Vcc3.3	B64	Vcc3.3
A32	Reserved	B32	AD_STBB	A65	AGP_AD0	B65	AGP_AD1
A33	AGP_CBE3	B33	AGP_AD23	A66	SMDATA	B66	SMBCLK

1.14 Back Panel Connectors

Figure 6 shows the general configuration of the I/O connectors on the back panel.

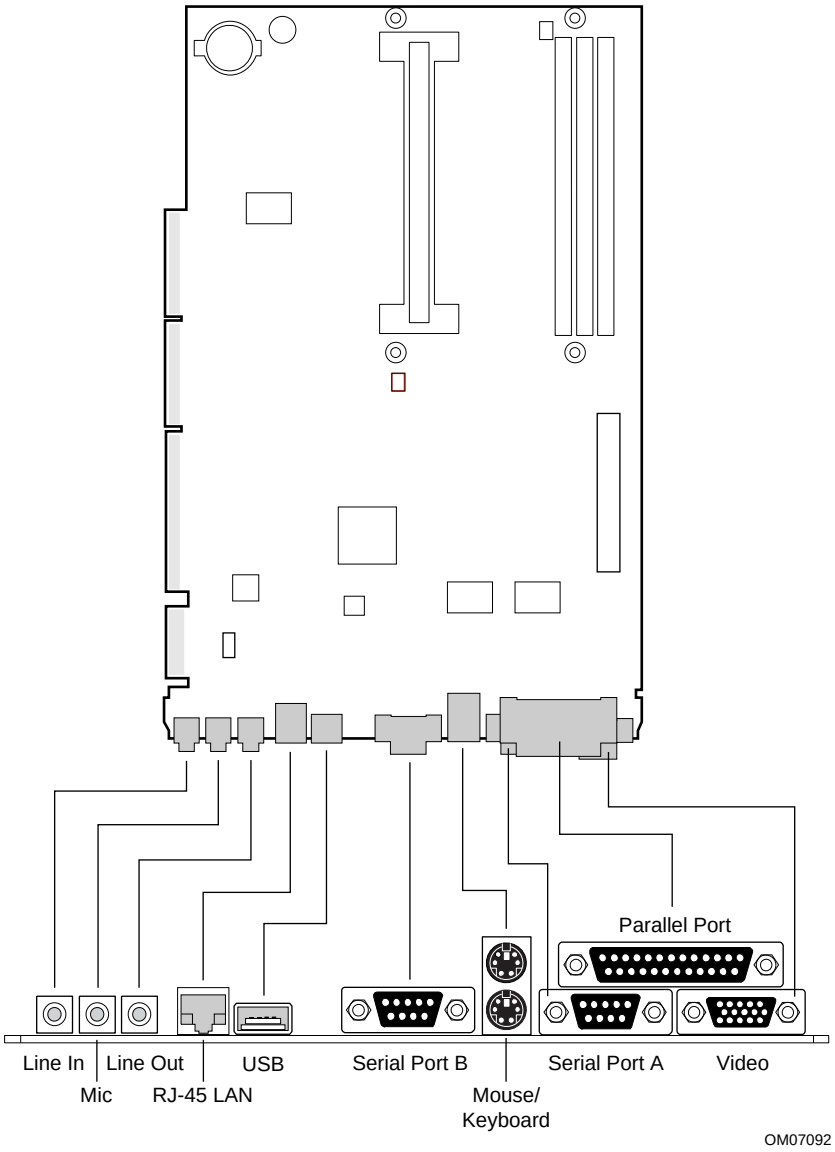


Figure 6. Back Panel I/O Connectors

Table 4. Line-In Connector (1/8” Stereo jack) (J9P1)

Pin	Signal	I/O	Description
TIP	LLINE_IN	I	Analog Line-In Left Audio
RING	RLINE_IN	I	Analog Line-In Right Audio
SLEEVE	GND	-	Ground

Table 5. Line-Out Connector (1/8” Stereo jack) (J8P1)

Pin	Signal	I/O	Description
TIP	LLINE_OUT	O	Analog Line-Out Left Audio
RING	RLINE_OUT	O	Analog Line-Out Right Audio
SLEEVE	GND	-	Ground

Table 6. Microphone Connector (1/8” Stereo jack) (J8P2)

Pin	Signal	I/O	Description
TIP	MIC_IN	I	Analog Microphone audio signal
RING	V_REF	O	Microphone Bias Voltage
SLEEVE	GND	-	Ground

Table 7. RJ-45 LAN Connector (J7P2)

Pin	Signal Name
1	TX-
2	TX-
3	RX-
4	No connect
5	No connect
6	RX-
7	No connect
8	No connect

Table 8. USB Connector (J6P1)

Pin	Signal	I/O	Description
1	+5V	O	Fused +5V
2	USB_D-	I/O	3.3V differential USB signal D-
3	USB_D+	I/O	3.3V differential USB signal D+
4	GND	-	Ground

Table 9. Serial Port A and B Connectors (J3P1 and J5P1)

Pin	Signal	I/O	Description
1	DCD	I	Carrier Detect
2	SIN	I	Serial Data In
3	SOUT	O	Serial Data Out
4	DTR	O	Data Terminal Ready
5	GND	-	Ground
6	DSR	I	Data Set Ready
7	RTS	O	Request to Send
8	CTS	I	Clear to Send
9	RI	I	Ring Indicator

Table 10. Keyboard/Mouse Connectors (J4P1)

Pin	Signal	I/O	Description
1	DATA	I/O	Keyboard/mouse data signal
2	Not connected	-	Not connected
3	GND	-	Ground
4	+5V	O	Fused +5V power
5	CLOCK	I/O	Keyboard/mouse clock signal
6	Not connected	-	Not connected

Table 11. Parallel Port Connector (J2P1)

Pin	Std Signal	ECP Signal	EPP Signal	I/O
1	STROBE#	STROBE#	WRITE#	I/O
2	PD0	PD0	PD0	I/O
3	PD1	PD1	PD1	I/O
4	PD2	PD2	PD2	I/O
5	PD3	PD3	PD3	I/O
6	PD4	PD4	PD4	I/O
7	PD5	PD5	PD5	I/O
8	PD6	PD6	PD6	I/O
9	PD7	PD7	PD7	I/O
10	ACK#	ACK#	INTR	I
11	BUSY	BUSY#, PERIPHACK	WAIT#	I
12	PE	PE, ACKREVERSE#	PE	I
13	SELECT	SELECT	SELECT	I
14	AUTOFD#	AUTOFD#, HOSTACK	DATASTB#	O
15	FAULT#	FAULT#, PERIPHREQST#	FAULT#	I
16	INIT#	INIT#, REVERSERQST#	RESET#	O
17	SLCTIN#	SLCTIN#	ADDRSTB#	O
18 - 25	GND	GND	GND	-

Table 12. VGA† Connector (J1P1)

Pin	Signal	I/O	Description
1	RED	I	Analog RED
2	GREEN	I	Analog GREEN
3	BLUE	I	Analog BLUE
4	Not connected	-	Not connected
5	GND	-	Return for RED
6	GND	-	Return for GREEN
7	GND	-	Return for BLUE
8	GND	-	
9	FUSED_+5V	O	Fused +5V
10	GND	-	
11	Not connected	-	Not connected
12	DDC_DAT	I/O	DDC Data signal / MON_ID1
13	HSYNC	O	Horizontal Sync signal
14	VSYNC	O	Vertical Sync signal
15	DDC_CLK	I/O	DDC clock signal / MON_ID2

1.15 Configuration Jumper

Figure 7 shows the location of the configuration jumper block on the motherboard. Table 13 summarizes the settings.

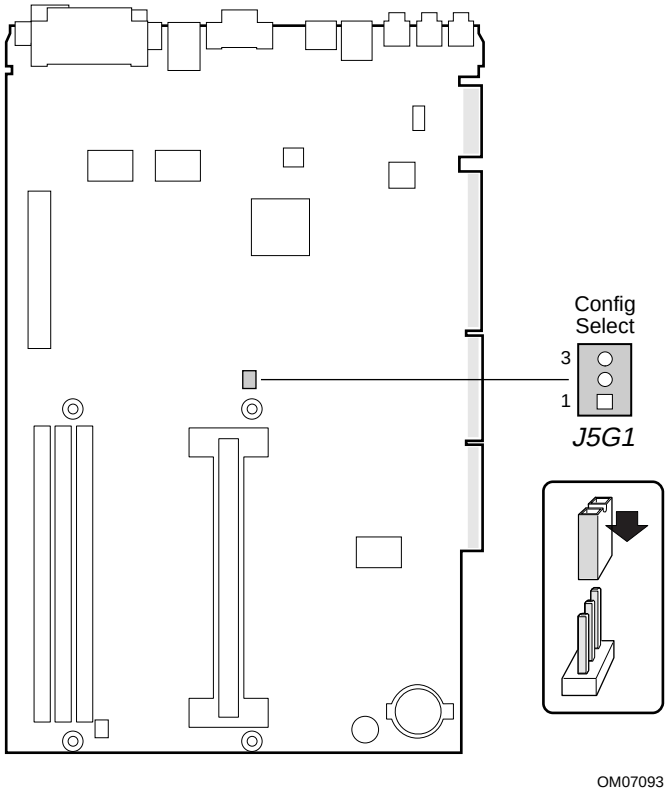


Figure 7. Configuration Jumper Block

Table 13. Configuration Jumper Settings (J5G1)

Function	Jumper	Configuration
Normal	1-2	The BIOS uses current configuration information and passwords for booting.
Configure	2-3	After the POST runs, Setup is run automatically, using BIOS defaults. The maintenance menu is displayed.
Recovery	none	The BIOS attempts to recover the BIOS configuration. A recovery diskette is required.

⚠ CAUTION

Moving the jumper with the power on can damage your computer. Always turn off the power and unplug the power cord from the computer before changing the jumper.

1.15.1 Normal Mode

This mode is for normal computer booting and operations. To enable this mode, pins 1 and 2 must be connected on the configuration jumper (J5G1). Access to the Setup program can be restricted using a supervisor or user password.

1.15.2 Configuration Mode

This mode is for configuring special BIOS settings, including processor speed and special maintenance options. This mode is used when upgrading the BIOS, upgrading the processor, or clearing the passwords. To enable this mode, pins 2 and 3 must be connected on the configuration jumper (J5G1). In this mode, Setup automatically executes after the POST runs. No password is required, and this mode overrides any passwords that are set. The Maintenance menu is the first menu displayed. This menu provides options for setting the processor speed and clearing passwords. User and supervisor settings are preserved and used when the computer is rebooted.

For the configuration changes to take effect after exiting the Setup program, power down the computer, set the configuration jumper to normal mode (see Section 1.15.1), and boot the computer.

1.15.3 Recovery Mode

This mode is for recovering BIOS data. To enable this mode, no pins are connected on the configuration jumper (J5G1). After the computer is powered-on, the BIOS attempts to upgrade or recover the BIOS data from a diskette in the drive. If a diskette is not in the boot drive, the BIOS runs the POST, does not boot the operating system, and sounds a 4 - 4 - 2 - 4 beep code. Continuos beeps indicate failed recovery attempt. For a full list of beep codes please refer to Section 5.3.

For the configuration changes to take effect after a successful recovery, power down the computer, set the configuration jumper to normal mode (see Section 1.15.1), and boot the computer.

1.16 NLX Card Edge Connector

The NLX riser connector on the motherboard consists of a 340 (2 x 170) position and a supplemental 26 (2 x 13) position gold finger contact. All edge connector pin definitions are defined in the NLX specification, version 1.2.

According to the NLX specification, the motherboard edge connector provides the following:

- PCI signals (the motherboard supports up to four PCI devices)
- ISA signals
- Two IDE channels
- One diskette drive interface
- Infrared signals
- Miscellaneous front panel signals
- Power connection for the motherboard

See Section 6.2 for information about the NLX Specification.

Table 14, Table 15, and Table 16 specify the pinouts located on the primary connector; Table 17 specifies the pinouts located on the supplemental connector. All edge connector pin definitions are defined in the NLX specification, version 1.2.

