Silicon Graphics® Zx10 System Board Guide

Document Number 007-4330-001

Contributors
Written by Bryan Cobb, with engineering contributions by Chuck Alexander, James Bullington, Jamey Dobbins, Jeff Elliot, Ron Headley, Ronnie Sams, Clark Smith, and Joel Whitehead.

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This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. If the equipment is not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, try to correct the interference as follows: reorient or relocate the affected device; increase the separation between this equipment and the affected device; connect this equipment to an outlet on a circuit different from the circuit to which the affected device is connected; consult a dealer or an experienced radio / television technician for help.

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Safety Notices
Service and upgrade tasks should be performed by users who can follow instructions in a manual to service equipment, and can do so without harm to themselves or damage to the equipment.

To reduce the risk of electrical shock and energy hazards, do not attempt to open the equipment unless instructed, and do not use a tool for purposes other than instructed.

Internal components may be at high temperatures. Allow time for them to cool before handling them.

Internal components can be damaged by static electricity. Use an antistatic wrist strap connected to the bare metal of the system's chassis to protect against electrostatic discharge.

Notes

Changes or modifications made to the system that are not approved by the party responsible for compliance could void the user's authority to operate the equipment.

Procedures in this document assume familiarity with the general terminology associated with personal computers, and with the safety practices and regulatory compliance required for using and modifying electronic equipment.

Read all operating instructions before using this device. Keep these instructions for future reference. Follow all warnings on the device or in the operating instructions.

Record of Revision

Version	Description
002	September 2000 Initial Rev

Contents

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Tables

About This Guide

This *System Board Guide* provides detailed information on the Silicon Graphics Zx10 system board. The document is organized as follows:

- Chapter 1, “Overview” introduces the system board, its features, and its major components.
- Chapter 2, “Components” locates and describes the major components on the system board.
- Chapter 3, “BIOS Setup” describes the BIOS Setup program and the system’s BIOS settings.
- Chapter 4, “Resources” lists and describes system board resources.
- Chapter 5, “Messages” lists and describes messages produced by the system board.

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Overview

This chapter describes the system board, its features, and its major components.

Features and Components

Table 1-1 Main Features and Components

Main Features	Components
Processors	Dual Intel SC242 (Slot 1) support
	Intel Pentium III processors
	Two integrated voltage regulators
	133 MHz 64-bit front-side bus (FSB)
System Chipset	ServerWorks ServerSet III WS
	Streaming Multiport Controllers
	266 MHz 32-bit fast I/O interface
	AGP controller – one AGP Pro expansion socket
	USB controller – four Universal Serial Bus (USB) ports – two external, one internal, one for the AGP controller
	EIDE controller – two Peripheral Component Interconnect (PCI) bus-mastering EIDE channels
I/O Controller	SMC FDC37B787
	Controls keyboard, mouse, real-time clock, and floppy disk
	Two serial ports, one parallel port

Table 1-1 (continued) Main Features and Components

Main Features	Components
Memory	PC133 Synchronous Dynamic Random Access Memory (SDRAM)
	Six 168-pin registered dual-inline memory module (DIMM) sockets
	Supports 72-bit Error Correction Code (ECC) memory modules
	Four banks, two DIMMs per bank, two-way interleaved
	133 MHz 128-bit memory bus
SCSI Controller	LSI 53C1010
	Low-voltage differential (LVD) Ultra 3 SCSI bus
	Two 16-bit 80 MHz SCSI channels
	Two high-density (HD) 68-pin SCSI connectors
	320 MB/sec Ultra 3 SCSI throughput
	Handles both Ultra2 and Ultra3 devices at their assigned transfer rates
Network Controller	Intel 82559
	100 Mbit/sec and 10 Mbit/sec Ethernet network interface
	Wake-on-Modem support
	Wake-on-LAN support
Audio Controller	Creative Labs ES1373 AudioPCI
	Audio Codec '97 (AC97)
	Advanced Technology Attachment Packet Interface (ATAPI) CD-ROM audio header, modem audio header, and video header
Expansion Sockets	One full-length AGP Pro socket
	Two full-length fast/wide PCI sockets (64 bits, 66 MHz/33 MHz, 3.3 V)
	Four full-length wide PCI sockets (64 bits, 33 MHz, 5 V)
	One full-length Industry Standard Architecture (ISA) socket (16 bits)
Input/Output Ports	One PS/2 mouse port (6-pin mini-DIN)

Table 1-1 (continued) Main Features and Components

Main Features	Components
	One PS/2 keyboard port (6-pin mini-DIN)
	One parallel (LPT) port (25-pin D-sub)
	Two serial (COM) ports (9-pin D-sub)
	Two USB ports (self-identifying, hot-pluggable, 12 MB/sec)
	One SCSI port (68-pin HD) – Ultra 3
	One Ethernet port (8-pin RJ-45)
	One each microphone in, line in, and line out audio ports (PC standard 1/8-inch phone jacks)
	One MIDI/game port (15-pin D-sub)
	Four ATAPI connectors (internal) – CD IN, VIDEO IN, MONO IN, MPEG IN
BIOS	Phoenix BIOS
	Supports Advanced Configuration and Power Interface (ACPI)
	Supports Desktop Management Interface (DMI)
	Supports PC99
	Supports S0, S1, S3, and S5 system states
	Auto-configuration of IDE hard disk types
Form Factor	Extended ATX (12 in x 13 in)
	Two 20-pin ATX power connectors
	Stacked input/output ports
Voltage and Power	ATX power supply connectors
	+12V variable power source for DC fans
	3.3 V SDRAM memory support
System Management	Monitoring of all system voltages and four temperature points

Table 1-1 (continued) Main Features and Components

Main Features	Components
	Fan headers with monitoring and control functions
	Chassis intrusion alert header
	Temperature and voltage monitoring
	Wake-on-Modem header
	Wake-on-LAN header
Regulatory Compliance	FCC Class B (Declaration of Conformity)
	European Community CE (Declaration of Conformity)
	Underwriter's Laboratories

Block Diagram

Figure 1-1 on the following page shows the major system board components and connections.

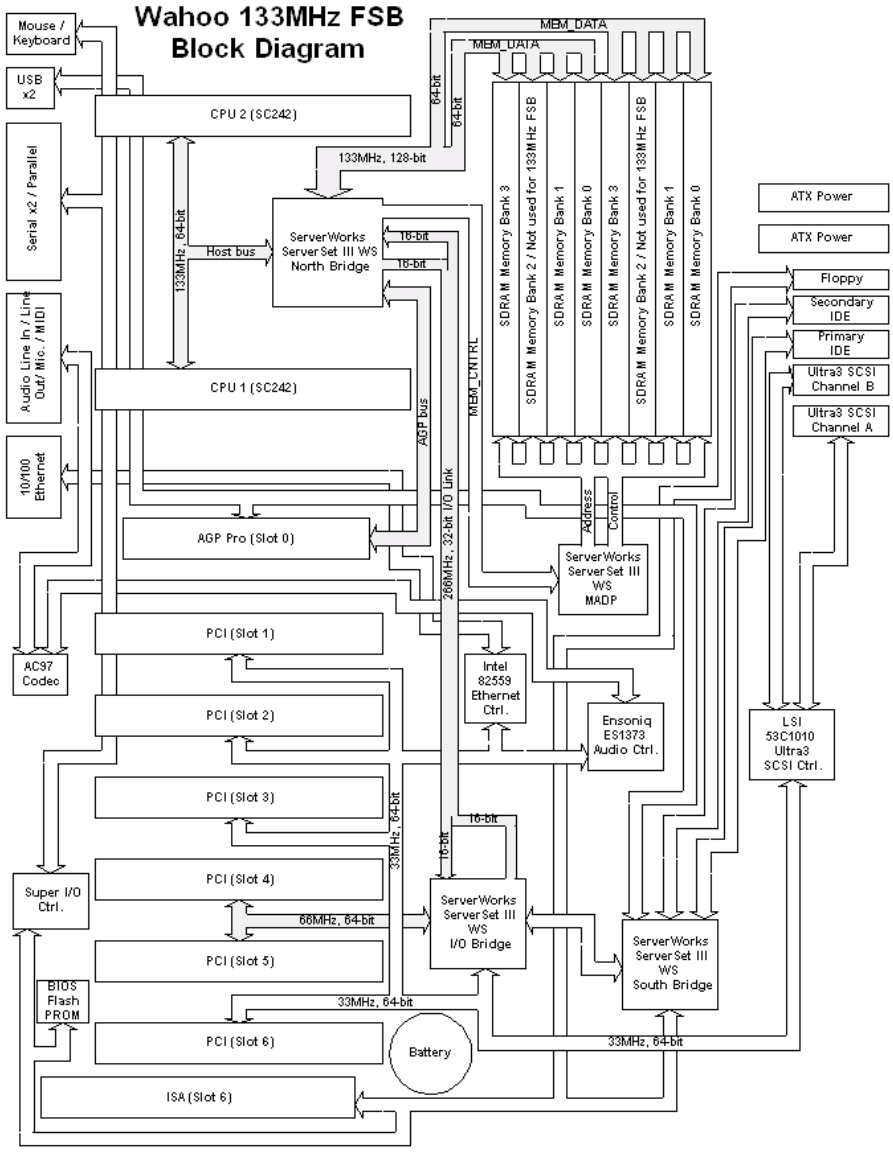

Figure 1-1 133MHz FSB Block Diagram

Figure 1-2 calls out the system board's major components. More detailed information on system board components is found in Chapter 2, "Components".

