



VS440FX Motherboard Technical Product Specification

Order Number 281812-003

October 1996

The VS440FX motherboard may contain design defects or errors known as errata. Characterized errata that may cause the VS440FX motherboard's behavior to deviate from published specifications are documented in the VS440FX Motherboard Specification Update.



Revision History

Revision	Revision History	Date
-001	Preliminary release of the VS440FX Technical Product Specification.	4/96
-002	Second release of the VS440FX Technical Product Specification.	5/96
-003	Updated to reflect Fab E	10/96

This product specification applies only to standard VS440FX motherboards with BIOS identifier CS1.

Changes to this specification will be published in the VS440FX Motherboard Specification Update before being incorporated into a revision of this document.

Information in this document is provided in connection with Intel products. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Intel's Terms and Conditions of Sale for such products, Intel assumes no liability whatsoever, and Intel disclaims any express or implied warranty, relating to sale and/or use of Intel products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright or other intellectual property right. Intel products are not intended for use in medical, life saving, or life sustaining applications.

Intel retains the right to make changes to specifications and product descriptions at any time, without notice.

The VS440FX motherboard may contain design defects or errors known as errata. Current characterized errata are available on request.

Contact your local Intel sales office or your distributor to obtain the latest specifications before placing your product order.

† Third-party brands and names are the property of their respective owners.

Copies of documents which have an ordering number and are referenced in this document, or other Intel literature, may be obtained from:

Intel Corporation
P.O. Box 7641
Mt. Prospect, IL 60056-7641

or call in North America 1-800-879-4683, Europe 44-0-1793-431-155, France 44-0-1793-421-777,
Germany 44-0-1793-421-333, other Countries 708-296-9333.

Copyright © 1996, Intel Corporation

Table of Contents

1 Motherboard Description

1.1	Overview	7
1.2	Motherboard Manufacturing Options	9
1.3	Form Factor	9
1.4	I/O Shield	10
1.5	Microprocessor	11
1.5.1	Microprocessor Heatsink and Clips	11
1.5.2	Microprocessor Upgrade	11
1.6	Main Memory	12
1.6.1	EDO DRAM	12
1.6.2	Parity/ECC DRAM	12
1.7	Chipset	13
1.7.1	82441FX PCI Bridge and Memory Controller (PMC)	13
1.7.2	82442FX Data Bus Accelerator (DBX)	13
1.7.3	82371SB PCI/ISA IDE Xcelerator (PIIX3).....	13
1.7.4	Universal Serial Bus Support.....	14
1.7.5	IDE Support.....	14
1.8	Super I/O Controller	15
1.8.1	Serial Ports.....	15
1.8.2	Parallel Port.....	15
1.8.3	Floppy Controller	15
1.8.4	Keyboard and Mouse Interface	16
1.8.5	Real-Time Clock, CMOS RAM, and Battery	16
1.8.6	Infrared Support	17
1.9	Audio Subsystem.....	17
1.9.1	Audio Drivers and Utilities.....	18
1.9.2	CD-ROM Audio Connector	18
1.9.3	Telephony Connector	18
1.9.4	Wavetable Connector.....	18
1.10	Management Extension Hardware.....	19
1.11	Motherboard Connectors	20
1.11.1	CD Audio (J1E2).....	21
1.11.2	Wavetable Upgrade Connector (J1E1).....	21
1.11.3	Telephony Connector (J1F1).....	21
1.11.4	Floppy Drive Connector (J9J2).....	22
1.11.5	PCI IDE Connectors (J9J1, J8J1).....	23
1.11.6	Power Supply Connector (J5M1).....	23
1.11.7	Microprocessor Fan Connector (J7M1)	24
1.11.8	Auxiliary Fan Connector (J9A1).....	24
1.11.9	Front Panel Connectors.....	25
1.11.10	Back Panel Connectors.....	27
1.12	Add-in Board Expansion Connectors.....	31

1.13	Jumper Settings.....	33
1.13.1	Processor Configuration (J6D1)	34
1.13.2	Password Clear (J6D1).....	34
1.13.3	Clear CMOS (J6D1).....	35
1.13.4	BIOS Setup Access (J6D1)	35
1.13.5	BIOS Recovery (J6D1).....	35
1.14	Reliability	35
1.15	Environmental.....	35
1.16	Power Supply Requirements	36
1.17	Power Consumption	36
1.18	Regulatory Compliance.....	37
1.18.1	Safety	37
1.18.2	Electromagnetic Interference (EMI).....	38
1.18.3	Product Certification Markings.....	38
2	Motherboard Resources	
2.1	Memory Map.....	39
2.2	DMA Channels.....	39
2.3	I/O Map.....	40
2.4	PCI Configuration Space Map	42
2.5	Interrupts	42
3	BIOS and Setup Utility	
3.1	Introduction.....	43
3.2	BIOS Flash Memory Organization	43
3.3	BIOS Upgrades.....	44
3.4	PCI IDE Support	44
3.5	PCI Auto-configuration.....	45
3.6	ISA Plug and Play.....	45
3.7	Desktop Management Interface.....	45
3.8	Advanced Power Management.....	46
3.9	Advanced Power Control	47
3.10	Language Support.....	47
3.11	Boot Options.....	47
3.12	Flash LOGO Area	47
3.13	BIOS Setup Access Jumper	48
3.14	Recovering BIOS Data	48
3.15	BIOS Setup Utility.....	48
3.15.1	Overview of the Setup Menu Screens	48
3.15.2	Main BIOS Setup Screen	49
3.15.3	Floppy Options Subscreen	50
3.15.4	Primary/Secondary IDE Master/Slave Configuration Subscreens	51
3.15.5	Boot Options Subscreen	53
3.15.6	Advanced Screen	56
3.15.7	Peripheral Configuration Subscreen.....	57
3.15.8	Advanced Chipset Configuration Subscreen.....	59
3.15.9	Power Management Configuration Subscreen.....	60
3.15.10	Plug and Play Configuration Subscreen.....	61

3.15.11	Event Logging Configuration Subscreen	62
3.15.12	Security Screen	63
3.15.13	Security Screen Options.....	64
3.15.14	Exit Screen	65

4 Error Messages and Beep Codes

4.1	BIOS Beep Codes	67
4.2	PCI Configuration Error Messages	68
4.3	BIOS Error Messages	69
4.4	ISA NMI Messages	70

5 Compliance with Specifications

5.1	Specifications.....	71
5.2	Online Support.....	71

Tables

1.	PCI Bus Connectors	31
2.	ISA Bus Connectors	32
3.	Jumper Settings.....	34
4.	Jumper Settings for Processor and Host Bus Frequencies.....	34
5.	Motherboard Environmental Specifications.....	35
6.	DC Voltage	36
7.	Power Usage	37
8.	Memory Map.....	39
9.	DMA Channels.....	39
10.	I/O Map.....	40
11.	PCI Configuration Space Map	42
12.	Interrupts	42
13.	Flash Memory Organization.....	43
14.	Recommendations for Configuring an ATAPI Device	44
15.	Overview of the Setup Menu Screens	48
16.	Administrative and User Password Functions.....	64

Figures

1.	Motherboard Components	8
2.	Motherboard Dimensions.....	9
3.	Back Panel I/O Shield (with Audio option) Dimensions.....	10
4.	Motherboard Connectors	20
5.	Front Panel I/O Connectors	25
6.	Back Panel I/O Connectors	28
7.	Jumper Locations	33

1 Motherboard Description

1.1 Overview

The VS440FX motherboard supports Pentium® Pro microprocessors operating at 150, 166, 180, and 200 MHz. The Pentium Pro microprocessor includes 16 KB of L1 cache on the chip. A 256 KB or 512 KB L2 cache device is contained in the same package as the microprocessor. The motherboard features:

- ATX form factor
- Socket 8 Pentium Pro processor socket

Main Memory

- Four 72-pin SIMM† sockets
- Support for up to 256 MB of Extended Data Out (EDO) or fast page memory
- Support for non-parity, parity, or Error Checking and Correcting (ECC) DRAM

Chipset and PCI/IDE Interface

- Intel 82440FX PCIset
- Integrated PCI bus mastering controller
- Two fast IDE interfaces
- Support for up to four IDE drives or devices
- Support for two Universal Serial Bus (USB) interfaces

I/O Features

- PC87308/87307 Super I/O controller
- Integrates standard I/O functions: floppy drive interface, one multi-mode parallel port, two FIFO serial ports, real-time clock, keyboard and mouse controller, and IrDA†-compatible interface

Expansion Slots

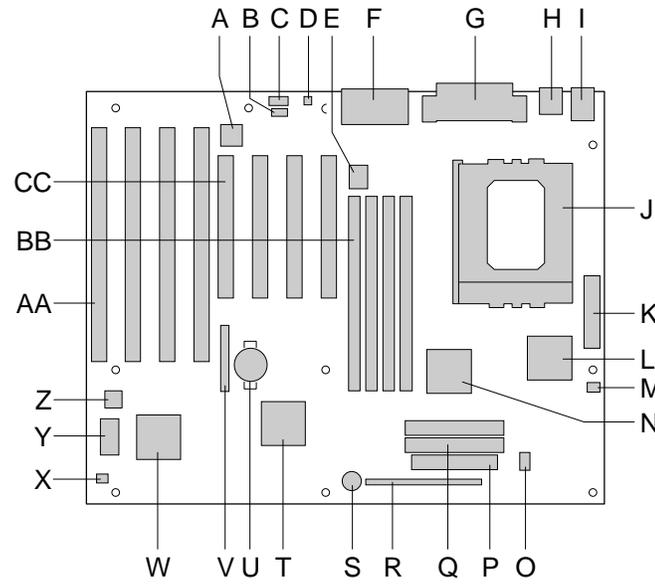
- Three ISA
- Three PCI
- One shared PCI/ISA

Audio Subsystem

- Crystal† CS4236 Multimedia codec
- Wavetable upgrade header

Other features

- Plug and Play compatible BIOS
- Support for Advanced Power Management (APM)



OM05506

Figure 1. Motherboard Components

- | | |
|--|--|
| A. Optional Crystal Audio device | P. Floppy connector |
| B. Optional CD-ROM audio connector | Q. IDE connectors |
| C. Optional wavetable connector | R. Front panel connectors |
| D. Optional telephony connector | S. Onboard speaker |
| E. VCCP voltage regulator | T. Intel 82371SB PIIX3 |
| F. MIDI/game port/audio jacks | U. Battery |
| G. Parallel port/serial connectors | V. Jumper block |
| H. Optional USB connectors | W. National PC87308/87307 Super I/O controller |
| I. Keyboard and mouse connectors | X. Auxiliary fan connector |
| J. Pentium Pro microprocessor / Socket 8 | Y. Flash BIOS |
| K. Power connector | Z. Management Extension Hardware ASIC |
| L. Intel 82441FX | AA. ISA add-in board connectors |
| M. Microprocessor fan connector | BB. SIMM connectors |
| N. Intel 82442FX | CC. PCI add-in board connectors |
| O. VTT voltage regulator | |

1.2 Motherboard Manufacturing Options

- Support for USB
- Audio Option
 - CS4236 audio codec
 - CD-ROM connector
 - Wavetable upgrade connector
 - Telephony connector
 - MIDI/game port/audio jacks
- Management Extension Hardware ASIC

1.3 Form Factor

The motherboard is designed to fit into a standard ATX form factor chassis. Figure 2 illustrates the mechanical form factor for the motherboard. Location of the I/O connectors and mounting holes is in strict compliance with the ATX specification (refer to Section 5.1).

