PR440FX
Motherboard
Technical Product Specification

Order Number: 281829-002

November 1996

The PR440FX motherboard may contain design defects or errors known as errata. Characterized errata that may cause the PR440FX motherboard's behavior to deviate from published specifications are documented in the PR440FX Motherboard Specification Update.

intel

Revision History

Revision	Revision History	Date
001	First release of the PR440FX Specification.	08/96
002	Second release of the PR440FX Specification	11/96

This product specification applies only to standard PR440FX with BIOS identifier 1.00.0x.DI0.

Changes to this specification will be published in the PR440FX Motherboard Specification Update (Order Number: 281832) before being incorporated into a revision of this document.

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1 Motherboard Description

1.1 Overview

The PR440FX motherboard supports dual Intel Pentium® Pro processors operating at 180 MHz or 200 MHz. Other features include the following:

- Custom ATX form factor
- Two 387-pin Socket 8 type processor sockets
- Four DIMM sockets for up to 512 MB EDO memory
- 256 KB or 512 KB second-level cache memory in Pentium Pro processor
- Intel 82440FX PCIset
  - PCI and Memory Controller (PMC) and Data Bus Accelerator (DBX)
  - 82371SB PCI/ISA IDE Xcelerator (PIIX3)
- Two Universal Serial Bus (USB) interfaces
- Three PCI slots and one shared slot that can support a PCI or ISA add-in card
- National Semiconductor PC87308 integrated I/O controller
- Intel EtherExpress™ PRO/100B PCI LAN subsystem
- Adaptec† 7880 SCSI controller
- Crystal† CS4236 audio subsystem
- Independent voltage and fan speed sensing for each processor
- Desktop Management Interface (DMI) included in BIOS

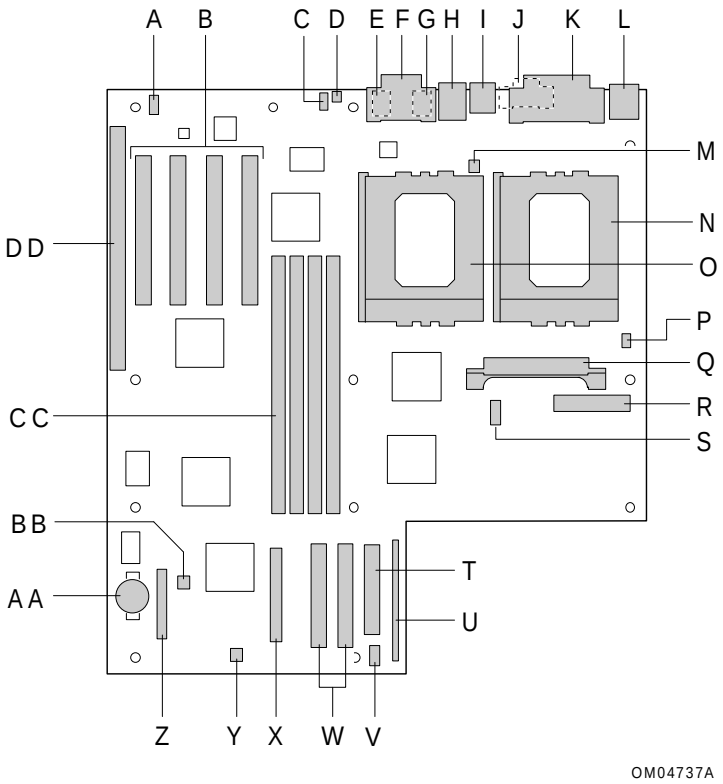

Figure 1. Motherboard Features

A	Wavetable connector	P	Primary processor fan connector
B	PCI add-in card connectors	Q	VRM connector
C	CD-ROM audio connector	R	Power supply connector
D	Telephony connector	S	Serial port 2 header
E	Audio connector (Mic In)	T	Floppy drive connector
F	MIDI/Game Port	U	Front panel I/O header
G	Audio connector (Line Out)	V	SCSI front panel LED connector
H	RJ-45 Ethernet connector	W	PCI IDE connectors
I	Dual USB connectors	X	SCSI connector
J	Serial port 1 connector	Y	Card slot fan connector
K	Parallel port connector	Z	Configuration jumper block
L	PS/2† mouse and PS/2 keyboard	AA	Battery
M	Secondary processor fan connector	BB	Memory speed jumper block
N	Primary processor socket	CC	DIMM connectors
O	Secondary processor socket	DD	ISA add-in card connector

1.2 Custom ATX Form Factor

The PR440FX motherboard is designed to fit into an ATX form factor chassis. Figure 2 illustrates the mechanical form factor of the motherboard.

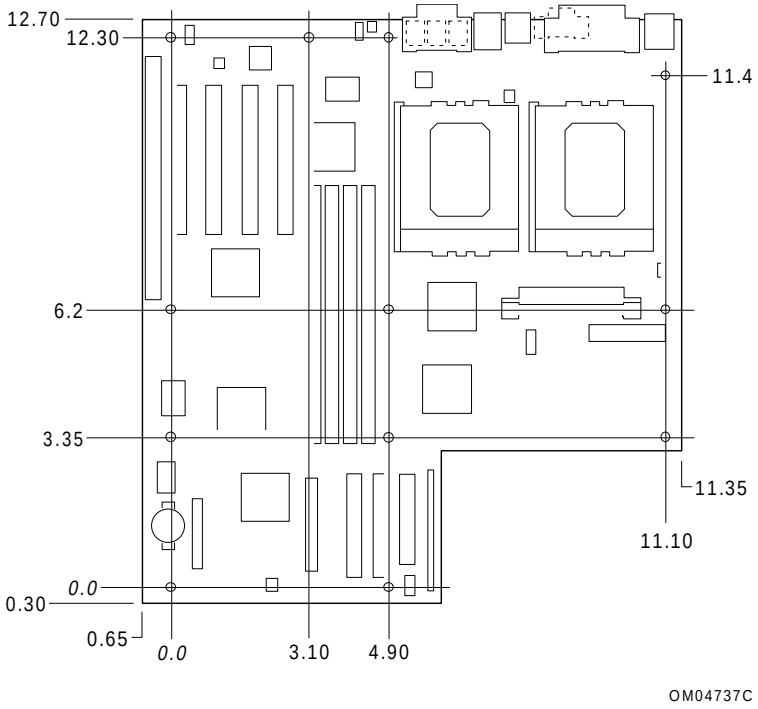

Figure 2. Motherboard Dimensions

1.3 Microprocessor

The PR440FX motherboard supports 2.1 V to 3.5 V Intel Pentium Pro processors operating at 180 MHz and 200 MHz. For motherboards with two processors installed, a voltage regulator module (VRM) is required for the second processor.

The Pentium Pro processor integrates an internal nonblocking second-level (L2) cache and cache controller. The motherboard supports processors with 256 KB or 512 KB L2 cache.

The Pentium Pro processor maintains full backward compatibility with the 8086, 80286, Intel386™, Intel486™ and Pentium processors. It also has a numeric coprocessor that significantly increases the speed of floating point operations and complies with ANSI/IEEE standard 754-1985.

1.3.1 Dual Processor Support

The dual processor support for the PR440FX motherboard consists of the following:

- Two Socket 8 ZIF processor sockets
- Voltage regulator module (VRM) socket for a VRM, which provides power to the secondary processor
- BIOS support for either MPS v1.1 or MPS v.1.4 operating systems

1.3.2 Microprocessor Upgrades

Two microprocessor upgrades are available:

- Single to dual processors
- Upgrade from 180 MHz Pentium Pro processor to 200 MHz Pentium Pro processor

⚠ CAUTION

The second processor must be the same speed and second-level cache size as the primary processor. The second processor must also be the same stepping as, or no more than one stepping higher than, the primary processor.

1.3.3 VRM Electrical Characteristics

Motherboards with two processors require a VRM. There are two types of VRMs: 5 V and 12 V. The PR440FX motherboard supports 5 V modules. Table 1 shows the electrical characteristics of the VRM.

Table 1. VRM Electrical Characteristics

Parameter	Value
Input Voltage	5 V ± 5%
Output Current	12.4A
Efficiency	>40% at low current, >80% at full current
Slew rate	30 A/µS at its pins
Maximum secondary input voltage source current	250 mA
DC Output Current	
Parameter	Value
I_{min}	0.3 Amps
I_{max}	12.4 Amps
I_{peak} (Overshoot lasting 15 µS)	13 Amps

Pentium Pro processor-based systems require voltage levels between the minimum and maximum levels shown in Table 2. The voltage level required by the system depends on the speed of the Pentium Pro processor. The Icc column represents Intel's current requirement for a Pentium Pro processor operating in this voltage range.

Table 2. VRM Voltage Ranges

Voltage Minimum	Voltage Maximum	Icc
2.4 Volts	3.4 Volts	12.4 Amps

1.3.4 Microprocessor Fan/Heat Sink Assembly and Clips

⚠ CAUTION

Do not use the older style of bail-wire clips for securing the fan/heat sink assembly. These clips could damage the motherboard if installed or removed incorrectly.

In an ATX v. 1.1 compliant chassis, the chassis's power supply provides the fan for the primary processor; the primary processor must also have a heat sink for proper thermal dissipation. The secondary processor must have an active fan/heat sink assembly for proper thermal dissipation. The heat sink assembly must be securely fastened to the Socket 8 ZIF socket by clips.

1.3.4.1 Secondary Processor Fan

In dual processor systems where both processors have a fan/heat sink assembly, both tach fans must comply with the specifications in Table 3.

Table 3. Tach Fan Specifications

Parameter	Value
Operating voltage range	10.2 - 13.8 VDC
Current (worst case)	80 mA
Air Volume (worst case) at zero pressure	9.9 CFM
Static Pressure (worst case) at zero air flow	0.051 inch H2O
Noise (worst case)	25 dB @ 1 m
Initial RPM (nominal)	2800 ± 600
Size	60 x 60 x 10 mm,
screw centers	50 x 50 mm
Tachometer output	2 cycles per revolution

1.4 Memory

1.4.1 Main Memory

The motherboard has four DIMM sockets. Minimum memory size is 16 MB and maximum memory size is 512 MB. The motherboard supports the following memory types, speeds, and module sizes:

- 168-pin 3.3 V DIMMs with gold-plated contacts
- 50 ns and 60 ns buffered asynchronous EDO memory
- Parity and ECC memory
- 2 MB x 72 (16 MB), 4 MB x 72 (32 MB), 8 MB x 72 (64 MB) and 16 MB x 72 (128 MB) modules

NOTE

Parity memory operates in ECC mode unless you disable memory error detection in the BIOS Setup program (see section 3.14.8.4).

1.5 Chipset

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

1.5.1 82441FX PCI Bridge and Memory Controller (PMC) and 82442FX Data Bus Accelerator (DBX)

Two devices from the Intel 82440FX chipset, the PMC and DBX, form the core of the motherboard design. As the host bridge function between the Pentium Pro processors and PCI I/O system, these devices maintain proper ordering of operations by trapping synchronization events and flushing buffers. The PMC also acts as memory controller for the system with the DBX providing the data path to memory

1.5.1.1 82441FX PCI Bridge and Memory Controller (PMC)

The 82441FX comes in a 208-pin QFP package that features:

- Processor interface control
  - — Up to 66 MHz external bus speed
  - — 32-bit addressing
- Integrated DRAM controller
  - — 72-bit non-interleaved path to memory with ECC support
  - — ECC is implemented as single-bit error checking and correction and multi-bit error checking and detection

  - — Support for EDO DRAM
  - — 16 MB to 512 MB main memory
- Fully synchronous PCI bus interface
  - — PCI Rev. 2.1 V compliant
  - — Up to 33 MHz bus speed
  - — PCI to DRAM > 100 MBps
- Data Buffering
  - — Processor-to-DRAM and PCI-to-DRAM write data buffering

1.5.1.2 82442FX Data Bus Accelerator (DBX)

The DBX connects to the 64-bit Pentium Pro processor data bus, the 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.

1.5.2 82371SB PCI/ISA IDE Xcelerator (PIIX3)

The PIIX3 provides the interface between the PCI and ISA buses and integrates a dual channel enhanced IDE interface capable of supporting up to four devices. The PIIX3 comes in a 208-pin QFP package that features:

- PCI-to-AT† interrupt mapping circuitry
- ISA refresh address generation
- Interface between the PCI and ISA buses
- Universal Serial Bus controller
  - — Host/hub controller
- Integrated enhanced IDE interface
  - — Support for up to four devices
  - — Programmed Input/Output (PIO) Mode 4 transfers up to 16 MB/sec
  - — Integrated 8 x 32-bit buffer for bus master PCI IDE burst transfers
  - — Bus master mode
- PCI 2.1 compliance
- Enhanced DMA controller
- Interrupt controller and interrupt steering
- Counters/timers
- SMI (System Management Interrupt) interrupt logic and timer with fast on/off mode
- NMI logic

1.5.3 Universal Serial Bus (USB) Support

NOTE

Computer systems that have an unshielded cable attached to the USB port may not meet FCC Class B requirements even if no device or a low-speed (sub-channel) USB device is attached to the cable. Use a shielded cable that meets the requirements for high-speed (fully rated) devices.

The motherboard has two USB ports. This permits direct connection of two USB peripherals without an external hub. If more devices are required, an external hub can be connected to either port. The motherboard supports the standard Universal Host Controller Interface (UHCI). Features of the USB include:

- Hot Pluggable
- Self-identifying 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
- Guaranteed bandwidth and low latencies appropriate for telephony, audio, and other applications
- Error handling and fault recovery mechanisms built into the protocol

1.5.4 IDE Support

The motherboard has two independent high-performance bus-mastering PCI/IDE interfaces capable of supporting PIO Mode 3, PIO Mode 4, and ATAPI devices. The system BIOS supports Logical Block Addressing (LBA) and Extended Cylinder Head Sector (ECHS) translation modes. The IDE device transfer rate and translation mode capability is automatically determined by the system BIOS.

Normally, programmed I/O operations require a substantial amount of processor bandwidth. In true multi-tasking operating systems like Windows NT†, the processor bandwidth freed by using bus mastering IDE can be used to complete other tasks while disk transfers are occurring. When used in conjunction with the appropriate driver for the operating system, the IDE interface can operate as a PCI bus master capable of supporting PIO Mode 4 devices with transfer rates of up to 16 MB/sec.

Detailed information on the PCIset is available in the Intel 82440FX PCIset data sheet.

1.6 I/O Controller

Control for the integrated into a single component, the National Semiconductor PC87308. The PC87308 is a Plug and Play device that features:

- Two NS16C550-compatible UARTs with send/receive 16-byte FIFO
- Multi-mode bidirectional parallel port
  - — Standard mode; IBM† and Centronics† compatible
  - — Enhanced Parallel Port (EPP) with BIOS/Driver support
  - — High Speed mode; Extended Capabilities Port (ECP) compatible
- Industry standard floppy controller with 16-byte FIFO (2.88 MB floppy support)
- Integrated real-time clock with century calendar functionality
- Integrated 8042-compatible keyboard controller

The PC87308 is normally configured automatically by the BIOS, but configuration of these interfaces is also possible using Setup. The serial ports can support any address configuration.