Table 14. PCI Segment, Riser Interconnect

Pin	Signal Name	Type	I/O	Termination	Pin	Signal Name	Type	I/O	Termination
A1	-12V	PWR	NA	NA	B1	PCSPKR_RT	AUDIO	O	NA
A2	REQ4#*	PCI	I	RIS	B2	+12V	PWR	NA	NA
A3	+12V	PWR	NA	NA	B3	PCSPKR_LFT	AUDIO	O	NA
A4	GNT4#*	PCI	O	RIS	B4	+12V	PWR	NA	NA
A5	3.3VDC	PWR	NA	NA	B5	PCICLK0	PCI	O	MB
A6	PCIINT3#	PCI	I	RIS	B6	GND	PWR	NA	NA
A7	3.3VDC	PWR	NA	NA	B7	PCICLK1	PCI	O	MB
A8	PCIINT0#	PCI	I	RIS	B8	SER_IRQ	MISC	I/O	MB
A9	PCIINT1#	PCI	I	RIS	B9	PCIINT2#	PCI	I	RIS
A10	PCICLK2	PCI	O	MB	B10	3.3VDC	PWR	NA	NA
A11	3.3VDC	PWR	NA	NA	B11	PCICLK3	PCI	O	MB
A12	PCI_RST#	PCI	O	MB	B12	GND	PWR	NA	NA
A13	GNT0#	PCI	O	RIS	B13	GNT3#	PCI	O	RIS
A14	PCICLK4	PCI	O	MB	B14	3.3VDC	PWR	NA	NA
A15	GND	PWR	NA	NA	B15	GNT2#	PCI	O	RIS
A16	GNT1#	PCI	O	RIS	B16	AD[31]	PCI	I/O	RIS

* Not supported

continued

Table 14. PCI Segment, Riser Interconnect (continued)

Pin	Signal Name	Type	I/O	Termination	Pin	Signal Name	Type	I/O	Termination
A17	3.3VDC	PWR	NA	NA	B17	REQ0#	PCI	I	RIS
A18	REQ2#	PCI	I	RIS	B18	GND	PWR	NA	NA
A19	REQ3#	PCI	I	RIS	B19	AD[29]	PCI	I/O	RIS
A20	AD[30]	PCI	I/O	RIS	B20	AD[28]	PCI	I/O	RIS
A21	GND	PWR	NA	NA	B21	AD[26]	PCI	I/O	RIS
A22	AD[25]	PCI	I/O	RIS	B22	3.3VDC	PWR	NA	NA
A23	REQ1#	PCI	I	RIS	B23	AD[24]	PCI	I/O	RIS
A24	AD[27]	PCI	I/O	RIS	B24	C/BE[3]#	PCI	I/O	RIS
A25	3.3VDC	PWR	NA	NA	B25	AD[22]	PCI	I/O	RIS
A26	AD[23]	PCI	I/O	RIS	B26	GND	PWR	NA	NA
A27	AD[20]	PCI	I/O	RIS	B27	AD[21]	PCI	I/O	RIS
A28	AD[18]	PCI	I/O	RIS	B28	AD[19]	PCI	I/O	RIS
A29	GND	PWR	NA	NA	B29	AD[16]	PCI	I/O	RIS
A30	AD[17]	PCI	I/O	RIS	B30	3.3VDC	PWR	NA	NA
A31	IRDY#	PCI	I/O	RIS	B31	C/BE[2]#	PCI	I/O	RIS
A32	DEVSEL#	PCI	I/O	RIS	B32	FRAME#	PCI	I/O	RIS
A33	3.3VDC	PWR	NA	NA	B33	TRDY#	PCI	I/O	RIS
A34	STOP#	PCI	I/O	RIS	B34	GND	PWR	NA	NA
A35	PERR#	PCI	I/O	RIS	B35	SDONE	PCI	I/O	RIS
A36	SERR#	PCI	I/O	RIS	B36	LOCK#	PCI	I/O	RIS
A37	GND	PWR	NA	NA	B37	SBO#	PCI	I/O	RIS
A38	C/BE[1]#	PCI	I/O	RIS	B38	3.3VDC	PWR	NA	NA
A39	AD[13]	PCI`	I/O	RIS	B39	AD[15]	PCI	I/O	RIS
A40	AD[10]	PCI	I/O	RIS	B40	PAR	PCI	I/O	RIS
A41	GND	PWR	NA	NA	B41	AD[14]	PCI	I/O	RIS
A42	C/BE[0]#	PCI	I/O	RIS	B42	GND	PWR	NA	NA
A43	AD[00]	PCI	I/O	RIS	B43	AD[11]	PCI	I/O	RIS
A44	AD[06]	PCI	I/O	RIS	B44	AD[12]	PCI	I/O	RIS
A45	3.3VDC	PWR	NA	NA	B45	AD[09]	PCI	I/O	RIS
A46	AD[05]	PCI	I/O	RIS	B46	3.3VDC	PWR	NA	NA
A47	AD[01]	PCI	I/O	RIS	B47	AD[08]	PCI	I/O	RIS
A48	AD[03]	PCI	I/O	RIS	B48	AD[07]	PCI	I/O	RIS
A49	GND	PWR	NA	NA	B49	AD[04]	PCI	I/O	RIS
A50	AD[02]	PCI	I/O	RIS	B50	GND	PWR	NA	NA
A51	5VDC	PWR	NA	NA	B51	PCI_PM#	PCI	I/O	MB

I/O Column Definitions Relative to Motherboard
O = Output from motherboard to riser
I = Input from riser to motherboard
Termination Column Definitions:
MB = Termination/Pullup/Pulldown/debounce is on motherboard
RIS = Termination/Pullup/Pulldown is on riser card
N/A = Not on motherboard or riser

Table 15. ISA Segment, Riser Interconnect

Pin	Signal Name	Type	I/O	Termination	Pin	Signal Name	Type	I/O	Termination
A52	RSTDRV	ISA	O	MB	B52	5VDC	PWR	NA	NA
A53	IOCHK#	ISA	I	MB	B53	IRQ9	ISA	O	MB
A54	SD[6]	ISA	I/O	MB	B54	DRQ2	ISA	I	MB
A55	SD[7]	ISA	I/O	MB	B55	SD[3]	ISA	I/O	MB
A56	SD[4]	ISA	I/O	MB	B56	0WS#	ISA	I	MB
A57	5VDC	PWR	NA	NA	B57	SD[1]	ISA	I/O	MB
A58	SD[2]	ISA	I/O	MB	B58	AEN	ISA	O	MB
A59	SD[5]	ISA	I/O	MB	B59	IOCHRDY	ISA	I	MB
A60	SD[0]	ISA	I/O	MB	B60	SA[18]	ISA	I/O	MB
A61	SMEMW#	ISA	O	MB	B61	SMEMR#	ISA	O	MB
A62	SA[19]	ISA	I/O	MB	B62	SA[16]	ISA	I/O	MB
A63	IOW#	ISA	I/O	MB	B63	IOR#	ISA	I/O	MB
A64	SA[17]	ISA	I/O	MB	B64	DRQ3	ISA	I	MB
A65	GND	PWR	NA	NA	B65	SA[15]	ISA	I/O	MB
A66	DACK#3	ISA	O	MB	B66	GND	PWR	NA	NA
A67	SA[14]	ISA	I/O	MB	B67	SA[13]	ISA	I/O	MB
A68	DACK1#	ISA	O	MB	B68	5VDC	PWR	NA	NA
A69	DRQ1	ISA	I	MB	B69	REFRESH#	ISA	I/O	MB
A70	SA[12]	ISA	I/O	MB	B70	SA[11]	ISA	I/O	MB
A71	SYSCLK	ISA	O	MB	B71	SA[10]	ISA	I/O	MB
A72	SA[9]	ISA	I/O	MB	B72	IRQ7	ISA	I	MB
A73	5VDC	PWR	NA	NA	B73	IRQ6	ISA	I	MB
A74	IRQ5	ISA	I	MB	B74	SA[8]	ISA	I/O	MB
A75	SA[7]	ISA	I/O	MB	B75	SA[6]	ISA	I/O	MB
A76	IRQ3	ISA	I	MB	B76	DACK2#	ISA	O	MB
A77	IRQ4	ISA	I	MB	B77	SA[4]	ISA	I/O	MB
A78	SA[5]	ISA	I/O	MB	B78	GND	PWR	NA	NA
A79	TC	ISA	O	MB	B79	SA[3]	ISA	I/O	MB
A80	BALE	ISA	O	MB	B80	SA[2]	ISA	I/O	MB
A81	GND	PWR	NA	NA	B81	SA[1]	ISA	I/O	MB
A82	OSC	ISA	O	MB	B82	SA[0]	ISA	I/O	MB
A83	IOCS16#	ISA	I	MB	B83	SBHE#	ISA	I/O	MB
A84	MEMCS16#	ISA	I	MB	B84	LA[23]	ISA	I/O	MB
A85	IRQ11	ISA	I	MB	B85	LA[22]	ISA	I/O	MB
A86	IRQ10	ISA	I	MB	B86	LA[21]	ISA	I/O	MB
A87	IRQ15	ISA	I	MB	B87	LA[20]	ISA	I/O	MB

continued

Table 15. ISA Segment, Riser Interconnect (continued)

Pin	Signal Name	Type	I/O	Termination	Pin	Signal Name	Type	I/O	Termination
A88	IRQ12	ISA	I	MB	B88	LA[19]	ISA	I/O	MB
A89	GND	PWR	NA	NA	B89	LA[18]	ISA	I/O	MB
A90	IRQ14	ISA	I	MB	B90	LA[17]	ISA	I/O	MB
A91	DRQ0	ISA	I	MB	B91	DACK0#	ISA	O	MB
A92	MEMR#	ISA	I/O	MB	B92	DACK5#	ISA	O	MB
A93	MEMW#	ISA	I/O	MB	B93	SD[8]	ISA	I/O	MB
A94	SD[9]	ISA	I/O	MB	B94	DACK6#	ISA	O	MB
A95	DRQ5	ISA	I	MB	B95	SD[10]	ISA	I/O	MB
A96	DRQ6	ISA	I	MB	B96	5VDC	PWR	NA	NA
A97	5VDC	PWR	NA	NA	B97	SD[11]	ISA	I/O	MB
A98	SD[12]	ISA	I/O	MB	B98	DRQ7	ISA	I	MB
A99	DACK7#	ISA	O	MB	B99	SD[13]	ISA	I/O	MB
A100	SD[14]	ISA	I/O	MB	B100	SD[15]	ISA	I/O	MB
A101	MASTER#	ISA	I	MB	B101	GND	PWR	NA	NA

I/O Column Definitions Relative to Motherboard
O = Output from motherboard to riser
I = Input from riser to motherboard
Termination Column Definitions:
MB = Termination/Pullup/Pulldown/debounce is on motherboard
RIS = Termination/Pullup/Pulldown is on riser card
N/A = Not on motherboard or riser

Table 16. IDE, Floppy, and Front Panel Section, Riser Interconnect

Pin	Signal Name	Type	I/O	Termination	Pin	Signal Name	Type	I/O	Termination
A102	IDEA_DD8	IDE	I/O	MB	B102	GND	PWR	NA	NA
A103	IDEA_RESET#	IDE	O	MB	B103	IDEA_DD7	IDE	I/O	MB
A104	IDEA_DD9	IDE	I/O	MB	B104	IDEA_DD6	IDE	I/O	MB
A105	5VDC	PWR	NA	NA	B105	IDEA_DD5	IDE	I/O	MB
A106	IDEA_DD4	IDE	I/O	MB	B106	IDEA_DD11	IDE	I/O	MB
A107	IDEA_DD10	IDE	I/O	MB	B107	IDEA_DD12	IDE	I/O	MB
A108	IDEA_DD3	IDE	I/O	MB	B108	GND	PWR	NA	NA
A109	IDEA_DD13	IDE	I/O	MB	B109	IDEA_DD14	IDE	I/O	MB
A110	IDEA_DD1	IDE	I/O	MB	B110	IDEA_DD2	IDE	I/O	MB
A111	GND	PWR	NA	NA	B111	IDEA_DD0	IDE	I/O	MB
A112	IDEA_DIOW#	IDE	O	MB	B112	IDEA_DD15	IDE	I/O	MB

continued

Table 16. IDE, Floppy, and Front Panel Section, Riser Interconnect (continued)