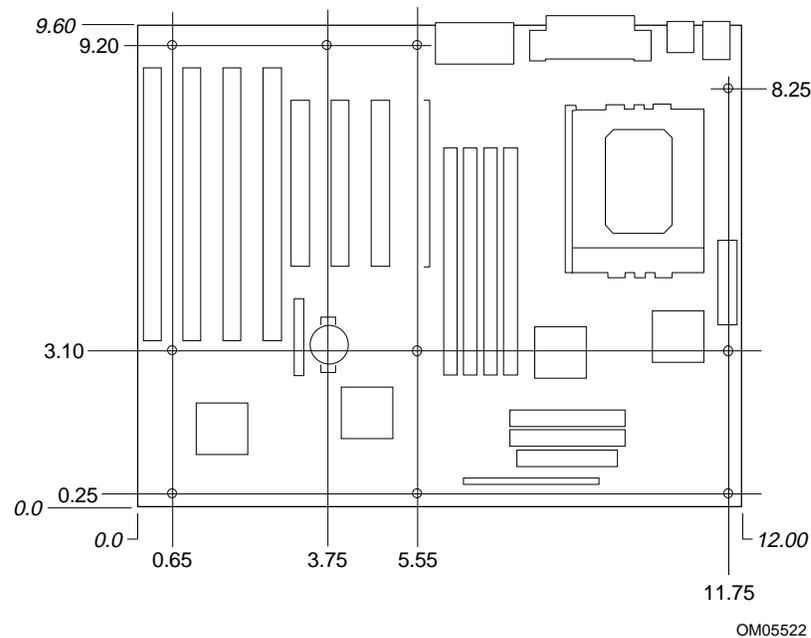
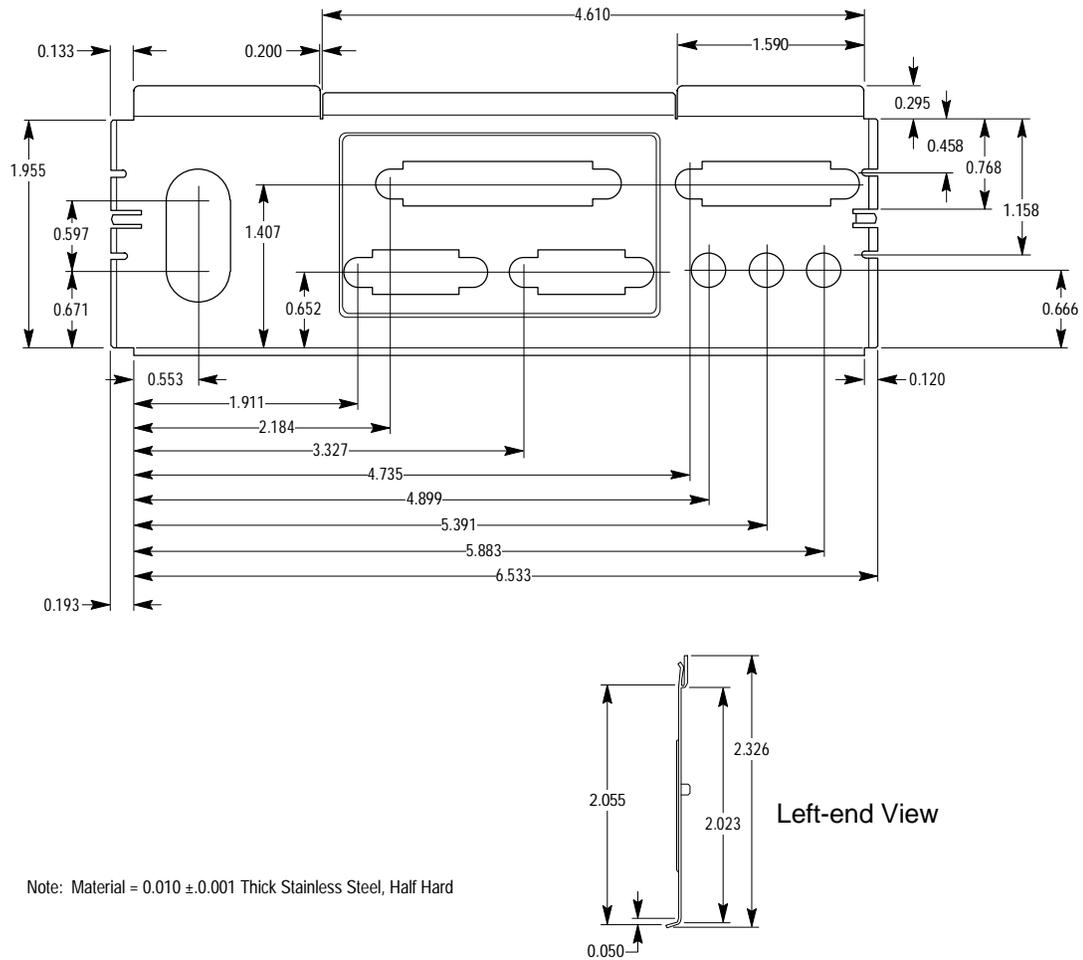


Figure 2. Motherboard Dimensions

1.4 I/O Shield

The back panel I/O shield for the VS440FX motherboard must meet specific dimensional and material requirements. Computers based on this motherboard need the back panel I/O shield in order to pass certification testing. Figure 3 shows the critical dimensions for both options of the I/O shield and indicates the position of each cutout.



OM05588

Figure 3. Back Panel I/O Shield (with Audio option) Dimensions

1.5 Microprocessor

The motherboard operates with 2.1 V to 3.5 V Pentium Pro processors. The onboard voltage regulator is automatically programmed and controlled by the VID pins of the processor to provide the required voltage. The motherboard supports Pentium Pro processors that run internally from 150 MHz up to 200 MHz.

The motherboard supports Pentium Pro processors with either 256 KB or 512 KB of second-level cache.

The processor maintains full backward compatibility with the 8086, 80286, Intel386™, Intel486™, and Pentium processors. Its numeric coprocessor maintains backward compatibility with math coprocessors and that comply with ANSI/IEEE standard 754-1985.

1.5.1 Microprocessor Heatsink and Clips



CAUTION

Do not use the older style of bail-wire clips for securing the heat sink assembly. These clips have been known to damage the motherboard when installed or removed incorrectly.

An approved Pentium Pro processor heat sink is necessary for proper thermal dissipation. The processor/heat sink assembly must be securely fastened to the ZIF socket by two clips. These clips fit over the heat sink assembly and attach to tabs on the socket.

1.5.2 Microprocessor Upgrade

The motherboard has a Socket 8 processor socket. Socket 8 is a 387-pin modified staggered pin grid array (SPGA) ZIF socket with a voltage regulator for the processor core. The socket supports upgrades to future Pentium Pro OverDrive® processors.

1.6 Main Memory

The motherboard has four SIMM sockets arranged in two banks: Bank 0 and Bank 1. Each bank has two sockets. SIMMs in the same bank must be the same type, size, and speed; SIMMs in different banks may differ in type, size, and speed. SIMMs must be installed in both sockets of a bank, and at least one bank must be filled. The BIOS automatically detects memory type and size so no jumper settings are required.

The motherboard supports:

- 72-pin SIMMs with tin-plated contacts
- 60 ns fast page mode SIMMs or 60 ns EDO SIMMs
- Non-parity, parity, or ECC SIMMs
- Single- or double-sided SIMMs in the following sizes:

SIMM size	Configuration (non-parity)	Configuration (parity)
4 MB	1 x 32	1 x 36
8 MB	2 x 32	2 x 36
16 MB	4 x 32	4 x 36
32 MB	8 x 32	8 x 36
64 MB	16 x 32	16 x 36

1.6.1 EDO DRAM

EDO DRAM improves memory read performance by holding the memory data valid until the next CAS# falling edge, unlike fast page mode DRAM, which tri-states the memory data when CAS# negates to precharge for the next memory cycle. With EDO DRAM, the CAS# precharge overlaps the data-valid time, which allows CAS# to negate earlier while still satisfying the memory-data valid window.

1.6.2 Parity/ECC DRAM

Memory error checking and correction is supported by parity memory. With parity memory, the motherboard can be configured to support ECC memory operation. Parity SIMMs are automatically detected, but you must enter Setup to configure the memory for either Parity or ECC operation. Parity memory detects single-bit errors. ECC memory detects double-bit errors and corrects single-bit errors.

1.7 Chipset

The Intel 82440FX PCIset consists of the 82441FX PCI Bridge and Memory Controller (PMC), the 82442FX Data Bus Accelerator (DBX), and one 82371SB PCI/ISA IDE Xcelerator (PIIX3) bridge chip.

1.7.1 82441FX PCI Bridge and Memory Controller (PMC)

The PMC provides all control signals necessary to drive second level cache and main memory, including multiplexed address signals. It also controls system access to memory and generates snoop controls to maintain cache coherency. The PMC comes in a 208-pin QFP package that features:

- Microprocessor interface control
- Integrated L2 write-back cache controller
 - 256 or 512 KB direct-mapped
- Integrated DRAM controller
 - 64/72-bit non-interleaved path to memory
 - EDO and fast page DRAM support
 - Non-parity, parity, and ECC support
- Fully synchronous PCI bus interface
 - 30 and 33 MHz bus speeds
 - PCI to DRAM data throughput at greater than 100 MB per second
 - Up to four PCI masters in addition to the PIIX3 and IDE
- Data Buffering
 - Pentium Pro processor-to-DRAM and PCI-to-DRAM write data buffering
 - Pentium Pro-processor-to-PCI burst writes

1.7.2 82442FX Data Bus Accelerator (DBX)

The DBX connects to the 64-bit Pentium Pro data bus, the 64/72-bit memory data bus, and the 16 bit PMC private data bus. The DBX works in parallel with the PMC to provide a high performance memory subsystem for Pentium Pro processor based systems. The DBX comes in a 208-pin QFP package.

1.7.3 82371SB PCI/ISA IDE Xcelerator (PIIX3)

The PIIX3 is the interface between the PCI and ISA buses. It features an integrated dual-channel enhanced IDE interface that supports up to four IDE devices. The PIIX3 comes in a 208-pin QFP package that features:

- PCI and ISA bus interface
- USB host/hub controller

- Integrated dual-channel enhanced IDE interface
 - Support for up to four IDE devices
 - PIO Mode 4 transfers at up to 16 MB per second
 - Integrated 8 x 32-bit buffer for bus master PCI IDE burst transfers
 - Bus master mode
- PCI compliance (refer to Section 5.1)
- Enhanced DMA controller supporting up to seven DMA channels
- Interrupt controller with PCI-to-ISA interrupt mapping circuitry
- A 16-bit counter/timer
- SMI interrupt logic and timer with fast on/off mode
- NMI circuitry

1.7.4 Universal Serial Bus Support

The motherboard features two optional USB ports. The ports permit the direct connection of two USB peripherals without an external hub. If more devices are required, an external hub can be connected to either of the built-in ports. The motherboard fully supports the standard universal host controller interface (UHCI) and uses standard software drivers that are UHCI-compatible. Features of the USB include:

- Self-identifying, hot pluggable peripherals.
- Automatic mapping of function to driver and configuration.
- Support for isochronous and asynchronous transfer types over the same set of wires.
- Support for up to 127 physical devices.
- Support for full speed (12 Mbs) and low speed (1.5 Mbs) USB connections. Full speed connections require shielded cabling.
- Guaranteed bandwidth and low latencies appropriate for telephony, audio, and other applications.
- Error handling and fault recovery mechanisms built into protocol.

1.7.5 IDE Support

The motherboard has two independent bus mastering PCI IDE interfaces that support PIO Mode 3, PIO Mode 4, and ATAPI (e.g., CD-ROM) devices. The BIOS supports Logical Block Addressing (LBA) and Extended Cylinder Head Sector (ECHS) translation modes. IDE device transfer rate and translation mode are automatically detected by the BIOS.

Normally, programmed I/O operations require a substantial amount of processor bandwidth; however, in true multi-tasking operating systems such as Windows[†] 95, the bandwidth freed by bus mastering IDE can be devoted to other tasks while disk transfers are occurring.

1.8 Super I/O Controller

The PC87308/87307 Super I/O Controller from National Semiconductor is a fully Plug and Play compatible device which provides:

- Serial ports: two NS16C550-compatible UARTs with send/receive 16-byte FIFO
- Multimode bidirectional parallel port
 - Standard mode, IBM[†] and Centronics[†] compatible
 - Enhanced Parallel Port (EPP) mode with BIOS and driver support
 - High-speed Extended Capabilities Port (ECP) mode
- Industry standard floppy controller with 16-byte FIFO and 2.88 MB floppy drive support
- 8042-compatible keyboard controller
- Real-time clock accurate within ± 13 minutes a year at 25 °C and 5 V
- Support for an IrDA-compliant infrared interface

By default, the I/O controller interfaces are automatically configured during boot up. The I/O controller can also be manually configured in the Setup program.

1.8.1 Serial Ports

The motherboard has two 9-pin D-Sub serial port connectors located on the back panel. The NS16C550-compatible UARTs support data transfers at speeds up to 921.6 kBaud (standard) or 1.5 MBaud.

1.8.2 Parallel Port

The connector for the multimode bidirectional 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).
- Bidirectional (PS/2[†] compatible).
- Bidirectional EPP. A driver from the peripheral manufacturer is required for operation.
- Bidirectional high-speed ECP.

1.8.3 Floppy Controller

The I/O controller is software compatible with the DP8473 and 82077 floppy drive controllers. In the Setup program, the floppy interface can be configured for the following floppy drive capacities and sizes:

- 360 KB, 5.25-inch
- 1.2 MB, 5.25-inch
- 720 KB, 3.5-inch
- 1.2 MB, 3.5-inch (driver required)
- 1.25/1.44 MB, 3.5-inch
- 2.88 MB, 3.5-inch

1.8.4 Keyboard and Mouse Interface

PS/2 keyboard and mouse connectors are located on the back panel of the motherboard. The 5 volt 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 the mouse and keyboard into either connector.

The keyboard controller contains the AMI Megakey keyboard and mouse controller 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 keyboard controller also supports the following hot-key sequences:

- <CTRL><ALT> Software reset. This key sequence resets the computer's software by jumping to the beginning of the BIOS code and running the Power On Self Test (POST).
- <CTRL><ALT><+> and <CTRL><ALT><-> Turbo mode. Note that Turbo mode could be affected by the operating system, or whether the processor is in protected mode or virtual x86 mode.
 - <CTRL><ALT><-> For Deturbo mode (emulates a 23 MHz AT)
 - <CTRL><ALT><+> For Turbo mode
- <CTRL><ALT><defined in Setup> Power management. This key sequence invokes power managed mode, which reduces the computer's power consumption while maintaining its ability to service external interrupts.
- <CTRL><ALT><defined in Setup> Keyboard lock. This key sequence is a security feature that locks the keyboard until the User password is entered. When keyboard lock is invoked, the keyboard LEDs flash. To enable the keyboard lock feature, a User password must be specified in the Setup program.