1.6.1 Floppy Controller

The PC87308 is software compatible with the DP8473 and 82077 floppy disk controllers. The floppy interface can be configured in Setup for:

- 5¼ inch media
  - 360 KB
  - 1.2 MB
- 3½ inch media
  - 720 KB
  - 1.2 MB (read/write only, no format capability)
  - 1.44 MB
  - 2.88 MB

By default, the Floppy A interface is configured for 1.44 MB and Floppy B is disabled. Configuring the floppy interface for 1.2 MB, 3½ inch (3-mode floppy) requires a driver.

1.6.2 Keyboard and Mouse Interface

PS/2 keyboard/mouse connectors are located on the back panel side of the motherboard. The 5 V lines to these connectors are protected with a PolySwitch† circuit which acts much like a self-healing fuse, re-establishing the connection after an over-current condition is removed. While this device eliminates the possibility of having to replace a fuse, take care to turn off the system power before installing or removing a keyboard or mouse.

The I/O controller contains the AMI Megakey keyboard/mouse controller code which, besides providing traditional keyboard and mouse control functions, supports Power-On/Reset (POR) and password protection. You can define the POR password with Setup. The keyboard controller also provides for the following hot-key sequences:

- <Ctrl> <Alt> <Del>: System software reset. This sequence performs a software reset of the system by jumping to the beginning of the BIOS code and running the POST operation.
- <Ctrl> <Alt> <defined in Setup>: Power management key sequences take advantage of the processor's System Management Mode (SMM) features to greatly reduce the system's power consumption while maintaining the responsiveness necessary to service external interrupts.
- <Ctrl> <Alt> <defined in Setup>: Keyboard secure hot keys lock the keyboard until you enter the password.

1.6.3 Real Time Clock, CMOS RAM and Battery

The integrated real-time clock (RTC) is compatible with DS1287 and MC146818 components. It provides a time of day clock, a 100-year calendar with alarm features, and a century register. You can set RTC in Setup. The RTC also supports 256-byte battery-backed CMOS RAM in two banks which is reserved for BIOS use. You can set the CMOS RAM to specific values or clear the CMOS RAM to system default values using Setup. You can also clear the CMOS RAM values to system defaults by using a configuration jumper on the motherboard.

An external coin-cell style battery provides power to the RTC and CMOS memory. The battery has an estimated lifetime of seven years and is socketed for easy replacement. When the system is on, the life of the battery is extended by a trickle current from the power supply.

1.6.4 Parallel Port

A 25-pin D-Sub header is provided on the back panel for a multi-mode bidirectional parallel port. The parallel port operates in standard mode, EPP version 1.7 mode (BIOS and driver support) or a high speed ECP compatible mode. EPP Mode requires a driver provided by the peripheral manufacturer to operate correctly.

1.7 Onboard Networking

1.7.1 EtherExpress™ PRO/100B PCI LAN Subsystem

The EtherExpress PRO/100B PCI LAN optional subsystem is a high performance Ethernet† LAN interface that provides both 10Base-T and 100Base-TX connectivity. Features include:

- 32-bit direct bus mastering on the PCI bus
- Shared memory structure in the host memory that copies data directly to/from host memory
- 10Base-T and 100Base-TX capability using a single RJ-45 connector
- IEEE 802.3µ Auto-Negotiation for hardware selection of the highest operating speed
- Jumperless configuration; the LAN subsystem is totally software configurable

The following block diagram provides an overview of the LAN subsystem architecture.

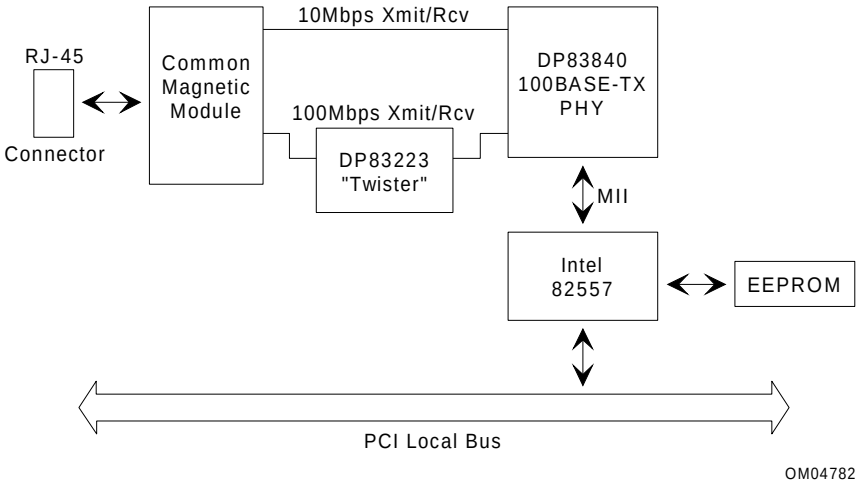

Figure 3. Functional Block Diagram of LAN Subsystem

1.7.2 Intel 82557 LAN Controller

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

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

1.7.3 10/100 MBps Physical Layer Interface

The physical layer interface is implemented in two devices from National Semiconductor, the DP83840 and the DP83223. The DP83840 provides:

- Complete functionality necessary for the 10Base-T interface; directly drives the cable when in 10 MBps mode
- All functionality required for the 100Base-TX interface except for the NRZ to MLT3 encoding/decoding function, which is provided by the DP83223 Twister device
- Complete set of MII management registers for control and status reporting
- 802.3µ Auto-Negotiation for automatically establishing the best possible operating mode when connected to other 10Base-T or 100Base-TX devices, whether capable of half or full-duplex operation

1.7.4 EtherExpress PRO/100B PCI LAN Subsystem Software Description

The software provided with the LAN subsystem includes setup/diagnostic software (SETUP.EXE), a readme file viewer (README.EXE) and the following drivers:

Table 4. EtherExpress PRP/100B PCI Drivers

Driver	Description	Environment(s)
E100BODI.COM	Novell ODI	NetWare† DOS Client
E100BODI.SYS	Novell ODI	NetWare OS/2† Client
E100B.LAN	Novell ODI	NetWare 3.11 Server NetWare 3.12 Server NetWare 4.x Server NetWare NT Requester NetWare for OS/2
E100B.DOS	NDIS 2.0.1	Windows† for Workgroups 3.11 MS-DOS† LANMAN 2.1
E100B.OS2	NDIS 2.0.1	MS OS/2 1.3 IBM OS/2 2.11 IBM OS/2 Warp
E100B.SYS	NDIS 3.1	Windows 95 Windows NT 3.5x

1.8 SCSI Subsystem

The onboard SCSI subsystem features the Adaptec AIC-7880, which contains a double-speed SCSI controller and a PCI bus master interface in a 160-pin PQFP. The AIC-7880 supports the following:

- 8- or 16-bit fast SCSI providing 10 MB per second or 20 MB per second throughput, or
- Double-speed SCSI that can burst data at 20 MB per second or 40 MB per second

As a PCI bus master, the AIC-7880 supports burst data transfers on the PCI bus up to the maximum rate of 133 MB per second using the on-chip 256-byte FIFO.

1.8.1 SCSI Interface

The AIC 7880 also offers active negation outputs and a disk activity output signal. Active negation outputs reduce the chance of data errors by actively driving both polarities of the SCSI bus, avoiding indeterminate voltage levels and common-mode noise on long cable runs. The SCSI output drivers can directly drive a 48 mA single-ended SCSI bus with no additional drivers. Synchronous SCSI can handle up to 15 REQ control signals simultaneously.

1.8.2 SCSI Bus

The SCSI data bus is 8- or 16-bits wide with odd ECC generated per byte. SCSI control signals are the same for either bus width. The motherboard has an onboard SCSI connector that supports 8- or 16-bit devices. On a 16-bit wide SCSI bus, the AIC-7880 assigns the highest arbitration priority to the low byte of the 16-bit word. This way, 16-bit targets can be mixed with 8-bit targets if the 8-bit devices are placed on the low data byte. During chip powerdown, all inputs are disabled to reduce power consumption.

1.8.2.1 SCSI Bus Topology

The following diagram shows how the SCSI bus is implemented.

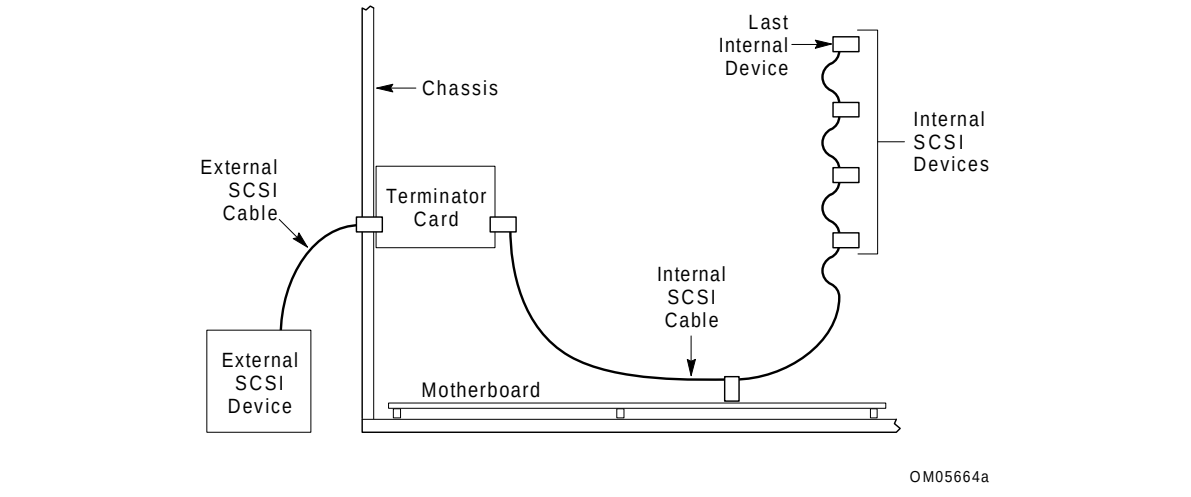

Figure 4. SCSI Bus Topology

From end to end, the SCSI bus cable is routed from the last internal SCSI device to each internal device. From the last internal device, the cable connects to the motherboard, where the SCSI controller resides. The cable can then continue to an optional terminator card installed in an unused I/O slot of the chassis. From the terminator card, an optional external SCSI cable can be used to connect external SCSI devices.

1.8.3 SCSI Cable

For proper operation of ultra/wide SCSI devices, the overall length of the SCSI cable from the **last internal device** to the **last external device** should not exceed three meters (within constraints as defined by ANSI SCSI-3 Specification). The recommended length for the internal SCSI cable (from the last internal device to the terminator card) is 42 inches. For more information, see the ANSI SCSI-3 Specification.

1.8.4 SCSI Bus Termination

Terminate the extreme ends of the SCSI bus (cable), typically by connecting a terminated device to the end connectors of the cable:

- On the last connector of the internal cable (farthest from the motherboard), attach either a terminated 16-bit device or some other type of 16-bit termination (see Note).
- If the internal cable ends at the motherboard, enable motherboard termination in the SCSI BIOS (on bootup press <Ctrl><A> to enter the SCSI*Select*† utility).
- If the internal cable continues from the motherboard to a termination card, disable motherboard termination in the SCSI BIOS (using SCSI*Select*). The terminator card provides the end termination, unless you attach an external cable.
- If an external SCSI cable is attached to the terminator card, its termination is disabled automatically. On the last connector of the external cable, attach either a terminated 16-bit device or some other type of 16-bit termination (see Note).

Disable termination on all other SCSI devices attached to the cable (except the devices attached to the extreme ends).

NOTE

A 68-pin connector on the motherboard supports 8-bit and wide 16-bit SCSI devices. Eight-bit devices require a 68- to 50-pin adapter. In general, if you use an 8-bit device to terminate the SCSI bus, you must attach it using a 68-to-50-pin SCSI adapter with high-byte termination, so that all 16 data bits are terminated.

1.8.4.1 Using Only 16-bit SCSI Devices

- Enable termination only on the device(s) attached to the last connector (internal and/or external).
- Remove or disable termination on all devices that are not on the last connector of the cable(s).

1.8.4.2 Mixing 8-and 16-bit SCSI Devices

- When mixing 8- and 16-bit devices, each 8-bit device must have a 68-to-50 pin adapter.
- Enable termination only on the device(s) attached to the last connector (internal and/or external). If you use an 8-bit device to provide termination, attach it using a 68-to-50-pin SCSI adapter with high-byte termination, so that all 16 data bits are terminated.
- Remove or disable termination on all devices that are not on the last connector of the cable(s).

1.8.4.3 Using Only 8-bit SCSI Devices

- Enable termination only on the device(s) attached to the last connector (internal and/or external). Attach the 8-bit device to provide termination using a 68-to-50-pin SCSI adapter with high-byte termination, so that all 16 data bits are terminated.
- Remove or disable termination on all devices that are not the last device on the cable(s).

NOTE

Examine the gender and polarities of connectors, adapters, and terminators to assure proper termination and connection to the low or high byte of the bus.

1.8.5 SCSI*Select* and SCSI Disk Utilities

See Section 4.0.

1.9 Audio Subsystem

The motherboard features a 16-bit stereo audio subsystem. The audio subsystem is based upon the Sound Blaster† compatible Crystal CS4236 multimedia codec. The CS4236 provides the digital audio and analog mixing functions required for playing and recording audio on personal computers including:

- Stereo analog-to-digital and digital-to-analog converters
- Analog mixing, anti-aliasing and reconstruction filters
- Line and microphone level inputs
- Digital audio compression using selectable A-law or μlaw rules
- Full digital control of all mixer and volume control functions

With the integrated Sound Blaster OPL3 compatible FM synthesizer, the CS4236 also provides support for four major sound standards including Adlib and Sound Blaster Pro 2.0, Windows Sound System and MPU-401 to meet all of the requirements of today's multimedia applications. The CS4236 also supports full-duplex operation to support future applications such as video conferencing.

The CS4236 includes a Plug and Play ISA interface and comprises six logical devices including:

- Synthesizer
- MIDI/Game Port
- Sound Blaster
- Microsoft† Sound System
- MPU-401
- CS4236 device

Each logical device is configured into the host environment using ISA Plug and Play configuration. The audio subsystem requires two interrupts and up to two DMA channels. The system can be configured to use either DMA channels 0, 1, or 3. The interrupt can be mapped to interrupt 5, 7, 9, 10, 11, or 15.