Pin	Signal Name	Type	I/O	Termination	Pin	Signal Name	Type	I/O	Termination
A113	IDEA_DMARQ	IDE	I	MB	B113	IDEA_DIOR#	IDE	O	MB
A114	IDEA_IORDY	IDE	I	MB	B114	IDEA_CSEL	IDE	O	MB
A115	IDEA_DMACK#	IDE	O	MB	B115	IDEA_INTRQ	IDE	I	MB
A116	RESERVED	RES	NA	NA	B116	5VDC	PWR	NA	NA
A117	IDEA_DA2	IDE	O	MB	B117	IDEA_DA1	IDE	O	MB
A118	IDEA_CS0#	IDE	O	MB	B118	IDEA_DA0	IDE	O	MB
A119	5VDC	PWR	NA	NA	B119	IDEA_CS1#	IDE	O	MB
A120	IDEA_DASP#	IDE	I	RIS	B120	IDEB_DD8	IDE	I/O	MB
A121	IDEB_RESET#	IDE	O	MB	B121	IDEB_DD7	IDE	I/O	MB
A122	IDEB_DD9	IDE	I/O	MB	B122	GND	PWR	NA	NA
A123	IDEB_DD6	IDE	I/O	MB	B123	IDEB_DD10	IDE	I/O	MB
A124	IDEB_DD5	IDE	I/O	MB	B124	5VDC	PWR	NA	NA
A125	IDEB_DD11	IDE	I/O	MB	B125	IDEB_DD4	IDE	I/O	MB
A126	IDEB_DD12	IDE	I/O	MB	B126	IDEB_DD3	IDE	I/O	MB
A127	GND	PWR	NA	NA	B127	IDEB_DD13	IDE	I/O	MB
A128	IDEB_DD2	IDE	I/O	MB	B128	IDEB_DD14	IDE	I/O	MB
A129	IDEB_DD15	IDE	I/O	MB	B129	IDEB_DD1	IDE	I/O	MB
A130	IDEB_DIOW#	IDE	I/O	MB	B130	IDEB_DD0	IDE	I/O	MB
A131	IDEB_DMARQ	IDE	I	MB	B131	IDEB_DIOR#	IDE	O	MB
A132	IDEB_IORDY	IDE	I	MB	B132	IDEB_CSEL	IDE	O	MB
A133	GND	PWR	NA	NA	B133	IDEB_INTRQ	IDE	I	MB
A134	IDEB_DMACK#	IDE	O	MB	B134	IDEB_DA1	IDE	O	MB
A135	RESERVED	RES	NA	NA	B135	IDEB_DA2	IDE	O	MB
A136	IDEB_DA0	IDE	O	MB	B136	IDEB_CS1#	IDE	O	MB
A137	IDEB_CS0#	IDE	O	MB	B137	IDEB_DASP#	IDE	I	RIS
A138	DRV2#	FLOPPY	GND	NA	B138	GND	PWR	NA	NA
A139	5VDC	PWR	NA	NA	B139	DRATE0	FLOPPY	O	NA
A140	RESERVED	RES	NA	NA	B140	FDS1#	FLOPPY	O	NA
A141	DENSEL	FLOPPY	O	NA	B141	FDS0#	FLOPPY	O	NA
A142	FDME0#	FLOPPY	O	NA	B142	DIR#	FLOPPY	O	NA
A143	INDX#	FLOPPY	I	RIS	B143	MSEN1	FLOPPY	I	NA

continued

Table 16. IDE, Floppy, and Front Panel Section, Riser Interconnect (continued)

Pin	Signal Name	Type	I/O	Termination	Pin	Signal Name	Type	I/O	Termination
A144	FDME1#	FLOPPY	O	NA	B144	GND	PWR	NA	NA
A145	GND	PWR	NA	NA	B145	WRDATA#	FLOPPY	O	NA
A146	WE#	FLOPPY	O	NA	B146	TRK0#	FLOPPY	I	RIS
A147	STEP#	FLOPPY	O	NA	B147	MSEN0	FLOPPY	I	NA
A148	WP#	FLOPPY	I	RIS	B148	RDDATA#	FLOPPY	I	RIS
A149	HDSEL#	FLOPPY	O	NA	B149	DSKCHG#	FLOPPY	I	RIS
A150	SDA	MISC	I/O	MB	B150	GND	PWR	NA	NA
A151	SCL	MISC	O	MB	B151	IRSL0	MISC	I/O	NA
A152	FAN_TACH1	MISC	I	NA	B152	IRSL1	MISC	I/O	NA
A153	FAN_TACH2	MISC	I	NA	B153	IRSL2	MISC	I/O	NA
A154	FAN_TACH3	MISC	I	NA	B154	IRTX	MISC	I/O	NA
A155	FAN_CTL	MISC	I	NA	B155	IRRX	MISC	I/O	NA
A156	5VDC	PWR	NA	NA	B156	FP_SLEEP	MISC	I	MB
A157	USB1/3_N	MISC	I/O	RIS	B157	FP_RST#	MISC	I	MB
A158	USB1/3_P	MISC	I/O	RIS	B158	GND	PWR	NA	NA
A159	USB1/3_OC#	MISC	I	RIS	B159	PWRLED#*	MISC	O	RIS
A160	USB2/4_N	MISC	I/O	RIS	B160	PWOK	PWR	I	NA
A161	USB2/4_P	MISC	I/O	RIS	B161	SOFT_ON/OFF#	PWR	I	MB
A162	USB2/4_OC#	MISC	I	RIS	B162	PS_ON#	PWR	O	NA
A163	GND	PWR	NA	NA	B163	LAN_WAKE	MISC	I	MB
A164	VBAT	MISC	O	RIS	B164	LAN_ACTVY_ LED#	MISC	O	NA
A165	TAMP_DET#	MISC	I	MB	B165	MDM_WAKE#	MISC	I	MB
A166	MSG_WAIT_ LED#	MISC	O	RIS	B166	1394_PWR	PWR	I	NA
A167	1394_GND	PWR	O	NA	B167	RESERVED	RES	NA	NA
A168	RESERVED	RES	NA	NA	B168	RESERVED	RES	NA	NA
A169	5VSB	PWR	I	NA	B169	RESERVED	RES	NA	NA
A170	3.3VSENSE	PWR	O	NA	B170	-5V	PWR	NA	NA

I/O Column Definitions Relative to Motherboard
O = Output from motherboard to riser
I = Input from riser to motherboard
Termination Column Definitions:
MB = Termination/Pullup/Pulldown/debounce is on motherboard
RIS = Termination/Pullup/Pulldown is on riser card
N/A = Not on motherboard or riser

* High (sleep) Low (normal) is a board specific implementation

Table 17. Signals, NLX Riser with Supplemental Connector

Pin	Signal Name	Type	I/O *	Description	Signal Type
X1	CD_IN_LT	AUDIO	I	CD-ROM Line-in left.	Analog 1 V RMS
X2	AGND	PWR	NA	Low pass filtered ground for audio circuitry on the riser.	NA
X3	MIC_IN	AUDIO	I	Pre-amplified microphone input. Pre-amp circuitry to reside on riser or in microphone.	Analog 1 V RMS
X4	LINE_OUT_LT	AUDIO	O	Analog Line-out left.	Analog 1 V RMS
X5	FP_SPKR_EN **	AUDIO	I	This signal indicates if headphones have been plugged into the front panel LINE-OUT jack. The signal is connected to one of the wipers on the audio jack and is HIGH when the headphones are plugged into the front audio jack and LOW when they are not. The signal is pulled high through a pull-up on the motherboard (Typically 100K).	TTL
X6	VOL_DN# **	AUDIO	I	Connects to Volume Down switch on front panel, appropriate pull-up resistor on motherboard. The motherboard provides debounce protection and a pull-up resistor.	TTL
X7	GND	PWR	NA	Ground	NA
X8	SMI# **	SYS	I	System Management Interrupt that is an input to the motherboard.	open drain
X9	RESERVED	RES	NA	Reserved	NA
X10	RESERVED	RES	NA	Reserved	NA
X11	RESERVED	RES	NA	Reserved	NA
X12	AGND	PWR	NA	Low pass filtered ground for audio circuitry on the riser.	NA
X13	MODEM_MIC	AUDIO	O	Pre-amplified microphone mono output signal from motherboard to telephony device.	Analog 1 V RMS
Y1	CD_IN_RT	AUDIO	I	CD-ROM Line-in right.	Analog 1 V RMS
Y2	CD_IN_GND	PWR	I	Isolated CD-ROM ground.	NA
Y3	AVCC	PWR	O	Clean power from the motherboard to audio circuitry on the NLX riser; could be an isolated power source; 1.5 Ampere max. limitation because of the connector / gold finger limitation.	5-9 V DC
Y4	LINE_OUT_RT	AUDIO	O	Analog Line-out right.	Analog 1 V RMS

continued

Table 17. Signals, NLX Riser with Supplemental Connector (continued)

Pin	Signal Name	Type	I/O *	Description	Signal Type
Y5	FP_MIC_EN **	AUDIO	I	This signal indicates if a microphone has been plugged into the front panel MIC_IN jack. The signal is connected to a wiper on the MIC_IN jack and is LOW when the microphone is plugged in and HIGH when it is not. The signal is pulled LOW through a pull down on the motherboard (Typically 100K).	TTL
Y6	VOL_UP# **	AUDIO	I	Connects to Volume Up switch on front panel, appropriate pull-up resistor on motherboard. The motherboard provides debounce protection and a pull-up resistor.	TTL
Y7	AC_RST# **	AC'97	O	AC'97 master H/W reset.	TTL
Y8	AC_SD_IN **	AC'97	I	Serial, time division, multiplexed, AC'97 input stream to the motherboard from the codec on the riser (output from the codec).	TTL
Y9	GROUND	PWR	NA	Digital (main motherboard) ground plane.	NA
Y10	AC_SD_OUT **	AC'97	O	Serial, time division, multiplexed, AC'97 output from the motherboard to the codec on the riser (input to the codec).	TTL
Y11	AC_SYNC **	AC'97	O	48 KHz fixed rate sample sync signal from the motherboard to the codec on the riser.	TTL
Y12	AC_BIT_CLK **	AC'97	I	12.288 MHz serial data clock.	TTL
Y13	MODEM_SPKR	AUDIO	O	Analog mono output signal from telephony device to motherboard.	Analog 1 V RMS

* I/O column: relative to motherboard, "O" = output, from motherboard to riser; "I" = input, from riser to motherboard.

** These signals are not supported.

1.17 Reliability

The mean time between failures (MTBF) prediction is calculated using component and subassembly random failure rates. The calculation is based on the Bellcore Reliability Prediction Procedure, TR-NWT-000332, Issue 4, September 1991. The MTBF prediction is for estimating repair rates and spare parts requirements.

The Mean Time Between Failures (MTBF) data is calculated from predicted data at 55 ºC.

Motherboard MTBF: 173,814 hours

1.18 Environmental

Table 18. Motherboard Environmental Specifications

Parameter	Specification		
Temperature			
Non-Operating	-40 °C to +70 °C		
Operating	0 °C to +55 °C		
Shock			
Unpackaged	50 G trapezoidal waveform		
	Velocity change of 170 inches/second		
Packaged	Half sine 2 millisecond		
	Product Weight	Free Fall (inches)	Velocity Change (inches/sec)
	<20 lbs.	36	167
	21-40 lbs.	30	152
	41-80 lbs.	24	136
	81-100 lbs.	18	118
Vibration			
Unpackaged	5 Hz to 20 Hz : 0.01g² Hz sloping up to 0.02 g² Hz		
	20 Hz to 500 Hz : 0.02g² Hz (flat)		
Packaged	10 Hz to 40 Hz : 0.015g² Hz (flat)		
	40 Hz to 500 Hz : 0.015g² Hz sloping down to 0.00015 g² Hz		

1.19 Power Consumption

Tables 19 and 20 list voltage and current specifications for a computer that contains the motherboard, a 350 MHz Pentium II processor, 32 MB SDRAM, 512 KB cache, 3.5-inch diskette drive, 2.1 GB IDE hard disk drive, and a 6X IDE CD-ROM drive. This information is provided only as a guide for calculating approximate power usage with additional resources added.

Values for the Windows 95 desktop mode are measured at 640 x 480 x 256 colors and 60 Hz refresh rate. AC watts are measured with a typical 145 W supply, nominal input voltage and frequency, with true RMS wattmeter at the line input.

Table 19. DC Voltage

Voltage	Acceptable Tolerance	Wattage	Current
+3.3V	± 5%	46W	=13.94A
+5V	± 5%	40W	=8A
-5V	± 5%	0W	=0A
+12V	± 5%	9W	=750mA
-12V	± 5%	3W	=250mA
5V SB (Stand By)	± 5%	3.6W	=720mA

Table 20. Power Usage

		DC (amps) at:			
Mode	**AC (watts)**	**+3.3 V**	**+5 V**	**+12 V**	**-12 V**
DOS prompt, APM disabled	46	1.64 A	3.16 A	178 mA	16.55 mA
Windows 95 desktop, APM disabled	47	1.59 A	3.17 A	190.5 mA	32.83 mA
Windows 95 desktop, APM enabled, in System Management Mode (SMM)	29	1.58 A	85 mA	156 mA	32.64 mA

For typical configurations, the motherboard is designed to operate with at least a 200 W NLX power supply (see Section 6.2 for the specification). Use a higher wattage supply for heavily loaded configurations. The power supply must comply with the NLX power supply recommendations.