1.8.5 Real-Time Clock, CMOS RAM, and Battery

The real-time clock is compatible with DS1287 and MC146818 components. It provides a time-of-day clock and a 100-year calendar with alarm features and century rollover. The real-time clock also supports 242-bytes of battery-backed CMOS RAM in two banks, which are reserved for BIOS use.

The time, date, and CMOS values can be specified in the Setup program. The CMOS values can be returned to their defaults by using the Setup program or by setting a configuration jumper on the motherboard.

An external coin-cell battery powers the real-time clock and CMOS memory. If 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 volt standby current from the motherboard's power supply extends the life of the battery. The RTC is accurate to ± 13 minutes/year at 25 °C and 5 V conditions.

1.8.6 Infrared Support

The motherboard has a 5-pin header that supports Hewlett Packard[†] HSDSL-1000 compatible infrared (IR) transmitters/receivers. The connection can be used to transfer files to or from portable devices like laptops, PDAs, and printers. The Infrared Data Association (IrDA) specification supports data transfers of 115 Kbps at a distance of 1 meter.

1.8.6.1 Consumer Infrared Support

The motherboard has a signal pin that supports Consumer IR devices (remote controls). The signal pin supports receive only. Consumer IR devices can be used to control telephony functions and multimedia operations like volume and CD track changes. A software and hardware interface is needed to use this feature.

1.9 Audio Subsystem

The optional onboard audio subsystem features the Crystal CS4236, a 100-pin TQFP audio codec with an integrated FM synthesizer. The audio subsystem provides all the digital audio and analog mixing functions needed for recording and playing sound on personal computers. Together, these components feature:

- Stereo analog-to-digital and digital-to-analog converters
- Analog mixing, anti-aliasing, and reconstruction filters
- Line and microphone level inputs
- ADPCM, A-law, or μ law digital audio compression/decompression
- Full digital control of all mixer and volume control functions
- Full duplex operation
- Sound Blaster[†] game and Windows Sound System compatibility

The audio subsystem requires up to two DMA channels and two IRQs. The following table shows the IRQ, DMA channel, and base I/O address options.

Resource	IRQ (Options)	DMA channel (Options)	I/O Address (Options)
Sound Blaster (DMA playback, DMA / IRQ shared with Windows Sound System capture)	5 (best choice) 7 9 11	0 (best choice) 3	210-21Fh 220-22Fh (best choice) 230-234h 240-24Fh 250-25Fh 260-26Fh
Windows Sound System (DMA playback)	5 7 9 (best choice) 11	0 1 (best choice) 3	534-537h (best choice) 608-60Bh
MPU-401 (IRQ shared with Sound Blaster)	5 (best choice) 7 9 11		300-301h 330-331h (best choice) 332-333h 334-335h
MIDI / Game Port			200-207h
FM Synthesis			388-308Bh
CS4236 Control			FF0-FFFh

1.9.1 Audio Drivers and Utilities

Audio software and utilities are available from Intel’s World Wide Web site (refer to Section 5.2).

1.9.2 CD-ROM Audio Connector

A 1 x 4-pin connector is available for connecting an internal CD-ROM reader to the audio subsystem’s mixer. The connector is compatible with most cables supplied with ATAPI CD-ROM readers designed to connect to audio add-in cards.

1.9.3 Telephony Connector

A 2 x 2-pin connector is available for connecting the monaural audio signals of an internal telephony device such as a fax/modem to the motherboard’s audio subsection. The mono-in and mono-out signal interface is necessary for telephony applications such as speakerphones and answering machines.

1.9.4 Wavetable Connector

An 8-pin connector supports wavetable add-in cards. Most wavetable add-in cards are installed in a standard ISA slot; a cable is then routed from the card to the connector.

Compatible wavetable cards are available from several vendors. The ICS WaveFront and the CrystaLake Series 2000 wavetable product families offer general MIDI-compatible audio operation.

1.10 Management Extension Hardware

The optional Management Extension hardware provides low-cost instrumentation capabilities designed to reduce the total cost of owning a PC. The hardware implementation is a single-chip ASIC. Features include:

- An integrated temperature sensor
- Fan speed sensors for up to three fans
- Power supply voltage monitoring to detect levels above or below acceptable values
- Registers for storing POST hardware test results and error codes
- Security switch for detecting physical intrusion, such as when the chassis lid has been removed (even when power is off). A photosensor is used as the switch.
- Remote reset capabilities from a remote peer or server through LANDesk[®] Client Manager, Version 3.0 and service layers (when available)
- Hardware compatibility with Windows NT[†]

When suggested ratings for temperature, fan speed, or voltage are exceeded, an interrupt is activated.

The Management Extension circuitry connects to the ISA bus as an 8-bit I/O mapped device. It uses these I/O addresses:

Address (hex)*	Description
80	POST codes
85	Address and control functions of the ASIC
86	Register read/write operations for the ASIC

* These addresses are accessible only when the processor is in System Management Mode.

1.11 Motherboard Connectors

The following figure shows the connectors on the motherboard.

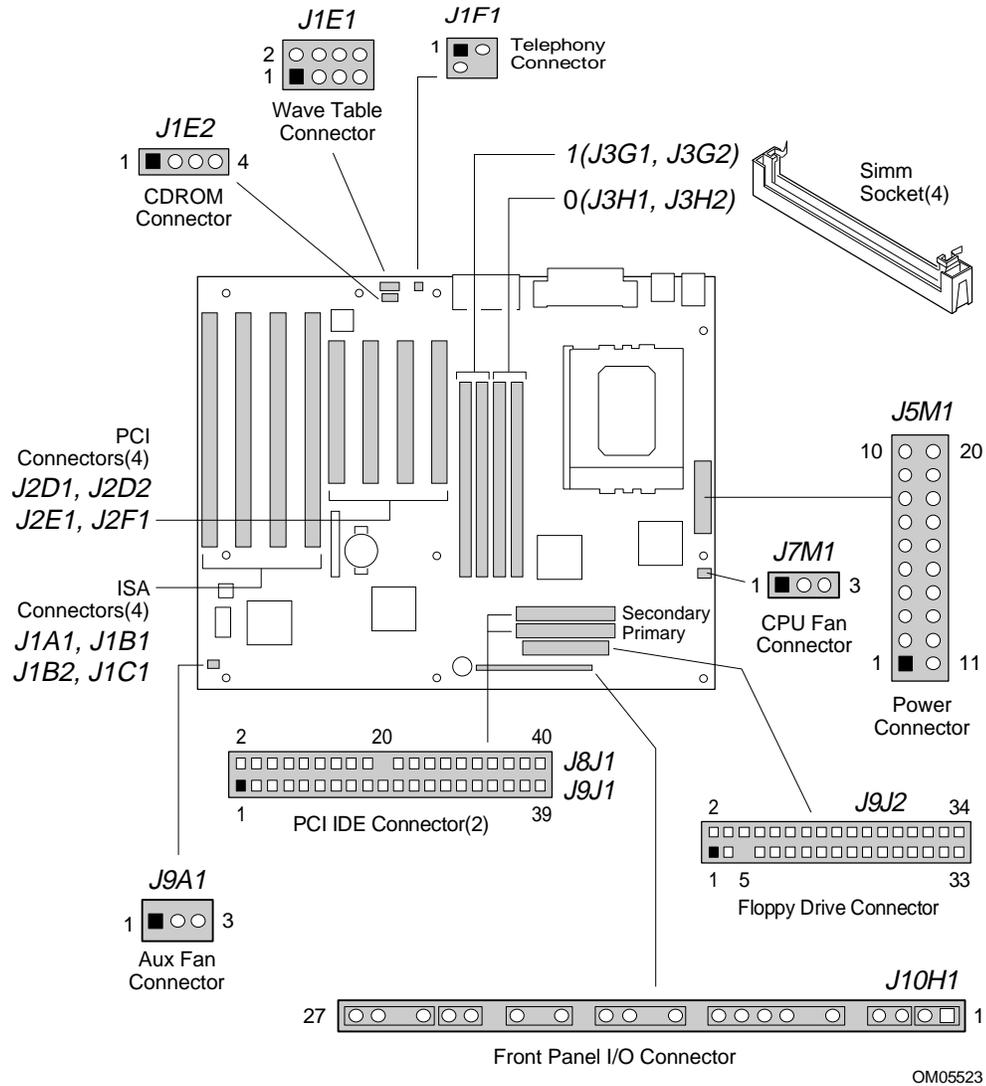


Figure 4. Motherboard Connectors

1.11.1 CD Audio (J1E2)

Pin	Signal Name
1	Ground
2	CD audio left channel
3	Ground
4	CD audio right channel

1.11.2 Wavetable Upgrade Connector (J1E1)

Pin	Signal Name
1	Wave in right
2	Ground
3	Wave in left
4	Ground
5	No connection
6	Ground
7	No connect
8	MIDI_Out

1.11.3 Telephony Connector (J1F1)

Pin	Signal Name
1	Ground
2	Audio out
3	Audio in
4	Key

1.11.4 Floppy Drive Connector (J9J2)

Pin	Signal Name	Pin	Signal Name
1	Ground	2	DENSEL
3	Ground	4	Reserved
5	Key	6	FDEDIN#
7	Ground	8	FDINDX# (Index)
9	Ground	10	FDM00# (Motor enable A)
11	Ground	12	FDDS1# (Drive select B)
13	Ground	14	FDDS0# (Drive select A)
15	Ground	16	FDM01# (Motor enable B)
17	MSEN1	18	FDDIR#
19	Ground	20	FDSTEP#
21	Ground	22	FDWD# (Write data)
23	Ground	24	FDWE# (Write gate)
25	Ground	26	FDTRK0# (Track 0)
27	MSEN0	28	FDWPD# (Write protect)
29	Ground	30	FDRDATA# (Read data)
31	Ground	32	FDHEAD# (Side 1 select)
33	Ground	34	DSKCHG# (Diskette change)

1.11.5 PCI IDE Connectors (J9J1, J8J1)

Pin	Signal Name	Pin	Signal Name
1	Reset IDE	2	Ground
3	Host data 7	4	Host data 8
5	Host data 6	6	Host data 9
7	Host data 5	8	Host data 10
9	Host data 4	10	Host data 11
11	Host data 3	12	Host data 12
13	Host data 2	14	Host data 13
15	Host data 1	16	Host data 14
17	Host data 0	18	Host data 15
19	Ground	20	Key
21	DDRQ0 [DDRQ1]	22	Ground
23	I/O write#	24	Ground
25	I/O read#	26	Ground
27	IOCHRDY	28	Vcc pull-up
29	DDACK0# [DDACK1#]	30	Ground
31	IRQ 14 [IRQ 15]	32	Reserved
33	Address 1	34	Reserved
35	Address 0	36	Address 2
37	Chip select 1P# [Chip select 1S#]	38	Chip select 3P# [Chip select 3S#]
39	Activity#	40	Ground

NOTE: Signal names in brackets are for the secondary IDE connector

1.11.6 Power Supply Connector (J5M1)

An ATX power supply supports remote power on/off through pin 14 of the power supply connector. This enables the motherboard to turn off system power through software control.

To enable soft-off control in software, APM must be enabled in the Setup program and in the operating system. When the system BIOS receives the correct APM command from the operating system, the BIOS turns off power to the computer. For example, in the Windows 95 Start menu, the user selects Shutdown to turn off the power.

With soft-off enabled, if power to the computer is interrupted by a power outage or a disconnected power cord, when power resumes the computer returns to the on or off state it was in before power was interrupted.

Pin	Signal Name
1	+3.3 V
2	+3.3 V
3	Ground
4	+5 V
5	Ground
6	+5 V
7	Ground
8	PWRGD (Power Good)
9	+5 VSB (Standby)
10	+12 V
11	+3.3 V
12	-12 V
13	Ground
14	PS-ON# (Power Supply Remote On/Off Control)
15	Ground
16	Ground
17	Ground
18	-5 V
19	+5 V
20	+5 V

1.11.7 Microprocessor Fan Connector (J7M1)

Pin	Signal Name
1	Ground
2	+12V
3	Sense tachometer

1.11.8 Auxiliary Fan Connector (J9A1)

Pin	Signal Name
1	Ground
2	+12V
3	Sense tachometer

1.11.9 Front Panel Connectors

The front panel connector includes headers for these I/O connections:

- Speaker
- Reset switch
- Power LED
- Hard drive activity LED
- Infrared (IrDA) port
- Sleep switch
- Power switch

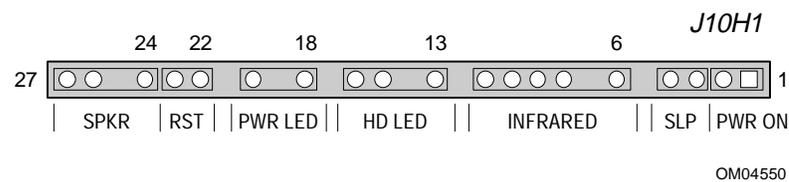


Figure 5. Front Panel I/O Connectors

1.11.9.1 Front Panel I/O Connectors

Pin	Signal Name	Connector
1	SW_ON#	Power On
2	Ground	
3	SLEEP	Sleep/Resume
4	SLEEP_PU (pullup)	
5	No connect	none
6	+5 V	IrDA
7	Key	
8	IrRX	
9	Ground	
10	IrTX	
11	CONIR (Consumer IR)	none
12	No connect	

continued ➡

Front Panel I/O Connectors (continued)

Pin	Signal Name	Connector
13	HD_PWR +5 V	HD LED
14	Key	
15	HD Active#	
16	HD_PWR	
17	No connect/Key	none
18	Ground	Sleep/Power LED
19	Key	
20	PWR_LED	
21	No connect/Key	none
22	Ground	Reset
23	SW_RST	
24	Ground	Speaker
25	Key	
26	PIEZO_IN	
27	SPKR_HDR	

1.11.9.2 Power On Connector

You must connect this header to a power switch that could be placed on the front panel. A momentary ground must be applied to the SW_ON pin to signal the supply to turn on or off. This requirement is usually satisfied by using a SPST normally open momentary contact switch. Because of the motherboard's internal debounce circuitry, the ground must be applied for at least 50 ms. To prevent double-clicking, at least 2 seconds must pass before the power supply will recognize another on/off signal.