1.10 Management Extension Hardware

The Management Extension hardware provides low-cost instrumentation capabilities. The hardware implementation is a single-chip ASIC. Features include the following:

- An integrated temperature sensor for internal chassis temperature
- Three fan-speed sensors
- Power supply voltage monitoring to detect levels above or below acceptable values
- Registers for storing power on self test (POST) hardware test results and error codes
- Optical sensor for detection of physical intrusion (such as when the chassis lid has been removed) even when the power is off (this feature is chassis dependent)
- 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, Windows 95, and Windows† 3.1

When an out-of-range condition (temperature, fan speed, or voltage) is reached, a System Management Interrupt (SMI) is activated. The Management Extension circuitry connects to the ISA bus as an 8-bit I/O mapped device and uses these I/O addresses:

Address (hex)	Description
80h	Monitors and stores POST codes
85h	Address and control functions
86h	Register read/write operations

1.11 Motherboard Connectors

Figure 5 shows the connectors on the motherboard. Following figure 5 are the pins and signal names for each connector. For front panel connectors, see section 1.12. For back panel connectors, see section 1.13.

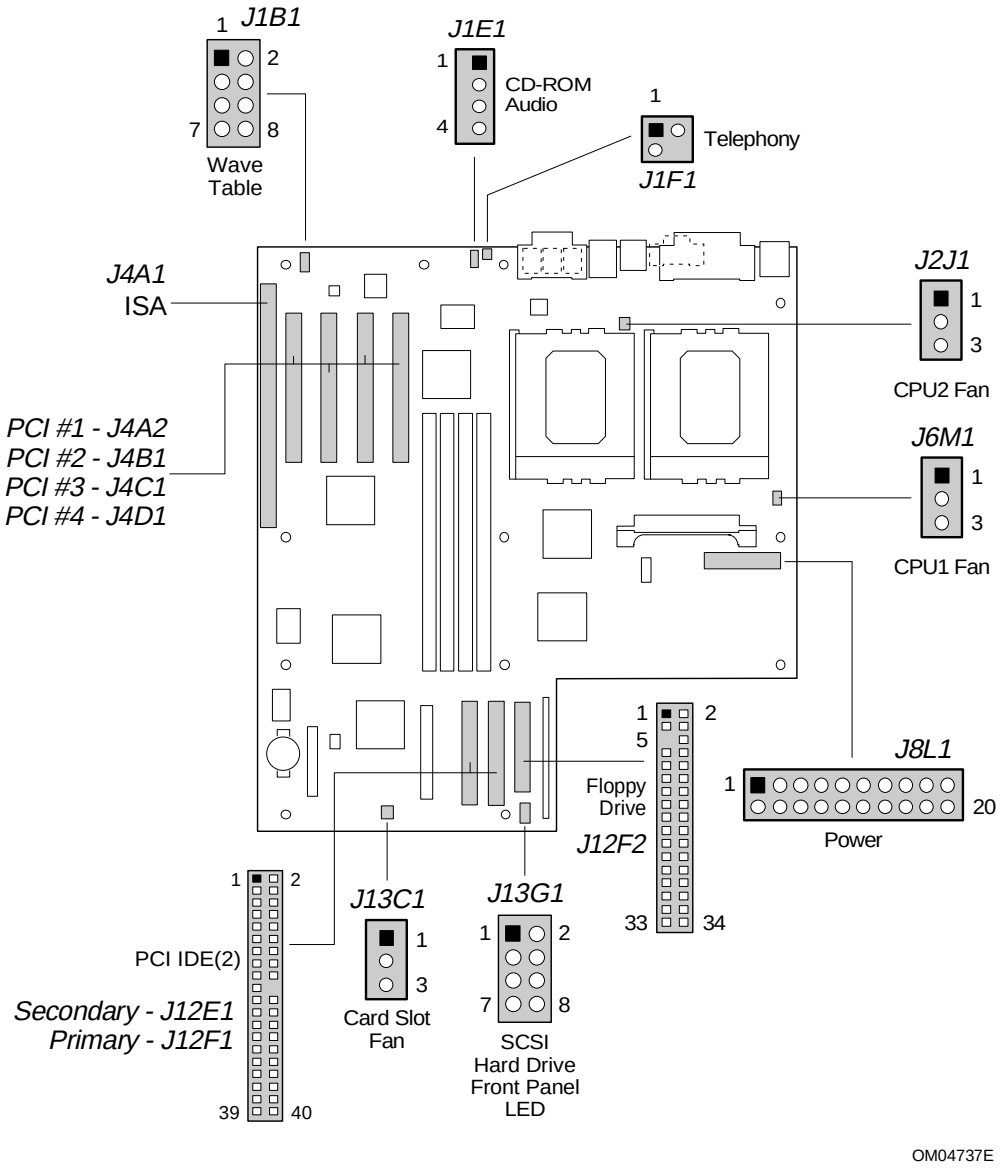

Figure 5. Motherboard Connectors

continued ☛

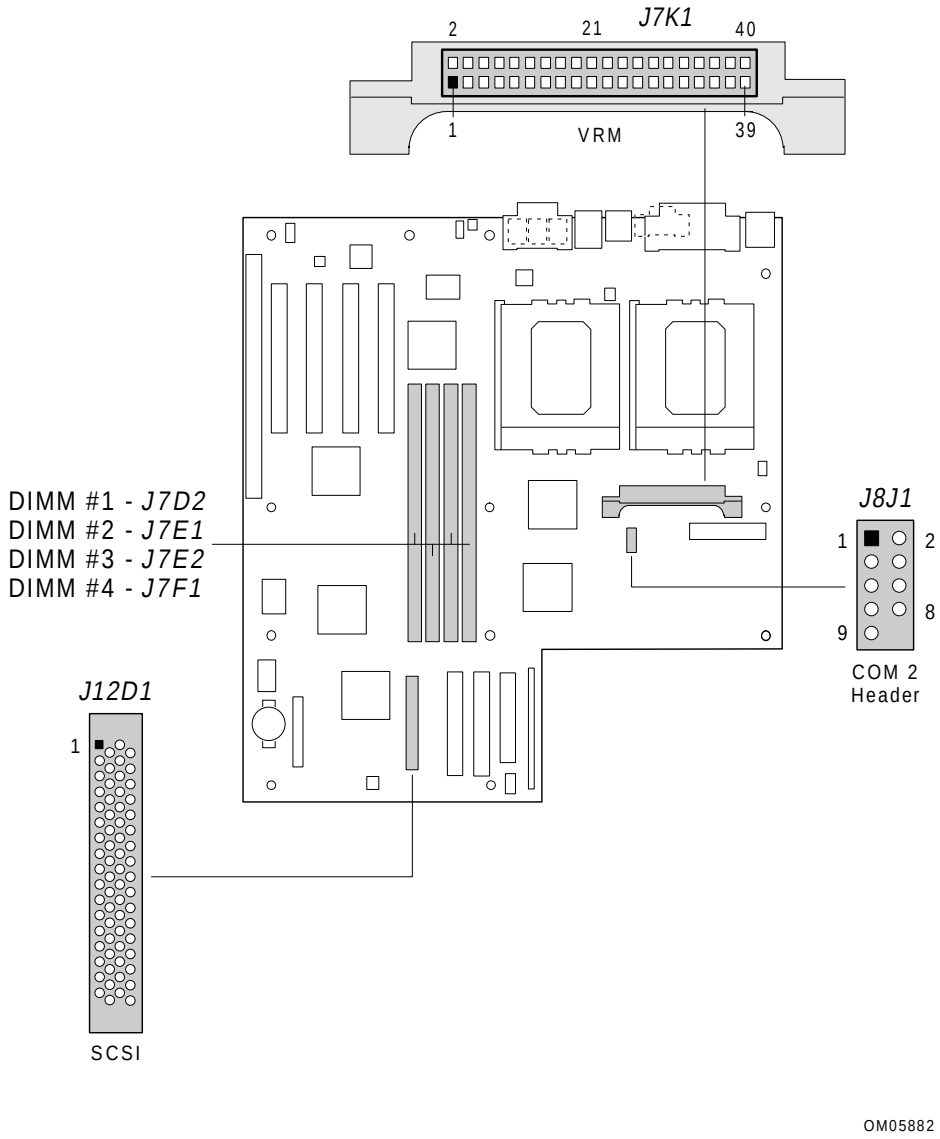

Figure 5. Motherboard Connectors (continued)

1.11.1 CD-ROM Connector - J1E1

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

1.11.2 Wavetable Connector - J1B1

Pin	Signal Name
1	Wave Right
2	Ground
3	Wave Left
4	Ground
5	Key
6	Ground
7	N/C
8	MIDI-Out

1.11.3 Telephony Connector - J1F1

Pin	Signal Name
1	Ground
2	Mono Out
3	Mic In
4	Key

1.11.4 Power Connector - J8L1

When used with a power supply that supports Remote On/Off, the motherboard can turn off the system power under software control. The BIOS turns the computer power off when it receives the proper APM command from the operating system. For example, Windows 95 issues an APM command when the user selects the Shutdown the Computer option. APM must be enabled in the BIOS and the operating system in order for Soft Off to work correctly. APM determines the status of the power supply system responses. For example, if the power is disconnected and computer is switched on, the computer's response is to either turn back on when power is reapplied or remain off. The response is predetermined by the configuration in Setup. Also see 1.12.1.4 Remote On/Off and Soft Power Support.

Pin	Signal Name	Pin	Signal Name
1	+3.3V	11	+3.3V
2	+3.3V	12	-12V
3	Ground	13	Ground
4	+5V	14	PS-ON
5	Ground	15	Ground
6	+5V	16	Ground
7	Ground	17	Ground
8	PW-OK	18	-5V
9	+5VSB	19	+5
10	+12V	20	+5V

1.11.5 Floppy Drive Connector - J12F2

Pin	Signal Name	Pin	Signal Name
1	Ground	2	DENSEL
3	Ground	4	Reserved
5	Key	6	FDEDIN
7	Ground	8	Index#
9	Ground	10	Motor Enable A#
11	Ground	12	Drive Select B#
13	Ground	14	Drive Select A#
15	Ground	16	Motor Enable B#
17	MSEN1	18	DIR#
19	Ground	20	STEP#
21	Ground	22	Write Data#
23	Ground	24	Write Gate#
25	Ground	26	Track 00#
27	MSEN0	28	Write Protect#
29	Ground	30	Read Data#
31	Ground	32	Side 1 Select#
33	Ground	34	Diskette Change#

1.11.6 IDE Connectors - J12E1, J12F1

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	IRQ14 (IRQ15)	32	Reserved

continued ☛

IDE Connectors (continued)

Pin	Signal Name	Pin	Signal Name
33	Addr 1	34	Reserved
35	Addr 0	36	Addr 2
37	Chip Select 1P# [Chip Select 1S#]	38	Chip Select 3P# [Chip Select 3S#]
39	Activity#	40	Ground

[ ] Indicates secondary IDE connector

1.11.7 ISA Connectors - J4A1

Pin	Signal Name	Pin	Signal Name
B1	GND	A1	IOCHK#
B2	RSTDRV	A2	SD7
B3	Vcc	A3	SD6
B4	IRQ9	A4	SD5
B5	-5 V	A5	SD4
B6	DRQ2	A6	SD3
B7	-12 V	A7	SD2
B8	0WS#	A8	SD1
B9	+12 V	A9	SD0
B10	GND	A10	IOCHRDY
B11	SMEMW#	A11	AEN
B12	SMEMR#	A12	SA19
B13	IOW#	A13	SA18
B14	IOR#	A14	SA17
B15	DACK3#	A15	SA16
B16	DRQ3	A16	SA15
B17	DACK1#	A17	SA14
B18	DRQ1	A18	SA13
B19	REFRESH#	A19	SA12
B20	SYSCLK	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

continued ☛

ISA Connectors J4A1 (continued)

Pin	Signal Name	Pin	Signal Name
B29	Vcc	A29	SA2
B30	OSC	A30	SA1
B31	GND	A31	SA0
KEY		KEY	
D1	MEMCS16#	C1	SBHE#
D2	IOCS16#	C2	LA23
D3	IRQ10	C3	LA22
D4	IRQ11	C4	LA21
D5	IRQ12	C5	LA20
D6	IRQ15	C6	LA19
D7	IRQ14	C7	LA18
D8	DACK0#	C8	LA17
D9	DRQ0	C9	MEMR#
D10	DACK5#	C10	MEMW#
D11	DRQ5	C11	SD8
D12	DACK6#	C12	SD9
D13	DRQ6	C13	SD10
D14	DACK7#	C14	SD11
D15	DRQ7	C15	SD12
D16	Vcc	C16	SD13
D17	Master#	C17	SD14
D18	GND	C18	SD15

1.11.8 PCI Connectors - J4A2, J4B1, J4C1, J4D1

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
A1	TRST#*	B1	-12 V	A32	AD16	B32	AD17
A2	+12 V	B2	TCK	A33	3.3 V	B33	CBE2#
A3	TMS (TMS)**	B3	GND	A34	FRAME#	B34	GND
A4	TDI**	B4	TDO (NC)	A35	GND	B35	IRDY#
A5	Vcc	B5	Vcc	A36	TRDY#	B36	3.3 V
A6	INTA# [INT1]	B6	Vcc	A37	GND	B37	DEVSEL#
A7	INTC# [INT3]	B7	INTB# [INT2]	A38	STOP#	B38	GND
A8	Vcc	B8	INTD# [INT4]	A39	3.3 V	B39	LOCK#
A9	Reserved	B9	Prsnt1#	A40	SDONE	B40	PERR#
A10	Vcc	B10	Reserved	A41	SBO#	B41	3.3 V
A11	Reserved	B11	Prsnt2#	A42	GND	B42	SERR#
A12	GND	B12	GND	A43	PAR	B43	3.3 V

continued ☛

PCI Connectors (continued)

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
A13	GND	B13	GND	A44	AD15	B44	CBE1#
A14	Reserved	B14	Reserved	A45	3.3 V	B45	AD14
A15	RST#	B15	GND	A46	AD13	B46	GND
A16	Vcc	B16	CLK	A47	AD11	B47	AD12
A17	GNT#	B17	GND	A48	GND	B48	AD10
A18	GND	B18	REQ#	A49	AD9	B49	GND
A19	Reserved	B19	Vcc	A50	KEY	B50	KEY
A20	AD30	B20	AD31	A51	KEY	B51	KEY
A21	3.3 V	B21	AD29	A52	CBEO#	B52	AD8
A22	AD28	B22	GND	A53	3.3 V	B53	AD7
A23	AD26	B23	AD27	A54	AD6	B54	3.3 V
A24	GND	B24	AD25	A55	AD4	B55	AD5
A25	AD24	B25	3.3 V	A56	GND	B56	AD3
A26	IDSEL	B26	CBE3#	A57	AD2	B57	GND
A27	3.3 V	B27	AD23	A58	AD0	B58	AD1
A28	AD22	B28	GND	A59	Vcc	B59	Vcc
A29	AD20	B29	AD21	A60	REQ64#	B60	ACK64#
A30	GND	B30	AD19	A61	Vcc	B61	Vcc
A31	AD18	B31	3.3 V	A62	Vcc	B62	Vcc

* Pulled down to a logic low.

** Pulled up to a logic high.

NOTE

The shared PCI slot (J4A2) does not support bus mastering.