Table 21 shows the max DC power requirements for systems in either Sleep or Normal operating modes. Power consumption is independent of the operating system used and other variables.

Table 21. Processor Fan DC Power Requirements (J2A1)

Mode	Voltage	Max Amps
Sleep	6.7	1
Normal	9.1	1

1.20 Regulatory Compliance

This motherboard complies with the following safety and EMC regulations when correctly installed in a compatible host system.

Table 22. Safety Regulations

Regulation	Title
UL 1950 - CSA 950-95, 3rd edition, Dated 07-28-95	The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (USA & Canada)
EN 60 950, 2nd Edition, 1992 (with Amendments 1, 2 & 3)	The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (European Union)
IEC 950, 2nd edition, 1991 (with Amendments 1, 2, 3, and 4)	The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (International)
EMKO-TSE (74-SEC) 207/94	Summary of Nordic deviations to EN 60 950. (Norway, Sweden, Denmark & Finland)

Table 23. EMC Regulations

Regulation	Title
FCC Class B	Title 47 of the Code of Federal Regulations, Parts 2 & 15, Subpart B, pertaining to unintentional radiators. (USA)
CISPR 22, 2nd Edition, 1993	Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (International)
EN 55 022, 1995	Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (Europe)
EN 50 082-1 (1992)	Generic Immunity Standard; Currently compliance is determined via testing to IEC 801-2, -3, and -4. (Europe)
VCCI Class B (ITE)	Implementation Regulations for Voluntary Control of Radio Interference by Data Processing Equipment and Electronic Office Machines. (Japan)
ICES-003, Issue 2	Interference-Causing Equipment Standard, Digital Apparatus. (Canada)

1.20.1 Product Certification Markings

This motherboard has the following product certification markings:

- European CE Marking: Consists of a marking on the board and shipping container.
- UL Recognition Mark: Consists of the UL File No. E139761 on the component side of the board and the PB No. on the solder side of the board. Board material flammability is 94V-1 or -0.
- Each board will be marked with an FCC Declaration of Conformity.
- Canadian Compliance: Consists of small c followed by a stylized backward UR on component side of the board.

2 Motherboard Resources

2.1 Memory Map

Table 24. System Memory Map

Address Range (decimal)	Address Range (hex)	Size	Description
1024 K - 393216 K	100000 - 18000000	383 MB	Extended memory
1008 K - 1024 K	FC000 - FFFFF	16 KB	Boot block
1000 K - 1008 K	FA000 - FBFFF	8 KB	ESCD (Plug and Play configuration and DMI)
996 K - 1000 K	F9000 - F9FFF	4 KB	Reserved for BIOS
992 K - 996 K	F8000 - F8FFF	4 KB	OEM Logo or Scan User Flash
928 K - 992 K	E8000 - F7FFF	64 KB	POST BIOS
896 K - 928 K	E0000 - E7FFF	32 KB	POST BIOS (Available as UMB)
800 K - 896 K	C8000 - DFFFF	96 KB	Available high DOS memory (open to ISA and PCI bus)
640 K - 800 K	A0000 - C7FFF	160 KB	Video memory and BIOS
639 K - 640 K	9FC00 - 9FFFF	1 KB	Extended BIOS data (movable by memory manager software)
512 K - 639 K	80000 - 9FBFF	127 KB	Extended conventional memory
0 K - 512 K	00000 - 7FFFF	512 KB	Conventional memory

2.2 DMA Channels

Table 25. DMA Channels

DMA Channel Number	Data Width	System Resource
0	8- or 16-bits	Audio
1	8- or 16-bits	Audio / Parallel Port
2	8- or 16-bits	Diskette Drive
3	8- or 16-bits	Parallel Port (for ECP or EPP) / Audio
4		Reserved - Cascade Channel
5	16-bits	Open
6	16-bits	Open
7	16-bits	Open

2.3 I/O Map

Table 26. I/O Map

Address (hex)	Size	Description
0000 - 000F	16 bytes	PIIX4- DMA 1
0020 - 0021	2 bytes	PIIX4 - interrupt controller 1
002E - 002F	2 bytes	I/O controller configuration registers
0040 - 0043	4 bytes	PIIX4 - Counter/Timer 1
0048 - 004B	4 bytes	PIIX4- Counter/Timer 2
0060	1 byte	Keyboard Controller Byte - Reset IRQ
0061	1 byte	PIIX4 - NMI, Speaker Control
0064	1 byte	Keyboard controller, CMD/STAT Byte
0070, bit 7	1 bit	PIIX4 - enable NMI
0070, bits 6:0	7 bits	PIIX4 - real time clock, address
0071	1 byte	PIIX4 - real time clock, data
0078	1 byte	Reserved - motherboard configuration
0079	1 byte	Reserved - motherboard configuration
0080 - 008F	16 bytes	PIIX4 - DMA page registers
00A0 - 00A1	2 bytes	PIIX4 - interrupt controller 2
00B2 - 00B3	2 bytes	APM control
00C0 - 00DE	31 bytes	PIIX4 - DMA 2
00F0	1 byte	Reset numeric error
0170 - 0177	8 bytes	Secondary IDE channel
01F0 - 01F7	8 bytes	Primary IDE channel
0220 - 022F	16 bytes	Audio (Sound Blaster compatible)
0240 - 024F	16 bytes	Audio (Sound Blaster compatible)
0278 - 027F	8 bytes	LPT2
02E8 - 02EF	8 bytes	COM4/Video (8514A)
02F8 - 02FF	8 bytes	COM2
0300 - 0301	2 bytes	MPU-401 (MIDI)
0330 - 0331	2 bytes	MPU-401 (MIDI)
0332 - 0333	2 bytes	MPU-401 (MIDI)
0334 - 0335	2 bytes	MPU-401 (MIDI)
0376	1 byte	Secondary IDE channel command port
0377, bits 6:0	7 bits	Secondary IDE channel status port
0378- 037F	8 bytes	LPT1

continued

Table 26. I/O Map (continued)

Address (hex)	Size	Description
0388- 038D	6 bytes	AdLib† (FM synthesizer)
03B4 - 03B5	2 bytes	Video (VGA)
03BA	1 byte	Video (VGA)
03BC - 03BF	4 bytes	LPT3
03C0 - 03CA	11 bytes	Video (VGA)
03CC	1 byte	Video (VGA)
03CE - 03CF	2 bytes	Video (VGA)
03D4 - 03D5	2 bytes	Video (VGA)
03DA	1 byte	Video (VGA)
03E8 - 03EF	8 bytes	COM3
03F0 - 03F5	6 bytes	Diskette Channel 1
03F6	1 byte	Primary IDE channel command port
03F7 (Write)	1 byte	Diskette channel 1 command
03F7, bit 7	1 bit	Diskette change channel 1
03F7, bits 6:0	7 bits	Primary IDE channel status port
03F8 - 03FF	8 bytes	COM1
04D0 - 04D1	2 bytes	Edge/level triggered PIC
0530 - 0537	8 bytes	Windows Sound System
0604 - 060B	8 bytes	Windows Sound System
LPT*n* + 400h	8 bytes	ECP port, LPT*n* base address + 400h
0CF8 - 0CFB*	4 bytes	PCI configuration address register
0CF9**	1 byte	Turbo and reset control register
0CFC - 0CFF	4 bytes	PCI configuration data register
0E80 - 0E87	8 bytes	Windows Sound System
0F40- 0F47	8 bytes	Windows Sound System
FF00 - FF07	8 bytes	IDE bus master register
FFA0 - FFA7	8 bytes	Primary bus master IDE registers
FFA8 - FFAF	8 bytes	Secondary bus master IDE registers

* DWORD access only

** Byte access only

2.4 PCI Configuration Space Map

Table 27. PCI Configuration Space Map

Bus Number (hex)	Device Number (hex)	Function Number (hex)	Description
00	00	00	Intel 82440BX (PAC)
00	01	00	Intel 82440BX PCI/A.G.P. bridge
00	07	00	Intel 82371EB (PIIX4E) PCI/ISA bridge
00	07	01	Intel 82371EB (PIIX4E) IDE bus master
00	07	02	Intel 82371EB (PIIX4E) USB
00	07	03	Intel 82371EB (PIIX4E) power management
00	14	00	PCI expansion slot 1‡
00	12	00	PCI expansion slot 2‡
00	10	00	PCI expansion slot 3‡
00	0D	00	PCI expansion slot 4‡
00	06	00	Intel 82558 PCI Ethernet Controller (LAN)
01	00	00	On-board A.G.P. or A.G.P. connector (J1K1)

2.5 Interrupts

Table 28. Interrupts

IRQ	System Resource
NMI	I/O Channel Check
0	Reserved, Interval Timer
1	Reserved, Keyboard Buffer Full
2	Reserved, Cascade Interrupt From Slave PIC
3	COM2*
4	COM1*
5	LPT2 (Plug and Play option) / Audio / User available
6	Diskette Drive
7	LPT1*
8	Real Time Clock
9	Reserved for PIIX4E system management bus
10	User available
11	Windows Sound System* / User available
12	Onboard Mouse Port (if present, else user available)
13	Reserved, Math Coprocessor
14	Primary IDE (if present, else user available)
15	Secondary IDE (if present, else user available)

* Default, but can be changed to another IRQ

2.6 PCI Interrupt Routing Map

This section describes interrupt sharing and how the interrupt signals are connected between the PCI expansion slots‡ and onboard PCI devices. The PCI specification specifies how interrupts can be shared between devices attached to the PCI bus. In most cases, the small amount of latency added by interrupt sharing does not affect the operation or throughput of the devices. In some special cases where maximum performance is needed from a device, a PCI device should not share an interrupt with other PCI devices. Use the following information to avoid sharing an interrupt with a PCI add-in card.

PCI devices are categorized as follows to specify their interrupt grouping:

- INTA: By default, all add-in cards that require only one interrupt are in this category. For almost all cards that require more than one interrupt, the first interrupt on the card is also classified as INTA.
- INTB: Generally, the second interrupt on add-in cards that require two or more interrupts is classified as INTB. (This is not an absolute requirement.)
- INTC and INTD: Generally, a third interrupt on add-in cards is classified as INTC and a fourth interrupt is classified as INTD.

The PIIX4E PCI-to-ISA bridge has four programmable interrupt request (PIRQ) input signals. Any PCI interrupt source (either onboard or from a PCI add-in card) connects to one of these PIRQ signals. Because there are only four signals, some PCI interrupt sources are mechanically tied together on the motherboard and therefore share the same interrupt. Table 29 lists the PIRQ signals and shows how the signals are connected to the PCI expansion slots‡ and to onboard PCI interrupt sources.

Table 29. PCI Interrupt Routing Map

PIIX4 PIRQ Signal	First PCI Expansion Slot‡	Second PCI Expansion Slot‡	Third PCI Expansion Slot‡	Onboard Video	AGP Card	USB	Ethernet LAN Controller
PIRQA	INTA	INTB	INTC				
PIRQB	INTB	INTC	INTD	INTA	INTA		
PIRQC	INTC	INTD	INTA		INTB		
PIRQD	INTD	INTA	INTB			INTA	INTA

For example, assume an add-in card has one interrupt (group INTD) into the second PCI slot. In this slot, an interrupt source from group INTA connects to the PIRQD signal, which is already connected to the onboard video and USB PCI sources. The add-in card shares an interrupt with these onboard interrupt sources.

NOTE

The PIIX4E can connect each PIRQ line internally to one of the IRQ signals (3, 4, 5, 7, 11, 14, 15). Typically, a device that does not share a PIRQ line will have a unique interrupt. However, in certain interrupt-constrained situations, it is possible for two or more of the PIRQ lines to be connected to the same IRQ signal.

3 Overview of BIOS Features

The motherboard uses an Intel/Phoenix BIOS, which is stored in flash memory and can be upgraded using a disk-based program. In addition to the BIOS, the flash memory contains the Setup program, Power-On Self Test (POST), Advanced Power Management (APM) software, the PCI auto-configuration utility, and Windows 95-ready Plug and Play. See Section 6.2 for the supported versions of these specifications.