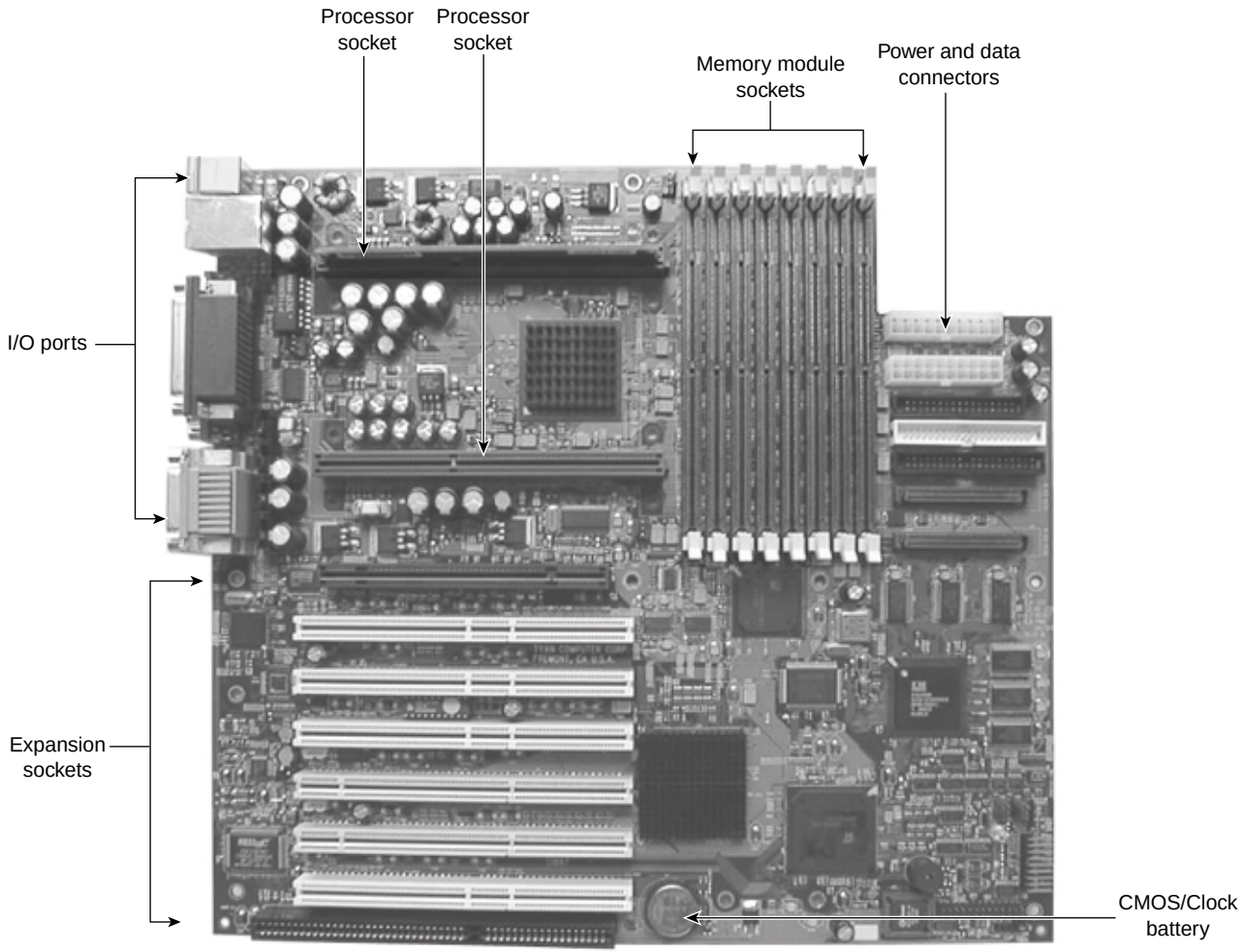

Figure 1-2 Major Components of the System Board

Components

This chapter locates and describes major components on the system board. The chapter also provides information on the integrated controllers and hardware monitoring.

Warning: B**efore touching the system board or its components, disconnect the system's power cord from its AC power outlet.**

Warning: System board components may be at high temperatures. Allow time for them to cool before handling them.

Warning: System board components can be damaged by static electricity. Use an antistatic wrist strap connected to the bare metal of the system's chassis to protect against electrostatic discharge.

Processors

The system board contains two Intel SC242 (Slot 1) processor sockets. Each socket has an associated voltage regulator integrated on the system board.

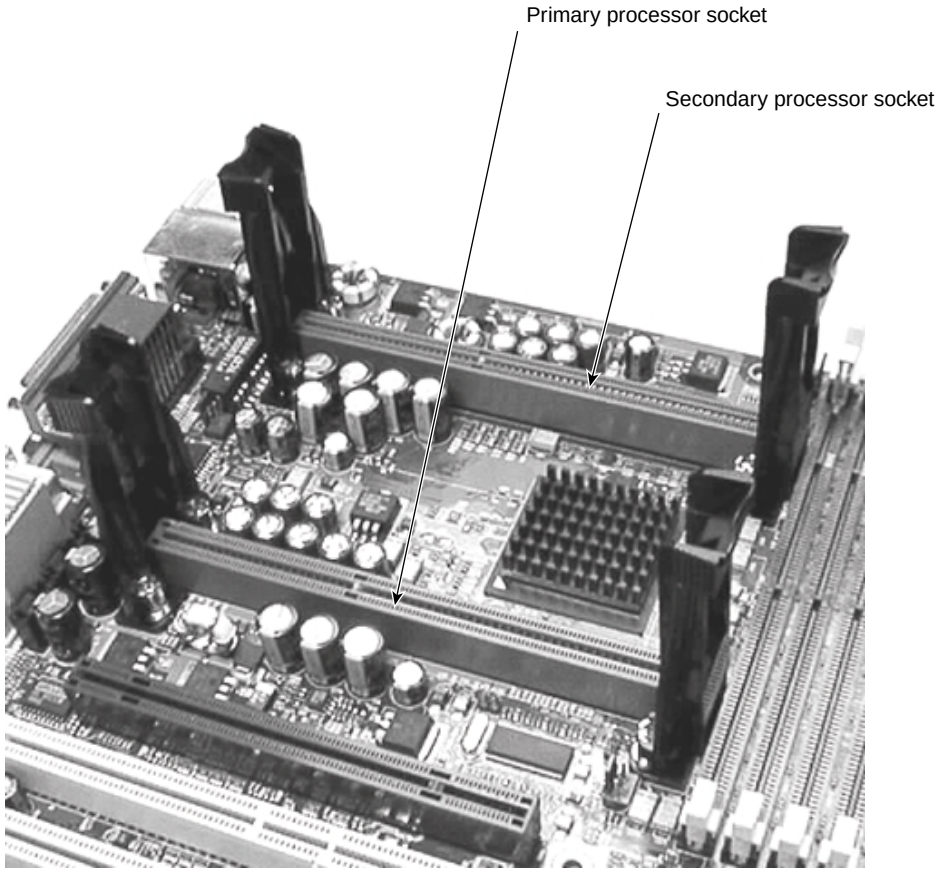

Figure 2-1 Installed Processor

Each processor socket accepts an Intel Pentium III processor (133 MHz front-side bus). The processor is secured to its socket by retention clips on both sides. The retention clips are secured by nuts to screws attached to the system board.

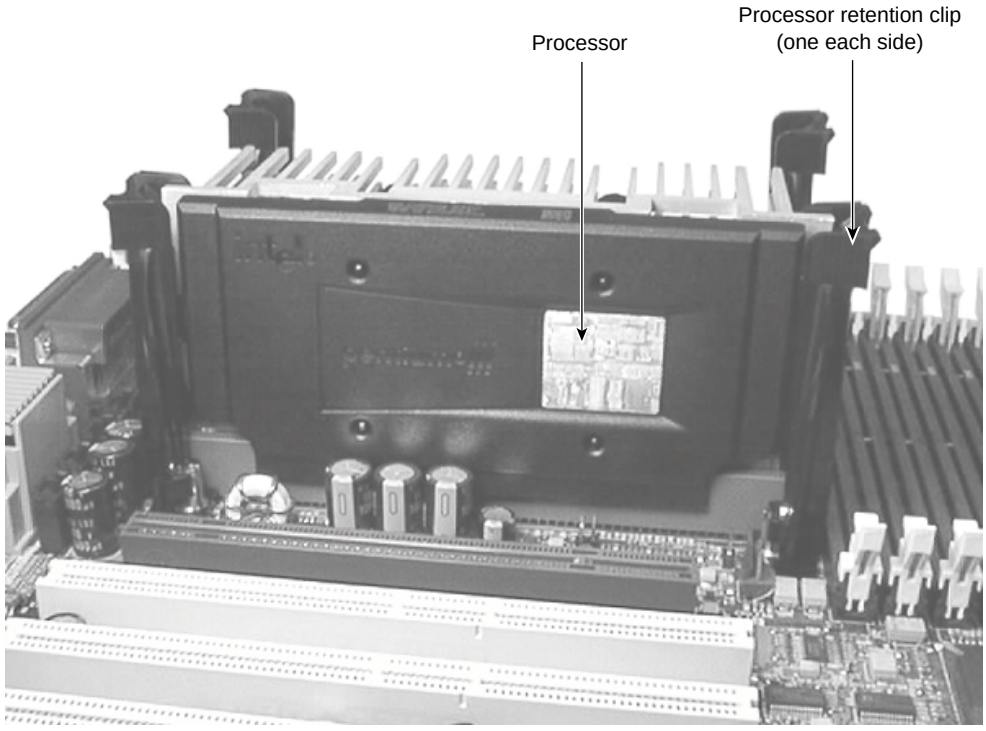

Figure 2-2 Processor Attachment

The system can function with one or two processors installed. For a single-processor system, a processor bus terminator card must be installed in the unused processor socket. For a dual-processor system, both processors must be the same speed.