1.11.9.3 Sleep/Resume

When APM is enabled in the system BIOS and the operating system's APM driver is loaded, the system can enter Sleep (Standby) mode in one of three ways:

- Optional front panel Sleep/Resume button
- Hot key defined in the BIOS Setup program
- Prolonged system inactivity; the default timeout is 10 minutes and can be changed in Setup

A Sleep/Resume button is supported by the 2-pin header located on the front panel I/O connector. The front panel Sleep/Resume switch must be a momentary SPST type that is normally open.

Closing the Sleep/Resume switch generates a System Management Interrupt (SMI) to the processor, which immediately goes into System Management Mode (SMM). While the system is in Sleep mode it is fully capable of responding to and servicing external interrupts (such as an incoming fax) even though the monitor turns on only if a keyboard or mouse interrupt occurs. To reactivate the system you must press the Sleep/Resume button again, or use the keyboard or mouse.

1.11.9.4 Infrared Connector

You can connect an IrDA module to a 6-pin header on the motherboard. After configuring the IrDA interface, you can transfer files to or from portable devices such as laptops, PDAs, and printers using application software.

1.11.9.5 Hard Drive (HD) LED

You can connect this header to an LED to provide a visual indicator that data is being read from or written to an IDE hard drive. For the LED to function properly, the IDE drive must be connected to the onboard IDE controller on the motherboard.

1.11.9.6 Sleep/Power LED

You can connect this header to an LED that will light when the computer is powered on. This LED will also blink when the computer is in a power-managed state.

1.11.9.7 Reset

You can connect this header to a momentary SPST type switch that is normally open. When the switch is closed, the board resets and runs the POST.

1.11.9.8 Speaker

A speaker may be installed on the motherboard as a manufacturing option. The speaker option includes a jumper on pins 26-27 of the front panel connector. You can disable the onboard speaker by removing the jumper, and you can connect an offboard speaker in its place. The speaker (onboard or offboard) provides error beep code information during the POST in the event that the computer cannot use the video interface. The speaker is not connected to the audio subsystem, and does not receive output from the audio subsystem.

1.11.10 Back Panel Connectors

Figure 6 shows the location of the back panel I/O connectors, which include:

- Two serial ports
- PS/2-style keyboard and mouse connectors
- One parallel port
- Two USB connectors (optional)
- External audio jacks: Line In, Line Out, and Mic In (optional)
- MIDI/game port (optional)

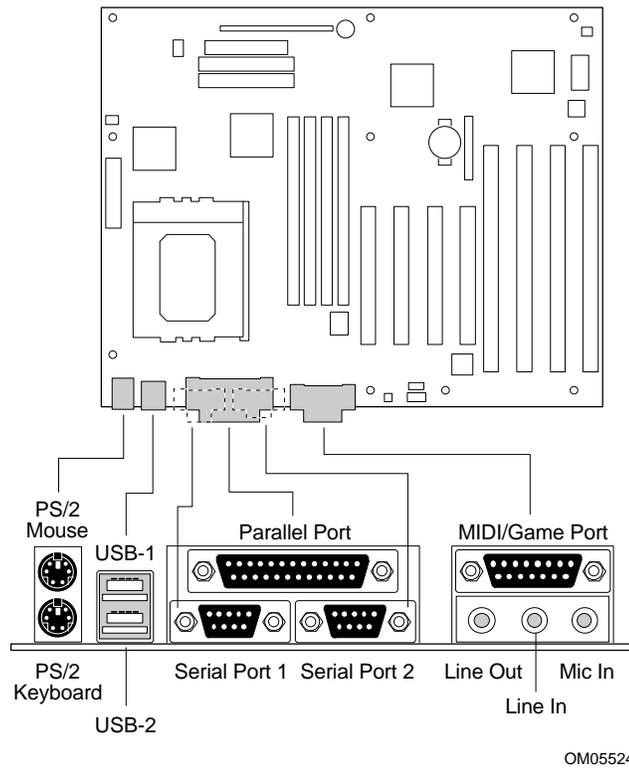


Figure 6. Back Panel I/O Connectors

1.11.10.1 Serial Port Connectors (J1J1, J1K1)

Pin	Signal Name
1	DCD
2	Serial In #
3	Serial Out #
4	DTR#
5	Ground
6	DSR#
7	RTS#
8	CTS#
9	Ground

1.11.10.2 PS/2 Keyboard and Mouse Connectors (J1M1)

Pin	Signal Name
1	Data
2	No connect
3	Ground
4	+5 V (fused)
5	Clock
6	No connect

1.11.10.3 Parallel Port Connector (J1J2)

Pin	Signal Name	Pin	Signal Name
1	Strobe#	14	Auto Feed#
2	Data bit 0	15	Fault#
3	Data bit 1	16	INIT#
4	Data bit 2	17	SLCT IN#
5	Data bit 3	18	Ground
6	Data bit 4	19	Ground
7	Data bit 5	20	Ground
8	Data bit 6	21	Ground
9	Data bit 7	22	Ground
10	ACK#	23	Ground
11	Busy	24	Ground
12	Error	25	Ground
13	Select		

1.11.10.4 USB Connectors (J1L1)

Pin	Signal Name
1	Power
2	USBP0# [USBP1#]
3	USBP0 [USBP1]
4	Ground

1.11.10.5 MIDI/Game Port (J1G1)

Pin	Signal Name
1	Vcc
2	JBUT0
3	JSX1
4	Ground
5	Ground
6	JSY1
7	JBUT1
8	Vcc
9	Vcc
10	JBUT2
11	JSX2
12	MIDI-OUT
13	JSY2
14	JBUT3
15	MIDI-IN

1.12 Add-in Board Expansion Connectors

The motherboard contains three PCI slots, three ISA slots, and one shared slot (for a PCI or ISA card). The PCI bus supports up to three bus masters through the three PCI connectors (refer to Section 5.1 for information about compliance with the PCI specification).

Table 1. PCI Bus Connectors

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
A1	+5 V (TRST#)*	B1	-12 V	A32	AD16	B32	AD17
A2	+12 V	B2	Ground (TCK)*	A33	+3.3 V	B33	C/BE2#
A3	+5 V (TMS)*	B3	Ground	A34	FRAME#	B34	Ground
A4	+5 V (TDI)*	B4	NC (TDO)*	A35	Ground	B35	IRDY#
A5	+5 V	B5	+5 V	A36	TRDY#	B36	+3.3 V
A6	INTA#	B6	+5 V	A37	Ground	B37	DEVSEL#
A7	INTC#	B7	INTB#	A38	STOP#	B38	Ground
A8	+5 V	B8	INTD#	A39	+3.3 V	B39	LOCK#
A9	Reserved	B9	PRSNT1#	A40	SDONE	B40	PERR#
A10	+5 V (I/O)	B10	Reserved	A41	SBO#	B41	+3.3 V
A11	Reserved	B11	PRSNT2#	A42	Ground	B42	SERR#
A12	Ground	B12	Ground	A43	PAR	B43	+3.3 V
A13	Ground	B13	Ground	A44	AD15	B44	C/BE1#
A14	Reserved	B14	Reserved	A45	+3.3 V	B45	AD14
A15	RST#	B15	Ground	A46	AD13	B46	Ground
A16	+5 V (I/O)	B16	CLK	A47	AD11	B47	AD12
A17	GNT#	B17	Ground	A48	Ground	B48	AD10
A18	Ground	B18	REQ#	A49	AD09	B49	Ground
A19	Reserved	B19	+5 V (I/O)	A50	Key	B50	Key
A20	AD30	B20	AD31	A51	Key	B51	Key
A21	+3.3 V	B21	AD29	A52	C/BE0#	B52	AD08
A22	AD28	B22	Ground	A53	+3.3 V	B53	AD07
A23	AD26	B23	AD27	A54	AD06	B54	+3.3 V
A24	Ground	B24	AD25	A55	AD04	B55	AD05
A25	AD24	B25	+3.3 V	A56	Ground	B56	AD03
A26	IDSEL	B26	C/BE3#	A57	AD02	B57	Ground
A27	+3.3 V	B27	AD23	A58	AD00	B58	AD01
A28	AD22	B28	Ground	A59	+5 V (I/O)	B59	+5 V (I/O)
A29	AD20	B29	AD21	A60	REQ64C#	B60	ACK64C#
A30	Ground	B30	AD19	A61	+5 V	B61	+5 V
A31	AD18	B31	+3.3 V	A62	+5 V	B62	+5 V

* These signals are optional in the PCI specification and are not implemented on this motherboard

Table 2. ISA Bus Connectors

Pin	Signal Name	Pin	Signal Name
B1	Ground	A1	IOCHK# (IOCHCK#)
B2	RESET (RESDRV)	A2	SD7
B3	+5 V	A3	SD6
B4	IRQ9	A4	SD5
B5	-5 V	A5	SD4
B6	DRQ2	A6	SD3
B7	-12 V	A7	SD2
B8	SRDY# (NOWS#)	A8	SD1
B9	+12 V	A9	SD0
B10	Ground	A10	IOCHRDY (CHRDY)
B11	SMEMW# (SMWTC#)	A11	AEN
B12	SMEMR# (SMRDC#)	A12	SA19
B13	IOW# (IOWC#)	A13	SA18
B14	IOR# (IORC#)	A14	SA17
B15	DACK3#	A15	SA16
B16	DRQ3	A16	SA15
B17	DACK1#	A17	SA14
B18	DRQ1	A18	SA13
B19	REFRESH#	A19	SA12
B20	BCLK	A20	SA11
B21	IRQ7	A21	SA10
B22	IRQ6	A22	SA9
B23	IRQ5	A23	SA8
B24	IRQ4	A24	SA7
B25	IRQ3	A25	SA6
B26	DACK2#	A26	SA5
B27	TC	A27	SA4
B28	BALE	A28	SA3
B29	+5 V	A29	SA2
B30	OSC	A30	SA1
B31	Ground	A31	SA0
Key		Key	
D1	MEMCS16# (M16#)	C1	SBHE#
D2	IOCS16# (IO16#)	C2	LA23
D3	IRQ10	C3	LA22

Note: Items in parentheses are alternate versions of signal names

continued ➡

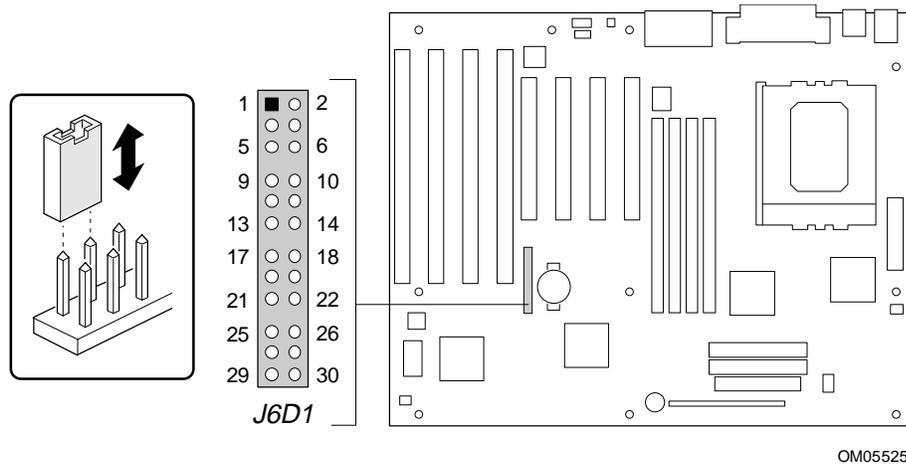
Table 2. ISA Bus Connectors (continued)

Pin	Signal Name	Pin	Signal Name
D4	IRQ11	C4	LA21
D5	IRQ12	C5	LA20
D6	IRQ15	C6	LA19
D7	IRQ14	C7	LA18
D8	DACK0#	C8	LA17
D9	DRQ0	C9	MEMR# (MRDC#)
D10	DACK5#	C10	MEMW# (MWTC#)
D11	DRQ5	C11	SD8
D12	DACK6#	C12	SD9
D13	DRQ6	C13	SD10
D14	DACK7#	C14	SD11
D15	DRQ7	C15	SD12
D16	+5 V	C16	SD13
D17	Master16# (MASTER#)	C17	SD14
D18	Ground	C18	SD15

Note: Items in parentheses are alternate versions of signal names

1.13 Jumper Settings

Figure 7 shows the location of jumper blocks on the motherboard.