This motherboard supports system BIOS shadowing, allowing the BIOS to execute from 64-bit onboard write-protected DRAM.

The BIOS displays a message during POST identifying the type of BIOS and a the revision code. The initial production BIOS is identified as 4J4NB0X1.

3.1 BIOS Upgrades

A new version of the BIOS can be upgraded from a diskette using the Intel® Flash Memory Update utility that is available from Intel. This utility does BIOS upgrades as follows:

- Updates the flash BIOS from a file on a disk
- Updates the language section of the BIOS
- Makes sure that the upgrade BIOS matches the target system to prevent accidentally installing a BIOS for a different type of system

BIOS upgrades and the update utility are available from Intel through the Intel World Wide Web site. See Section 6.1 for information about this site.

NOTE

Please review the instructions distributed with the update utility before attempting a BIOS upgrade.

3.2 4 Mbit E28F004S5 Symmetrical Flash Memory

The Intel® E28F004S5 is a high performance 4 Mbit (512 KB) symmetrical flash memory device. Internally, the device is grouped into eight 64-KB blocks that are individually erasable, lockable, and unlockable. Figure 8 shows the organization of the flash memory.

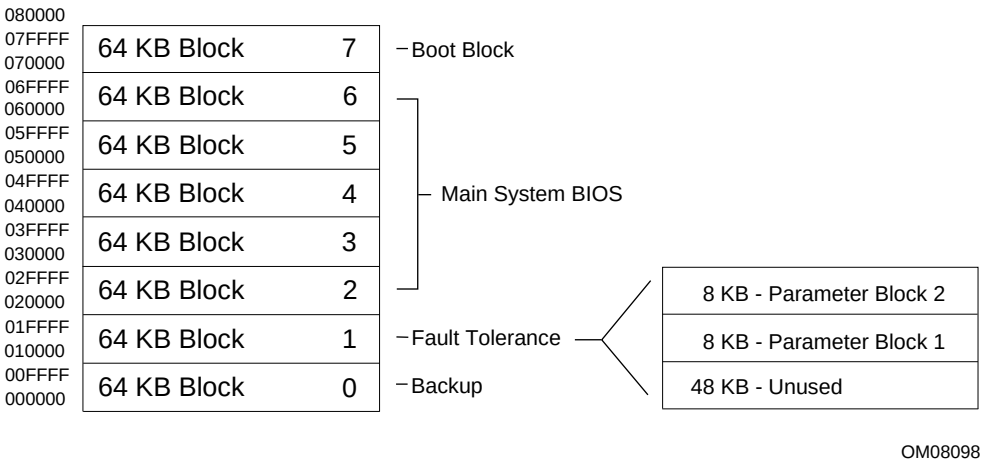


Figure 8. Memory Map of the Flash Device

Symmetrical flash memory allows both the boot and the fault tolerance blocks to increase in size from 16 KB to 64 KB. This increase allows the addition of features such as flash memory manager (FMM), dynamic memory detection, LS-120 recovery code, and extended security features.

The first two 8 KB blocks of the fault tolerance area are the parameter blocks. These blocks contain data such as microcode patches, vital product data (VPD), logo, SMBIOS interface, and ESCD information. The backup block contains a copy of the fault tolerance block.

The 4-Mbit flash component is organized as 512 KB x 8 bits and is divided into areas as described in Table 30. The table shows the addresses in the ROM image in normal mode.

Table 30. Flash Memory Organization

Address (Hex)	Size	Description
FFFF0000 - FFFFFFFF	64 KB	Boot Block
FFFA0000 - FFFEFFFF	256 KB	Main BIOS Block
FFF9F000 - FFF9FFFF	8 KB	Used by BIOS (for Event Logging, as an example)
FFF9E000 - FFF9EFFF	8 KB	OEM logo or Scan Flash Area
FFF9C000 - FFF9DFFF	16 KB	Vital Product Data (VPD) Extended System Configuration Data (ESCD) (DMI configuration data/Plug and Play Data)
FFF90000 - FFF9BFFF	96 KB	Fault Tolerant Storage
FFF80000 - FFF8FFFF	64 KB	Fault Tolerant Backup Block

3.3 Plug and Play: PCI Autoconfiguration

The BIOS automatically configures PCI devices and Plug and Play devices. PCI devices may be onboard or add-in cards. Plug and Play devices are ISA add-in cards built to meet the Plug and Play specification. Autoconfiguration lets a user insert or remove PCI or Plug and Play cards without having to configure the system. When a user turns on the system after adding a PCI or Plug and Play card, the BIOS automatically configures interrupts, the I/O space, and other system resources. Any interrupts set to Available in Setup are considered to be available for use by the add-in card.

PCI interrupts are distributed to available ISA interrupts that have not been assigned to an ISA card or to system resources. The assignment of PCI interrupts to ISA IRQs is non-deterministic. PCI devices can share an interrupt, but an ISA device cannot share an interrupt allocated to PCI or to another ISA device. Autoconfiguration information is stored in the extended system configuration data (ESCD) format.

For information about the versions of PCI and Plug and Play supported by this BIOS, see Section 6.2. Copies of the specifications can be obtained from the Intel World Wide Web site (see Section 6.1).

3.4 PCI IDE Support

If Auto is selected as a primary or secondary IDE device (see Section 4.3.2) in Setup, the BIOS automatically sets up the two local-bus IDE connectors with independent I/O channel support. The IDE interface supports hard disk drives up to PIO Mode 4 and recognizes any ATAPI devices, including CD-ROM drives and tape drives (see Section 6.2 for the supported version of ATAPI). The BIOS determines the capabilities of each drive and configures them so as to optimize capacity and performance. To take advantage of the high-capacity storage devices, hard disk drives are automatically configured for logical block addressing (LBA) and to PIO Mode 3 or 4, depending on the capability of the drive. To override the autoconfiguration options, use the specific IDE device options in Setup. The ATAPI specification recommends that ATAPI devices be configured as shown in Table 31.

Table 31. Recommendations for Configuring an ATAPI Device

	Primary Cable		**Secondary Cable**	
Configuration	Drive 0	Drive 1	Drive 0	Drive 1
Normal, no ATAPI	ATA			
Disk and CD-ROM for enhanced IDE systems	ATA		ATAPI	
Legacy IDE system with only one cable	ATA	ATAPI		
Enhanced IDE with CD-ROM and a tape or two CD-ROMs	ATA		ATAPI	ATAPI

3.5 ISA Plug and Play

If Plug and Play operating system (see Section 4.3) is selected in Setup, the BIOS autoconfigures only ISA Plug and Play cards that are required for booting (IPL devices). If Plug and Play operating system is not selected in Setup, the BIOS autoconfigures all Plug and Play ISA cards.

3.6 ISA Legacy Devices

Since ISA legacy devices are not autoconfigurable, the resources for them must be reserved. Resources can be reserved in the Setup program.

3.7 Desktop Management Interface (DMI)

Desktop Management Interface (DMI) is an interface for managing computers in an enterprise environment. The main component of DMI is the management information format (MIF) database, which contains information about the computing system and its components. Using DMI, a system administrator can obtain the system types, capabilities, operational status, and installation dates for system components. The MIF database defines the data and provides the method for accessing this information. The BIOS enables applications such as Intel® LANDesk Client Manager to use DMI. The BIOS stores and reports the following DMI information:

- BIOS data, such as the BIOS revision level
- Fixed-system data, such as peripherals, serial numbers, and asset tags
- Resource data, such as memory size, cache size, and processor speed
- Dynamic data, such as event detection and error logging

OEMs can use a utility that programs flash memory so the BIOS can report on system and chassis information. This utility is available through Intel sales offices. See Section 6.1 for information about contacting a local Intel sales office. See Section 6.2 for information about the latest DMI specification.

DMI does not work directly under non-Plug and Play operating systems (for example, Windows NT). However, the BIOS supports a DMI table interface for such operating systems. Using this support, a DMI service-level application running on a non-Plug and Play operating systems can access the DMI BIOS information.

3.8 Advanced Power Management (APM)

The BIOS supports APM and standby mode. See Section 6.2 for the version of the APM specification that is supported. The energy saving standby mode can be initiated in the following ways:

- Time-out period specified in Setup
- Suspend/resume switch connected to the front panel sleep connector
- From the operating system, such as the Suspend menu item in Windows 95

In standby mode, the motherboard reduces power consumption by using SMM capabilities, spinning down hard disk drives, and reducing power to, or turning off, VESA† DPMS-compliant monitors. Power-management mode can be enabled or disabled in Setup (see Section 4).

While in standby mode, the system retains the ability to respond to external interrupts and service requests, such as incoming faxes or network messages. Any keyboard or mouse activity brings the system out of standby mode and immediately restores power to the monitor.

The BIOS enables APM by default; but the operating system must support an APM driver for the power-management features to work. For example, Windows 95 supports the power-management features upon detecting that APM is enabled in the BIOS.

3.9 Advanced Configuration and Power Interface (ACPI)

ACPI gives the operating system direct control over the power management and Plug and Play functions of a computer. ACPI requires an ACPI-aware operating system such as Windows NT 5.0 or Windows 98. ACPI features include:

- Plug and Play (including bus and device enumeration) and Advanced Power Management (APM) functionality normally contained in the BIOS
- Power management control of individual devices, add-in boards (some add-in boards may require an ACPI-aware driver), video displays, and hard disk drives
- Methods for achieving less than 30-watt system operation in the Power On Suspend sleeping state, and less than 5-watt system operation in the Suspend to Disk sleeping state
- A Soft-off feature that enables the operating system to power off the computer
- Support for multiple wake up events (see Table 34)
- Support for a front panel power and sleep mode switch. Table 32 describes the system states based on how long the switch is pressed

Table 32. Effects of Pressing the Power Switch

If the system is in this state…	…and the power switch is pressed for	…the system enters this state
Off	Less than four seconds	Power on to G0 state
On	Less than four seconds	Power off to G2 state
On	More than four seconds	Power off to G2 state
Sleep	Less than four seconds	Wake up to G0 state

3.9.1 System States and Power States

Under ACPI, the operating system directs all system and device power state transitions. The operating system puts devices in and out of low-power states based on user preferences and knowledge of how devices are being used by applications. Devices that are not being used can be turned off. The operating system uses information from applications and user settings to put the system as a whole into a low-power state. Table 33 lists the power states supported by the motherboard along with the associated system power targets. See the ACPI specification for a complete description of the various system and power states.

Table 33. Power States and Targeted System Power

Global States	Sleeping States	Processor States	Device States	Targeted System Power *
G0 - working state	S0 - working	C0 - working	D0 - working state	Full power > 60 W
G1 - sleeping state	S1 - Processor stopped	C1 - stop grant	D1, D2, D3- device specification specific	5 W < power < 30 W
G1 - sleeping state	S2 - power on suspend	C2 - clock stopped	D2, D3- device specification specific	5 W < power < 30 W
G1 - sleeping state	S3 - suspend to RAM. Not supported.	No power	D3 - no power except for wake up logic	power < 5 W **
G1 - sleeping state	S4BIOS - suspend to disk***. Not supported.	No power	D3 - no power except for wake up logic	power < 5 W **
G2/S5	S5 - Soft off. Context not saved. Cold boot is required.	No power	D3 - no power except for wake up logic	power < 5 W **
G3 -mechanical off. The power supply switch is off.	No power to the system.	No power	D3 - no power for wake up logic, except when provided by battery or external source	No power to the system so that service can be performed.

* Total system power is dependent on the system configuration, including add-in boards and peripherals powered by the system chassis' power supply.

** Dependent on the standby power consumption of wake-up devices used in the system.

*** S3 and S4BIOS states are entered at the same time to preserve system context. In normal operation, the system restores context from RAM. In case of power failure, the system restores context from disk.

3.9.2 Wake Up Devices and Events

The table below describes which devices or specific events can wake the computer from specific states. Sleeping states S3, S4BIOS, and S5 are the same for the wake up events.

Table 34. Wake Up Devices and Events

These devices/events can wake up the computer…	…from this state
Power switch	S1, S2, S3, S4BIOS, S5
RTC alarm	S1, S2, S3, S4BIOS, S5
LAN	S1, S2, S3, S4BIOS, S5
Modem	S1, S2, S3, S4BIOS, S5
Thermal event	S1, S2, S3, S4BIOS
IR command	S1, S2
Voice	S1, S2
USB	S1, S2
PS/2 keyboard	S1, S2
PS/2 mouse	S1, S2
IEEE-1394.95/a/b high-speed serial bus	none

3.9.3 Plug and Play

In addition to power management, ACPI provides controls and information so that the operating system can facilitate Plug and Play device enumeration and configuration. ACPI is used only to enumerate and configure motherboard devices that do not have other hardware standards for enumeration and configuration. PCI devices on the motherboard, for example, are not enumerated by ACPI.