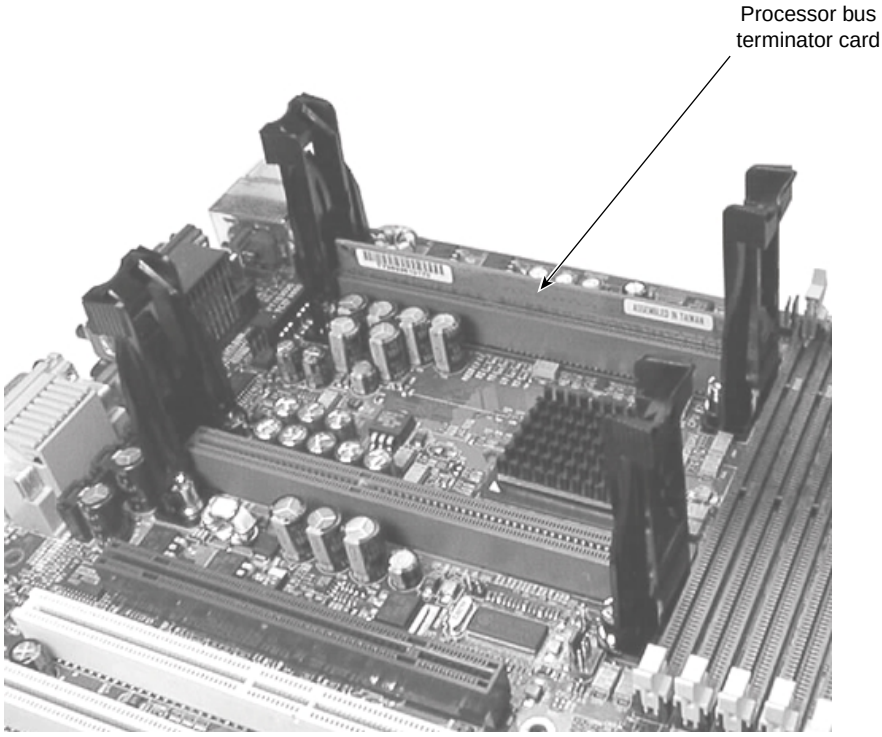

Figure 2-3 Processor Bus Terminator Card

Memory Modules

The system board includes sockets for up to six PC133 dual inline memory modules (DIMMs). The memory speed matches the system board's front-side bus speed.

Memory module sockets are organized into four banks (Bank 0 through Bank 3) of two sockets each that use two-way memory interleaving.

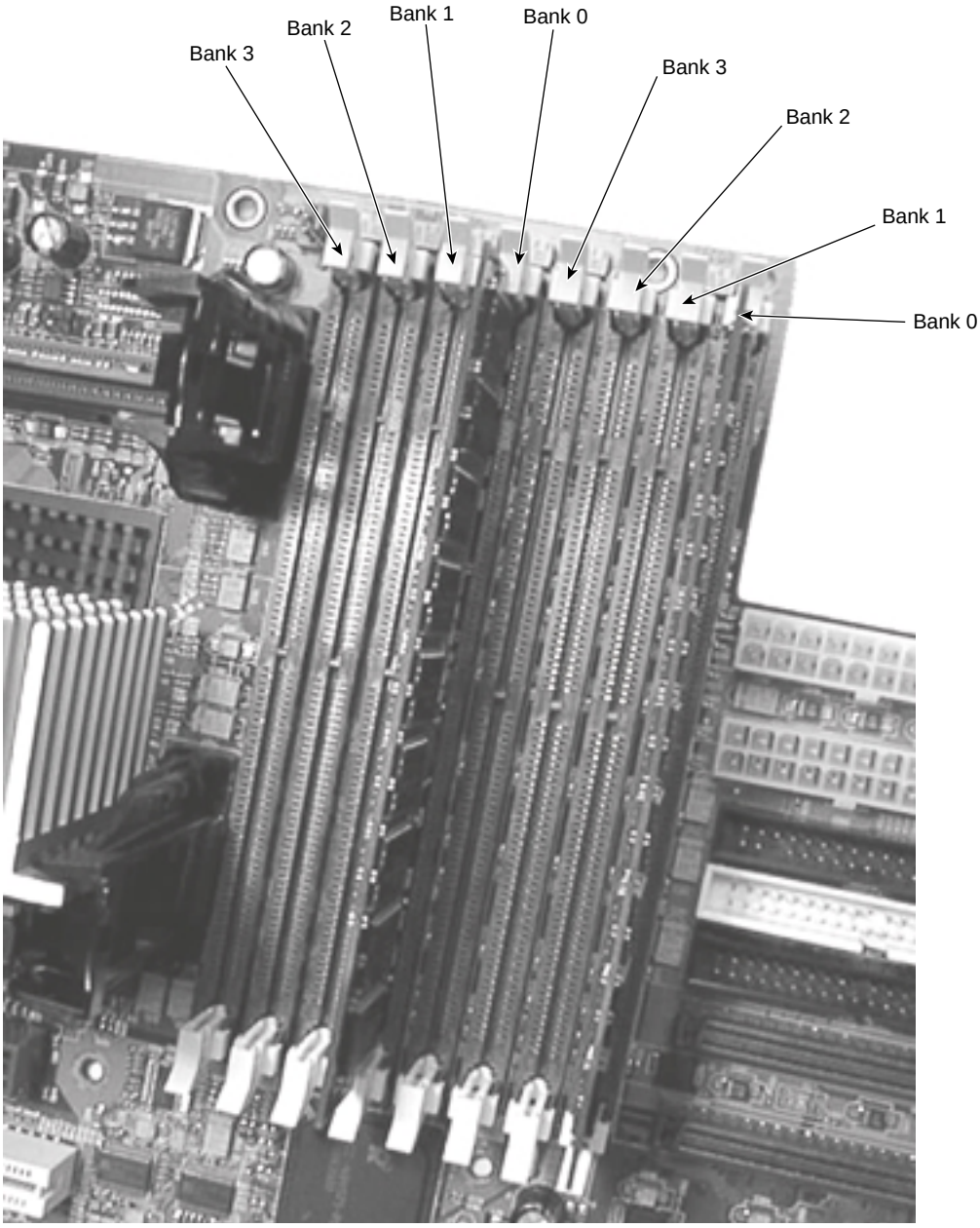

Figure 2-4 Memory ModuleSockets and Banks

Each socket accepts a 168-pin registered Synchronous Dynamic RAM (SDRAM) DIMM. Each DIMM has a 128-bit memory width and 16-bit error correcting code (ECC) protection.

Each socket is keyed for proper DIMM insertion. Release tabs on each end of the socket capture the DIMM and secure it in the socket.

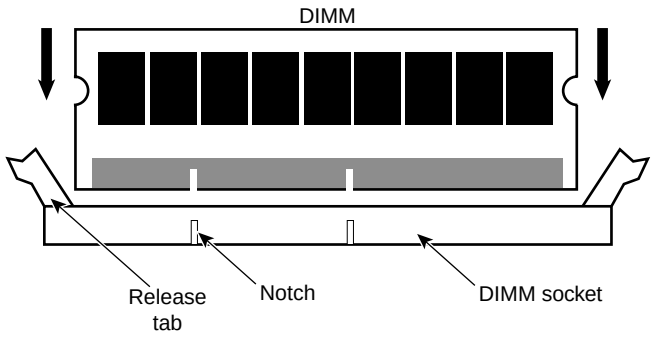

Figure 2-5 Dual Inline Memory Module (DIMM) Insertion

DIMM terminator modules (similar to the one shown in the following figure) are installed in Bank 1 instead of standard DIMMs.

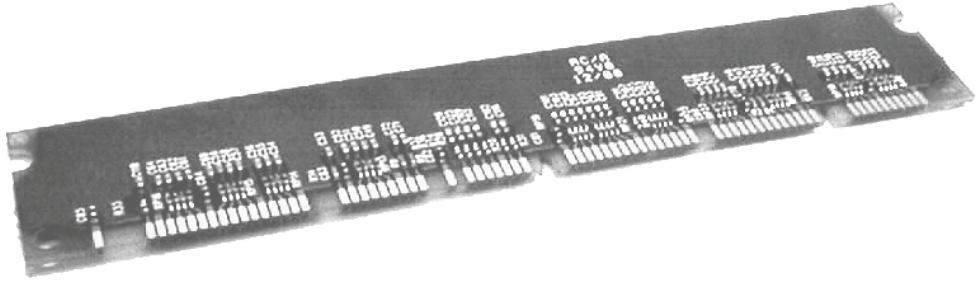

Figure 2-6 DIMM Terminator Module

To avoid damaging a DIMM and voiding its warranty, take the following precautions:

- Do not remove the DIMM from its antistatic package until you are ready to install it.
- Do not touch the metallic finger contacts.

- Do not bend, twist, drop, or otherwise handle the DIMM carelessly.
- Do not expose the DIMM to moisture or extreme temperatures.

When adding or replacing system memory on all system boards:

- Install DIMMs first in Bank 3, then in Bank 2, and finally in Bank 0.
- Do not replace DIMM terminator modules in Bank 1 with standard DIMMs.
- Ensure all installed DIMMs are PC133 (133 MHz). Do not mix DIMMs of different speeds.
- Use only registered DIMMs. Do not use unbuffered DIMMs.
- Install DIMMs in both sockets of a bank. Do not install only one DIMM in a bank.
- Install the same size DIMM in both sockets of a bank. You can vary DIMM sizes from bank to bank, but not within a bank.

A system board can have up to 6,144 MB of system memory, in increments of 256 MB, 512 MB, and 1,024 MB. The following are common configurations.