1.11.9 Primary Processor Fan Connector - J6M1

Pin	Signal Name
1	GND
2	+12 V
3	P60_FAN (fan tachometer)

1.11.10 Secondary Processor Fan Connector - J2J1

Pin	Signal Name
1	GND
2	+12 V
3	P61_FAN (fan tachometer)

1.11.11 Card Slot Fan Connector - J13C1

Pin	Signal Name
1	GND
2	+12 V
3	SLOT_FAN (fan tachometer)

1.11.12 SCSI Hard Drive Front Panel LED Connector LED - J13G1

Pin	Signal Name*	Pin	Signal Name*
1	No connect	2	No connect
3	HDACT#	4	HDACT#
5	HDACT#	6	HDACT#
7	No connect	8	No connect

* The signals in this table are all input signals

1.11.13 VRM Connector - J7K1

Pin	Signal Name (Row A)	Pin	Signal Name (Row B)
1	Vcc	2	Vcc
3	Vcc	4	Vcc
5	Vcc	6	Vcc
7	+12 V in	8	+12 Vin
9	Reserved	10	Reserved
11	Reserved	12	OUTEN
13	VID0	14	VID1
15	VID2	16	VID3
17	UP#	18	PWRGD
19	Vccp	20	Vss
21	Vss	22	Vccp
23	Vccp	24	Vss
25	Vss	26	Vccp
27	Vccp	28	Vss
29	Vss	30	Vccp
31	Vccp	32	Vss
33	Vss	34	Vccp
35	Vccp	36	Vss
37	Vss	38	Vccp
39	Vccp	40	Vss

1.11.14 Serial Port 2 Header - J8J1

Pin	Signal Name
1	DCD#
2	DSR#
3	SIN#
4	RTS#
5	SOUT#
6	CTS#
7	DTR#
8	RI
9	GND
10	Key

1.11.15 SCSI Connector - J12D1

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
1	GND	19	N/C	37	SCSI_D14	55	SCSI_ATN#
2	GND	20	GND	38	SCSI_D15	56	GND
3	GND	21	GND	39	SCSI_DPH#	57	SCSI_BSY#
4	GND	22	GND	40	SCSI_D0	58	SCSI_ACK#
5	GND	23	GND	41	SCSI_D1	59	SCSI_RST#
6	GND	24	GND	42	SCSI_D2	60	SCSI_MSG#
7	GND	25	GND	43	SCSI_D3	61	SCSI_SEL#
8	GND	26	GND	44	SCSI_D4	62	SCSI_CD#
9	GND	27	GND	45	SCSI_D5	63	SCSI_REQ
10	GND	28	GND	46	SCSI_D6	64	SCSI_IO#
11	GND	29	GND	47	SCSI_D7	65	SCSI_D8
12	GND	30	GND	48	SCSI_DPL#	66	SCSI_D9
13	GND	31	GND	49	GND	67	SCSI_D10
14	GND	32	GND	50	GND	68	SCSI_D11
15	GND	33	GND	51	TERM_PWR		
16	GND	34	GND	52	TERM_PWR		
17	TERM_PWR	35	SCSI_D12	53	N/C		
18	TERM_PWR	36	SCSI_D13	54	GND		

1.12 Front Panel Connectors

The motherboard has header connectors to support controls and indicators typically located on the chassis bezel including:

- Power switch
- Power LED
- Sleep switch
- Hard drive activity LED
- Reset switch
- Speaker

Figure 6 shows the location of the front panel connectors on the motherboard. Following figure 6 are the pins and signal names for each connector.

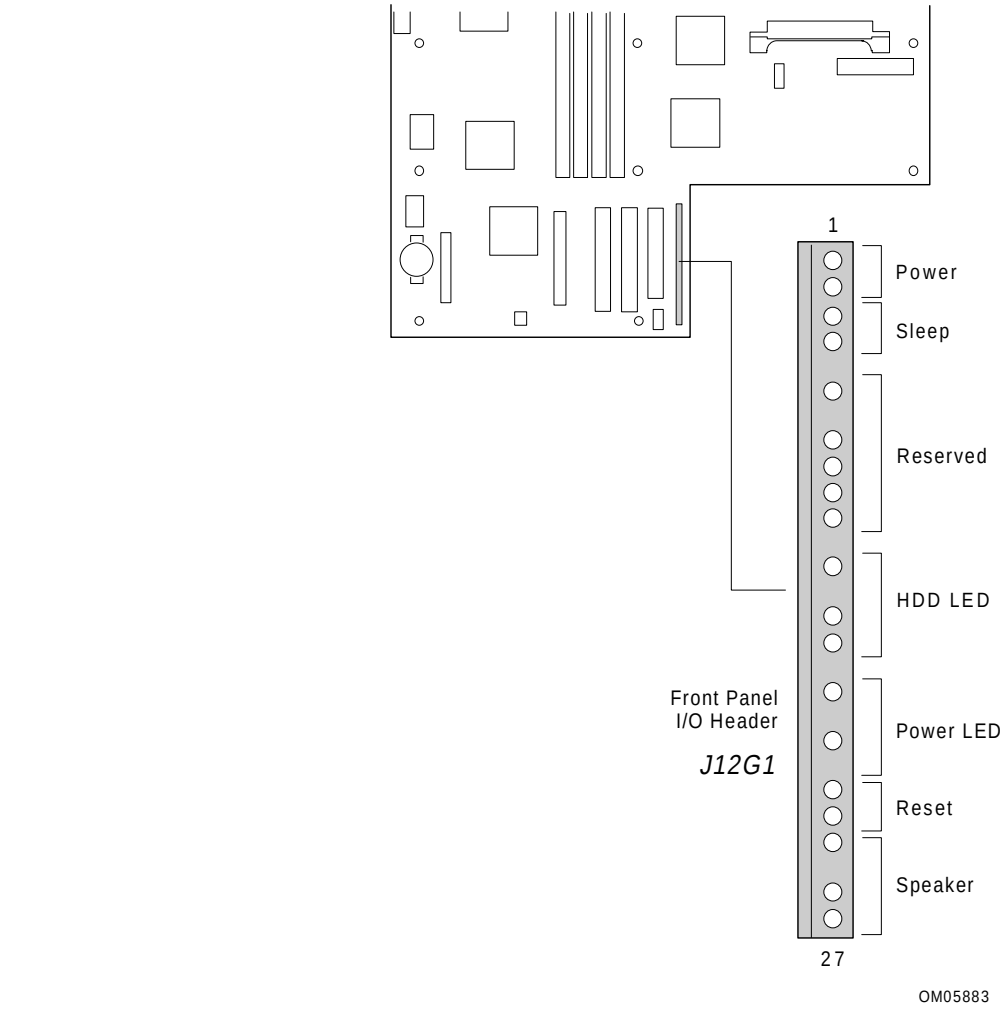

Figure 6. Front Panel Connectors

1.12.1 Front Panel Connectors - J12G1

Pin	Signal Name	Pin	Signal Name
1	Power On (SW_ON)	15	HD ACTIVE#
2	Power Return	16	+5V
3	Sleep Req	17	Key
4	+5V (Sleep Driver)	18	Ground
5	Key	19	Key
6	+5V	20	+5V (LED_PWR)
7	Key	21	Key
8	Reserved	22	Ground
9	Ground	23	Reset
10	Reserved	24	Ground
11	Reserved	25	Key
12	Key	26	SPKR_DATA onboard
13	+5V	27	SPKR_DATA out
14	Key		

1.12.1.1 System 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.

1.12.1.2 Speaker

The external speaker provides error beep code information during the Power-On Self Test, if the system cannot use the video interface.

1.12.1.3 Sleep / Resume

When advanced power management (APM) is activated in the system BIOS and the Operating System's APM driver is loaded, the system can enter Sleep (Standby) in one of three ways:

- Optional front panel Sleep/Resume button
- Hot key (defined in Setup), or mouse button (if mouse driver loaded)
- Prolonged system inactivity; the default is 10 minutes and can be changed in Setup

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

Closing the Sleep switch generates an SMI (System Management Interrupt) 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 incoming FAX) even though the monitor turns on only if a keyboard or mouse interrupt occurs. To reactivate the system, or "Resume," you must press the sleep / resume button again, or use the keyboard or PS/2 mouse.

1.12.1.4 Remote On/Off and Soft Power Support

For power supplies that support the Remote On/Off feature, pins 1 and 2 of the front panel connectors (see Figure 6, pins 1 and 2 of J12G1) should be connected to the system power On/Off switch. The power On/Off button should be a momentary SPST switch that is normally open. The power supply control signal (SW_ON) is supported by the primary power connector. Traditional power supplies with mechanical On/Off switches that do not support Remote On/Off or Soft Off by-pass this circuit.

After turning the system on by pushing the power On/Off button, the motherboard (with a power supply that supports Remote On/Off) can be turned off from one of two sources:

- Front panel power On/Off switch
- Soft Off signal (coming from the I/O controller)

Soft Off signal can be controlled by the operating system. In Soft Off, an APM command issued to the system BIOS causes the power supply to turn off with the SW_ON control signal on the power connector.

1.13 Back Panel I/O Connectors

The motherboard has PS/2 style keyboard and mouse connectors, two USB connectors, one RJ-45 LAN connector, one serial port connector, one parallel port connector, one MIDI/Gameport connector, and Line In, Line Out, and Mic In audio jacks. Figure 7 shows the location of the connectors.

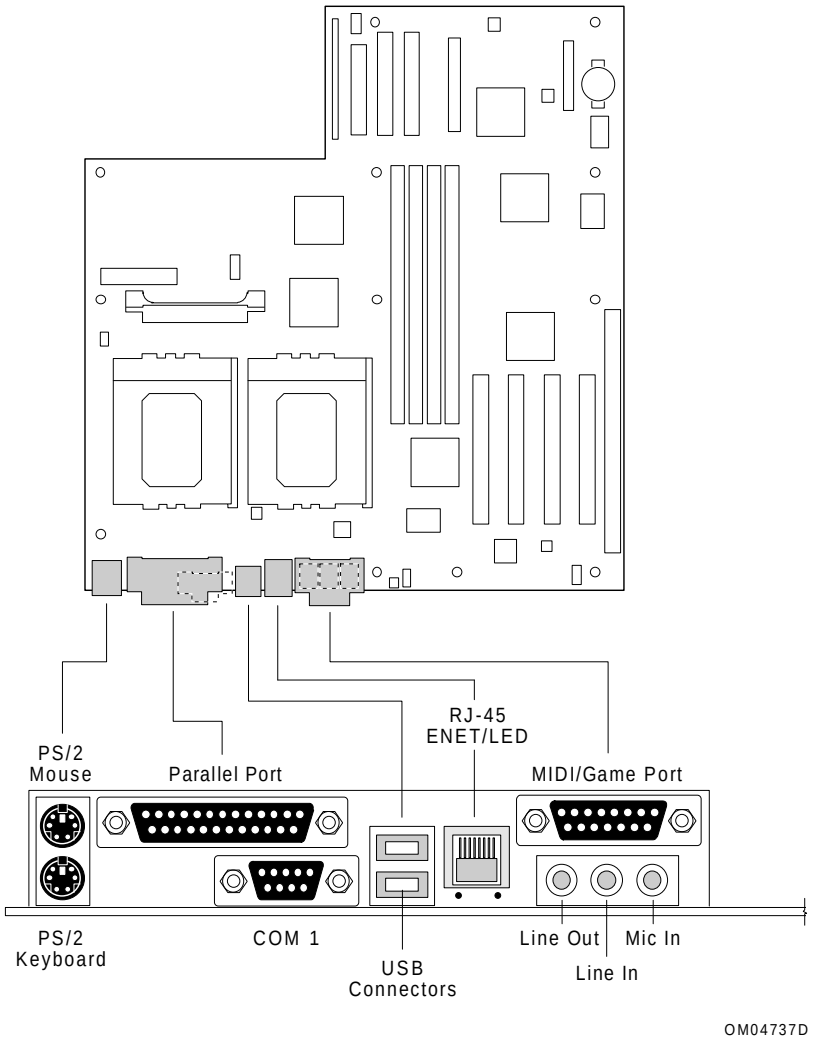

Figure 7. Back Panel I/O Connectors

1.14 Jumper Settings

Figure 8 shows the location of jumper blocks on the motherboard.

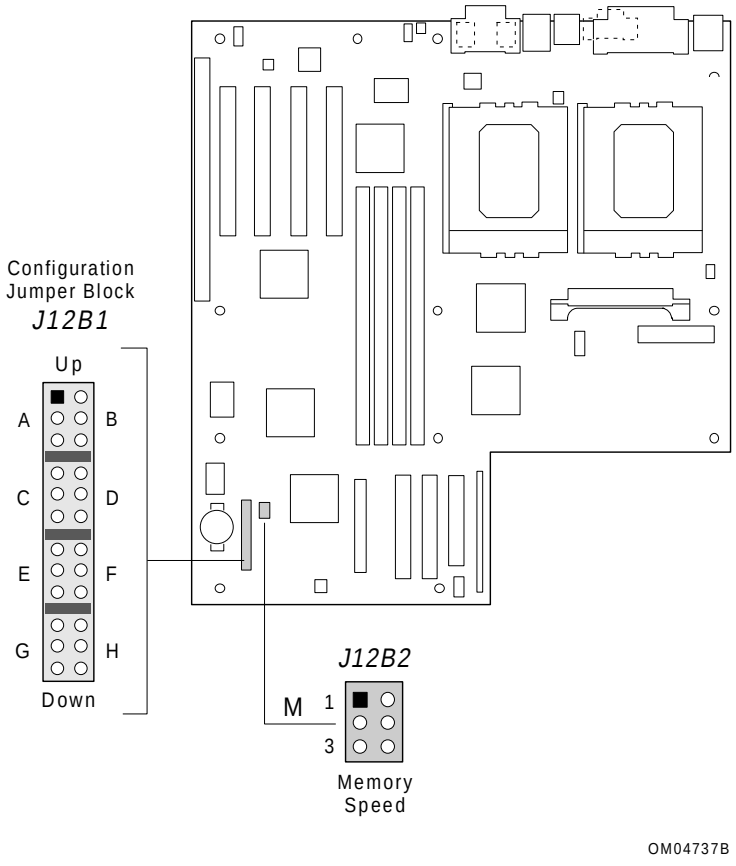

Figure 8. Jumper Block Locations

Table 5. Configuration Jumpers

Function	Jumper Block	Jumper Setting	
Setup access	J12B1-A	Down Up	Access allowed **(Default)** Access denied
Flash mode	J12B1-B	Down Up	Normal **(Default)** Recover
CMOS settings	J12B1-C	Down Up	Keep **(Default)** Clear
Password	J12B1-D	Down Up	Password enabled **(Default)** Password clear / function disabled
Processor clock speed	J12B1-E through J12B1-H	See Table 6	
DIMM speed	J12B2-M	See Table 7	

1.14.1 Setup Access (J12B1-A)

You can disable access to Setup by moving this jumper from the down position to the up position. Default access is the down position (access allowed).