**Figure 7. Jumper Locations**

CAUTION

Do not move any of the jumpers with the power on. Always turn off the power and unplug the power cord from the computer before changing jumpers.

Table 3. Jumper Settings

Function	Jumper	Configuration
Password Clear	J6D1	27-29 Password enabled (Default) 25-27 Password clear/disabled
CMOS (NVRAM and ESCD) Clear	J6D1	20-22 Keep (Default) 18-20 Clear
BIOS Setup Access	J6D1	28-30 Access enabled (Default) 26-28 Access denied (password protected)
Processor Frequency	J6D1	Refer to Table 4
Host Bus Frequency*	J6D1	Refer to Table 4
BIOS Recovery	J6D1	4-6 Normal operation (Default) 2-4 Recover BIOS

* These jumpers also set the PCI and ISA bus frequencies

1.13.1 Processor Configuration (J6D1)

The motherboard must be configured for the frequency of the installed processor. Table 4 shows the jumper settings for each frequency and the corresponding host bus, PCI bus, and ISA bus frequencies.

Table 4. Jumper Settings for Processor and Host Bus Frequencies

Processor Freq. (MHz)	Jumpers (J6D1)	Host Bus Freq. (MHz)	PCI Bus Freq. (MHz)	ISA Bus Freq. (MHz)	Bus/Processor Freq. Ratio
200	19-21, 12-14, and 9-11	66	33	8.33	3
180	17-19, 12-14, and 9-11	60	30	7.5	3
166	19-21, 10-12, and 11-13	66	33	8.33	2.5
150	17-19, 10-12, and 11-13	60	30	7.5	2.5
reserved	17-19, 10-12, and 9-11				
reserved	17-19, 12-14, and 11-13				
reserved	19-21, 10-12, and 9-11				
reserved	19-21, 12-14, and 11-13				

1.13.2 Password Clear (J6D1)

Use this jumper to clear the password if the password is forgotten. The default setting is pins 27-29, (password enabled). To clear the password, turn off the computer, move the jumper to pins 25-27, and turn on the computer. Then turn off the computer, and return the jumper to pins 27-29 to restore normal operation. If the jumper is in the 25-27 position (password disabled), you cannot set a password.

1.13.3 Clear CMOS (J6D1)

This jumper resets areas of non-volatile, Flash, and CMOS memory to default values. The default setting for this jumper is pins 20-22 (keep CMOS settings). To reset the CMOS settings to the default values, turn off the computer, move the jumper to pins 18-20, then turn on the computer. When the computer displays the message “NVRAM cleared by jumper,” turn off the computer and return the jumper to pins 20-22 to restore normal operation.

1.13.4 BIOS Setup Access (J6D1)

This jumper enables or disables access to the Setup program. The default setting is pins 28-30 (access enabled). To disable access to the Setup program, move the jumper to pins 26-28.

1.13.5 BIOS Recovery (J6D1)

This jumper lets you recover the BIOS data from a diskette in the event of a catastrophic failure. The default setting is pins 4-6 (normal operation). To recover the BIOS, turn off the computer, move the jumper to pins 2-4, then turn on the computer to perform BIOS recovery. After recovery, turn off the computer and return the jumper to pins 4-6 to restore normal operation. Refer to Section 3.14 for more details.

1.14 Reliability

The Mean-Time-Between-Failures (MTBF) data is calculated from predicted data @ 55 °C.

Motherboard MTBF: 61534 hours calculated

1.15 Environmental

Table 5. Motherboard Environmental Specifications

Parameter	Specification
Temperature	
Non-Operating	-40 °C to +70 °C
Operating	+0 °C to +55 °C
Vibration	
Unpackaged	5 Hz to 20 Hz : 0.01g ² Hz sloping up to 0.02 g ² Hz 20 Hz to 500 Hz : 0.02g ² Hz (flat)
Packaged	10 Hz to 40 Hz : 0.015g ² Hz (flat) 40 Hz to 500 Hz : 0.015g ² Hz sloping down to 0.00015 g ² Hz

1.16 Power Supply Requirements

The VS440FX motherboard is designed to operate with a minimum 200-watt ATX power supply for typical configurations or a higher wattage supply for heavily loaded configurations. The power supply must meet the following requirements:

- Rise time of 2 ms to 20 ms
- Delay of 100 ms (min) from Reset to Powergood
- Power down warning of 1 ms (min)

The +3.3 V output must reach its minimum regulation level within ± 20 ms of the +5 V output reaching its minimum regulation level

1.17 Power Consumption

Tables 6 and 7 list voltage and current specifications for a computer that contains the motherboard, a 200 MHz Pentium Pro processor, 32 MB EDO DRAM, 256 KB cache, 3.5-inch floppy drive, 1.6 GB hard drive, 4X IDE CD-ROM, and a PCI graphics card. This information is preliminary and is provided only as a guide for calculating approximate power usage with additional resources added.

Table 6. DC Voltage

DC Voltage	Acceptable Tolerance
+3.3 V	$\pm 5\%$
+5 V	$\pm 5\%$
-5 V	$\pm 5\%$
+12 V	$\pm 5\%$
-12 V	$\pm 5\%$

Table 7. Power Usage

	AC (watts)	DC (amps)				
		+3.3 V	+5 V	-5 V	+12 V	-12 V
APM disabled						
DOS prompt	53.1	0.5	5.8	0.1	0.6	0.1
Windows 95	54.8	0.8	6.1	0.1	0.6	0.1
Windows NT	31.6	0.4	2.2	0.1	0.6	0.1
APM enabled (Typical)						
DOS prompt	53.1	0.5	5.8	0.1	0.6	0.1
Windows 95	31.5	0.8	2.3	0.1	0.6	0.1
Windows NT	31.6	0.4	2.2	0.1	0.6	0.1
APM enabled (SMM)						
DOS prompt	27.3	0.4	1.9	0.1	0.4	0.1
Windows 95	26.6	0.8	1.9	0.1	0.4	0.1
Windows NT	N/A	N/A	N/A	N/A	N/A	N/A

1.18 Regulatory Compliance

This printed circuit assembly meets the following safety and EMI regulations when correctly installed in a compatible host system.

1.18.1 Safety

1.18.1.1 UL 1950 - CSA 950-95, 3rd edition, 28 July 1995

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (USA and Canada)

1.18.1.2 CSA C22.2 No. 950-93, 2nd Edition

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (Canada)

1.18.1.3 EN 60 950, 2nd Edition, 1992 (with Amendments 1, 2, and 3)

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (European Union)

1.18.1.4 IEC 950, 2nd edition, 1991 (with Amendments 1, 2, and 3)

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (International)

1.18.1.5 EMKO-TSE (74-SEC) 207/94

Summary of Nordic deviations to EN 60 950. (Norway, Sweden, Denmark, and Finland)

1.18.2 Electromagnetic Interference (EMI)

1.18.2.1 FCC Class B

Title 47 of the Code of Federal Regulations, Parts 2 and 15, Subpart B, pertaining to unintentional radiators. (USA)

1.18.2.2 CISPR 22, 2nd Edition, 1993

Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (International)

1.18.2.3 EN 55 022, 1995

Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (Europe)

1.18.2.4 EN 50 082-1, 1992

Generic Immunity Standard. Currently compliance is determined via testing to IEC 801-2, -3 and -4. (Europe)

1.18.2.5 VCCI Class 2 (ITE)

Implementation Regulations for Voluntary Control of Radio Interference by Data Processing Equipment and Electronic Office Machines. (Japan)

1.18.2.6 ICES-003, Issue 2

Interference-Causing Equipment Standard, Digital Apparatus. (Canada)

1.18.3 Product Certification Markings

This printed circuit assembly has the following product certification markings:

- European CE Mark
Marking on the board or shipping container.
- UL Recognition Mark
Marking is 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.
- Canadian Compliance Mark
Marking is a small c followed by a stylized backward UR on the component side of the board.

2 Motherboard Resources

2.1 Memory Map

Table 8. Memory Map

Address Range (decimal)	Address Range (hex)	Size	Description
1024 K - 262144 K	100000 - 10000000	255 MB	Extended Memory
960 K - 1023 K	F0000 - FFFFF	64 K	System BIOS
944 K - 959 K	EC000 - EFFFF	16 K	Boot Block (available as UMB)
936 K - 943 K	EA000 - EBFFF	8 K	ESCD (Plug and Play configuration)
932 K - 935 K	E9000 - E9FFF	4 K	Reserved for BIOS
928 K - 931 K	E8000 - E8FFF	4 K	OEM Logo or Scan User Flash
896 K - 927 K	E0000 - E7FFF	32 K	POST BIOS (available as UMB)
800 - 895 K	C8000 - DFFFF	96 K	Available High DOS memory (open to ISA and PCI bus)
640 K - 799 K	A0000 - C7FFF	160 K	Video memory and BIOS
639 K	9FC00 - 9FFFF	1 K	Extended BIOS data (movable by memory manager software)
512 K - 639 K	80000 - 9FBFF	127 K	Extended conventional memory
0 K - 511 K	00000 - 7FFFF	512 K	Conventional memory

2.2 DMA Channels

Table 9. DMA Channels

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

2.3 I/O Map

Table 10. I/O Map

Address (hex)	Size	Description
0000 - 000F	16 bytes	PIIX3 - DMA 1
0020 - 0021	2 bytes	PIIX3 - Interrupt Controller 1
002E - 002F	2 bytes	Super I/O Controller Configuration Registers
0040 - 0043	4 bytes	PIIX3 - Counter/Timer 1
0048 - 004B	4 bytes	PIIX3 - Counter/Timer 2
0060	1 byte	Keyboard Controller Byte - Reset IRQ
0061	1 byte	PIIX3 - NMI, Speaker Control
0064	1 byte	Keyboard Controller, CMD/STAT Byte
0070, bit 7	1 bit	PIIX3 - Enable NMI
0070, bits 6:0	7 bits	PIIX3 - Real Time Clock, Address
0071	1 byte	PIIX3 - Real Time Clock, Data
0078	1 byte	Reserved - Board Configuration
0079	1 byte	Reserved - Board Configuration
0080 - 008F	16 bytes	PIIX3 - DMA Page Registers
00A0 - 00A1	2 bytes	PIIX3 - Interrupt Controller 2
00C0 - 00DE	31 bytes	PIIX3 - DMA 2
00F0	1 byte	Reset Numeric Error
0170 - 0177	8 bytes	Secondary IDE Channel
01F0 - 01F7	8 bytes	Primary IDE Channel
0200 - 0207	8 bytes	Audio / Game Port
0220 - 022F	16 bytes	CS4236 Audio
0278 - 027F	8 bytes	LPT2
02E8 - 02EF	8 bytes	COM4 / Video (8514A)
02F8 - 02FF	8 bytes	COM2
0330 - 0331	2 bytes	MPU-401 (MIDI)
0376	1 byte	Secondary IDE Channel Command Port
0377	1 byte	Secondary IDE Channel Status Port
0378 - 037F	8 bytes	LPT1
0388 - 038B	4 bytes	FM Synthesis
03B4 - 03B5	2 bytes	Video (VGA)
03BA	1 byte	Video (VGA)
03BC - 03BF	4 bytes	LPT3
03C0 - 03CA	2 bytes	Video (VGA)
03CC	1 byte	Video (VGA)
03CE - 03CF	2 bytes	Video (VGA)

continued 

Table 10. I/O Map (continued)

Address (hex)	Size	Description
03D4 - 03D5	2 bytes	Video (VGA)
03DA	1 byte	Video (VGA)
03E8 - 03EF	8 bytes	COM3
03F0 - 03F5	6 bytes	Floppy Channel 1
03F6	1 byte	Primary IDE Channel Command Port
03F7 (Write)	1 byte	Floppy Channel 1 Command
03F7, bit 7	1 bit	Floppy Disk 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
0534 - 0537	4 bytes	WSS Audio
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
0FF0 - 0FF7	4 bytes	CS4236 Audio Control
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

⇒ NOTE

Refer to the Audio section in Chapter 1 for specific I/O addresses that can be used by the audio components on your motherboard. This table does not list I/O addresses that may be used by add-in cards in the system.

2.4 PCI Configuration Space Map

Table 11. PCI Configuration Space Map

Bus Number (hex)	Device Number (hex)	Function Number (hex)	Description
00	00	00	Intel 82440FX (PMC) Host bridge
00	07	00	Intel 82371FB (PIIX3) PCI/ISA bridge
00	07	01	Intel 82371FB (PIIX3) IDE Bus Master
00	07	02	Intel 82371FB (PIIX3) USB
00	13	00	PCI Expansion Slot: J2D1
00	11	00	PCI Expansion Slot: J2D2
00	0F	00	PCI Expansion Slot: J2E1
00	0B	00	PCI Expansion Slot: J2F1

2.5 Interrupts

Table 12. 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	Audio if present, else user available
6	Floppy Drive
7	LPT1*
8	Real Time Clock
9	Audio if present, else user available
10	User available
11	Audio if present, else user available
12	Onboard Mouse Port if present, audio if present, else user available
13	Reserved, Math Coprocessor
14	Primary IDE if present, else user available
15	Secondary IDE if present, audio if present, else user available

* Default, but can be changed to another IRQ

3 BIOS and Setup Utility

3.1 Introduction

The motherboard uses an Intel BIOS, which is stored in Flash EEPROM and can be upgraded using a floppy disk-based program. In addition to the BIOS, the Flash EEPROM contains the Setup utility, POST, APM, the PCI auto-configuration utility, and Windows 95-ready Plug and Play.