Table 2-1 Memory Configurations

Memory	Bank 3	Bank 2	Bank 0
256 MB	2 x 128 MB		
512 MB	2 x 128 MB	2 x 128 MB	
	2 x 256 MB		
768 MB	2 x 128 MB	2 x 128 MB	2 x 128 MB
	2 x 128 MB	2 x 256 MB	
1,024 MB	2 x 128 MB	2 x 128 MB	2 x 256 MB
	2 x 256 MB	2 x 256 MB	
	2 x 512 MB		
2,048 MB	2 x 256 MB	2 x 256 MB	2 x 512 MB
	2 x 512 MB	2 x 512 MB	
	2 x 1,024 MB		
3,072 MB	2 x 512 MB	2 x 512 MB	2 x 512 MB

Table 2-1 (continued) Memory Configurations

Memory	Bank 3	Bank 2	Bank 0
	2 x 512 MB	2 x 1,024 MB	
4,096 MB	2 x 512 MB	2 x 512 MB	2 x 1,024 MB
	2 x 1,024 MB	2 x 1,024 MB	
5,120 MB	2 x 1,024 MB	2 x 512 MB	
6,144 MB	2 x 1,024 MB	2 x 1,024 MB	2 x 1,024 MB

Expansion Sockets

The system board includes sockets for up to seven expansion cards, as follows:

- One full-length Accelerated Graphics Port (AGP) Pro socket
- Two full-length fast / wide Peripheral Component Interconnect (PCI) socket (64 bits, 66 MHz / 33 MHz, 3.3 V)
- Four full-length wide PCI socket (64 bits, 33 MHz, 5 V)
- One full-length Industry Standard Architecture (ISA) socket (16 bits)

When installing expansion cards, note the following:

- All PCI sockets support Universal adapters.
- An expansion card can be installed in either socket 7 (wide PCI or ISA), but not in both.

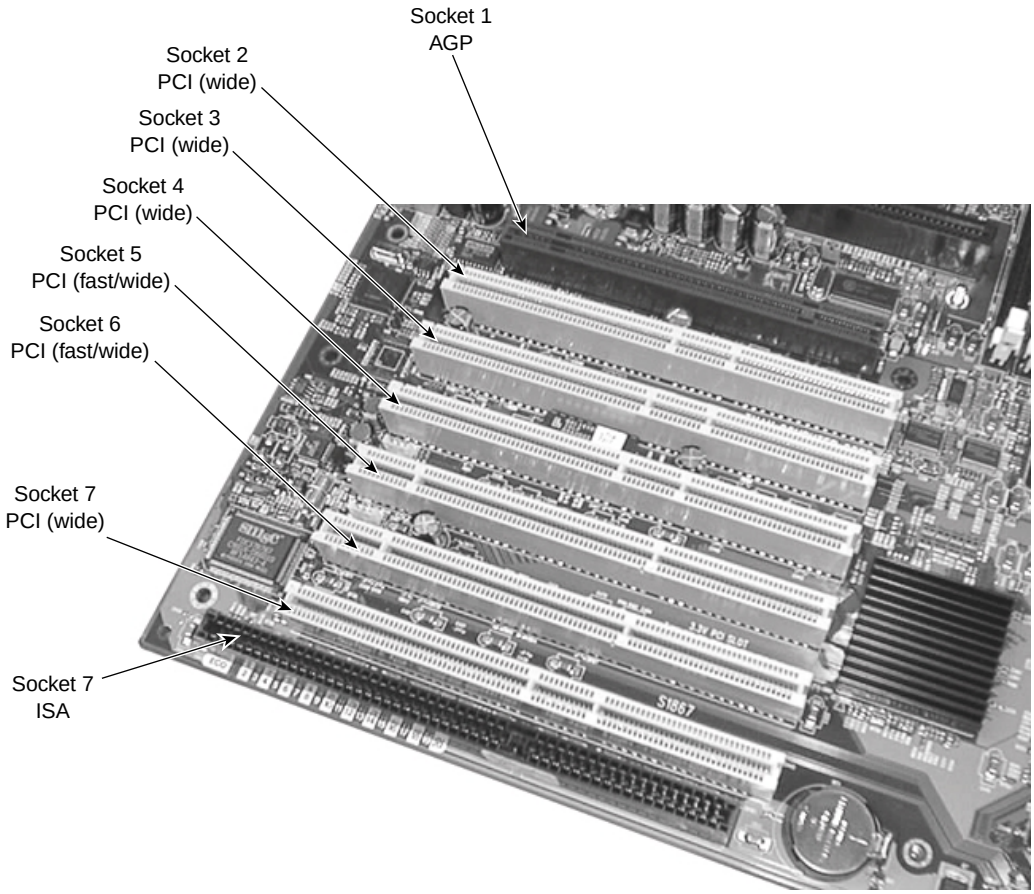

Figure 2-7 Expansion Sockets

Power and Data Connectors

The system board contains two 20-pin ATX power connectors. These connectors accept power cables (P1 and P2) from the system's power supply. The connectors are keyed for proper connection.

The system board contains five data connectors, immediately below the power connectors. These connectors accept data cables from the system's peripheral devices. The connectors are keyed for proper connection.

Warning: For continued protection against fire and energy hazards, do not connect an external SCSI port to SCSI Channel B. Connect an external SCSI port only to SCSI Channel A.

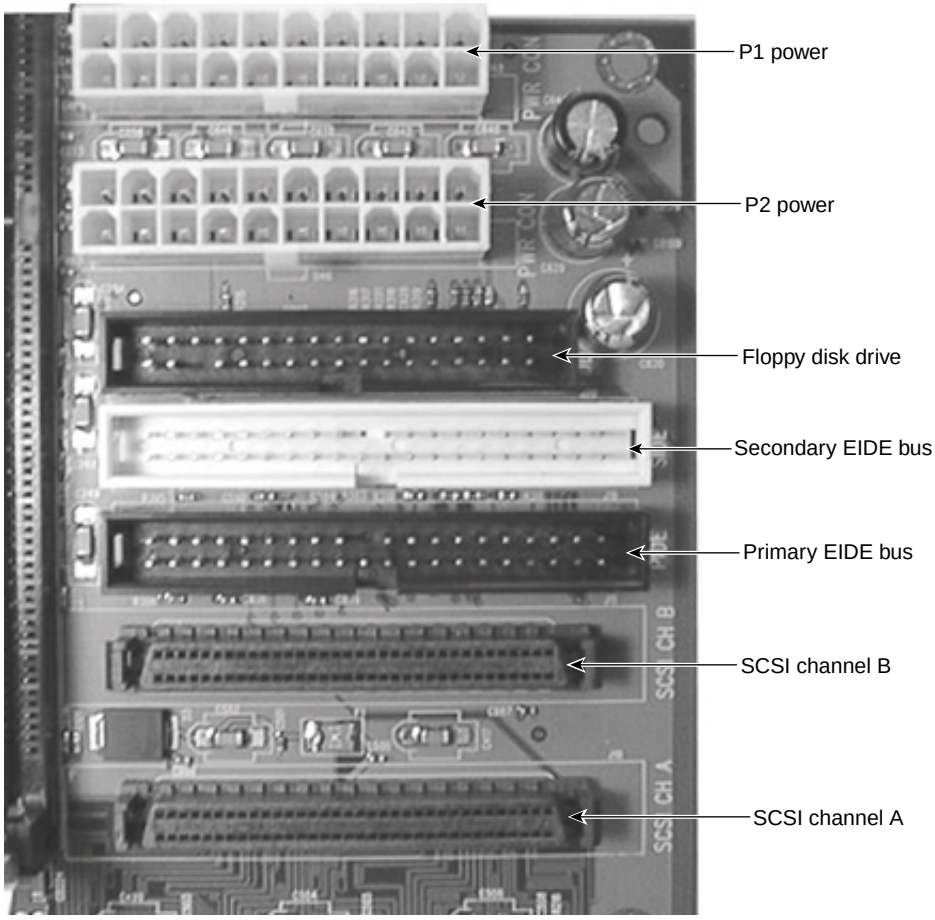

Figure 2-8 Power and Data Connectors

Fan Connectors

The system's rear fan connects to one of the 3-pin CPU FAN connectors (shown in the following figure). The connectors are keyed for proper connection. The rear fan in a tower chassis connects to the FAN4 connector to the left of and between the processor sockets. The rear fan in a rack-mount chassis connects to the FAN3 connector below and to the right of the lower processor socket.