1.14.2 Flash Mode (J12B1-B)

You can recover Flash mode by moving the jumper from the down position to the up position. The default for Flash mode is the down position (normal). For additional information, See Section 3.

1.14.3 CMOS Settings (J12B1-C)

You can reset the CMOS RAM to default values by moving the jumper from the down position to the up position and turning the system on. Use this procedure only if you update the system BIOS. To restore normal operation, wait until the system reports “NVRAM cleared by jumper,” then turn the system off, and the return the jumper to the down position. Default is the down position (keep).

1.14.4 Password (J12B1-D)

You can clear the system password by moving the jumper from the down position to the up position and turning the system on. Use this procedure only if you have forgotten the user password. To restore the system to normal operation, turn the system off and return the jumper to the down position.

The password function is effectively disabled if this jumper is in the up position. Default is the down position (password enabled).

1.14.5 Processor Clock Speed (J12B1-E, F, G, and H)

The motherboard supports 180 MHz and 200 MHz Pentium Pro processors. Table 6 shows jumper settings for processor speed. These jumpers also affect the host bus, PCI, and ISA clock frequencies.

Table 6. Jumpers for Processor / System Speed

Processor Frequency (MHz)	Host Bus Frequency (MHz)	PCI Bus Frequency (MHz)	ISA Bus Frequency (MHz)	Settings	
180	60	30	7.5	E - Down G - Down	F - Up H - Down
200	66	33	8.33	E - Down G - Down	F- Down H - Down

1.14.6 DIMM Speed (J12B1-M)

The motherboard supports two DIMM speeds: 50 ns and 60 ns. Installed DIMMs must be the same speed. If you install a 50 ns DIMM in one socket and a 60 ns DIMM in another, both modules will operate at the slower speed. Table 7 shows the jumper settings for memory speed.

CAUTION

The jumper on pins 4-5 (block J12B2-M) is reserved. Do not change it.

Table 7. Jumpers for DIMM Speed

Memory Speed	Jumper Block	Setting
50 ns	J12B2-M	Up (pins 1-2)
60 ns	J12B2-M	Down (pins 2-3) **(Default)**

1.15 Reliability

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

Motherboard 56,755 Hours

1.16 Environmental

Table 8. Motherboard Environmental Specifications

Parameter	Specification
Temperature	
Non-Operating	-40°C to +70°C
Operating	+0°C to +55°C
DC Voltage	
+5 V	±5 %
-5 V	±5 %
-12 V	±5 %
+3.3V	±3 %
Vibration	
Unpackaged	5 Hz to 20 Hz : 0.01g² Hz sloping up to 0.02 g² Hz
	20 Hz to 500 Hz : 0.02g² Hz (flat)
Packaged	10 Hz to 40 Hz : 0.015g² Hz (flat)
	40 Hz to 500 Hz : 0.015g² Hz sloping down to 0.00015 g² Hz

1.17 Power Consumption

Tables 9 and 10 list the voltage and current specifications for a hypothetical system configured with the motherboard and the following components: a 200 MHz Pentium Pro Processor, 64 MB RAM, 256 KB cache, 3.5-inch floppy drive, ATI† mach64† graphics card, a Seagate† 31230W hard drive, and Sony† CDU76S 4X CD-ROM. This information is preliminary and is provided only as a guide for calculating **approximate** total system power usage with additional resources added. For Windows 95, the SCSI was replaced with a 1.6GB WD 31600 IDE hard drive.

Table 9. DC Voltage

DC Voltage	Acceptable Tolerance
+5 VDC	± 5%
+5 VDC SB (Stand By)	± 5%
-5 VDC	± 5%
+12 VDC	± 5%
-12 VDC	± 5%
+3.3 VDC	± 3%

Table 10. Power Usage

		DC (amps)				
	AC (watts)	**+5 V**	**-5 V**	**+12 V**	**-12V**	**+3.3 V**
Windows NT UP	70	7.02	0	0.28	0	0.38
Windows NT DP	104	11.04	0	0.46	0	0.38
Windows 95 UP	70	7.02	0	0.28	0	0.38
Windows 95 UP (Sleep)	37	N/A	N/A	N/A	N/A	N/A

1.17.1 Power Supply Considerations

The PR440FX is designed to operate with a minimum of 200 W ATX power supply for typical configurations and higher wattage supplies for heavily loaded configurations.

- Rise time for power supply - 2 ms to 20 ms
- Minimum delay from RESET to Powergood - 100 ms
- Minimum Powerdown warning - 1 ms
- The +3.3V output must reach its minimum regulation level within ±20 ms of the time the +5 V output reaches it minimum regulation level.

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 by 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 Marking: Consists of a marking on the board or shipping container.
- UL Recognition Mark: Consists of the UL File No. E139761 on the component side of the board and the PBA No. on the solder side of the board. Board material flammability is 94V-1 or -0.
- Canadian Compliance Mark: The mark consists of small c followed by a stylized backward UR on component side of board.

1.18.4 Use Only for Intended Applications

This product was evaluated for use in systems that are installed in offices, homes, schools, computer rooms or similar applications. Other applications, such as medical, industrial, alarm systems and test equipment may necessitate an evaluation of the product suitability.

2 Motherboard Resources

2.1 Memory Map

Table 11. Memory Map

Address Range (Decimal)	Address Range (hex)	Size	Description
1024K-524288K	100000-20000000	511M	Extended Memory
960K-1023K	F0000-FFFFF	64K	AMI System BIOS
944K-959K	EC000-EFFFF	16K	Boot Block
936K-943K	EA000-EBFFF	8K	ESCD* (Plug-N-Play configuration area)
932K-935K	E9000-E9FFF	4K	Reserved for BIOS
928K-931K	E8000-E8FFF	4K	OEM Logo Area
896K-927K	E0000-E7FFF	32K	BIOS Reserved
800-895K	C8000-DFFFF	96K	Available HI DOS memory (open to ISA and PCI** bus)
640K-799K	A0000-C7FFF	160K	Video memory and BIOS
639K	9FC00-9FFFF	1K	Extended BIOS Data (moveable by QEMM†, 386MAX†)
512K-638K	80000-9FBFF	127K	Extended conventional
0K-511K	00000-7FFFF	512K	Conventional

* Extended System Configuration Data

** Peripheral Component Interconnect

2.2 I/O Map

Table 12. I/O Map

Address (hex)	Size	Description	Address (hex)	Size	Description
0000 - 000F	16 bytes	PIIX3 - DMA 1	0330 - 0331	1 byte	MPU-401 (MIDI)
0020 - 0021	2 bytes	PIIX3 - Interrupt Controller 1	0376	1 byte	Sec Integrated Drive Electronics (IDE) Chan Cmd Port
002E - 002F	2 bytes	87308B Base Configuration	0377	1 byte	Sec IDE Chan Stat Port
0040 - 0043	4 bytes	PIIX3 - Timer 1	0378 - 037F	8 bytes	Parallel Port 1
0048 - 004B	4 bytes	PIIX3 - Timer 2	0388 - 038B	4 bytes	CS4236 Audio
0060	1 byte	Keyboard Controller Byte - Reset IRQ	03BC - 03BF	4 bytes	Parallel Port 3

continued ☛

Table 12. I/O Map (continued)

Address (hex)	Size	Description	Address (hex)	Size	Description
0061	1 byte	PIIX3 - NMI, speaker control	03E8 - 03EF	8 bytes	COM 3
0064	1 byte	Keyboard Controller, CMD/STAT Byte	03F0 - 03F5	6 bytes	Floppy Channel 1
0070, bit 7	1 bit	PIIX3 - Enable NMI	03F6	1 byte	Primary IDE Chan Cmd Port
0070, bits 6:0	7 bits	PIIX3 - Real Time Clock, Address	03F7 (Write)	1 byte	Floppy Chan 1 Cmd
0071	1 byte	PIIX3 - Real Time Clock, Data	03F7, bit 7	1 bit	Floppy Disk Chg Chan 1
0078	1 byte	Reserved - Board Configuration	03F7, bits 6:0	7 bits	Primary IDE Chan Status Port
0079	1 byte	Reserved - Board Configuration	03F8 - 03FF	8 bytes	COM1
0080 - 008F	16 bytes	PIIX3 - DMA Page Register	04D0 - 04D1	2 bytes	Edge/level triggered
00A0 - 00A1	2 bytes	PIIX3 - Interrupt Controller 2	LPT + 400h	8 bytes	Extended Capabilities Port (ECP) Port, LPT + 400h
00C0 - 00DE	31 bytes	PIIX3 - DMA 2	0608 - 060B	4 bytes	CS4236 Audio
00F0	1 byte	Reset Numeric Error	0CF8*	1 byte	PCI Configuration Address Register
0170 - 0177	8 bytes	Secondary IDE Channel	0CF9	1 byte	Turbo & Reset Control Registers
01F0 - 01F7	8 bytes	Primary IDE Channel	0CFC-0CFF*	4 bytes	PCI Config Data Register
0200 - 0207	8 bytes	Game Port	FF00 - FF07	8 bytes	IDE Bus Master Register
0220-022F	8 bytes	CS4236 Audio	FFA0 - FFA7	8 bytes	IDE Primary Channel
0278 - 027B	4 bytes	LPT	FFA8 - FFAF	8 bytes	IDE Secondary channel
0290 - 0297	8 bytes	Hardware Monitor ASIC	0FF0-0FF7	4 bytes	CS4236 Audio
02F8 - 02FF	8 bytes	COM2			

* Only by DWORD accesses.

2.3 PCI Configuration Space Map

Table 13. PCI Configuration Space Map

Bus Number (hex)	Dev Number (hex)	Function Number (hex)	Description
00	00	00	Intel 82440FX
00	07	00	Intel 82371FB (PIIX3) PCI/ISA bridge
00	07	01	Intel 82371FB (PIIX3) IDE Bus Master
00	07	02	Intel 823871FB (PIIX3) USB
00	06	00	Intel 82557 Ethernet Controller
00	09	00	AIC 7880 Adaptec SCSI Controller
00	0B	00	PCI Expansion Slot: J4D1
00	0F	00	PCI Expansion Slot: J4C1
00	11	00	PCI Expansion Slot: J4B1
00	13	00	PCI Expansion Slot: J4A2 (no bus mastering)

2.4 DMA Channels

Table 14. DMA Channels

DMA	Data Width	System Resource
0	8- or 16-bits	Available
1	8- or 16-bits	Parallel Port
2	8- or 16-bits	Floppy
3	8- or 16-bits	Parallel Port (for ECP*/EPP** Configuration)
4		Reserved - Cascade channel
5	16-bits	Available
6	16-bits	Available
7	16-bits	Available

* Extended Capabilities Port

** Enhanced Parallel Port

2.5 Interrupts

Table 15. 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	LAN*
4	Share COM1, COM2*
5	Audio 1*
6	Floppy
7	LPT1*
8	Real Time Clock
9	Audio 2*
10	USB*
11	SCSI*
12	Onboard Mouse Port if present
13	Reserved, Math Coprocessor
14	Primary IDE if present, else user available
15	Secondary IDE if present, else user available

* Typical Configuration (Plug and Play determined)

NOTE

For some operating systems, the IRQ mapping feature in Setup makes more than fifteen PCI IRQs available for PCI devices in the computer (see section 3.14.8.7).

3 Motherboard BIOS and Setup Utility

3.1 Introduction

The motherboard uses an AMI BIOS, which is stored in Flash EEPROM and easily upgraded using a floppy disk-based program. In addition to the BIOS, the Flash EEPROM also contains Setup, Power-On Self Tests (POST), APM 1.2, the Peripheral Component Interconnect (PCI) auto-configuration utility, and Plug and Play utilities. The motherboard also supports 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.DI0.

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 AMI BIOS Technical Reference* published by AMI. Both manuals are available at most technical bookstores.

3.2 BIOS Flash Memory Organization

The Intel PA28FB002BX 2 Mb Flash component is organized as 256K x 8 (256 KB). The Flash device is divided into seven areas, as described in the table below.

Table 16. Flash Memory Organization

System Address		FLASH Memory Area
FFFF0000h	FFFFFFFFh	64 KB Main BIOS
FFFEC000h	FFFEFFFFh	16 KB Boot block (Not FLASH erasable)
FFFEA000h	FFFEBFFFh	8 KB ESCD Area (Plug-N-Play data storage area)
FFFE9000h	FFFE9FFFh	4 KB Reserved for BIOS (DMI GPM Varea)
FFFE8000h	FFFE8FFFh	4 KB OEM Logo Area
FFFE0000h	FFFE7FFFh	32 KB Reserved for BIOS
FFFD0000h	FFFDFFFFh	64 KB Reserved for BIOS
FFFC0000h	FFFCFFFFh	64 KB Reserved for BIOS

3.3 Secure Flash

PR440FX Flash ROM is hardware protected to circumvent BIOS corruption due to viruses.

3.4 BIOS Upgrades

Flash memory makes distributing BIOS upgrades easy. A new version of the BIOS can be installed from a diskette. BIOS upgrades are available from Intel's FTP site: ftp.intel.com/pub/bios.

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

- The Flash BIOS can be updated from a file on a disk.
- The current BIOS code can be copied from the Flash EEPROM to a disk file as a backup in the event that an upgrade cannot be successfully completed.
- The BIOS in the Flash device can be compared with a file to ensure the motherboard 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.

3.5 PCI IDE Support

The BIOS automatically sets up two local bus IDE (Integrated Drive Electronics) connectors with independent I/O channel support if you select Auto-configuration in Setup. The IDE interface supports Programmed Input/Output (PIO) Mode 3 and Mode 4 hard drives, and recognizes ATAPI CD-ROMs, tape drives, and any other ATAPI devices. The BIOS determines the capabilities of each drive and configures them to optimize capacity and performance. For the high-capacity hard drives typically available, the drive is automatically configured for Logical Block Addressing (LBA) for maximum capacity and to PIO Mode 3 or 4 depending on the capability of the drive. You can override the auto-configuration options by using the manual mode setting. The ATAPI Specification Revision 2.5 recommends that an ATAPI device be configured as shown in the table below.

Table 17. Recommendations for Configuring an ATAPI Device

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

3.6 PCI Auto-configuration

The PCI auto-configuration utility operates in conjunction with Setup to allow inserting and removing of PCI cards without user configuration (Plug and Play). When the system is turned on after you add a PCI add-in card, the BIOS automatically configures interrupts, I/O space, and other parameters. PCI interrupts are distributed to available ISA interrupts that have not been assigned to an ISA card or to system resources. Interrupts that you leave set to Available in Setup are considered free for PCI add-in cards. It is not possible to predict which PCI interrupt is assigned to which ISA IRQ.

The PCI Auto-Configuration function complies with version 2.10 of the PCI BIOS specification. System configuration information is stored in ESCD format. You can clear the ESCD data by setting the CMOS clear jumper to the Up position.

PCI specification 2.1 for add-in card auto-configuration is also a part of the Plug and Play BIOS. Peer-to-peer hierarchical PCI Bridge 1.0 is supported, and by using an OEM-supplied option ROM or TSR, a PCI-to-PCMCIA bridge capability is possible as well.