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

The BIOS displays a sign-on message during POST identifying the type of BIOS and a five-digit revision code. The initial production BIOS in the motherboard is identified as 1.00.01.CS1.

Information on BIOS functions can be found in the *IBM PS/2 and Personal Computer BIOS Technical Reference* published by IBM, and the *ISA and EISA Hi-Flex AMIBIOS Technical Reference* published by AMI. Both manuals are available at most technical bookstores.

3.2 BIOS Flash Memory Organization

The Intel PA28FB200BX 2 Mbit Flash component is organized as 256K x 8 (256 KB). The Flash device is divided into eight areas, as described in Table 13.

Table 13. Flash Memory Organization

System Address (Hex)	Size	Description
FFFF0000 - FFFFFFFF	64 KB	Main BIOS
FFFE0000 - FFFE0000	16 KB	Boot Block (available as UMB)
FFFEA000 - FFFE0000	8 KB	VPD ESCD (DMI configuration data / Plug and Play data)
FFFE9000 - FFFE9000	4 KB	Reserved for BIOS
FFFE8000 - FFFE8000	4 KB	OEM logo or Scan User Flash
FFFE0000 - FFFE7000	32 KB	POST BIOS (available as UMB)
FFFD0000 - FFFD0000	64 KB	Reserved for BIOS
FFFC0000 - FFFC0000	64 KB	Reserved for BIOS

3.3 BIOS Upgrades

Flash memory simplifies distributing BIOS upgrades. You can install a new version of the BIOS from a diskette. BIOS upgrades are available to be downloaded from the secure section on the Intel bulletin board or from Intel's FTP or World Wide Web sites (refer to Section 5.2).

The disk-based Flash upgrade utility, FMUP.EXE, has three options for BIOS upgrades:

- Update the Flash BIOS from a file on a disk
- Copy the current BIOS code from the Flash EEPROM to a disk file as a backup, in the event that an upgrade cannot be successfully completed
- Compare the BIOS in the Flash device with a file to make sure the system has the correct version

The upgrade utility ensures that the upgrade BIOS extension matches the target system to prevent accidentally installing a BIOS for a different type of system.

3.4 PCI IDE Support

If you select "Autoconfiguration" in Setup, the BIOS automatically sets up the two local bus IDE connectors with independent I/O channel support. The IDE interface supports PIO Mode 3 and Mode 4 hard drives and recognizes any ATAPI devices, including CD-ROM drives and tape drives. The BIOS determines the capabilities of each drive and configures them to optimize capacity and performance. To take advantage of the high capacities typically available today, hard drives are automatically configured for LBA and to PIO Mode 3 or 4, depending on the capability of the drive. You can override the auto-configuration options by specifying manual configuration in Setup. The ATAPI Specification recommends that ATAPI devices be configured as shown in Table 14.

Table 14. Recommendations for Configuring an ATAPI Device

	Primary Cable		Secondary Cable	
	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 PCI Auto-configuration

The PCI auto-configuration utility operates in conjunction with the Setup utility to let you insert and remove PCI cards without user configuration (Plug and Play). When you turn on the system after adding a PCI card, the BIOS automatically configures interrupts, I/O space, and other parameters. PCI interrupts are distributed to available ISA interrupts that have been not been assigned to an ISA card or to system resources. Any interrupts set to “available” in Setup are considered free for use by PCI add-in cards. The assignment of PCI interrupts to ISA IRQs is nondeterministic.

System configuration information is stored in ESCD format. You can clear the ESCD data by moving the Clear CMOS jumper (refer to Section 1.13.3).

For information about the version of PCI supported by this BIOS, refer to Section 5.1. Peer-to-peer hierarchical PCI Bridge is supported, and by using an OEM-supplied option ROM or TSR, a PCI-to-PCMCIA bridge capability is possible as well.

3.6 ISA Plug and Play

The BIOS incorporates ISA Plug and Play capabilities. When used in conjunction with the ISA Configuration Utility (ICU) for DOS or Windows 3.x, the system allows auto-configuration of Plug and Play ISA cards or PCI cards, and manages resource for legacy ISA cards. Because the BIOS supports configuring devices across PCI bridges, you must use ICU release 1.41 or greater to properly view and change system settings.

System configuration information is stored in ESCD format. You can clear the ESCD data by moving the Clear CMOS jumper (refer to Section 1.13.3).

There is a Setup option to support Windows 95 runtime Plug and Play utilities. If you select this option, the BIOS assigns resources only to devices that are critical to booting. Device Node information is available for all devices to ensure compatibility with Windows 95.

3.7 Desktop Management Interface

Desktop Management Interface (DMI) is a method of managing computers in an enterprise. 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, installation date, and other information about the system components. The DMI specification requires that certain information about the system’s motherboard be made available to an applications program. This information is located in a series of data structures which are accessed in various ways by the DMI service layer. Component instrumentation allows the service layer to gain access to information stored in the general-purpose area of non-volatile memory. The MIF database defines the data and provides the method for accessing the information.

The BIOS support for DMI enables the maximum benefit from applications such as LANDesk Client Manager from Intel. The BIOS stores and can report on the following types of DMI information:

- BIOS data, such as the BIOS revision level
- Fixed system information, such as data about the motherboard, peripherals, serial numbers and asset tags, etc.
- System information discovered during bootup, such as memory size, cache size, processor speed, etc.
- Dynamic information, such as event detection and error logging

An OEM can use a utility that makes DMI calls to program system and chassis-related information into the Flash memory, so the BIOS can also report that information. Once this information is written, it is locked (read-only).

Intel can provide a utility for making DMI calls to the BIOS. Contact your local Intel Sales office for further information. The latest DMI specification is available from Intel (refer to Section 5.2) and other sites.

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

3.8 Advanced Power Management

The BIOS supports APM. You can initiate the energy saving Standby mode in these ways:

- Keyboard hot key sequence specified in Setup
- Time-out period specified in Setup
- Suspend/resume switch connected to the front panel sleep connector

When in Standby mode, the motherboard reduces power consumption by using the processor's System Management Mode (SMM) capabilities and by spinning down hard drives and reducing power to or turning off VESA[†] DPMS-compliant monitors. In Setup you can select the DPMS mode to use for the monitor: Standby, Suspend, Sleep, or Disabled (Off).

While in Standby mode, the system retains the ability to respond to external interrupts; it can service requests such as incoming faxes or network messages while unattended. Any keyboard or mouse activity brings the system out of Standby mode and immediately restores power to the monitor and IDE drives.

APM is enabled in the BIOS by default; however, the system must be configured with an APM driver for the power-saving features to take effect. For example, Windows 95 enables APM automatically upon detecting the presence of the APM BIOS.

3.9 Advanced Power Control

The BIOS supports Advanced Power Control (APC) through the Super I/O controller. Two features include:

- Auto Start On AC Loss, which sets the control for returning to the last known state of the system or powering down the system if the motherboard detects that the power supply has lost AC power.
- Power-On COM1 Ring, which sets the control that allows the system to be powered on when an incoming POTS call is received on a telephony device configured for operation on COM1.

3.10 Language Support

The BIOS Setup utility and help messages are supported in 32 languages. Five languages are available at this time for use: American English, German, Italian, French, and Spanish. Translations of other languages may become available at a later date.

With a 2 Mb Flash BIOS, only two languages can be resident at a time. The default language is American English, which is always present unless another language is programmed into the BIOS using the Flash Memory Update Program (FMUP.EXE). Refer to Section 5.2 for information about downloading FMUP and other utilities.

3.11 Boot Options

Booting from CD-ROM is supported in adherence to the “El Torito” bootable CD-ROM format specification developed by Phoenix Technologies and IBM. Under the Boot Options field in Setup, CD-ROM is one of four possible boot devices, which are defined in priority order. The default setting is for the floppy drive to be the primary boot device and the hard drive to be the secondary boot device. (By default the third and fourth devices are disabled.) If you select CD-ROM as the boot device, it must be the first device.

⇒ NOTE

A copy of “El Torito” is available on the Phoenix Web site <http://www.ptltd.com/techs/specs.html>.

In Setup you can also select the network as a boot device, which allows booting from a network add-in card with a remote boot ROM installed.

3.12 Flash LOGO Area

The motherboard supports a 4 KB programmable Flash user area located at E8000-E8FFF. You can use this area to display a custom OEM logo. The BIOS accesses the user area just after completing POST. A utility is available from Intel to assist with installing a logo into Flash for display during POST. Contact your local Intel Sales office for further information.

3.13 BIOS Setup Access Jumper

You can move the Setup Access jumper on the motherboard to enable or disable access to the Setup utility. The default is for access to be enabled. Refer to Section 1.13.4 for the specific pins on which to place the jumper.

3.14 Recovering BIOS Data

Some types of failure can destroy the BIOS data. For example, the data could be lost if a power outage occurs while you are updating the BIOS in Flash memory. You can recover the BIOS data from a diskette by changing the setting of the BIOS Recover jumper (refer to Section 1.13.5). To recover the BIOS:

1. Turn off the computer and move the jumper to the BIOS recovery setting.
2. In drive A, insert the supplied boot disk containing the BIOS files and Recovery file.
3. Boot the computer. The system should beep once and drive activity should start. When recovery is successful, the system beeps twice and drive activity stops.

After recovery, turn off the computer and return the jumper to the original pins to restore normal operation.

3.15 BIOS Setup Utility

The Setup utility lets you modify the configuration for most basic changes without opening the system. Setup is accessible only during the POST. To enter Setup, press the <F1> key after the POST memory test has begun and before boot begins. By default, there is a prompt to press the <F1> key to access Setup, but this prompt may be disabled. Refer to Section 1.13.4 for information on placing the jumper that prevents user access to Setup for security purposes.

3.15.1 Overview of the Setup Menu Screens

Table 15 lists the screens displayed by the Setup utility. Setup initially displays the Main menu screen. In each screen there are options for modifying the system configuration. Select a menu screen by pressing the left <<-> or right <-> arrow keys. Use the up <↑> or down <↓> arrow keys to select items in a screen. Use the <Enter> key to select an item for modification. For certain items, pressing <Enter> brings up a subscreen. After you have selected an item, use the arrow keys to modify the setting.

Table 15. Overview of the Setup Menu Screens

Setup Menu Screen	Description
Main	Set up and modify some of the basic options of a PC, such as time, date, diskette drives, and hard drives.
Advanced	Modify the more advanced features of a PC, such as peripheral configuration and advanced chipset configurations.
Security	Specify passwords that can be used to limit access to the system.
Exit	Save or discard changes.

continued ➡

Table 15. Overview of the Setup Menu Screens (continued)

Setup Subscreen	Description
Floppy Options	Configure diskette drives.
IDE Device Configuration	Configure IDE devices such as hard disk drives.
Boot Options	Modify options that affect the system boot up, such as the boot sequence.
Peripheral Configuration	Modify options that affect the serial ports, the parallel port, and the disk drive interfaces.
Advanced Chipset Configuration	Modify options that affect memory and system buses.
Power Management Configuration	Access and modify APM options.
Plug and Play Configuration	Modify options that affect the system's Plug and Play capabilities.
Event Logging Configuration	Access and modify event logging options.

3.15.2 Main BIOS Setup Screen

This section describes the Setup options found on the main menu screen. If you select certain options from the main screen (e.g., Hard Disk), Setup switches to a subscreen for the selected option.

3.15.2.1 System Date

Specifies the current date. Select the month from a pop-up menu.

3.15.2.2 System Time

Specifies the current time.

3.15.2.3 Floppy Options

When selected, this displays the Floppy Options menu.

3.15.2.4 Primary IDE Master

Reports if an IDE device is connected to the Primary IDE master interface. When selected, this displays the IDE Device Configuration subscreen.

3.15.2.5 Primary IDE Slave

Reports if an IDE device is connected to the Primary IDE slave interface. When selected, this displays the IDE Device Configuration subscreen.

3.15.2.6 Secondary IDE Master

Reports if an IDE device is connected to the Secondary IDE master interface. When selected, this displays the IDE Device Configuration subscreen.

3.15.2.7 Secondary IDE Slave

Reports if an IDE device is connected to the Secondary IDE slave interface. When selected, this displays the IDE Device Configuration subscreen.

3.15.2.8 Language

Specifies the language of the text strings used in the Setup utility and the BIOS. The options are any installed languages.

3.15.2.9 Boot Options

When selected, this displays the Boot Options subscreen.

3.15.2.10 Video Mode

Reports the video mode. There are no options.

3.15.2.11 Mouse

Reports if a mouse is installed or not. There are no options.

3.15.2.12 Base Memory

Reports the amount of base memory. There are no options.

3.15.2.13 Extended Memory

Reports the amount of extended memory. There are no options.

3.15.2.14 BIOS Version

Reports the BIOS identification string. There are no options.

3.15.3 Floppy Options Subscreen

3.15.3.1 Floppy A:

Reports if a diskette drive is connected to the system. There are no options.

3.15.3.2 Floppy B:

Reports if a second diskette drive is connected to the system. There are no options.