3.9.4 BIOS Support

The BIOS supports both APM and ACPI. If the board is used with an ACPI-aware operating, the BIOS provides ACPI support. Otherwise, it defaults to APM support.

3.10 Language Support

Five languages will be available: American English, German, Italian, French, and Spanish. The BIOS includes extensions to support the Kanji character set and other non-ASCII character sets. Translations of other languages may become available at a later date.

The default language is American English, which is always present unless another language is programmed into the BIOS using the flash memory update utility. See Section 3.1 for information about the BIOS update utility.

3.11 Boot Options

In the Setup program, the user can choose to boot from a diskette drive, hard disk drive, CD-ROM, or the network. The default setting is for the diskette drive to be the primary boot device and the hard disk drive to be the secondary boot device. By default the third and fourth devices are disabled.

Booting from CD-ROM is supported in compliance to the El Torito bootable CD-ROM format specification. See Section 6.2 for information about the El Torito specification. Under the Boot menu in the Setup program, CD-ROM is listed as a boot device. Boot devices are defined in priority order. If the CD-ROM is selected as the boot device, it must be the first device.

The network can be selected as a boot device. This selection allows booting from a network add-in card with a remote boot ROM installed.

3.12 OEM Logo or Scan Area

A 4 KB flash-memory user area at memory location FFFF8000h-FFFF8FFFh is for displaying a custom OEM logo during POST. A utility is available from the Intel web site (see Section 6.1) to assist with installing a logo into the flash memory. Contact Intel customer support for further information. See Section 6.1 for information on contacting Intel customer support.

3.13 USB Legacy Support

USB legacy support enables USB keyboards and mice to be used although no operating system drivers are in place. By default, USB legacy support is disabled. USB Legacy support is for use in accessing BIOS Setup and the installation of a USB aware operating system only.

This sequence describes how USB legacy support operates in the default (disabled) mode.

1. When you power up the computer, USB legacy support is disabled.
2. POST begins.
3. USB legacy support is temporarily enabled by the BIOS. This allows you to use a USB keyboard to enter the Setup program or the maintenance mode.
4. POST completes and disables USB legacy support (unless it was set to Enabled while in Setup).
5. The operating system loads. While the operating system is loading, USB keyboards and mice are not recognized. After the operating system loads the USB drivers, the USB devices are recognized.

To install a USB aware operating system, enable USB Legacy support in BIOS Setup and follow the operating system's installation instructions. Once the operating system is installed and the USB drivers configured, USB Legacy Support is no longer used. USB Legacy Support can be left enabled in BIOS Setup if needed.

Notes on using USB legacy support:

- If USB legacy support is enabled, don't mix USB and PS/2 keyboards and mice. For example, don't use a PS/2 keyboard with a USB mouse, or a USB keyboard and a PS/2 mouse.
- It is not recommended to use USB devices with an operating system that does not support USB. USB legacy does not support the use of USB devices in a non USB operating system.
- USB legacy support is for keyboards and mice only. Hubs and other USB devices are not supported in this special mode.

3.14 BIOS Setup Access

Access to the Setup program can be restricted using passwords. User and supervisor passwords can be set using the Security menu in Setup. The default is no passwords enabled. See Section 4.4 for information about setting user and supervisor passwords.

3.15 Recovering BIOS Data

Some types of failure can destroy the BIOS. For example, the data can be lost if a power outage occurs while the BIOS is being updated in flash memory. The BIOS can be recovered from a diskette using the BIOS recovery mode (see Section 1.15.3).

To create a BIOS recovery diskette, a bootable diskette must be created and the recovery files copied to it. The recovery files are available from Intel, contact Intel customer support for further information. See Section 6.1 for information on contacting Intel customer support.

4 BIOS Setup Program

The Setup program is for viewing and changing the BIOS settings for a computer. Setup is accessed by pressing the <F2> key after the Power-On Self Test (POST) memory test begins and before the operating system boot begins.

Table 35 shows the menus available from the menu bar at the top of the Setup screen.

Table 35. Setup Menu Bar

Setup Menu Screen	Description
Maintenance	Specifies the processor speed and clears the Setup passwords. This menu is only available in configure mode. Refer to Section 1.15 for information about configure mode.
Main	Allocates resources for hardware components.
Advanced	Specifies advanced features available through the chipset.
Security	Specifies passwords and security features.
Power	Specifies power management features.
Boot	Specifies boot options and power supply controls.
Exit	Saves or discards changes to the Setup program options.

Table 36 shows the function keys available for menu screens.

Table 36. Setup Function Keys

Setup Key	Description
<F1> or <Alt-H>	Brings up a help screen for the current item.
<Esc>	Exits the menu.
<←> or <→>	Selects a different menu screen.
<↑> or <↓>	Moves cursor up or down.
<Home> or <End>	Moves cursor to top or bottom of the window.
<PgUp> or <PgDn>	Moves cursor to top or bottom of the window.
<F5> or <->	Selects the previous value for a field.
<F6> or <+> or <Space>	Selects the next value for a field.
<F9>	Load the default configuration values for the current menu.
<F10>	Save the current values and exit Setup.
<Enter>	Executes command or selects the submenu.

4.1 Maintenance Menu

This menu is for setting the processor speed and clearing the Setup passwords. Setup only displays this menu in configure mode. See Section 1.15 for information about setting configure mode.

Table 37. Maintenance Menu

Feature	Options	Description
Processor Speed (66 MHz Host Bus)	233 266 300 333	Specifies the processor speed in megahertz With a host bus operating at 66 MHz, the board supports processors at the following speeds: 233, 266, 300, and 333 MHz
Processor Speed (100 MHz Host Bus)	300 350	With a host bus operating at 100 MHz, the board supports processors at the following speeds: 300 and 333 MHz
Clear All Passwords	No options	Clears the user and administrative passwords

4.2 Main Menu

This menu reports processor and memory information and is for configuring the system date, system time, floppy options, and IDE devices.

Table 38. Main Menu

Feature	Options	Description
BIOS Version	No options	Displays the version of the BIOS.
Processor Type	No options	Displays processor type.
Processor Speed	No options	Displays processor speed.
Cache RAM	No options	Displays size of second-level cache.
System Memory	No options	Displays the total amount of RAM on the motherboard.
Memory Bank 0 Memory Bank 1 Memory Bank 2	No options	Displays size and type of DIMM installed in each memory bank.
Language	• **English (US) (default)** • Francais • Italiano • Deutch • Espanol	Selects the default language used by the BIOS.
ECC Configuration	• **Non-ECC (default)** • ECC	Specifies ECC memory operation.
L2 Cache ECC Support	• Enabled • **Disabled (default)**	If Enabled, allows error checking to occur on data accessed from L2 Cache.
System Time	Hour, minute, and second	Specifies the current time.
System Date	Month, day, and year	Specifies the current date.

4.3 Advanced Menu

This menu is for setting advanced features that are available through the chipset.

Table 39. Advanced Menu

Feature	Options	Description
Plug & Play O/S	**No (default)** Yes	Specifies if a Plug and Play operating system is being used. *No* lets the BIOS configure all devices. *Yes* lets the operating system configure Plug and Play devices. Not required with a Plug and Play operating system.
Reset Configuration Data	**No (default)** Yes	Clears the BIOS configuration data on the next boot.
Numlock	**Auto (default)** On Off	Specifies the power on state of the Num Lock feature on the numeric keypad of the keyboard.
Peripheral Configuration	No options	Configures peripheral ports and devices. When selected, displays the Peripheral Configuration submenu.
IDE Configuration	No options	Specifies type of connected IDE device.
Floppy Configuration	No options	When selected, displays the Floppy Options submenu.
DMI Event Logging	No options	Configures DMI Events Logging. When selected, displays the DMI Events Logging submenu.
Video Configuration	No options	Configures video features. When selected, displays the Video Configuration submenu.
Resource Configuration	No options	Configures memory blocks and IRQs for legacy ISA devices. When selected, displays the Resource Configuration submenu.

4.3.1 Peripheral Configuration Submenu

This submenu is used for configuring the computer peripherals.

Table 40. Peripheral Configuration Submenu

Feature	Options	Description
Serial port A	• Disabled • Enabled • **Auto (default)**	Configures serial port A. *Auto* assigns the first free COM port, normally COM1, the address 3F8h, and the interrupt IRQ4. An * (asterisk) displayed next to an address indicates a conflict with another device.
Base I/O address	• 3F8 • 2F8 • 3E8 • 2E8	Specifies the base I/O address for serial port A, if serial port A is Enabled.
Interrupt	• IRQ 3 • **IRQ 4 (default)**	Specifies the interrupt for serial port A, if serial port A is Enabled.
Serial port B	• Disabled • Enabled • **Auto (default)**	Configures serial port B. *Auto* assigns the first free COM port, normally COM2, the address 2F8h and the interrupt IRQ3. An * (asterisk) displayed next to an address indicates a conflict with another device. If either serial port address is set, that address will not appear in the list of options for the other serial port. If an *ATI mach32*† or an *ATI mach64*† video controller is active as an add-in card, the COM4, 2E8h address will not appear in the list of options for either serial port.
Mode	• **Normal (default)** • IrDA • ASK-IR	Specifies the mode for serial port B for normal (COM 2) or infrared applications. This option is not available if serial port B has been disabled.
Base I/O address	• 3F8 • **2F8 (default)** • 3E8 • 2E8	Specifies the base I/O address for serial port B, if serial port B is Enabled.
Interrupt	• **IRQ 3 (default)** • IRQ 4	Specifies the interrupt for serial port B, if serial port B is Enabled.
Parallel port	• Disabled • Enabled • **Auto (default)**	Configures the parallel port. *Auto* assigns LPT1 the address 378h and the interrupt IRQ7. An * (asterisk) displayed next to an address indicates a conflict with another device.

continued

Table 40. Peripheral Configuration Submenu (continued)

Feature	Options	Description
Mode	• Output Only • **Bi-directional (default)** • EPP • ECP	Selects the mode for the parallel port. Not available if the parallel port is disabled. *Output Only* operates in AT†-compatible mode. *Bi-directional* operates in PS/2-compatible mode. *EPP* is Extended Parallel Port mode, a high-speed bi - directional mode. *ECP* is Enhanced Capabilities Port mode, a high-speed bi-directional mode.
Base I/O address	• 378 • 278 • 228	Specifies the base I/O address for the parallel port, if the parallel port is Enabled.
Interrupt	• IRQ 5 • IRQ 7	Specifies the interrupt for the parallel port, if the parallel port is Enabled.
Audio	• Disabled • **Enabled (default)**	Enables or disables the onboard audio subsystem.
LAN	• Disabled • **Enabled (default)**	Enables or disables the onboard LAN device.
Embedded PXE Support	• Disabled • **Enabled (default)**	Enables or disables LANDesk service agent option.
Legacy USB Support	• **Disabled (default)** • Enabled	Enables or disables USB legacy support. (See Section 3.13 for more information.)

4.3.2 IDE Configuration

Table 41. IDE Device Configuration

Feature	Options	Description
IDE Controller	• Disabled • Primary • Secondary • **Both (default)**	Specifies the integrated IDE controller. *Primary* enables only the Primary IDE Controller. *Secondary* enables only the Secondary IDE Controller. *Both* enables both IDE controllers.
Hard Disk Pre-Delay	• **Disabled (default)** • 3 Seconds • 6 Seconds • 9 Seconds • 12 Seconds • 15 Seconds • 21 Seconds • 30 Seconds	Specifies the hard disk drive pre-delay.
Primary IDE Master	No options	Reports type of connected IDE device. When selected, displays the Primary IDE Master submenu.
Primary IDE Slave	No options	Reports type of connected IDE device. When selected, displays the Primary IDE Slave submenu.
Secondary IDE Master	No options	Reports type of connected IDE device. When selected, displays the Secondary IDE Master submenu.
Secondary IDE Slave	No options	Reports type of connected IDE device. When selected, displays the Secondary IDE Slave submenu.