3.7 ISA Plug and Play

The BIOS incorporates Release 1.0A (ESCD V. 1.03). When used in conjunction with the ISA Configuration Utility (ICU) for DOS, the system allows auto-configuration of Plug and Play ISA cards, PCI cards, and resource management for legacy ISA cards. Because the BIOS supports configuring devices across PCI bridges, release 1.41 or greater of the ICU must be used with the motherboard to properly view and change system settings.

The BIOS also has a Setup option to support the Windows 95 run-time Plug and Play utilities. When this option is selected, only the devices critical to booting are assigned resources by the BIOS. Device Node information is available for all devices to ensure compatibility with Windows 95.

You can obtain copies of the Plug and Play specification from Intel's WWW site: http://www.intel.com.

3.8 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 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 application program. This user-defined information will be located in a series of data structures which are accessed in various ways by means of the DMI service layer. Component instrumentation allows the service layer to gain access to the information stored in the GPNV. The included MIF database defines the data and provides the method for accessing the information.

The BIOS provides the first stage of DMI v. 2.0 support, including static system configuration information, motherboard and peripheral data. Future product releases will provide event detection and error logging, achieving the maximum benefit of DMI with applications such as LANDesk Client Manager.

3.9 Advanced Power Management

The BIOS supports Advanced Power Management (APM) version 1.2. The energy saving Standby mode can be initiated by a keyboard hot-key sequence set by the user, a time-out period set by the user, or by a Sleep/Resume button tied to the front panel sleep connector.

When in Standby mode, the motherboard reduces power consumption by utilizing the processor's System Management Mode (SMM) capabilities and by spinning down hard drives and by turning off VESA† DPMS (Display Power Management System) compliant monitors. In Setup, you can select which DPMS mode (Standby, Suspend, or Off) to send to the monitor. The system maintains the ability to respond to external interrupts while in Standby mode and service requests such as incoming FAXes or network messages while unattended. Any keyboard or mouse activity brings the system out of Stand By mode. When this occurs the monitor and IDE drives are turned back on immediately.

The BIOS enables APM by default. However, the system must be configured with an APM driver for the system power saving features to take effect.

3.10 Language Support

The Setup screen and help messages are supported in 32 languages. There are 5 languages translated at this time; American English, German, Italian, French, and Spanish. Translations of other languages will be 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, and is always present unless another language is programmed into the BIOS using the Flash Memory Update Program (FMUP). For additional information, contact your Intel Sales Representative.

3.11 Boot Options

Booting from CD-ROM is supported in compliance with 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 to be the primary boot device and the hard drive to be the secondary boot device. If you select CD-ROM, it must be the first device. The third and fourth devices are set to disabled in the default configuration. You can also select Network as a boot device. The network option allows booting from a network add-in card with a remote boot ROM installed.

NOTE

A copy of El Torito is available on the Phoenix WWW page: http://www.ptltd.com.

3.12 Flash Logo Area

The motherboard supports a 4 KB programmable Flash user area located at EC000-ECFFF. An OEM can use this area to display a custom 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. Contact your authorized distributor for further information.

3.13 Setup Enable Jumper

A motherboard configuration jumper controls access to Setup. When you set the jumper to the disable position, you cannot access Setup, and the computer does not display the message prompting you to press <F1> to enter Setup.

3.14 BIOS Setup Program

The ROM-based Setup program allows you to modify the configuration without opening the computer for most basic changes. You can access Setup by pressing the <F1> key after the memory test has begun and before the boot begins. A prompt may be enabled that informs you to press the <F1> key to access Setup.

3.14.1 Overview of the Setup Menu Screens

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 fields in a screen. Use the <Enter> key to select a field for modification. For certain fields, pressing <Enter> brings up a subscreen. After you have selected an item, use the arrow keys to modify the setting.

Table 18. Overview of 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, hard drives.
Advanced	Modify the more advanced features of a PC, such as peripheral configuration and advanced chipset configuration.
Security	Specify passwords that can be used to limit access to the system.
Exit	Save or discard changes.
Setup Subscreen	**Description**
Floppy Options	Configure your diskette drives.
Hard Disk Configuration	Configure your hard 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 busses.
Power Management Configuration	Access and modify Advanced Power Management (APM) options.
Plug and Play Configuration	Modify options that affect the system's Plug and Play capabilities.
Event Logging Configuration	Configure options that affect the system's event logging functions.

3.14.2 Main Screen

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

3.14.2.1 System Date

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

3.14.2.2 System Time

Specifies the current time.

3.14.2.3 Floppy Options

When selected, this displays the Floppy Options menu.

3.14.2.4 Primary IDE Master

Reports if a hard disk is connected to the Primary IDE Master interface. When selected, this brings up the Primary IDE Master Configuration subscreen.

3.14.2.5 Primary IDE Slave

Reports if a hard disk is connected to the Primary IDE Slave interface. When selected, this brings up the Primary IDE Slave Configuration subscreen.

3.14.2.6 Secondary IDE Master

Reports if a hard disk is connected to the Secondary IDE Master interface. When selected, this brings up the Secondary IDE Master Configuration subscreen.

3.14.2.7 Secondary IDE Slave

Reports if a hard disk is connected to the Secondary IDE Slave interface. When selected, this brings up the Secondary IDE Slave Configuration subscreen.

3.14.2.8 Language

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

3.14.2.9 Boot Options

When selected, this displays the Boot Options subscreen.

3.14.2.10 Video Mode

Reports the video mode. There are no options.

3.14.2.11 Mouse

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

3.14.2.12 Base Memory

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

3.14.2.13 Extended Memory

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

3.14.3 Floppy Options Subscreen

3.14.3.1 Floppy A:

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

3.14.3.2 Floppy B:

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

3.14.3.3 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

3.14.3.4 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

3.14.4 Primary/Secondary IDE Master/Slave configuration Subscreens

There are four subscreens used to enable IDE devices (e.g., hard disks):

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

Each of these subscreens contains the following eight fields.

3.14.4.1 IDE Device Configuration

Used to manually configure the attached hard disk or have the BIOS auto configure it. The options are:

- Auto Configured (default)
- User Definable
- Disabled

If you select User Definable then the Number of Cylinders, Number of Heads, and Number of Sectors items can be modified.

3.14.4.2 Number of Cylinders

If IDE Device Configuration is set to User Definable, you must type the correct number of cylinders for the attached hard disk. If IDE Device Configuration is set to Auto Configured, this field reports the number of cylinders for the attached hard disk.

3.14.4.3 Number of Heads

If IDE Device Configuration is set to User Definable, you must type the correct number of heads for the attached hard disk. If IDE Device Configuration is set to Auto Configured, this field reports the number of heads for the attached hard disk.

3.14.4.4 Number of Sectors

If IDE Device Configuration is set to User Definable, you must type the correct number of sectors for the attached hard disk. If IDE Device Configuration is set to Auto Configured, this field reports the number of sectors for the attached hard disk.

3.14.4.5 Maximum Capacity

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

3.14.4.6 IDE Translation Mode

CAUTION

Do not change the IDE Translation Mode from the option selected when the hard drive was formatted. Changing the option can result in corrupted data.

Specifies the IDE translation mode. The options are:

- Standard CHS (standard cylinder head sector –less than 1024 cylinders)
- Logical Block
- Extended CHS (extended cylinder head sector–greater than 1024 cylinders)
- Auto Detected (BIOS detects IDE drive support for LBA) (default)

3.14.4.7 Multiple Sector Setting

Sets the number of sectors transferred by an IDE device 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.

3.14.4.8 Fast Programmed I/O Modes

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

- Disabled
- Auto Detected (default)

If set to disabled, transfers occur at less than optimized speed. If set to Auto Detected, transfers occur at maximum speed

3.14.5 Boot Options Subscreen

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

3.14.5.1 First, Second, Third, Fourth Boot Device

Sets which drives the system checks to find an operating system to boot from. The following options are available.

OPTIONS			
First Boot Device	**Second Boot Device**	**Third Boot Device**	**Fourth Boot Device**
Disabled	Disabled	Disabled (default)	Disabled (default)
Floppy (default)	Floppy	Floppy	Floppy
Hard Disk	Hard Disk (default)	Hard Disk	Hard Disk
CD-ROM	Network	CD-ROM	CD-ROM
Network			

3.14.5.2 System Cache

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

- Disabled
- Enabled (default)

3.14.5.3 Num Lock

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

- On
- Off (default)

3.14.5.4 Setup Prompt

Turns on (or off) the F1 prompt (Press <F1> Key if you want to run Setup) during the power-up sequence. The options are:

- Enabled (default)
- Disabled

NOTE

This option does not affect your ability to access the Setup program. It only toggles the prompt.

3.14.5.5 Hard Disk Pre-Delay

Sets the hard disk drive pre-delay. The options are:

- Disabled (default)
- 3 seconds
- 6 seconds
- 9 seconds
- 12 seconds
- 15 seconds
- 21 seconds
- or seconds
- 30 seconds

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.

3.14.5.6 Typematic Rate Programming

Sets the typematic rates. The options are:

- Default (default)
- Override (enables Typematic Rate Delay and Typematic Rate fields)

3.14.5.7 Typematic Rate Delay

Sets how long it takes (in milliseconds) for the key-repeat function to start when you hold down a key on the keyboard. The options are:

- 250 (default)
- 500
- 750
- 1000

If Typematic Rate Programming is set to Default, this field does not appear.

3.14.5.8 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. The options are:

- 6 characters per second (default)
- 8 characters per second
- 10 characters per second
- 12 characters per second
- 15 characters per second
- 20 characters per second
- 24 characters per second
- 30 characters per second

The Typematic Rate Programming Item is set to Default, this field does not appear.

3.14.5.9 Scan User Flash Area

Sets the scan user flash area. The options are:

- Enabled
- Disabled (default)

3.14.6 Advanced Screen

This section describes the Setup items found on the Advanced menu screen. If you select certain items from the Advanced screen (e.g., Peripheral Configuration), Setup switches to a subscreen for the selected item. Subscreens are described below.

3.14.6.1 Processor 0 Type

Reports the processor type in the Primary processor socket. There are no options.

3.14.6.2 Processor 1 Type

Reports the processor type in the Secondary processor socket. There are no options.

3.14.6.3 Processor Speed

Reports the processor(s) clock speed. There are no options.

3.14.6.4 Cache Size

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

3.14.6.5 Peripheral Configuration

When selected, this displays the Peripheral Configuration subscreen.

3.14.6.6 Advanced Chipset Configuration

When selected, this displays the Advanced Chipset Configuration subscreen.

3.14.6.7 Power Management Configuration

When selected, this displays the Power Management Configuration subscreen.

3.14.6.8 Plug and Play Configuration

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

3.14.6.9 Event Logging Configuration

When selected, this displays the Event Logging Configuration subscreen.

3.14.7 Peripheral Configuration Subscreen

This section describes the Setup options in the Peripheral Configuration subscreen.

When Auto is selected for PCI IDE Interface, Floppy Interface, Serial Port 1 Address, Serial Port 2 Address, or Parallel Port Address, the computer automatically configures that peripheral during power up. Reported settings for these options reflect the current state of the computer.

3.14.7.1 Primary PCI IDE Interface

Used to disable or automatically configure the Primary PCI IDE interface. The options are:

- Enabled
- Auto Configured (default)

When Auto Configured is selected, the Primary PCI IDE interface is automatically configured during power up.

3.14.7.2 Secondary PCI IDE Interface

Used to disable or automatically configure the Secondary PCI IDE interface. The options are:

- Enabled
- Auto Configured (default)

When Auto Configured is selected, the Secondary PCI IDE interface is automatically configured during power up.

3.14.7.3 Floppy Interface

Enables or disables the diskette drive interface. The options are:

- Disabled
- Enabled
- Auto Configured (default)

When Auto is selected, the Floppy Interface is automatically configured during power up.

3.14.7.4 Serial Port 1 Interface

Selects the address of the serial port. The options are:

- Disabled
- COM1, 3F8h IRQ4
- COM2, 2F8h IRQ3
- COM3, 3E8h IRQ4
- COM4, 2E8h, IRQ3
- COM1, 3F8h IRQ3
- COM2, 2F8h IRQ4
- COM3, 3E8h IRQ3
- COM4, 2E8h IRQ4
- Auto Configured (default)

When Auto is selected, the Setup program assigns the first free COM port (normally COM1, 3F8, IRQ4) as the serial port 1 address and IRQ.

3.14.7.5 Serial Port 2 Interface

NOTE

If either serial port address is set, the address it is set to will not appear in the options dialog box of the other serial port. If an ATI mach32† *or an* ATI mach64 *video controller is active, the COM4, 2E8, IRQ3 address will not appear in the options dialog box of either serial port.*

Selects the address of the serial port. The options are:

- Disabled
- COM1, 3F8h IRQ4
- COM2, 2F8h IRQ3
- COM3, 3E8h IRQ4
- COM4, 2E8h, IRQ3
- COM1, 3F8h IRQ3
- COM2, 2F8h IRQ4
- COM3, 3E8h IRQ3
- COM4, 2E8h IRQ4
- Auto Configured (default)

When Auto is selected, the Setup program assigns the first free COM port (normally COM2, 2F8, IRQ3) as the serial port 2 address and IRQ.

3.14.7.6 Parallel Port Interface

Selects the address and IRQ of the parallel port. The parallel port (Compatible/Bidirectional mode) options are:

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

The parallel port (EPP mode) options are:

- Disabled
- LPT1 378h IRQ7
- LPT2 278h IRQ7
- LPT1 378h IRQ5
- LPT2 278h IRQ5
- LPT2 228h IRQ7
- LPT3 228h IRQ5
- Auto Configured (default)

The parallel port (ECP mode) options are:

- Disabled
- LPT1 378h IRQ7 DMA3
- LPT2 278h IRQ7 DMA3
- LPT1 378h IRQ5 DMA3
- LPT2 278h IRQ5 DMA3
- LPT1 378h IRQ7 DMA1
- LPT2 278h IRQ7 DMA1
- LPT1 378h IRQ5 DMA1
- LPT2 278h IRQ5 DMA1
- LPT3 228h IRQ7 DMA3
- LPT3 228h IRQ5 DMA3
- LPT3 228h IRQ7 DMA1
- LPT3 228h IRQ5 DMA1
- Auto Configured (default)

When Auto Configured is selected the Setup program assigns LPT1, 378h, IRQ7 as the parallel port address and IRQ

3.14.7.7 Parallel Port Type

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

- Compatible (default)
- Bi-directional
- EPP
- ECP

Compatible means the parallel port operates in AT-compatible mode. Bidirectional means the parallel port operates in bidirectional PS/2-compatible mode. EPP and ECP mean the parallel port operates in a bidirectional mode at high-speed.

3.14.7.8 USB Interface

Sets the USB interface. The options are:

- Enabled (default)
- Disabled

3.14.7.9 Hardware Monitor Interface

Enables or disables the hardware monitor interface. The options are:

- Disabled
- Enabled (default)

3.14.7.10 Primary PCI IDE Status

Reports if the Primary IDE Interface is enabled or disabled. There are no options.