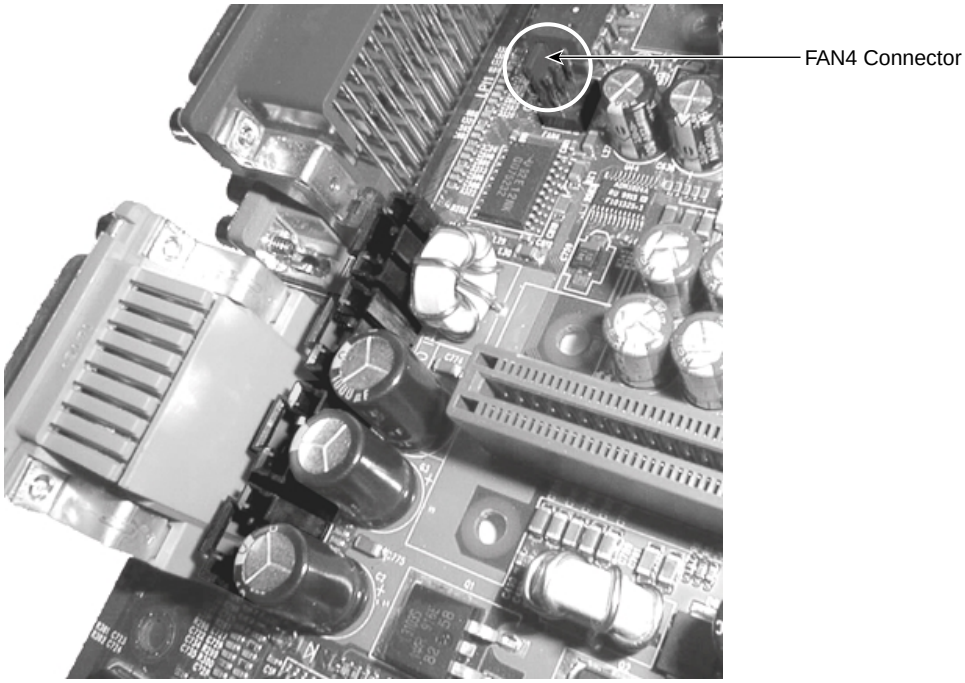

Figure 2-9 Fan4 Connector

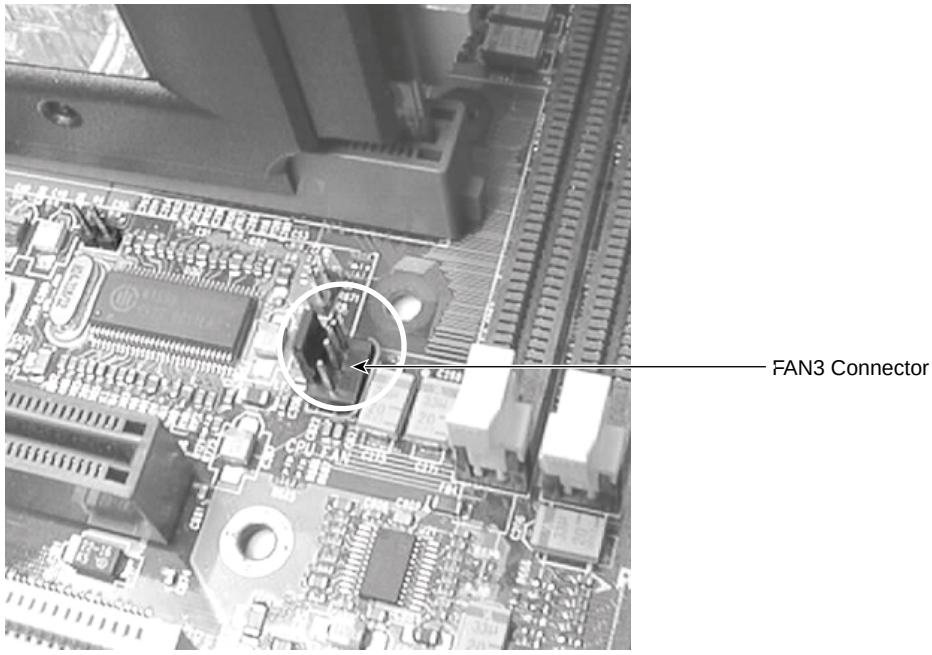

Figure 2-10 Fan3 Connector

Fans in the front of the chassis connect to one of the 3-pin FAN1 or FAN2 connectors in the lower-right corner of the system board.

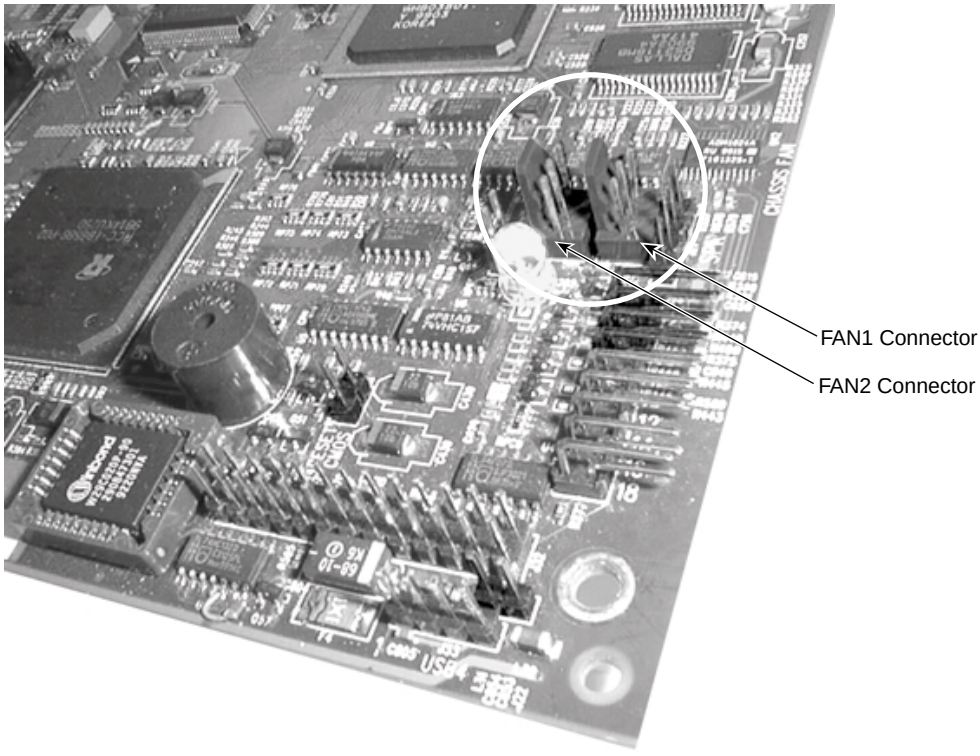

Figure 2-11 Fan1 and Fan Connectors

ATAPI Connectors

The system board has four 4-pin Advanced Technology Attachment Packet Interface (ATAPI) connectors. The connectors are keyed for proper connection.

Table 2-2 ATAPI Connectors

ATAPI Connector	Function
CD IN	Connects to the audio cable from the system's CD-ROM drive. Pin 1=CD In Left, Pins 2 and 3=Ground, Pin 4=CD In Right
VIDEO IN	Connects to the audio cable from an internal device such as a TV tuner expansion card. Pin 1=Left Line In, Pins 2 and 3=Ground, Pin 4=Right Line In
MONO IN	Connects to the mono audio signal cable from a modem or other telephony device. Pin 1=Audio Out, Pins 2 and 3=Ground, Pin 4=Audio In
MPEG IN	Connects to the cable carrying the decoded audio signal from a DVD player or similar device. Pin 1=Left Line In, Pins 2 and 3=Ground, Pin 4=Right Line In

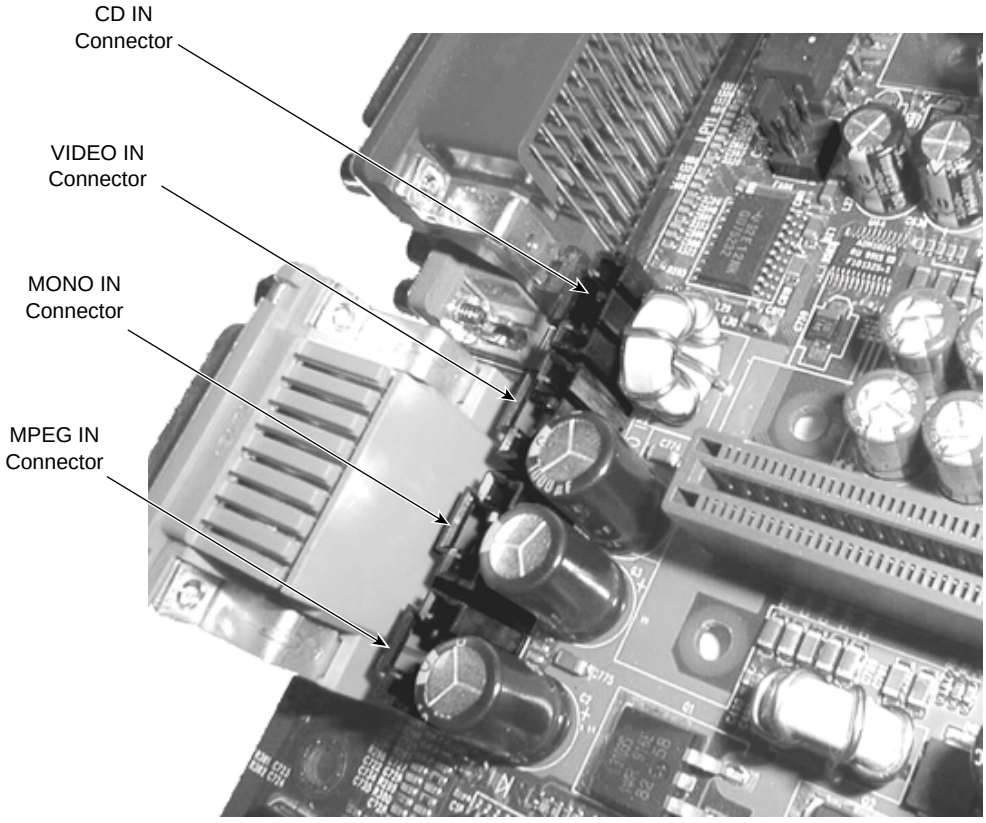

Figure 2-12 (ATAPI) Connectors

Jumper Connectors

Jumper connectors on the system board connect to system components or provide essential system functions.

Table 2-3 Jumper Connectors

Jumper Connector	Function
J22	Connects to chassis intruder alert switch.
J24	Connects to power switch, power LED, and disk drive LED. Cable connects to top eight pins.
J29	Causes CMOS reset. Instructs basic input/output system (BIOS) to use factory settings, clears BIOS Setup password, and forces BIOS Setup at each system boot. See Chapter 3, "BIOS Setup," for instructions to use CMOS reset.
JP3	Spread spectrum control. If factory installed, do not remove. (See figure on following page.)