4.3.3 IDE Configuration Submenus

This submenu is for configuring IDE devices, including:

- Primary IDE master
- Primary IDE slave
- Secondary IDE master
- Secondary IDE slave

Table 42. IDE Configuration Submenus

Feature	Options	Description
Type	• Auto • None • ATAPI Removable • CD-ROM • IDE Removable • Other ATAPI • User	Specifies the IDE configuration mode for IDE devices. *User* allows the cylinders, heads, and sectors fields to be changed. *Auto* automatically fills in the values for the cylinders, heads, and sectors fields.
Maximum Capacity	No options	Reports the maximum capacity for the hard disk, if the type is User or Auto.
Multi-Sector Transfers	• Disabled • 2 Sectors • 4 Sectors • 8 Sectors • 16 Sectors	Specifies number of sectors per block for transfers from the hard disk drive to memory. Check the hard disk drive's specifications for optimum setting.
LBA Mode Control	• Disabled • Enabled	Enables or disables the LBA mode control.
Transfer Mode	• Standard • Fast PIO 1 • Fast PIO 2 • Fast PIO 3 • Fast PIO 4 • FPIO 3 / DMA 1 • FPIO 4 / DMA 2	Specifies the method for moving data to/from the drive.
Ultra DMA	• Disabled • Mode 0 • Mode 1 • Mode 2	Specifies the Ultra DMA mode for the drive.

The default values for these options is determined by the device being configured, as shown in the following table.

Table 43. Default Values By IDE Device Type

	Primary IDE Master	All other devices
Type	Auto	Auto
Multi-Sector Transfers	16 Sectors	Disabled
LBA Mode Control	Enabled	Disabled
Transfer Mode	FPIO 4/DMA 2	Standard
Ultra DMA	Disabled	Disabled

4.3.4 Floppy Options

This submenu is for configuring floppy drives.

Table 44. Floppy Options

Feature	Options	Description
Floppy Disk Controller	• Disabled • **Enabled (default)** • Auto	Disables or enables the integrated floppy disk controller.
Diskette A:	• Disabled • 360 KB, 5¼″ • 1.2 MB, 5¼″ • 720 KB, 3½″ • **1.44/1.25 MB, 3½″ (default)** • 2.88 MB, 3½″	Specifies the capacity and physical size of diskette drive A.
Floppy Write Protect	**Disabled (default)** Enabled	Disables or enables write protect for the diskette drive.

4.3.5 DMI Event Logging

This submenu is for configuring the DMI event logging features.

Table 45. DMI Event Logging Submenu

Feature	Options	Description
Event log capacity	No options	Indicates if there is space available in the event log.
Event log validity	No options	Indicates if the contents of the event log are valid.
View DMI event log	[Enter]	Displays the DMI event log.
Clear all DMI event logs	• **No (default)** • Yes	Clears the DMI event log after rebooting.
Event Logging	• Disabled • **Enabled (default)**	Enables logging of DMI events.
ECC Event Logging	• Disabled • **Enabled (default)**	Enables logging of ECC events.
Mark DMI events as read	[Enter]	Marks all DMI events as read.

4.3.6 Video Configuration Submenu

This submenu is for configuring video features.

Table 46. Video Configuration Submenu

Feature	Options	Description
Palette Snooping	• **Disabled (default)** • Enabled	Controls the ability of a primary PCI graphics controller to share a common palette with an ISA add-in video card.
AGP Aperture Size	• **64 MB (default)** • 256 MB	Specifies the aperture size for the A.G.P. video controller.

4.3.7 Resource Configuration Submenu

This submenu is for configuring the memory and interrupts.

Table 47. Resource Configuration Submenu

Feature	Options		Description
Memory Reservation	• C800 - CBFF • CC00- CFFF • D000 - D3FF • D400 - D7FF • D800 - DBFF • DC00 - DFFF	**Available (default)** | Reserved **Available (default)** | Reserved **Available (default)** | Reserved **Available (default)** | Reserved **Available (default)** | Reserved **Available (default)** | Reserved	Reserves specific upper memory blocks for use by legacy ISA devices.
IRQ Reservation	• IRQ3 • IRQ4 • IRQ5 • IRQ7 • IRQ10 • IRQ11	**Available (default)** | Reserved **Available (default)** | Reserved **Available (default)** | Reserved **Available (default)** | Reserved **Available (default)** | Reserved **Available (default)** | Reserved	Reserves specific IRQs for use by legacy ISA devices. An * (asterisk) displayed next to an IRQ indicates an IRQ conflict.

4.4 Security Menu

This menu is for setting passwords and security features.

Table 48. Security Menu

Feature	Options	Description
User Password Is	No options	Reports if there is a user password set.
Administrative Password Is	No options	Reports if there is a administrative password set.
Set User Password	Password can be up to seven alphanumeric characters.	Specifies the user password.
Set Administrative Password	Password can be up to seven alphanumeric characters.	Specifies the administrative password.
Clear User	No Options	Clears the user password.
User Setup Access	• None • **View Only (default)** • Limited Access • Full	Establishes the user access level.
Unattended Start	• **Disabled (default)** • Enabled	Enables the unattended start feature. When enabled, the computer boots, but the keyboard is locked. The user must enter a password to unlock the computer or boot from a floppy diskette.

4.5 Power Menu

This menu is for setting power management features.

Table 49. Power Menu

Feature	Options	Description
Power Management	• Disabled • **Enabled (default)**	Enables or disables the BIOS power management feature.
Inactivity Timer	• **Off (default)** • 1 Minute • 5 Minutes • 10 Minutes • 20 Minutes • 30 Minutes • 60 Minutes • 120 Minutes	Specifies the amount of time before the computer enters standby mode.
Hard Drive	• Disabled • **Enabled (default)**	Enables power management for hard disks during standby and suspend modes.
VESA Video Power Down	• Disabled • **Standby (default)** • Suspend • Sleep	Specifies power management for video during standby and suspend modes.

4.6 Boot Menu

This menu is for setting the boot features and the boot sequence.

Table 50. Boot Menu

Feature	Options	Description
Quick Boot Mode	• Disabled • **Enabled (default)**	Enables the computer to boot without running certain POST tests.
Scan User Flash Area	• **Disabled (default)** • Enabled	Enables the BIOS to scan the flash memory for user binary files that are executed at boot time.
After Power Failure	• Stay Off • **Last State (default)** • Power On	Specifies the mode of operation if an AC/Power loss occurs. *Power On* restores power to the computer. *Stay Off* keeps the power off until the power button is pressed. *Last State* restores the previous power state before power loss occurred.
On Modem Ring	• Stay Off • **Power On (default)**	Specifies how the computer responds to an incoming call on an installed modem when the power is off.
On LAN	• Stay Off • **Power On (default)**	Specifies how the computer responds to a LAN wakeup event when the power is off.

continued

Table 50. Boot Menu (continued)

Feature	Options	Description
On PME	• **Stay Off (default)** • Power On	Specifies how the computer responds to a PME wakeup event when the power is off.
Hard Drive Pre-delay	• Disabled (default) • 3 Seconds • 6 Seconds • 9 Seconds • 12 Seconds • 15 Seconds • 21 Seconds • 30 Seconds	Sets the hard disk drive pre-delay. When enabled, this option causes the BIOS to wait the specified time before it accesses the first hard drive. If the computer contains a hard drive and the drive type is not displayed during boot-up, but the drive type is displayed following a warm boot (<Ctrl><Alt><Del>), the hard drive may need more time before it is able to communicate with the controller. Setting a pre-delay provides additional time for the hard drive to initialize.
First Boot Device Second Boot Device Third Boot Device Fourth Boot Device Fifth Boot Device	• Removable devices • Hard Drive • ATAPI CD-ROM Drive • Network Boot • LANDesk Service Agent	Specifies the boot sequence from the available devices. To specify boot sequence: 1. Select the boot device with <↑> or <↓>. 2. Press <+> to move the device up the list or <-> to move the device down the list. The operating system assigns a drive letter to each boot device in the order listed. Changing the order of the devices changes the drive lettering.
Hard Drive	No options	Lists available hard disk drives. When selected, displays the Hard Drive submenu.
Removable Devices	No options	Lists available removable devices. When selected, displays the Removable Devices submenu.

4.6.1 Hard Drive Submenu

This submenu is for configuring the boot sequence for hard disk drives.

Table 51. Hard Drive Submenu

Options	Description
Bootable Add in Card	Specifies the boot sequence for the hard disk drives attached to the computer. To specify boot sequence: 1. Select the boot device with <↑> or <↓>. 2. Press <+> to move the device up the list or <-> to move the device down the list. The operating system assigns a drive letter to each device in the order listed. Changing the order of the devices changes the drive lettering.

4.6.2 Removable Devices Submenu

This submenu is for configuring the boot sequence for removable devices.

Table 52. Removable Devices Submenu

Options	Description
Legacy Floppy Drives	Specifies the boot sequence for the removable devices attached to the computer. To specify boot sequence: 1. Select the boot device with <↑> or <↓>. 2. Press <+> to move the device up the list or <-> to move the device down the list. The operating system assigns a drive letter to each device in the order listed. Changing the order of the devices changes the drive lettering.

4.7 Exit Menu

This menu is for exiting the Setup program, saving changes, and loading and saving defaults.

Table 53. Exit Menu

Feature	Description
Exit Saving Changes	Exits and saves the changes in CMOS SRAM.
Exit Discarding Changes	Exits without saving any changes made in Setup.
Load Setup Defaults	Loads the factory default values for all the Setup options.
Load Custom Defaults	Loads the custom defaults for Setup options.
Save Custom Defaults	Saves the current values as custom defaults. Normally, the BIOS reads the Setup values from flash memory. If this memory is corrupted, the BIOS reads the custom defaults. If no custom defaults are set, the BIOS reads the factory defaults.
Discard Changes	Discards changes without exiting Setup. The option values present when the computer was turned on are used.

5 Error Messages and Beep Codes

5.1 BIOS Error Messages

Table 54. BIOS Error Messages

Error Message	Explanation
Diskette drive A error	Drive A: is present but fails the POST diskette tests. Ensure that the drive controller is enabled, the drive is correctly installed, and the drive type is properly defined in Setup.
Extended RAM Failed at offset: *nnnn*	Extended memory not working or not configured properly at offset *nnnn*.
Failing Bits: *nnnn*	The hexadecimal number *nnnn* is a map of the bits at the RAM address (System, Extended, or Shadow memory) that failed the memory test. Each 1 in the map indicates a failed bit.
Fixed Disk 0 Failure or Fixed Disk 1 Failure or Fixed Disk Controller Failure	Fixed disk is not working or not configured properly. Check to see if fixed disk is installed properly. Run Setup be sure the fixed-disk type is correctly identified and enabled.
Incorrect Drive A type - run SETUP	Type of floppy drive for drive A: not correctly identified in Setup.
Invalid NVRAM media type	Problem with NVRAM (CMOS) access.
Keyboard controller error	The keyboard controller failed test. Try replacing the keyboard.
Keyboard error	Keyboard not working.
Keyboard error nn	BIOS discovered a stuck key and displays the scan code nn for the stuck key.
Keyboard locked - Unlock key switch	Unlock the system to proceed.
Monitor type does not match CMOS - Run SETUP	Monitor type not correctly identified in Setup.
Operating system not found	Operating system cannot be located on either drive A or drive C. Enter Setup and see if fixed disk and drive A are properly identified.
Parity Check 1	Parity error found in the system bus. BIOS attempts to locate the address and display it on the screen. If it cannot locate the address, it displays ????.
Parity Check 2	Parity error found in the I/O bus. BIOS attempts to locate the address and display it on the screen. If it cannot locate the address, it displays ????.
Press <F1> to resume, <F2> to Setup	Displayed after any recoverable error message. Press <F1> to start the boot process or <F2> to enter Setup and change any settings.
Real time clock error	Real-time clock fails BIOS test. May require motherboard repair.

continued

Table 54. BIOS Error Messages (continued)

Error Message	Explanation
Shadow RAM Failed at offset: *nnnn*	Shadow RAM failed at offset *nnnn* of the 64 KB block at which the error was detected.
System battery is dead - Replace and run SETUP	The CMOS clock battery indicator shows the battery is dead. Replace the battery and run Setup to reconfigure the system.
System cache error - Cache disabled	RAM cache failed the BIOS test. BIOS disabled the cache.
System CMOS checksum bad - run SETUP	System CMOS RAM has been corrupted or modified incorrectly, perhaps by an application program that changes data stored in CMOS. Run Setup and reconfigure the system either by getting the default values and/or making your own selections.
System RAM Failed at offset: *nnnn*	System RAM failed at offset *nnnn* of the 64 KB block at which the error was detected.
System timer error	The timer test failed. Requires repair of system motherboard.