3.14.7.11 Secondary PCI IDE Status

Reports if the Secondary IDE Interface is enabled or disabled. There are no options.

3.14.7.12 Floppy Status

Reports if the Floppy Interface is enabled or disabled. There are no options.

3.14.7.13 Serial Port 1 Status

Reports the com port, I/O address, and IRQ for serial port 1 (COM1). There are no options.

3.14.7.14 Serial Port 2 Status

Reports the com port, I/O address, and IRQ for serial port 2 (COM2). There are no options.

3.14.7.15 Parallel Port Status

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

3.14.8 Advanced Chipset Configuration Subscreen

This section describes the fields available on the Advanced Chipset Configuration Subscreen.

3.14.8.1 ISA LFB Size

Sets the size of the Linear Frame Buffer (LFB). The options are:

- Disabled (default)
- 1 MB

If this option is set to 1 MB, the ISA LFB Base Address field appears.

3.14.8.2 ISA LFB Base Address

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

3.14.8.3 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 options are:

- Auto Configured (default)
- Valid numbers between 8 and 128

3.14.8.4 Memory Error Detection

Enables or disables the memory error detection. The options are:

- Disabled (default)
- Enabled

If parity or ECC memory is installed in the motherboard, the BIOS automatically enables memory error detection.

3.14.8.5 Audio Interface

Sets the audio interface. The options are:

- Disabled
- Enabled (default)

3.14.8.6 MP Version

Specifies the Multiprocessor Specification to be used for MP tables. The options are:

- 1.1
- 1.4 (default)

3.14.8.7 PCI IRQ Mapping

Selects whether PCI interrupts are mapped to the I/O APIC or to ISA interrupts. The options are:

- To ISA Legacy IRQs
- To I/O APIC IRQs (default)

For operating systems that recognize the I/O APIC, selecting To I/O APIC makes more PCI IRQs available to the computer. For operating systems that do not recognize the I/O APIC, the computer uses the ISA legacy IRQs regardless of which option is selected.

3.14.9 Power Management Configuration Subscreen

This section describes the fields available on the Power Management Subscreen.

3.14.9.1 Advanced Power Management

Enables or disables the Advanced Power Management (APM) support in the BIOS. The options are:

- Enabled
- Disabled (default)

APM will manage power consumption only when used with an APM-capable operating system. If this field is set to Disabled, the fields in the Advanced Power Management subscreen will not appear except the Auto Start On AC Loss field.

3.14.9.2 IDE Drive Power Down

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

- Enabled (default)
- Disabled

3.14.9.3 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)

3.14.9.4 Inactivity Timer

Sets how long (in minutes) the system must be inactive before it enters power management mode. The range is 0 to 255. The default is 10 minutes.

3.14.9.5 Hot Key

Sets the hot key for power management mode. Press the hot key while holding down the <Ctrl> and <Alt> keys to enter power management mode. All alphabetic keys are valid entries for this field.

3.14.9.6 Auto Start On AC Loss

Specifies whether the power supply should resume after AC power interruption. The options are:

- Disabled
- Enabled (default)

3.14.10 Plug and Play Configuration Subscreen

This section describes the options found on the Plug and Play configuration subscreen.

3.14.10.1 Configuration Mode

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

- Use BIOS Setup (default)
- Use PnP OS

If Use BIOS Setup is selected, you must specify the IRQ for each non-Plug and Play ISA add-in card you install on the motherboard.

If PnP OS is selected, the BIOS uses run-time software to prevent conflicts between Plug and Play and non-Plug and Play add-in cards. If Use PnP OS is selected, PnP OS is the only field visible in the subscreen.

3.14.10.2 Boot with PnP OS

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

- Disabled
- Other PnP OS
- Windows 95 (default)

If Boot with PnP OS is selected, the operating system automatically assigns the IRQ resources.

3.14.10.3 ISA Shared Memory Size

Enables you to “unshadow” a block of the upper memory area. The options are:

- Disabled (default)
- 16 KB
- 32 KB
- 48 KB
- 64 KB
- 80 KB
- 96 KB

If this field is set to Disabled, the ISA Shared Memory Base Address field (described below) will not appear.

This field should be enabled only when you are using a non-Plug and Play ISA add-in card (legacy card) that requires non-ROM memory space. For example, video capture cards that have video buffer memory.

By default, allocation of upper memory is 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 will then autoconfigure the PCI and Plug and Play devices, shadowing the ROM requirements (other than video) into the area above E0000 until that area is full. It will then assign additional PCI and Plug and Play add-in cards to the area between C8000 and DFFFF. If an ISA legacy card has non-ROM memory requirements, the autoconfigure routine may write into an area that is needed by the ISA add-in card. The ISA Shared Memory Size parameter signifies the autoconfigure routine that this block of memory is reserved and should not be shadowed.

Shadowing copies a block of memory from an add-in card's ROM to the same address in computer DRAM memory. This improves computer performance.

3.14.10.4 ISA Shared Memory Base Address

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

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

This setting could affect the ISA Shared Memory Size field. The value entered in the ISA Shared Memory Size field cannot extend to the E0000h address. For example, if a size of 64K was selected, options D4000h, D8000h, and DC000h will not be available.

3.14.10.5 IRQ 5, 9, 10, 11

Sets the status of the IRQ. The options are:

- Available (default)
- Used By ISA Card

The PCI auto-configuration code looks here to see if these interrupts are available for use by a PCI add-in board. If an interrupt is available, the PCI auto-configuration code can assign the interrupt to be used by the system. If your system contains an ISA agent that uses one of these interrupts, select Used By ISA Card for that interrupt.

3.14.11 Event Logging Configuration

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

3.14.11.1 Event Log Capacity

This information field tells whether or not the log is full.

3.14.11.2 Event Log Count Granularity

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

3.14.11.3 Event Time Granularity

Defines the amount of time (in minutes) that must pass before the event log is updated. The default is 30 minutes.

3.14.11.4 Event Log Control

Allows users to enable or disable event logging. The options are:

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

3.14.11.5 Clear Event Log

Sets a flag that clears the event log on the next pass through POST. The options are:

- Keep (default)
- On Next Boot

3.14.11.6 Mark Existing Events as Read

Marks all events already in the log as having been not read (Do Not Mark) or read (Mark). The options are:

- Do Not Mark (default)
- Mark

3.14.11.7 Single Bit ECC Events

When selected, this displays the Single Bit ECC Events subscreen.

3.14.11.8 Multiple Bit ECC Events

When selected, this displays the Multiple Bit ECC Events subscreen.

3.14.11.9 Pre-Boot Events

When selected, this displays the Pre-Boot Events subscreen.

3.14.12 Single Bit ECC Events Subscreen

If Clear Event Log is set to On Next Boot (see pg. 64), the following fields report information for the last single-bit ECC error to occur since the last pass through POST.

3.14.12.1 Date of Last Occurrence

Reports the date when the last single bit ECC error occurred. There are no options.

3.14.12.2 Time of Last Occurrence

Reports the time when the last single bit ECC error occurred. There are no options.

3.14.12.3 Total Count of Events/Errors

Reports the total number of single bit ECC errors in the log. There are no options.

3.14.12.4 Memory Bank with Errors

Reports the memory bank that contained the last single bit ECC error. There are no options.

3.14.13 Multiple Bit ECC Events Subscreen

If Clear Event Log is set to On Next Boot (see pg. 64), the following fields report information for the last multiple-bit ECC error to occur since the last pass through POST.

3.14.13.1 Date of Last Occurrence

Reports the date when the last multiple bit ECC error occurred. There are no options.

3.14.13.2 Time of Last Occurrence

Reports the time when the last multiple bit ECC error occurred. There are no options.

3.14.13.3 Total Count of Events/Errors

Reports the total number of multiple bit ECC errors in the log. There are no options.

3.14.13.4 Memory Bank with Errors

Reports the memory bank that contained the last multiple bit ECC error. There are no options.

3.14.14 Pre-Boot Events Subscreen

If Clear Event Log is set to On Next Boot (see pg. 64), the following fields report information for the last pre-boot event to occur since the last pass through POST.

3.14.14.1 Date of Last Occurrence

Reports the date when the last pre-boot event occurred. There are no options.

3.14.14.2 Time of Last Occurrence

Reports the time when the last pre-boot event occurred. There are no options.

3.14.14.3 Total Count of Events/Errors

Reports the total number of pre-boot events in the log. There are no options.

3.14.14.4 POST Errors Found

Reports the last type of POST error to occur. There are no options.

3.14.15 Security Screen

This section describes the two access modes that can be set using the options found on the Security screen, and then describes the Security screen options themselves.

3.14.15.1 Administrative and User Access Modes

The options on the Security screen menu let you restrict access to Setup by enabling passwords for two different access modes: Administrative mode and User mode.

In general, Administrative mode has full access to the Setup fields, whereas User mode has restricted access to the fields. 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 either the Administrative or User passwords or both are set. (See the table below for a description of how the passwords actually work together.)

To limit access to who can boot the computer, 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.

The following table shows the effects of setting the Administrative and User passwords. (The table is for reference only, and is not shown on the Security screen.) In the table, the statement "Can change a limited number of options" means you can change the system date and time, the power management hot key, the User password, the security hot key, and unattended start.

Table 19. Administrative and User Password Functions

Password Set	Administrative Mode Can . . .	User Mode Can . . .	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.

3.14.16 Security Screen Options

3.14.16.1 User Password Is

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

3.14.16.2 Administrative Password Is

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

3.14.16.3 Set User Password

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

3.14.16.4 Set Administrative Password

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

3.14.16.5 Unattended Start

Controls when the security password is requested. The options are Enabled and Disabled. The default is Disabled. The User password must be enabled before you can enable this option. If Enabled is selected, the system boots, but the keyboard is locked until the User password is entered.

3.14.16.6 Security Hot Key (CTRL-ALT-)

Sets a hot key that, when pressed, locks the keyboard until the User password is entered. The Keyboard LEDs flash to indicate that the keyboard is locked. When you enter the User password, you do not have to press the <Enter> key.

3.14.17 Exit Screen

This section describes the different ways to exit and save or not save changes made in Setup.

3.14.17.1 Exit Saving Changes

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

3.14.17.2 Exit Discarding Changes

Exits Setup without saving any changes. This means that any changes made while in Setup are discarded and NOT SAVED. Pressing the <Esc> key in any of the four main screens does this.

3.14.17.3 Load Setup Defaults

Resets all of the Setup fields to their defaults. You can also press the <F5> key anywhere in Setup to do this.

This selection loads the default Setup values from the ROM table.

3.14.17.4 Discard Changes

Discards any changes you made during the current Setup session without exiting the utility. You can also press the <F6> key anywhere in Setup to do this.

This selection loads the CMOS RAM values that were present when the computer was turned on.

4 SCSI*Select* and SCSI Disk Utilities

4.1 SCSI*Select* Utility

The integrated SCSI*Select* Utility enables you to:

- Modify the SCSI controller's configuration (including termination)
- Change SCSI device settings that conflict with other device settings
- Perform a low-level format on SCSI devices connected to the motherboard

To enter the SCSI*Select* Utility, boot the computer and press <Ctrl><A> when the following message appears:

Press <Ctrl><A> for SCSI*Select*(TM) Utility!

Table 20 provides an overview of the function keys in the SCSI*Select* Utility. Following Table 20 are descriptions of the options in each screen of the utility.

Table 20. Overview of the SCSI*Select* Keys

Press	To
ESC	Go back to previous screen / Exit the utility
Enter	Select an option
↑	Move to the previous field
↓	Move to the next field
F5	Switch between color and monochrome
F6	Reset to defaults

4.1.1 Main Screen

4.1.1.1 Configure/View Host Adapter Settings

When selected, this brings up the Configuration Menu.

4.1.1.2 SCSI Disk Utilities

When selected, this brings up the SCSI Disk Utilities Menu.

4.1.2 Configuration Menu

NOTE

In the utility, an asterisk (*) indicates the default setting for a field.

4.1.2.1 Host Adapter SCSI ID

Specifies the SCSI ID of the host adapter. The options are ID 0–15. The default is ID 7. For proper operation, use the default.

4.1.2.2 SCSI Parity Checking

Enables or disables parity checking. When enabled, the host adapter checks parity when reading from the SCSI bus to verify the correct transmission of data from the SCSI devices. Select disabled if any SCSI devices attached to the chain do not support SCSI parity. The options are:

- Enabled (default)
- Disabled

4.1.2.3 Host Adapter SCSI Termination

Enables or disables SCSI termination on the motherboard. If the motherboard is connected to the end of the SCSI cable, you must select Low ON/High ON. If the motherboard is connected to the middle of the SCSI cable (as in Figure 5), select Low OFF/High OFF. "Low" means the lower 8-bits of the SCSI data bus, and "High" means the upper 8-bits.

The options are:

- Low ON/High ON, (16-bit termination) (default)
- Low OFF/High OFF (all termination disabled)
- Low OFF/High ON (not supported; this option disables all termination)

4.1.2.4 Boot Device Options

When selected, this brings up the Boot Device Configuration Menu.

4.1.2.5 SCSI Device Configuration

When selected, this brings up the SCSI Device Configuration Menu.

4.1.2.6 Advanced Configuration Options

When selected, this brings up the Advanced Configuration Options Menu.

4.1.3 Boot Device Configuration

4.1.3.1 Boot Target ID

Specifies the SCSI ID of the device from which you wish to boot. The SCSI ID selected will be installed as drive C. The options are ID 0–15. The default is ID 0.

The SCSI ID selected here must correspond to the ID configured on the boot device.

4.1.3.2 Boot LUN Number

Sets which LUN (Logical Unit Number) to boot from on your boot device if your boot device has multiple LUNs and Multiple LUN Support is enabled (see pg. 73, Multiple LUN support). The options are ID 0–15. The default is ID 0.

4.1.4 SCSI Device Configuration Menu

These settings enable you to configure each device on the SCSI bus. You must know the SCSI ID of the device you want to configure.