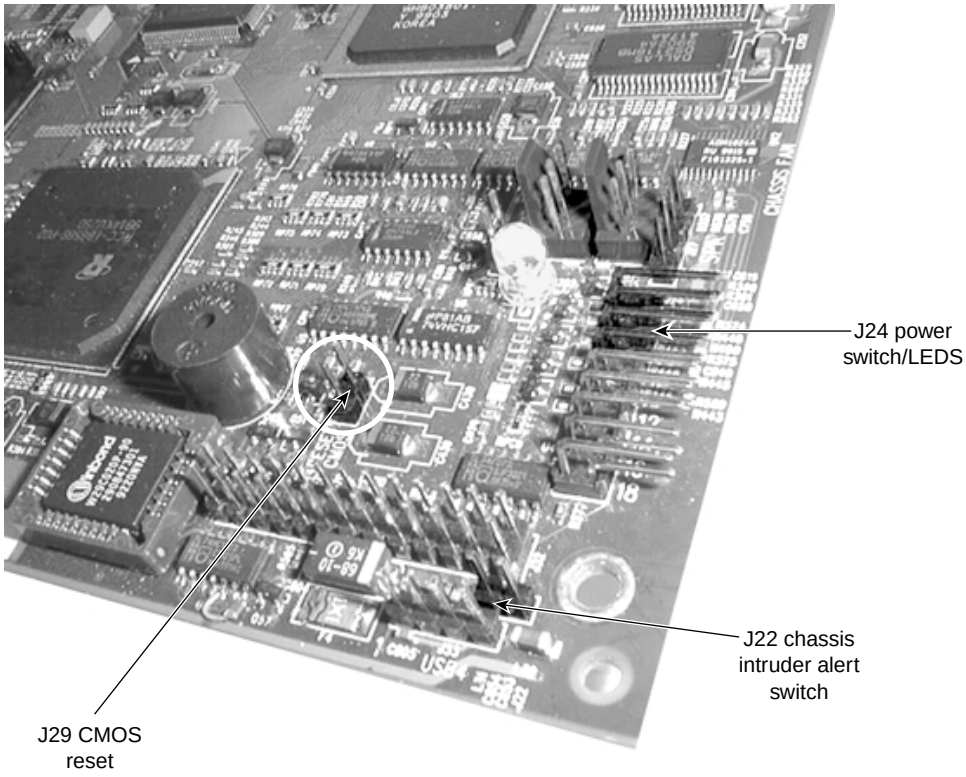

Figure 2-13 Jumper Connectors

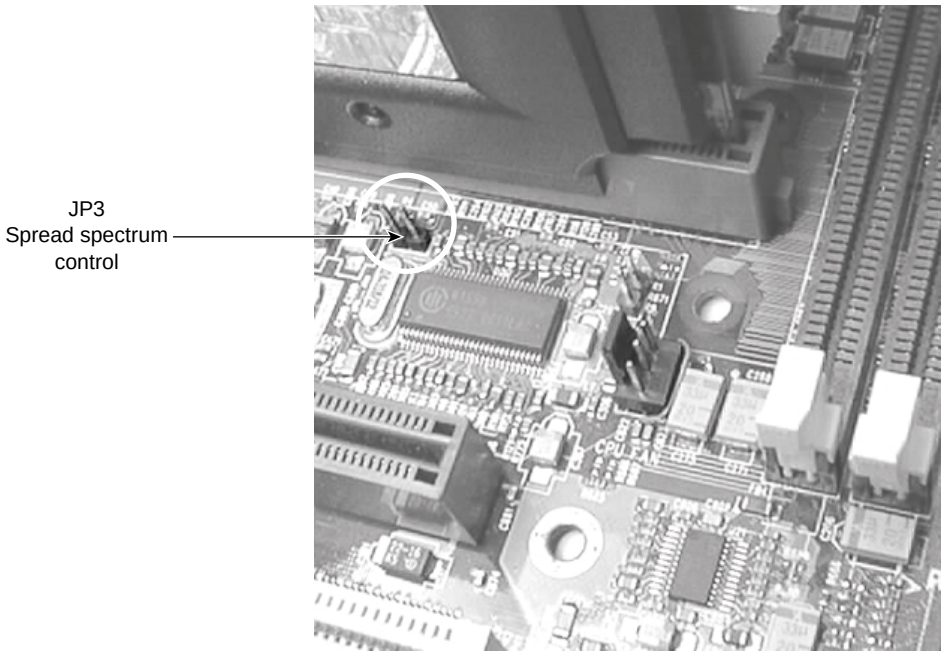

Figure 2-14 JP3 Spread Spectrum Control

I/O Port Connectors

The input/output (I/O) port connectors are stacked on the system board adjacent to the processor sockets.

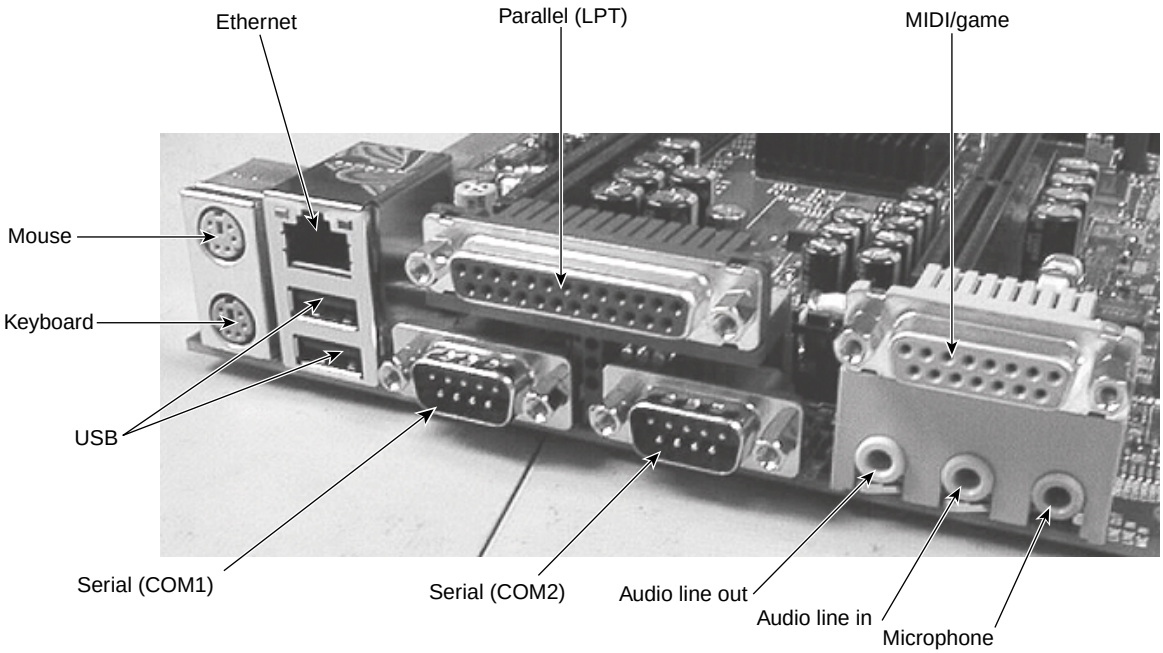

Figure 2-15 Input/Output (I/O) Port Connectors

Keyboard, Mouse

Keyboard and mouse ports are PS/2-style 6-pin male min-DIN connectors. The functionality of the two ports is not interchangeable. The keyboard is powered by standby power. The keyboard port color is purple; the mouse port color is green.

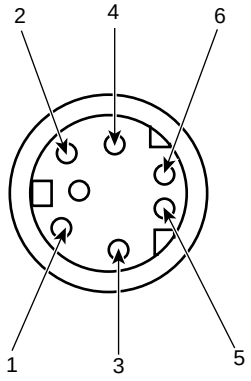

Figure 2-16 Keyboard or Mouse Ports

Table 2-4 Keyboard / Mouse Ports

Pin	Signal
1	KDATA (keyboard) MDATA (mouse)
2	Spare
3	Ground
4	VCC
5	KCLK
6	Spare

Parallel

The parallel port is a 25-pin female D-sub connector. The port color is burgundy.

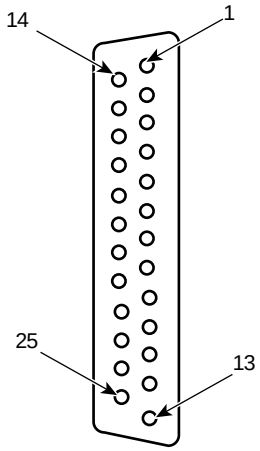

Figure 2-17 Parallel Port

Table 2-5 Parallel Port

Pin	Signal	Pin	Signal
1	Strobe	10	Acknowledge (-ACK)
2	Data 0	11	Busy
3	Data 1	12	Paper Empty (PE)
4	Data 2	13	+Select
5	Data 3	14	Auto Feed (-Auto FDXT)
6	Data 4	15	-Error
7	Data 5	16	Start (-Init)
8	Data 6	17	Select (-SLCTIN)
9	Data 7	18-25	Ground

Serial

Serial (COM) ports are 9-pin male D-sub connectors. The port color is teal.

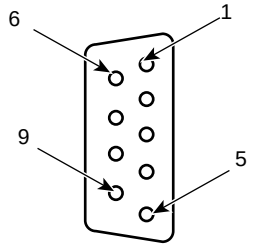

Figure 2-18 Serial Port

Table 2-6 Serial Port

Pin	Signal	Pin	Signal
1	Data Carrier Detect (DCD)	6	Data Set Ready (DSR)
2	Receive Data (RD)	7	Request to Send (RTS)
3	Transmit Data (TD)	8	Clear to Send (CTS)
4	Data Terminal Ready (DTR)	9	Ring Indicator (RI)
5	Ground		

Universal Serial Bus

Universal Serial Bus (USB) ports are 8-pin female USB connectors.