5.2 Port 80h POST Codes

During the POST, the BIOS generates diagnostic progress codes (POST codes) to I/O port 80h. If the POST fails, execution stops and the last POST code generated is left at port 80h. This code is useful for determining the point where an error occurred.

Displaying the POST codes requires an add-in card (often called a POST card). The POST card can decode the port and display the contents on a medium such as a seven-segment display. These cards can be purchased from JDR Microdevices or other sources.

The following table provides the POST codes that can be generated by the BIOS. Some codes are repeated in the table because that code applies to more than one operation.

Table 55. Port 80h Codes

Code	Description of POST Operation
02h	Verify real mode
03h	Disable non-maskable interrupt (NMI)
04h	Get processor type
06h	Initialize system hardware
08h	Initialize chipset with initial POST values
09h	Set IN POST flag
0Ah	Initialize processor registers
0Bh	Enable processor cache
0Ch	Initialize caches to initial POST values
0Eh	Initialize I/O component
0Fh	Initialize the local bus IDE

continued

Table 55. Port 80h Codes (continued)

Code	Description of POST Operation Currently In Progress
10h	Initialize power management
11h	Load alternate registers with initial POST valuesnew
12h	Restore processor control word during warm boot
13h	Initialize PCI bus mastering devices
14h	Initialize keyboard controller
16h	BIOS ROM checksum
17h	Initialize cache before memory autosize
18h	8254 timer initialization
1Ah	8237 DMA controller initialization
1Ch	Reset programmable interrupt controller
20h	Test DRAM refresh
22h	Test keyboard controller
24h	Set ES segment register to 4 GB
26h	Enable A20 line
28h	Autosize DRAM
29h	Initialize POST memory manager
2Ah	Clear 512 KB base RAM
2Ch	RAM failure on address line *xxxx* (See note on page 79)
2Eh	RAM failure on data bits *xxxx* of low byte of memory bus (See note on page 79)
2Fh	Enable cache before system BIOS shadow
30h	RAM failure on data bits *xxxx* of high byte of memory bus (See note on page 79)
32h	Test processor bus-clock frequency
33h	Initialize POST dispatch manager
34h	Test CMOS RAM
35h	Initialize alternate chipset registers
36h	Warm start shut down
37h	Reinitialize the chipset (MB only)
38h	Shadow system BIOS ROM
39h	Reinitialize the cache (MB only)
3Ah	Autosize cache
3Ch	Configure advanced chipset registers
3Dh	Load alternate registers with CMOS valuesnew
40h	Set Initial processor speed new
42h	Initialize interrupt vectors
44h	Initialize BIOS interrupts
45h	POST device initialization
46h	Check ROM copyright notice

continued

Table 55. Port 80h Codes (continued)

Code	Description of POST Operation Currently In Progress
47h	Initialize manager for PCI option ROMs
48h	Check video configuration against CMOS RAM data
49h	Initialize PCI bus and devices
4Ah	Initialize all video adapters in system
4Bh	Display QuietBoot screen
4Ch	Shadow video BIOS ROM
4Eh	Display BIOS copyright notice
50h	Display processor type and speed
51h	Initialize EISA motherboard
52h	Test keyboard
54h	Set key click if enabled
56h	Enable keyboard
58h	Test for unexpected interrupts
59h	Initialize POST display service
5Ah	Display prompt "Press F2 to enter SETUP"
5Bh	Disable processor cache
5Ch	Test RAM between 512 and 640 KB
60h	Test extended memory
62h	Test extended memory address lines
64h	Jump to UserPatch1
66h	Configure advanced cache registers
67h	Initialize multiprocessor APIC
68h	Enable external and processor caches
69h	Setup System Management Mode (SMM) area
6Ah	Display external L2 cache size
6Ch	Display shadow-area message
6Eh	Display possible high address for UMB recovery
70h	Display error messages
72h	Check for configuration errors
74h	Test real-time clock
76h	Check for keyboard errors
7Ah	Test for key lock on
7Ch	Set up hardware interrupt vectors
7Eh	Initialize coprocessor if present
80h	Disable onboard Super I/O ports and IRQs
81h	Late POST device initialization
82h	Detect and install external RS232 ports
83h	Configure non-MCD IDE controllers

continued

Table 55. Port 80h Codes (continued)

Code	Description of POST Operation Currently In Progress
84h	Detect and install external parallel ports
85h	Initialize PC-compatible PnP ISA devices
86h	Re-initialize onboard I/O ports
87h	Configure motherboard configurable devices
88h	Initialize BIOS Data Area
89h	Enable Non-Maskable Interrupts (NMIs)
8Ah	Initialize extended BIOS data area
8Bh	Test and initialize PS/2 mouse
8Ch	Initialize diskette controller
8Fh	Determine number of ATA drives
90h	Initialize hard-disk controllers
91h	Initialize local-bus hard-disk controllers
92h	Jump to UserPatch2
93h	Build MPTABLE for multiprocessor boards
94h	Disable A20 address line (Rel. 5.1 and earlier)
95h	Install CD ROM for boot
96h	Clear huge ES segment register
97h	Fix up multiprocessor table
98h	Search for option ROMs
99h	Check for SMART Drive
9Ah	Shadow option ROMs
9Ch	Set up power management
9Eh	Enable hardware interrupts
9Fh	Determine number of ATA and SCSI drives
A0h	Set time of day
A2h	Check key lock
A4h	Initialize typematic rate
A8h	Erase F2 prompt
Aah	Scan for F2 key stroke
Ach	Enter SETUP
Aeh	Clear IN POST flag
B0h	Check for errors
B2h	POST done - prepare to boot operating system
B4h	One short beep before boot
B5h	Terminate QuietBoot
B6h	Check password (optional)
B8h	Clear global descriptor table
B9h	Clean up all graphics

continued

Table 55. Port 80h Codes (continued)

Code	Description of POST Operation Currently In Progress
Bah	Initialize DMI parameters
BBh	Initialize PnP Option ROMs
BCh	Clear parity checkers
BDh	Display MultiBoot menu
Beh	Clear screen (optional)
BFh	Check virus and backup reminders
C0h	Try to boot with INT 19h
C1h	Initialize POST Error Manager (PEM)
C2h	Initialize error logging
C3h	Initialize error display function
C4h	Initialize system error handler
E0h	Initialize the chipset
E1h	Initialize the bridge
E2h	Initialize the processor
E3h	Initialize system timer
E4h	Initialize system I/O
E5h	Check force recovery boot
E6h	Checksum BIOS ROM
E7h	Go to BIOS
E8h	Set huge segment
E9h	Initialize multiprocessor
Eah	Initialize OEM special code
Ebh	Initialize PIC and DMA
Ech	Initialize memory type
Edh	Initialize memory size
Eeh	Shadow boot block
Efh	System memory test
F0h	Initialize interrupt vectors
F1h	Initialize runtime clock
F2h	Initialize video
F3h	Initialize beeper
F4h	Initialize boot
F5h	Clear huge segment
F6h	Boot to mini-DOS
F7h	Boot to full DOS

NOTE

If the BIOS detects error 2C, 2E, or 30 (base 512 K RAM error), it displays an additional word-bitmap (xxxx) indicating the address line or bits that failed. For example, "2C 0002" means address line 1 (bit one set) has failed. "2E 1020" means data bits 12 and 5 (bits 12 and 5 set) have failed in the lower 16 bits. The BIOS also sends the bitmap to the port-80 LED display. It first displays the check point code, followed by a delay, the high-order byte, another delay, and then the low-order byte of the error. It repeats this sequence continuously.

5.3 BIOS Beep Codes

Whenever a recoverable error occurs during power-on self test (POST), the BIOS displays an error message describing the problem. The BIOS also issues a beep code (one long tone followed by two short tones) during POST if the video configuration fails (a faulty video card or no card installed) or if an external ROM module does not properly checksum to zero.

An external ROM module (for example, a video BIOS) can also issue audible errors, usually consisting of one long tone followed by a series of short tones. For more information on the beep codes issued, check the documentation for that external device.

There are several POST routines that issue a POST terminal error and shut down the system if they fail. Before shutting down the system, the terminal-error handler issues a beep code signifying the test point error, writes the error to I/O port 80h, attempts to initialize the video and writes the error in the upper left corner of the screen (using both monochrome and color adapters).

If POST completes normally, the BIOS issues one short beep before passing control to the operating system.

Table 56. Beep Codes

Beeps	80h Code	Description
1	B4h	One short beep before boot
1-2	98h	Search for option ROMs
1-2-2-3	16h	BIOS ROM checksum
1-3-1-1	20h	Test DRAM refresh
1-3-1-3	22h	Test 8742 keyboard controller
1-3-4-1	2Ch	RAM failure on address line *xxxx* (See note on page 79)
1-3-4-3	2Eh	RAM failure on data bits *xxxx* of low byte of memory bus (See note on page 79)
1-4-1-1	30h	RAM failure on data bits *xxxx* of high byte of memory bus (See note on page 79)
2-1-2-3	46h	Check ROM copyright notice
2-2-3-1	58h	Test for unexpected interrupts

6 Specifications and Customer Support

6.1 Online Support

You will find information about Intel boards under “Product Info” or “Customer Support” at the following World Wide Web site:

http://www.intel.com/

6.2 Specifications

The motherboard complies with the following specifications:

Table 57. Specifications

Specification	Description	Revision Level
A.G.P.	Accelerated Graphics Port Interface Specification	Revision 1.0, August, 1996, Intel Corporation. The specification is available through the Accelerated Graphics Implementers Forum at: http://www.agpforum.org/
APM	Advanced Power Management BIOS interface specification	Revision 1.2, February, 1996 Intel Corporation, Microsoft Corporation
ATA-3	Information Technology - AT Attachment-3 Interface	X3T10/2008D Revision 6 ATA Anonymous FTP Site: fission.dt.wdc.com
ATAPI	ATA Packet Interface for CD-ROMs	SFF-8020i Revision 2.5 (SFF) Fax Access: (408) 741-1600
DMI	Desktop Management Interface BIOS specification	Version 2.1, June 16, 1997 American Megatrends Inc., Award Software International Inc., Dell Computer Corporation, Intel Corporation, Phoenix Technologies Ltd., SystemSoft Corporation http://www.ptltd.com/techs/specs.html
El Torito	Bootable CD-ROM format specification	Version 1.0, January 25, 1995 Phoenix Technologies Ltd., IBM Corporation. The El Torito specification is available on the Phoenix Web site http://www.ptltd.com/techs/specs.html
EPP	Enhanced Parallel Port	IEEE 1284 standard, Mode [1 or 2], v1.7
IrDA	Serial Infrared Physical Layer Link specification	Version 1.1, October 17, 1995 Infrared Data Association. Phone: (510) 943-6546 Fax: (510) 943-5600 E-mail: irda@netcom.com

continued

Table 57. Specifications (continued)

NLX	NLX form factor specification	Revision 1.2, February 1997, Intel Corporation The specification is available at: http://www.teleport.com/~nlx/
NLX Power Supply	NLX Power Supply Recommendations	Revision 1.1, May 1997, Intel Corporation The recommendation is available at: http://www.teleport.com/~nlx/
PCI	PCI Local Bus specification	Revision 2.1, June 1, 1995, PCI Special Interest Group http://www.pcisig.com/
Phoenix BIOS	PhoenixBIOS	Revision 4.0, February 27, 1997 Phoenix Technologies Ltd.
Plug and Play	Plug and Play BIOS specification	Version 1.0a, May 5, 1994 Compaq Computer Corporation, Phoenix Technologies Ltd., Intel Corporation
SDRAM DIMMs (64-and 72-bit)	PC SDRAM Unbuffered DIMM specification PC SDRAM DIMM Specification PC Serial Presence Detect (SPD) Specification	Revision 1.0, February, 1998, Intel Corporation Revision 1.5, November, 1997, Intel Corporation Revision 1.2A, December, 1997
SDRAM DIMMs (64- and 72-bit)	PC SDRAM Unbuffered DIMM specification	Revision 0.9, October 22, 1997, Intel Corporation
UHCI	Universal Host Controller Interface	Design Guide Revision 1.1, March 1996 Intel Corporation. The specification is available at: http://www.usb.org
USB	Universal serial bus specification	Revision 1.0, January 15, 1996 Compaq Computer Corporation, Digital Equipment Corporation, IBM PC Company, Intel Corporation, Microsoft Corporation, NEC, Northern Telecom http://www.intel.com/