3.15.3.3 Floppy A: Type

Specifies the physical size and capacity of the diskette drive. The options are:

- Disabled
- 360 KB, 5.25-inch
- 1.2 MB, 5.25-inch
- 720 KB, 3.5-inch
- 1.44/1.25 MB, 3.5-inch (default)
- 2.88 MB, 3.5-inch

3.15.3.4 Floppy B: Type

Specifies the physical size and capacity of the diskette drive. The options are:

- Disabled (default)
- 360 KB, 5.25-inch
- 1.2 MB, 5.25-inch
- 720 KB, 3.5-inch
- 1.44/1.25 MB, 3.5-inch
- 2.88 MB, 3.5-inch

3.15.4 Primary/Secondary IDE Master/Slave Configuration Subscreens

There are four subscreens used to enable IDE devices:

- Primary IDE Master
- Primary IDE Slave
- Secondary IDE Master
- Secondary IDE Slave

All four subscreens contain the same eight fields described below.

3.15.4.1 IDE Device Configuration

Used to manually configure the hard drive or have the system auto-configure it. The options are:

- Auto Configured (default)
- User Definable
- Disabled

If you select User Definable, you can modify the Number of Cylinders, Number of Heads, and Number of Sectors items. If you select Disabled, the BIOS will not scan for a device on that interface.

3.15.4.2 Number of Cylinders

If IDE Device Configuration is set to Auto Configured, this field reports the number of cylinders for your hard disk and cannot be modified. If IDE Device Configuration is set to User Definable, you must type the correct number of cylinders for your hard disk.

3.15.4.3 Number of Heads

If IDE Device Configuration is set to Auto Configured, this field reports the number of heads for your hard disk and cannot be modified. If IDE Device Configuration is set to User Definable, you must type the correct number of heads for your hard disk.

3.15.4.4 Number of Sectors

If IDE Device Configuration is set to Auto Configured, this field reports the number of sectors for your hard disk and cannot be modified. If IDE Device Configuration is set to User Definable, you must type the correct number of sectors for your hard disk.

3.15.4.5 Maximum Capacity

Reports the maximum capacity of your hard disk, which is calculated from the number of cylinders, heads, and sectors. There are no options.

3.15.4.6 IDE Translation Mode



CAUTION

Do not change the IDE translation mode from the option selected when the hard drive was formatted. Changing the option after formatting can result in corrupted data.

Specifies the IDE translation mode. The options are:

- Standard CHS (standard cylinder head sector, for drives with fewer than 1024 cylinders)
- Logical Block (LBA)
- Extended CHS (extended cylinder head sector, for drives with more than 1024 cylinders)
- Auto Detected (BIOS detects IDE drive support for LBA) (default)

3.15.4.7 Multiple Sector Setting

Sets the number of sectors transferred by an IDE drive per interrupt generated. The options are:

- Disabled
- 4 Sectors/Block
- 8 Sectors/Block
- Auto Detected (default)

Check the specifications for your hard disk drive to determine which setting provides optimum performance for your drive.

3.15.4.8 Fast Programmed I/O Modes

Sets how fast the transfers occur on the IDE interface. The options are:

- Disabled (transfers occur at a less than optimized speed)
- Auto Detected (transfers occur at the drive's maximum speed) (default)

3.15.5 Boot Options Subscreen

This section describes the options available on the Boot Options subscreen.

3.15.5.1 First Boot Device

Sets which drive the system checks first to find an operating system to boot from. The options are:

- Disabled
- Floppy (default)
- Hard Disk
- CD-ROM
- Network

3.15.5.2 Second Boot Device

Sets which drive the system checks second to find an operating system to boot from. The options are:

- Disabled
- Floppy
- Hard Disk (default)
- Network

3.15.5.3 Third Boot Device

Sets which drive the system checks third to find an operating system to boot from. The options are:

- Disabled (default)
- Floppy
- Hard Disk
- Network

3.15.5.4 Fourth Boot Device

Sets which drive the system checks fourth to find an operating system to boot from. The options are:

- Disabled (default)
- Floppy
- Hard Disk
- Network

3.15.5.5 System Cache

Enables or disables both primary and secondary cache memory. The options are:

- Enabled (default)
- Disabled

3.15.5.6 Boot Speed

Sets the system's boot speed. The options are:

- Deturbo (the motherboard operates at the speed of an AT system)
- Turbo (boot-up occurs at full speed) (default)

3.15.5.7 Num Lock

Sets the beginning state of the Num Lock feature on the numeric keypad of your keyboard. The options are:

- Off (default)
- On

3.15.5.8 Speaker

Turns the onboard speaker control on or off. The options are:

- Disabled
- Enabled (default)

3.15.5.9 Setup Prompt

Controls whether the "Press <F1> Key if you want to run Setup" prompt is displayed during the power-up sequence. The options are:

- Enabled (default)
- Disabled

⇒ NOTE

The Setup Prompt option has no effect on your ability to access the Setup program. It only enables or disables the prompt.

3.15.5.10 Hard Disk Pre-Delay

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 your system contains a hard drive and you don't see the drive type displayed during boot-up, 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. The options are:

- Disabled (default)
- 3 seconds
- 6 seconds
- 9 seconds

- 12 seconds
- 15 seconds
- 21 seconds
- 30 seconds

3.15.5.11 Typematic Rate Programming

Sets the typematic rates. The options are:

- Default (default)
- Override (lets you enter Typematic Rate Delay and Typematic Rate options)

3.15.5.12 Typematic Rate Delay

Sets the delay time before the key-repeat function starts when you hold down a key on the keyboard. If Typematic Rate Programming is set to Default, this option will not be visible. The options are:

- 250 milliseconds (default)
- 500 milliseconds
- 750 milliseconds
- 1000 milliseconds

3.15.5.13 Typematic Rate

Sets the speed at which characters repeat when you hold down a key on the keyboard. The higher the number, the faster the characters repeat. If Typematic Rate Programming is set to Default, this option will not be visible. The options are:

- 6 char/s (default)
- 8 char/s
- 10 char/s
- 12 char/s
- 15 char/s
- 20 char/s
- 24 char/s
- 30 char/s

3.15.5.14 Scan User Flash Area

Scans the user Flash area. The options are:

- Disabled (default)
- Enabled

3.15.6 Advanced Screen

This section describes the Setup options found on the Advanced menu screen. If you select certain options from the Advanced screen (e.g., Peripheral Configuration), the Setup program switches to a subscreen for the selected option. Subscreens are described in the sections following the description of the Advanced screen options.

3.15.6.1 Processor Type

Reports the processor type. There are no options.

3.15.6.2 Processor Speed

Reports the processor clock speed. There are no options.

3.15.6.3 Cache Size

Reports the size of the secondary cache. There are no options.

3.15.6.4 Peripheral Configuration

When selected, this displays the Peripheral Configuration subscreen.

3.15.6.5 Advanced Chipset Configuration

When selected, this displays the Advanced Chipset Configuration subscreen.

3.15.6.6 Power Management Configuration

When selected and enabled, this displays the Advanced Power Management subscreen.

3.15.6.7 Plug and Play Configuration

When selected, this displays the Plug and Play Configuration subscreen.

3.15.6.8 Event Logging Configuration

When selected, this displays the Event Logging Configuration subscreen.

3.15.7 Peripheral Configuration Subscreen

This section describes the Setup options for the Peripheral Configuration subscreen. For peripherals set to Auto, the BIOS automatically configures the peripheral during power up.

3.15.7.1 Primary PCI IDE Interface

Disables or automatically configures the primary PCI IDE hard disk interface. The options are:

- Disabled
- Auto (default)

3.15.7.2 Secondary PCI IDE Interface

Disables or automatically configures the secondary PCI IDE hard disk interface. The options are:

- Disabled
- Auto (default)

3.15.7.3 Floppy Interface

Disables or automatically configures the diskette drive interface. The options are:

- Disabled
- Enabled
- Auto (default)

3.15.7.4 Serial Port 1 Address

Selects the logical COM port, I/O address, and IRQ of Serial Port 1. The options are:

- Disabled
- COM1, 3F8h, IRQ4
- COM2, 2F8h, IRQ3
- COM3, 3E8h, IRQ4
- COM1, 3F8h, IRQ3
- COM2, 2F8h, IRQ4
- COM3, 3E8h, IRQ3
- Auto (Setup assigns the first free COM port, normally COM1, 3F8h, IRQ4) (default)

3.15.7.5 Serial Port 2 Address

Selects the logical COM port, I/O address, and IRQ of Serial Port 2. The options are:

- Disabled
- COM1, 3F8h, IRQ4
- COM2, 2F8h, IRQ3
- COM3, 3E8h, IRQ4
- COM1, 3F8h, IRQ3
- COM2, 2F8h, IRQ4
- COM3, 3E8h, IRQ3
- Auto (Setup assigns the first free COM port, normally COM2, 2F8h, IRQ3) (default)

⇒ **NOTE**

If you specifically set either serial port address, that address will not appear in the list of options for the other serial port.

3.15.7.6 Parallel Port Address

Selects the logical printer port, I/O address, and IRQ of the parallel port. The options are:

- Disabled
- LPT3, 3BCh, IRQ7
- LPT1, 378h, IRQ7
- LPT2, 278h, IRQ7
- LPT3, 3BCh, IRQ5
- LPT1, 378h, IRQ5
- LPT2, 278h, IRQ5
- Auto (Setup assigns LPT1, 378h, IRQ7) (default)

3.15.7.7 Parallel Port Mode

Selects the mode for the parallel port. The options are:

- Compatible (operates in AT⁺-compatible mode) (default)
- Bi-directional (operates in bidirectional PS/2-compatible mode)
- EPP (Enhanced Parallel Port, a high-speed bidirectional mode)
- ECP (Extended Capabilities Port, a high-speed bidirectional mode)

3.15.7.8 Primary IDE Status

Reports if the primary IDE interface is enabled or disabled. There are no options.

3.15.7.9 Secondary IDE Status

Reports if the secondary IDE interface is enabled or disabled. There are no options.

3.15.7.10 Floppy Status

Reports if the diskette drive interface is enabled or disabled. There are no options.

3.15.7.11 Serial Port 1 Status

Reports the COM port, I/O address, and IRQ for Serial Port 1. There are no options.

3.15.7.12 Serial Port 2 Status

Reports the COM port, I/O address, and IRQ for Serial Port 2. There are no options.

3.15.7.13 Parallel Port Status

Reports the logical printer port, I/O address, and IRQ for the parallel port. There are no options.

3.15.8 Advanced Chipset Configuration Subscreen

This section describes the options available on the Advanced Chipset Configuration subscreen.

3.15.8.1 Base Memory Size

Sets the size of the base memory. The options are:

- 512 KB
- 640 KB (default)

3.15.8.2 ISA LFB Size

Sets the size of the linear frame buffer. The options are:

- Disabled (default)
- 1 MB (if selected, the ISA LFB Base Address field appears)

3.15.8.3 ISA LFB Base Address

Reports the base address of the linear frame buffer. There are no options. This field does not appear if the ISA LFB Size is set to Disabled.

3.15.8.4 Video Palette Snoop

Controls the ability of a primary PCI graphics controller to share a common palette with an ISA add-in video card. The options are:

- Disabled (default)
- Enabled

3.15.8.5 Latency Timer (PCI Clocks)

Sets the length of time an agent on the PCI bus can hold the bus when another agent has requested the bus. The units are numbers of PCI clocks. Valid numbers are between 0 and 256. The default is 66.

3.15.8.6 Onboard Audio

Controls the onboard audio (if present) on the motherboard. This field will not appear if the onboard audio is not present. The options are:

- Disabled
- Enabled (default)

3.15.8.7 Bank 0 SIMM Detected

Reports the type of memory found in bank 0. There are no options.

3.15.8.8 Bank 1 SIMM Detected

Reports the type of memory found in bank 1. There are no options.

3.15.9 Power Management Configuration Subscreen

This section describes the options available on the Power Management Configuration subscreen.

3.15.9.1 Advanced Power Management

Enables or disables the APM support in the BIOS. APM manages power consumption only when used with an APM-capable operating system. The options are:

- Disabled (none of the following fields in the Advanced Power Management subscreen appear)
- Enabled (default)

3.15.9.2 IDE Drive Power Down

Sets any IDE drives to spin down when the computer goes into power managed mode. The options are:

- Disabled
- Enabled (default)

3.15.9.3 VESA Video Power Down

Sets any VESA-compliant monitor to be power managed when the system goes into power managed mode. The options are:

- Disabled
- Standby
- Suspend
- Sleep (default)

3.15.9.4 Inactivity Timer

Sets the number of minutes the computer must be inactive before it enters power-managed mode. The range is 0-255 minutes. The default is 10 minutes.

3.15.9.5 Hot Key

Sets the hot key for power-managed mode. When a user presses this key while holding down the <Ctrl> and <Alt> keys, the system enters power-managed mode. All alphabetic keys are valid entries for this field.

⇒ NOTE

If you set the APM hot key and the Security hot key (refer to Section 3.15.13.6) to the same key, the APM function has priority.

3.15.9.6 Auto Start On AC Loss

Enables returning to the last known state of the system, or powering down the system if the motherboard detects that AC power to the power supply is lost. The options are:

- Disabled
- Enabled (default)

3.15.9.7 Power-On COM1 Ring

Power-On COM1 Ring, which sets the control that allows the system to be powered on when an incoming POTS call is received on a telephony device configured for operation on COM1.