4.1.4.1 Initiate Sync Negotiation

When Yes is selected, the motherboard initiates synchronous negotiation with the SCSI device. When No is selected, the motherboard does not initiate synchronous negotiation. If the SCSI device initiates synchronous negotiation, the motherboard always responds. Select No if you are using an old SCSI I device at this ID. The options are:

- Yes (default)
- No

4.1.4.2 Maximum Sync Transfer Rate

Sets the maximum synchronous data transfer rate in MB/second. The motherboard supports synchronous data transfer rates up to the Fast SCSI maximum rate of 20 MB/second. Select the lowest value if you are using an old SCSI I device. The options are:

- 20.0 (default)
- 16.0
- 13.4
- 10.0

4.1.4.3 Enable Disconnection

Sets whether the motherboard allows SCSI devices to disconnect from the SCSI bus. Enabling disconnection allows the motherboard to perform other operations on the SCSI bus while the SCSI device is temporarily disconnected. If two or more SCSI devices are connected to the host adapter, select Yes. The options are:

- Yes (default)
- No

4.1.4.4 Initiate Wide Negotiation

Specifies whether the motherboard attempts 16-bit instead of 8-bit data transfer. Selecting Yes enables Fast/Wide SCSI-2 hard drives to achieve their highest performance. Selecting No specifies 8-bit data transfer unless the SCSI device requests wide negotiation. Select No if you are using an old SCSI I device. The options are:

- Yes (default)
- No

4.1.4.5 Send Start Unit Command

Specifies whether the Start Unit Command is sent to a SCSI device at boot. Selecting Yes reduces the load on the computer's power supply by allowing the host adapter to start SCSI devices one at a time. Most devices require you to set a jumper before the device can respond to this command. The options are:

- Yes
- No (default)

4.1.5 Advanced Configuration Options

4.1.5.1 Host Adapter BIOS

Enables or disables the host adapter BIOS. If you are booting from a SCSI disk drive connected to the motherboard, the Host Adapter BIOS must be enabled. Disable the Host Adapter BIOS if the peripherals on the SCSI bus (for example CD-ROM drives) are all controlled by device drivers and do not need the BIOS. The options are:

- Enabled (default)
- Disabled

NOTE

Several of the following fields are ignored if the Host Adapter BIOS is Disabled.

4.1.5.2 Support Removable Disks Under BIOS as Fixed Disks

CAUTION

If a removable-media SCSI device is controlled by the host adapter BIOS, do not remove the media while the drive is on or you could lose data! If you want to be able to remove media while the drive is on, install your removable-media device driver and set this option to Disabled.

Controls which removable-media drives are supported by the SCSI BIOS. This field is ignored if the Host Adapter BIOS is disabled. The options are:

- Boot Only (default) (Only the removable-media drive designated as the boot device is treated as a hard disk drive)
- All Disks (All removable-media drives supported by the BIOS are treated as hard disk drives)
- Disabled (No removable-media drives are treated as hard disk drives. In this situation, software drivers are needed because the drives are not controlled by the BIOS)

4.1.5.3 Extended BIOS Translation for DOS Drives Larger than 1 GB

CAUTION

All data on all connected hard drives is lost when you change from one setting to another.

Enables or disables extended translation for SCSI hard disks with capacities greater than 1 GB. This field is ignored if the Host Adapter BIOS is disabled. The options are:

- Enabled (default)
- Disabled

Use Extended BIOS Translation only with MS-DOS 5.0 or higher. You do not need to enable this option if you are using another operating system such as NetWare, OS/2, Windows NT, or UNIX†.

When you partition a disk larger than 1 GB, use the MS-DOS **fdisk** utility as you normally would. Because the cylinder size increases to 8 MB under extended translation, the partition size you choose must be a multiple of 8 MB. If you request a size that is not a multiple of 8 MB, **fdisk** rounds up to the nearest whole multiple of 8 MB.

4.1.5.4 Display <Ctrl><A> Message During BIOS Initialization

NOTE

This option does not affect your ability to access the SCSI*Select Utility. It only toggles the prompt.*

Turns on (or off) the "Press <Ctrl> <A> for SCSI*Select* (TM) Utility!" prompt at boot. This field is ignored if the Host Adapter BIOS is disabled. The options are:

- Enabled (default)
- Disabled

4.1.5.5 Multiple LUN Support

Enables or disables support for booting from a SCSI device that has multiple LUNs. Enable this option if your boot device has multiple LUNs (e.g., multiple partitions on a hard disk). This field is ignored if the Host Adapter BIOS is disabled. The options are:

- Enabled
- Disabled (default)

4.1.5.6 BIOS Support for Bootable CD-ROM

Enables or disables support for booting from a CD-ROM drive. This field is ignored if the Host Adapter BIOS is disabled. The options are:

- Enabled (default)
- Disabled

4.1.5.7 BIOS Support for Int 13 Extensions

Enables or disables support for disks with more than 1024 cylinders. Allows the computer to boot from El Torito non-emulation CD-ROM. This field is ignored if the Host Adapter BIOS is disabled. The options are:

- Enabled (default)
- Disabled

4.1.5.8 Support for Ultra SCSI Speed

Enables or disables support for the fast transfer rates of Ultra SCSI devices. Enable this option is you are using Ultra/Wide SCSI disk drives. The options are:

- Enabled
- Disabled (default)

4.2 SCSI Disk Utilities

To enter the SCSI Disk Utilities, select the SCSI Disk Utilities option from the SCSI*Select* menu. When you select this option, SCSI*Select* scans the SCSI bus (to determine the devices installed) and displays a list of all SCSI IDs and the devices assigned to each ID.

When you select a specific ID and device, a small menu appears, displaying two options: Format Disk and Verify Disk Media.

4.2.1 Format Disk

CAUTION

A low-level format destroys all data on the drive. Back up your data before performing this operation. You cannot abort a low-level format once it is started.

This utility enables you to perform a low-level format on a hard disk drive. Most SCSI disk devices are preformatted at the factory and do not need to be formatted again. The Adaptec Format Disk utility is compatible with most SCSI disk drives.

4.2.2 Verify Disk Media

This utility enables you to scan the media of a hard disk drive for defects. If the utility finds bad blocks on the media, it prompts you to reassign them; if you select Yes, those blocks are no longer used. Press <Esc> at any time to abort the utility.

5 Error Messages and Beep Codes

5.1 BIOS Beep Codes

Beeps	Error Message	Description
1	Refresh Failure	The memory refresh circuitry on the motherboard is faulty.
3	Base 64 KB Memory Failure	Memory failure in the first 64 KB.
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.
8	Display Memory Read/Write Error	The system video adapter is either missing or its memory is faulty. This is not a fatal error.
9	ROM Checksum Error	ROM checksum value does not match the value encoded in BIOS.

5.2 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 was 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) data 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 has requested a resource that is already in use.
PCI Error Log is Full	This message is displayed when more than 15 PCI conflict errors are detected. No additional PCI errors can be logged.
PCI I/O Port Conflict	Two devices requested the same resource, resulting in a conflict.
PCI IRQ Conflict	Two devices requested the same resource, resulting in a conflict.
PCI Memory Conflict	Two devices requested the same 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.

continued ☛

PCI Configuration Error Messages (continued)

Message	Explanation
Primary IDE Controller Resource Conflict	The primary Integrated Drive Electronics (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, 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.

5.3 BIOS Error Messages

Error Message	Explanation
CH-2 Timer Error	Most AT systems include two timers. There is an error in timer 2.
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 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. Use another boot disk.
Memory size decreased	The memory size has changed or decreased from the previous BOOT.

5.4 ISA NMI Messages

ISA NMI Message	Explanation
Unrecoverable ECC Error	A multi-bit ECC error has occurred; computer halted.
DMA Bus Time-out	A device has driven the bus signal for more than 7.8 microseconds.

5.5 Port 80h POST Codes

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

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

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

Code	Description of POST Operation Currently In Progress
00h	Give control to ROM in Flash - execute boot.
00h	Execute boot.
02h	Disable internal cache. Keyboard controller test.
08h	Disable DMA controller #1, #2. Disable interrupt controller #1, #2. Reset video display.
0Dh	Check for signature of the board manufacturing company.
0Dh	If default jumper is set, go to Load CMOS Default.
0Eh	Check the validity of CMOS - if there is anything wrong or invalid, force to default.
0Fh	Load default CMOS settings.
10h	Clear error register, clear CMOS pending interrupt, check and set clock rate, check and set base memory size 512 KB of 640 KB.
10h	If base memory size is 640 KB, allocate extended BIOS data area (EBDA) - otherwise, calculate the EBDA.
10h	Set up overlay environment. Update setupFlags with current operating environment. Initialize interrupt vector pointing to the error handlers, Update setupFlags in EBDA. Initialize CMOS pointers in EBDA.
13h	Program all chipset registers.
15h	Initialize system timer.
1Bh	Go to real memory base 64 KB test.
20h	16 KB base RAM Test.
23h	Hook made available prior to initializing the interrupt vector table.
23h	Set up interrupt vectors.
24h	Initialize and load interrupt vectors.

continued ☛

Port 80h Codes (continued)

Code	Description of POST Operation Currently In Progress
25h	Video rows initialization.
28h	Set monochrome mode.
29h	Set color display - color mode set.
2Ah	Clear parity status if any.
2Bh	Initialization required internal to some chipset before video initialization. Custom video initialization.
2Ch	Test optional video ROM.
2Dh	Initialize registers internal to chipset after video initialization.
2Eh	Check for video ROM.
2Fh	Display memory read/write test.
30h	Test video horizontal and vertical tracing.
31h	Display video memory read/write test.
32h	Test video horizontal and vertical tracing - Beep if no video controller installed. Check for MDA.
34h	Set up video configuration (column x row). Display copyright message.
36h	Initialize messaging services. Clear the screen.
37h	Display the first screen signon.
39h	Update screen pointer. Display setup message. Display keyboard signon. Display mouse signon.
40h	Memory test starting segment at 00000h.
43h	Calculate the memory size left to be tested.
4Fh	Disable caching, etc. Check if the system memory size is larger than zero. Test and initialize to zero all DRAM. Remap memory partition if necessary. Test one MB of memory. Update counter on screen. Repeat memory test for each MB of memory until done.
52h	ChipsetAdjustMemorySize - Adjust any base of extended memory size because of chipset.
61h	Test DMA master page registers.
62h	Test DMA slave page registers.
65h	Program DMA controllers.
66h	Clear DMA write control registers.
67h	Unmask timer and NMI. Update master mask register.
80h	Run keyboard detection. Run mouse detection.
80h	Read interrupt mask - setup diskette ISR, #2, keyboard, and timer.
81h	8042 interface test - Enable keyboard interrupt if keyboard is detected.
82h	Enable interrupt.
83h	Check and set keyboard lock bit.
88h	Floppy unit initialization - Floppy controller and data setup.
8Ch	Set up interface between the BIOS POST and the device initialization management (DIM).

continued ☛

Port 80h Codes (continued)

Code	Description of POST Operation Currently In Progress
8Fh	Read interrupt mask. Unmask floppy interrupt. Setup floppy controller and data setup.
92h	Set up COM port and LPT port timeout values. Display wait message if setup key is pressed.
96h	Clear to bottom of the screen - Perform chipset initialization required before option ROM scans. Give control to ROM in Flash.
97h	Verify and give control to optional ROM.
98h	Perform any chipset initialization required after option ROM scans - give control to ROM in Flash.
9Ah	Adds MP entries for buses, I/O APIC, I/O INTRs, and LINTs.
9Dh	Timer data area initialization - set time and date.
A0h	Set up printer base addresses.
A0h	Enable internal cache.
A1h	Set COM base addresses - keyboard stuck key check.
A2h	Reset floating point unit.
A3h	Log and display POST errors if any. Check if manufacturing mode - if there are POST errors, display setup key and boot key options.
A6h	Call Setup program if setup was requested.
A7h	Load and wait for the valid password - unmask INT-0A redirection.
ABh	Custom floating point unit initialization.
ACh	Initialize internal floating point unit.
ADh	Update CMOS with floating point unit presence.
ADh	A fatal error results in a continuous echo of ‘DEAD’ to port 80h - echo ‘DE’ (wait 1 sec.), echo ‘AD’ (wait 1 sec.).
AEh	Set typematic rate.
AFh	Read keyboard ID.
B0h	Process POST errors.
B1h	Test cache memory.
B3h	Set up display mode (40x25, 80x25).
B4h	Jump to PreOS (pre-operating system) module.
BBh	Perform work before registers and circular keyboard buffer are cleared just prior to INT 19h. Reinitialize message services. Initialize APM. Perform post SMI initialization. Circumvents EMM386’s attempts to utilize the lower 32 KB area base.
BBh	Fix CMOS Read and CMOS Write so that every call does not set NMI off. Shadow product information in the compatibility segment. Give a beep for boot. Handle chipset specific manipulation before boot. Check keyboard for data before MP manipulation.
D0h	Initialize DS, ES, GS, and FS. Check if keyboard system bit is set. Check whether a hard or soft reset has occurred.
D1h	Power on initialization Initialize special chipsets in power on/hard reset. Check cache size and type, write reserved cache size information to CMOS, determine processor speed (optional).
D2h	Disable NMI reporting.
D3h	Reset video adapter.
D4h	If the microprocessor is in protected mode, load GDT 4G segment - ChipsetPreInit(), Disable L1 and L2 cache, perform any initialization required before the main chipset configuration is done.

continued ☛

Port 80h Codes (continued)

Code	Description of POST Operation Currently In Progress
D5h	System validity check. Calculate checksum.
D6h	Provides ability to do any special chipset initialization required before keyboard controller testing can begin.
D7h	Flush the keyboard input buffer.
D8h	Issue keyboard BAT command.
D9h	Retrieve 8042 KBC output buffer.
DAh	If keyboard initialization failed, display error message and halt.
DBh	Provide ability to do any special chipset initialization after KBC test.
DDh	Initialize keyboard controller command byte.
DEh	A fatal error results in a continuous echo of 'DEAD' to port 80h - echo 'DE' (wait 1 sec.), echo 'AD' (wait 1 sec).
DFh	Disable master/slave DMA controllers.
E0h	Initialize master/slave programmable interrupt controllers.
E1h	ChipsetInit - Preset any defaults needed to chipset registers.
E1h	Start the refresh timer(s) running.
E1h	Size all L2/L3 Cache (if present/required).
E1h	Detect EDO memory module (SIMM† or DIMM).
E1h	Size memory partition boundaries.
E1h	Disable all memory holes.
E1h	The 512-640 KB must be DRAM mapped.
E1h	Gate A20 must be set and left set for POST.
E2h	Initialize timer channel 2 for speaker.
E3h	Initialize timer channel 0 for system timer.
E4h	Clear pending parity errors - disable and clear parity, reactivate parity.
E5h	Enter flat mode.
E6h	Test the first 2 MB of system memory.
E7h	Get minimum memory partition size and test memory.
E8h	Remap DIMMs if failure detected and remapping supported.
E8h	Display error message and halt if remapping not supported.
E9h	After memory test, clear pending parity errors. Disable and clear parity, set bits to reactivate parity.
EAh	Set up stack for POST, enable enhanced POST, shadow FE00h block.
EBh	Look for the location of dispatcher in the packing list.
EBh	Call decompression dispatcher Init function.
ECh	Make F000h DRAM R/W enabled, force use of EDI.
EDh	Actively dispatch BIOS.
F0h	Initialize I/O cards in slots.
F1h	Enable extended NMI sources.

continued ☛

Port 80h Codes (continued)

Code	Description of POST Operation Currently In Progress
F2h	Test extended NMI sources.
F3h	Display EISA error message if any. Get keyboard controller vendor, program the keyboard controller.
F4h	Enable extended NMI sources.
F5h	Initialize mouse.

Note: Some port 80 codes are listed more than once because they test multiple functions. For example code 0EBh tests both of the following:
Look for the location of dispatcher in the packing list.
Call decompression dispatcher Init function.