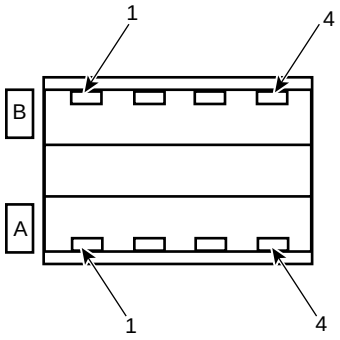

Figure 2-19 Universal Serial Bus (USB) Port

Table 2-7 Universal Serial Bus (USB) Port

Pin	Signal	Pin	Signal
A1	Power	B1	Power
A2	-	B2	-
A3	+	B3	+
A4	Ground	B4	Ground

Ethernet Network

The Ethernet Network port is an 8-pin RJ45 connector.

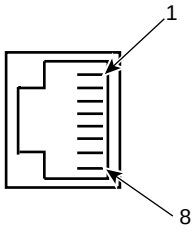

Figure 2-20 Ethenet Network Port

Table 2-8 Ethernet Network Port

Pin	Signal	Pin	Signal
1	Transmit (TD+)	5	Reserved
2	Transmit (TD-)	6	Receive (RD-)
3	Receive (RD+)	7	Reserved
4	Reserved	8	Reserved

External Wide Ultra2 SCSI (LVDS)

The external Wide Ultra2 SCSI (LVDS) port is a 68-pin female SCSI connector. Pins not listed are connected to ground.

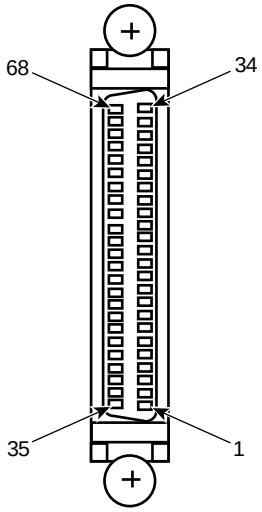

Figure 2-21 External Wide Ultra2 SCSI (LVDS) Port

Table 2-9 External Wide Ultra2 SCSI (LVDS) Port

Pin	Signal	Pin	Signal
17	TERMPWR	50	Ground
18	TERMPWR	52	TERMPWR
35	SD-(12)	53	No connection
36	SD-(13)	54	Ground
37	SD-(14)	55	SATII-
38	SD-(15)	56	Ground
39	SDP1-	57	SBSY-

Table 2-9 (continued) External Wide Ultra2 SCSI (LVDS) Port

40	SD-(0)	58	SACK-
41	SD-(1)	59	SRSI-
42	SD-(2)	60	SMSG-
43	SD-(3)	61	SSEL-
44	SD-(4)	62	SCD-
45	SD-(5)	63	SREQ-
46	SD-(6)	64	SIO-
47	SD-(7)	65	SD-(8)
48	SDP0-	66	SD-(9)
49	Ground	67	SD-(10)
51	TERMPWR	68	SD-(11)

Audio Line Out, Line In, Microphone

The Audio Line Out, Line In, and Microphone ports are PC-standard 1/8-inch female phone jacks. The Audio Line Out port color is lime; the Audio Line In port color is light blue; and the Microphone port color is pink.

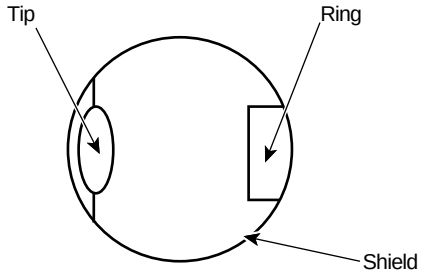

Figure 2-22 Audio Line Out, Line In, and Microphone Ports

Table 2-10 Audio Line Out, Line In, and Microphone Ports

Pin	Signal
Shield	Ground
Tip	Left (line) / Mic (microphone)
Ring	Right (line) / Bias (microphone)

MIDI/Game

The MIDI / Game port is a 15-pin female D-sub connector. The port color is gold.

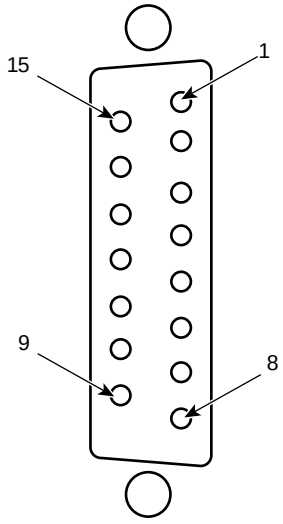

Figure 2-23 MIDI / Game Port

Table 2-11 MIDI / Game Port

Pin	Signal	Pin	Signal
1	=5 V	9	=5 V
2	Fire button 0	10	Fire button 2
3	X-axis, joystick 1	11	X-axis, joystick 2
4	Ground	12	MIDI out
5	Ground	13	Y-axis, joystick 2
6	Y-axis, joystick 1	14	Fire button 3
7	Fire button 1	15	MIDI in
8	+5 V		

Integrated Controllers

The system board has three integrated controllers. Each controller can be disabled if needed using the BIOS Setup program. For more information, see Chapter 3, “BIOS Setup”.

SCSI Controller

The system board includes an integrated LSI 53C1010 SCSI controller. The controller provides the system with a dual-channel Ultra3 SCSI bus.

Channel A connects to an external SCSI port and (on some systems) to internal SCSI devices. Channel B connects (on some systems) to internal SCSI devices. Both channels use 68-pin SCSI connectors located on the system board.

Warning: For continued protection against fire and energy hazards, do not connect an external SCSI port to SCSI Channel B. Connect an external SCSI port only to SCSI Channel A.

Controller features include:

- Low-Voltage Differential (LVD) bus
- 2 16-bit 80 MHz channels
- 160 MB / sec transfer rate per channel for Ultra3 devices
- Ultra2 and Ultra3 devices connected to the controller operate at their respective transfer rates
- PCI bus interface
- Advanced Configuration and Power Interface (ACPI) support

You may need to use the SCSI Configuration Utility to configure the operation of SCSI peripherals connected to the controller. This utility lets you configure SCSI controllers, perform a low-level format on a SCSI hard disk drive, select boot order, and verify media. To run the SCSI Configuration Utility, press CTRL+C when prompted during system boot. See SCSI Configuration Utility Help for more information on using the utility.

Network Controller

The system board includes an integrated Intel 82559 10/100 Mb/sec Fast Ethernet controller. The controller provides support for the Advanced Configuration and Power Interface (ACPI), Wake-on-LAN, System Management Bus, and Wired for Management compliance.

Note: The Zx10 system board supports Wake-On-LAN through a PCI 2.2-compliant power-management event (PME) on the PCI bus. The system board does not support expansion cards that require a Wake-On-LAN header for wake events.

The controller's Ethernet port is located on the input/output (I/O) panel.

Controller features include:

- IEEE 802.3 10BASE-T and 100BASE-TX compatibility
- Full-duplex support at both speeds
- 3 Kb Transmit and Receive FIFO
- IEEE 802.3x 100BASE-TX flow control support
- PCI bus interface
- RJ45 Ethernet port

Audio Controller

The system board includes a Creative Technologies ES1373 AudioPCI controller. The controller provides support for the Advanced Configuration and Power Interface (ACPI), DirectSound, DirectSound 3D, MIDI, Sound Blaster, Roland MPU401, and Audio Codec '97 (AC97).

The controller's jacks and its MIDI/game port are located on the input/output (I/O) panel. The ATAPI connectors are located on the system board adjacent to the I/O panel ports.

Controller features include:

- 64 voices and 128 general MIDI wavetable instruments

- 8-bit and 16-bit, mono and stereo recording and playback
- Sampling rates up to 48 kHz
- 16 MIDI channels
- Full-duplex operation
- Line in, line out, and microphone in jacks
- MIDI / game port
- ATAPI connectors for CD-ROM input, video input, and monaural audio (telephony) input
- PCI bus interface

Hardware Monitoring and Power Management

The system board features advanced hardware monitoring capabilities. These features help save energy, prolong system life, and provide for functionality such as remote system wakeup.

When used with the hardware monitoring software on a system, these features enable you to monitor:

- Major system voltages, including +1.5 V, +2.5 V, +3.3 V, +3.3 V standby, +5 V, +5 V standby, -5 V, +12 V, -12 V, processor (CPU) cores, and AGP input / output (I / O)
- Temperature of processor (CPU) cores, and ambient temperature near the processors and in the chassis
- Presence and location of fans – front (Fan 1 and Fan 2) and rear (Fan 3 and Fan 4); presence varies by system
- Chassis intrusion

The system board includes integrated temperature sensors. These sensors provide signals for reporting temperature readout data and for controlling cooling fan speed.