Enables the system to power on when a telephony device configured for operation on COM1 receives an incoming POTS call. The options are:

- Disabled
- Enabled (default)

3.15.10 Plug and Play Configuration Subscreen

This section describes the options in the Plug and Play configuration subscreen.

3.15.10.1 Configuration Mode

Sets how the BIOS gets information about ISA cards that do not have Plug and Play capabilities. The options are:

- Use Setup Utility (default)
- Use ICU (The BIOS will depend on run-time software to prevent conflicts between add-in cards with Plug and Play capabilities and those without. Boot with PnP OS will be the only field that appears on this subscreen.)

3.15.10.2 Boot with PnP OS

Lets the computer boot with an operating system capable of managing Plug and Play add-in cards. The options are:

- None
- Other
- Windows 95 (default)

3.15.10.3 ISA Shared Memory Size

Lets you specify a range of memory addresses that will be usable by ISA add-in cards for shared memory, and that will not be used for shadowing ROM memory from other devices. The options are:

- Disabled (the ISA Shared Memory Base Address field does not appear) (default)
- 16 KB
- 32 KB
- 48 KB
- 64 KB
- 80 KB
- 96 KB

Enable this field only if you are using a legacy ISA add-in card without Plug and Play capabilities, and the card requires non-ROM memory space. For example, this could include LAN cards that have onboard memory buffers or video capture cards that have video buffer memory.

By default, upper memory is allocated as follows: Memory from C0000-C7FFF is automatically shadowed (this memory range is typically reserved for video BIOS). Memory from C8000-DFFFF is initially unshadowed. The BIOS scans this range for any ISA add-in cards that may be present and notes their location and size. The BIOS then auto-configures the PCI devices and Plug and Play devices, shadowing their ROM requirements (other than video) into the area above E0000. If that area becomes full, the BIOS continues shadowing to the area between C8000 and DFFFF. If an ISA legacy card has non-ROM memory requirements, the auto-configure routine might write into an area that is needed by the ISA card. Use the ISA Shared Memory Size and ISA Shared Memory Base Address fields to reserve a block of memory that will not be used for shadowing.

3.15.10.4 ISA Shared Memory Base Address

Sets the base address for the ISA Shared Memory. The options are:

- C8000h (default)
- CC000h
- D0000h
- D4000h
- D8000h
- DC000h

The options that appear depend on the ISA Shared Memory Size field. The total amount of ISA Shared Memory cannot extend to the E0000h address. For example, if you specify a size of 64 KB, options D4000h, D8000h, and DC000h will not be available.

3.15.10.5 IRQ 3, 4, 5, 7, 9, 10, 11, 12, 14, 15

Sets the status of the IRQ. The options are:

- Available (default)
- Used By ISA Card

The PCI auto-configuration code uses these settings to determine whether these interrupts are available for use by PCI add-in cards. If an interrupt is marked available, the auto-configuration code can assign the interrupt to be used by the system. If your computer has an ISA add-in card that requires an interrupt, select Used By ISA Card for that interrupt.

⇒ NOTE

IRQs 5, 9, 10, 11, and 12 are the default user-available IRQs. Depending on the configuration of your system, other IRQs may be listed (for example, if you disable the parallel port and/or serial ports).

3.15.11 Event Logging Configuration Subscreen

This section describes the options available in the Event Logging Configuration subscreen.

3.15.11.1 Event Log Status

This information field tells whether the log is full or not. There are no options.

3.15.11.2 Log Count Granularity

Enter the number of log events that must occur before the event log is updated. The default is 10 events.

3.15.11.3 Time Granularity (Minutes)

Enter the number of minutes that must pass before the event log is updated. The default is 30 minutes.

3.15.11.4 Log Control

Enables event logging. The options are:

- All Events Enabled (default)
- ECC Events Disabled
- All Events Disabled

3.15.11.5 Clear Log

Sets a flag that clears the event log the next time the POST runs. The options are:

- No (default)
- Yes

3.15.11.6 Mark Existing Events Read

Marks or does not mark all events already in the log as having been read. The options are:

- No (default)
- Yes

3.15.12 Security Screen

This section describes the passwords you can set to restrict access to the Setup program and to restrict who can boot the computer.

3.15.12.1 Administrative and User Access Modes

The options on the Security screen let you set a User password and/or an Administrative password. The access restrictions for the User and Administrative modes are:

- Setup options: The Administrative password gives you full access to Setup options; the User password can be limited to only certain options. Thus, by setting separate Administrative and User passwords, a system administrator can limit who can change critical Setup values. The actual limitations depend on whether one or both passwords are set. Table 16 shows how the passwords work together.
- Booting the system: To limit access to who can boot the system, set the User password. This is the password that the system asks for before booting. If only the Administrative password is set, the system boots up without asking for a password. If both passwords are set, you can enter either password to boot the system.

Table 16 shows the effects of setting the Administrative and User passwords. The table is for reference only, and is not shown on the Security screen.

Table 16. Administrative and User Password Functions

Password Set	Administrative Mode	User Mode	Password Required During Boot Process
Neither	Can change all options*	Can change all options*	None
Administrative only	Can change all options	Can change a limited number of options **	None
User only	N/A	Can change all options	User
Both	Can change all options	Can change a limited number of options **	Administrative or User

* If no password is set, any user can change all Setup options.

** Limited options include only: system date and time, power management hot key, User password, security hot key, and unattended start.

3.15.13 Security Screen Options

3.15.13.1 User Password is

Reports if there is a User password set. There are no options.

3.15.13.2 Administrative Password is

Reports if there is an Administrative password set. There are no options.

3.15.13.3 Set User Password

Sets the User password. The password can be up to seven alphanumeric characters.

3.15.13.4 Set Administrative Password

Sets the Administrative password. The password can be up to seven alphanumeric characters.

3.15.13.5 Unattended Start

Controls when the security password is requested. The User password must be set to enable this field. The options are:

- Enabled (the system boots, but the keyboard is locked until the User password is entered)
- Disabled (default)

3.15.13.6 Security Hot Key (CTRL-ALT-)

Sets a hot key that locks the keyboard until the User password is entered. All alphabetic keys are valid entries for this field. When a user presses this key while holding down the <Ctrl> and <Alt> keys, the keyboard locks and the keyboard LEDs flash to indicate that the keyboard is locked.

When you enter the User password to unlock the keyboard, you do not have to press <Enter>.

⇒ NOTE

If you set the Security hot key and the APM hot key (refer to Section 3.15.9.5) to the same key, the APM function has priority.

3.15.14 Exit Screen

This section describes how to exit Setup with or without saving the changes you have made.

3.15.14.1 Exit Saving Changes

Exits Setup and saves the changes in CMOS RAM. You can also press the <F10> key anywhere in the Setup utility to do this.

3.15.14.2 Exit Discarding Changes

Exits Setup program without saving any changes. This means that any changes you have made while in Setup are discarded and not saved. Pressing the <Esc> key in any of the four main screens will also exit and discard changes.

3.15.14.3 Load Setup Defaults

Returns all of the Setup options to their defaults. The default Setup values are loaded from the ROM table. You can also press the <F5> key anywhere in Setup to load the defaults.

3.15.14.4 Discard Changes

Discards any changes made up to this point in Setup without exiting Setup. This selection loads the CMOS RAM values that were present when the system was turned on. You can also press the <F6> key anywhere in Setup to discard changes.

4 Error Messages and Beep Codes

4.1 BIOS Beep Codes

Beeps	Error Message	Description
1	Refresh Failure	The memory refresh circuitry on the motherboard is faulty.
1 continuous	Memory Failure	Memory failure in the first memory block checked.
1 long and 2 short	Display Memory Read/Write Error	The system video adapter is either missing or its memory is faulty. This is not a fatal error.
4	Timer Not Operational	Memory failure in the first 64 KB of memory, or Timer 1 on the motherboard is not functioning.
6	8042 - Gate A20 Failure	The keyboard controller may be bad. The BIOS cannot switch to protected mode.
7	Processor Exception Interrupt Error	The processor generated an exception interrupt.
9	ROM Checksum Error	ROM checksum value does not match the value encoded in BIOS.

4.2 PCI Configuration Error Messages

The following PCI messages are displayed as a group with bus, device, and function information.

Message	Explanation
Bad PnP Serial ID Checksum	The Serial ID checksum of a Plug and Play card is invalid.
Floppy Disk Controller Resource Conflict	The floppy disk controller has requested a resource that is already in use.
NVRAM Checksum Error, NVRAM Cleared	The Extended System Configuration Data (ESCD) was reinitialized because of an NVRAM checksum error. Try rerunning the ICU.
NVRAM Cleared By Jumper	The Clear CMOS jumper has been moved to the Clear position and CMOS RAM has been cleared.
NVRAM Data Invalid, NVRAM Cleared	Invalid entry in the ESCD.
Parallel Port Resource Conflict	The parallel port requested a resource that is already in use.
PCI Error Log is Full	More than 15 PCI conflict errors have been detected and no additional PCI errors can be logged.
PCI I/O Port Conflict	Two devices requested the same I/O address, resulting in a conflict.
PCI IRQ Conflict	Two devices requested the same IRQ, resulting in a conflict.
PCI Memory Conflict	Two devices requested the same memory resource, resulting in a conflict.
Primary Boot Device Not Found	The designated primary boot device (hard disk drive, diskette drive, or CD-ROM drive) could not be found.
Primary IDE Controller Resource Conflict	The primary IDE controller has requested a resource that is already in use.
Primary Input Device Not Found	The designated primary input device (keyboard, mouse, or other device if input is redirected) could not be found.
Secondary IDE Controller Resource Conflict	The secondary IDE controller has requested a resource that is already in use.
Serial Port 1 Resource Conflict	Serial Port 1 has requested a resource that is already in use.
Serial Port 2 Resource Conflict	Serial Port 2 has requested a resource that is already in use.
Static Device Resource Conflict	A non Plug and Play ISA card has requested a resource that is already in use.
System Board Device Resource Conflict	A non Plug and Play ISA card has requested a resource that is already in use.

4.3 BIOS Error Messages

Error Message	Explanation
8042 Gate - A20 Error	Gate A20 on the keyboard controller is not working.
Address Line Short!	Error in the address decoding circuitry on the motherboard.
CH-2 Timer Error	There is an error in Counter/Timer 2.
CMOS Battery State Low	CMOS RAM is powered by a battery. The battery power is low. Replace the battery.
CMOS Checksum Failure	After CMOS RAM values are saved, a checksum value is generated for error checking. The previous value is different from the current value. Run Setup.
CMOS System Options Not Set	The values stored in CMOS RAM are either corrupt or nonexistent. Run Setup.
CMOS Memory Size Mismatch	The amount of memory on the motherboard is different than the amount indicated in CMOS RAM. Run Setup.
CMOS Time and Date Not Set	Run Setup to set the date and time in CMOS RAM.
Diskette Boot Failure	The boot disk in floppy drive A is corrupt. It cannot be used to boot the system. Use another boot disk and follow the screen instructions.
DMA Error	Error in the DMA controller.
DMA #1 Error	Error in the first DMA channel.
DMA #2 Error	Error in the second DMA channel.
FDD Controller Failure	The BIOS cannot communicate with the floppy disk drive controller. Check all appropriate connections after the system is powered down.
HDD Controller Failure	The BIOS cannot communicate with the hard disk drive controller. Check all appropriate connections after the system is powered down.
INTR #1 Error	Interrupt channel 1 failed POST.
INTR #2 Error	Interrupt channel 2 failed POST.
Invalid Boot Diskette	The BIOS can read the disk in floppy drive A, but cannot boot the system from it. Use another boot disk.
KB/Interface Error	There is an error in the keyboard connector.
Off Board Parity Error	Parity error in memory installed in an expansion slot. The format is: OFF BOARD PARITY ERROR ADDR (HEX) = (XXXX) where XXXX is the hex address where the error occurred.
Parity Error	Parity error in system memory at an unknown address.

4.4 ISA NMI Messages

NMI Message	Explanation
Memory Parity Error at xxxxx	Memory failed. If the memory location can be determined, it is displayed as xxxxx. If not, the message is Memory Parity Error ????.
I/O Card Parity Error at xxxxx	An expansion card failed. If the address can be determined, it is displayed as xxxxx. If not, the message is I/O Card Parity Error ????.
DMA Bus Time-out	A device has driven the bus signal for more than 7.8 microseconds.

5 Compliance with Specifications

5.1 Specifications

The motherboard complies with the following specifications:

- *Advanced Power Management Specification*, revision 1.2
- *ATX Specification*, release 1.1
- *Infrared Data Association (IrDA) Serial Infrared Data Link Standards*
- *Multimedia PC Level 3 Specification*, release 1.3
- *PCI BIOS Specification*, revision 2.1
- *PCI Local Bus Specification*, revision 2.1
- *Universal Serial Bus Specification*, revision 1.0
- *USB Host Controller Interface Specification*, revision 1.0

5.2 Online Support

Find information about Intel motherboards at this World Wide Web site:

http://www-cs.intel.com/oem_developer/motherbd

or from this FTP site:

<ftp://ftp.intel.com/pub/>