The Power LED on the front of the system base unit indicates the system's normal power states:

Table 2-12 Base Unit Power LED

LED	Power State	Explanation
Unlit	Off	Auxiliary power is off (fans are not running) or there is a system failure (fans are running)
Amber	Auxiliary	Auxiliary power is on; power consumption is reduced
Blinking Green	Managed Power	The system is in an ACPI-compliant power conservation state managed by the operating system; power consumption is reduced
Steady Green	Full	Full power is on; power conservation is per device

The Power / Status LED on the system board indicates the system's operational status:

Table 2-13 System Board Power / Status LED

LED	Status
Unlit	Auxiliary power is off (fans are not running)
Bright	System failure (fans are running)
Amber	Auxiliary power is on
Green	Full power is on

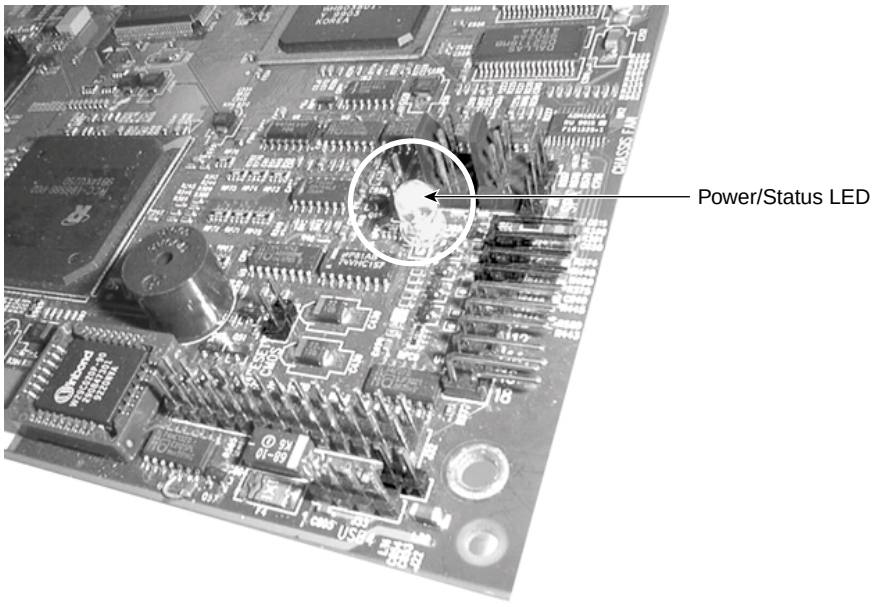

Figure 2-24 System Board Power / Status LED

CMOS/Clock Lithium Battery

The CMOS / clock lithium battery is located at the bottom of the system board, next to the lowest expansion sockets. The battery may be hidden under installed expansion cards.

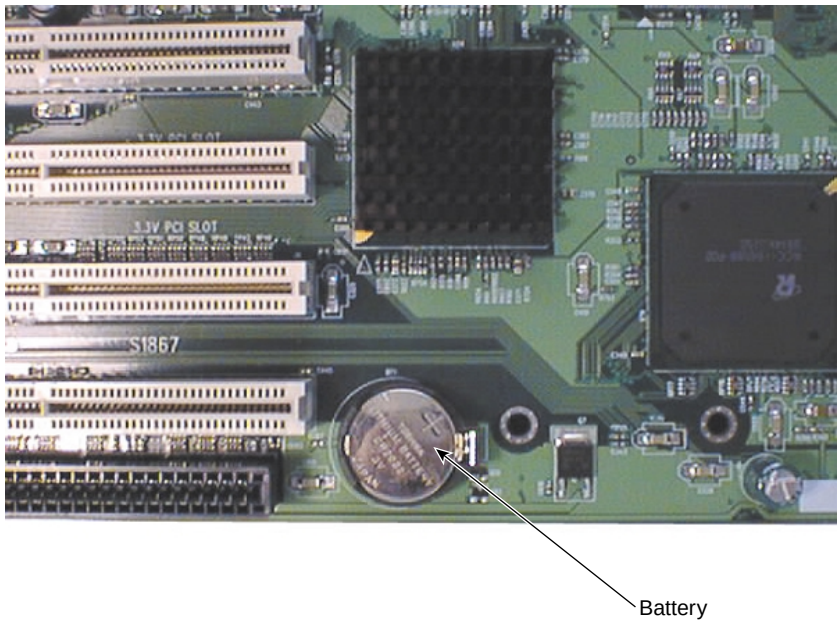

Figure 2-25 CMOS / Clock Lithium Battery

Battery replacement is not normally required. The battery has a life expectancy of 10 years with no line power applied to the system. When line power is present, there is no drain on the battery.

If you must remove the battery, the system loses its operating parameters stored in CMOS memory. As a result, the system BIOS parameter settings are lost. After you install a new battery, you must reset the date and time and reconfigure the BIOS parameter settings. See Chapter 3, "BIOS Setup," for more information on configuring BIOS parameter settings.

Warning: Turn off the system and disconnect it from AC power before changing the battery. Damage to components can occur if the battery is shorted while AC power is applied.

To remove the battery, push out the clip on the side of the battery holder to release the battery. Ensure that the new battery is properly oriented before installing it (positive side

facing up). Replace the battery only with the same or equivalent type as recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

BIOS Setup

This chapter describes the BIOS Setup program and BIOS parameter settings. It also describes how to use CMOS reset and how to update the system BIOS.

BIOS Overview

The system's *basic input/output system* (BIOS) records basic system operating parameters, such as the amount of memory, the boot sequence, and the type of video display. The BIOS is stored in flash erasable-programmable memory (EPROM) on the system board, and reads the system parameters in the system's complementary metal-oxide semiconductor (CMOS) random-access memory (RAM). When you power off the system, a lithium battery provides power to CMOS RAM to retain the operating parameters. Each time you power on the system, the BIOS uses stored parameters to configure system operation.

The *BIOS Setup program*, which is also stored in the flash EPROM on the system board, allows you to manually change the system operating parameters. You can also run the BIOS Setup program during the system's power-on self-test (POST). For the system to operate correctly, you should run BIOS Setup after you make any hardware changes to the system.

Using BIOS Setup

To run BIOS Setup:

Start or restart the system and press `f2` when the SGI logo displays.

To navigate BIOS Setup screens and parameters:

- Press the right or left arrow key to move from one screen to the next.
- Press the up or down arrow key to select a parameter displayed onscreen.

- Press `enter` to enter a submenu or execute a command.
- Press `+` or `–` to change the value of a selected parameter.
- Press `f9` to change all parameters to their default values (as shipped from the factory).
- Press `f10` to save changes to any parameters and exit from a screen.
- Press `esc` to exit from a screen.
- Press `f1` for general help with BIOS Setup.

To exit from BIOS Setup:

Go to the Exit screen and select the appropriate option. See “Exit Screen” on page 49“ for more information.

BIOS Setup Screens

Each BIOS Setup screen has the following features:

- A *screen bar* across the top gives you access to all of the BIOS Setup screens.
- A *navigation bar* across the bottom tells you how to navigate BIOS Setup.
- A *parameter window* on the left contains the parameters in the selected screen or submenu.
- A *help window* on the right displays basic information about the selected item.
- A pointer (υ) denotes a *submenu*. Press `enter` to display it and `esc` to exit from it.

Main Screen

The Main screen gives you access to the other BIOS Setup screens and to basic parameters.

Table 3-1 Main Screen Parameters

Parameter	Description
BIOS Version	Displays the BIOS version.
System Time	Sets the system time.
System Date	Sets the system date.
Processor Speed	Displays the processor speed (in MHz).
Front Side Bus	Displays the front-side bus speed (in MHz).
Legacy Diskette A / Legacy Diskette B	Sets the type of floppy disk drive(s) installed in your system. The standard floppy disk drive is 1.44 MB 3½ inch.
HDD Configuration	Controls the devices on the system's primary and secondary Integrated Drive Electronics (IDE) buses. Each bus supports one master device and one slave device. A submenu lets you manually configure device parameters, select large-disk access mode, and control IDE bus master DMA. By default, the Type parameters for all devices are set to Auto to let the BIOS configure them.
Keyboard Features	Controls keyboard operation. A submenu lets you configure specific keyboard functions.
PS/2 Mouse	Controls mouse operation. Disabling this parameter prevents a PS/2 mouse from functioning and releases interrupt request (IRQ) 12. By default, this parameter is Enabled.
System Memory	Displays the amount of conventional memory detected during system boot.
Extended Memory	Displays the amount of extended memory detected during system boot.
Memory Cache	Sets the state of the processor memory cache. A submenu lets you enable or disable the cache and configure specific areas of the cache as needed. By default, the cache is Enabled; the system and video BIOS areas are set to Write Protect; and the cache base and extended memory areas are set to Write Back.

Advanced Screen

The Advanced screen lets you configure system devices..

Table 3-2 Advanced Screen Parameters

Parameter	Description
Processor Serial Number	Controls detection of the processor serial number. By default, this parameter is Enabled.
Installed O/S	Sets the operating system most commonly used on the system. By default, this parameter is Other.
Reset Configuration Data	Controls whether the Extended System Configuration Data (ESCD) area is cleared. By default, this parameter is No.
Extended Memory Test	Controls whether extended memory is tested during power-on self test (POST).
PCI Configuration	Controls configuration of installed Peripheral Component Interconnect (PCI) devices. Submenus let you enable, disable, and configure the integrated controllers – SCSI, network, Universal Serial Bus (USB), and audio. Submenus let you enable or disable PCI bus mastering and change the configuration of each PCI socket. Submenus let you configure operation of a system with installed Accelerated Graphics Port (AGP), Peripheral Component Interconnect (PCI), and Industry Standard Architecture (ISA) devices. You can enable an ISA graphics device to access PCI graphics palette data (default is No), reserve upper memory for ISA devices, and reserve IRQs for use by ISA devices. If your system has dual monitors, you can select which video controller is the boot display device (used for VGA display).
I/O Device Configuration	Controls configuration of the input/output (I/O) ports. You can configure the serial ports, the parallel port, and the floppy disk controller as needed.

Security Screen

The Security screen lets you control access to BIOS Setup and to the system.

Note: When you enter a password, it is saved immediately. All other changes may still be discarded (see “Exit Screen” on page 49 in this chapter).

Warning: If you forget the supervisor password, it cannot be disabled without clearing CMOS memory. See "Using CMOS Reset" in this chapter for more information.

Table 3-3 Security Screen Parameters

Parameter	Description
Supervisor Password Is	Displays the state of the supervisor password.
User Password Is	Displays the state of the user password.
Set Supervisor Password	Sets the supervisor password. Press Enter to display the entry dialog. To disable a set password, set the password to nothing (press enter without typing a password).
Set User Password	Sets the user password. Press enter to display the entry dialog. To disable a set password, set the password to nothing (press enter without typing a password).
Password on Boot	Controls whether a password is required to boot the system. You can use either the supervisor or user password. By default, this parameter is Disabled.
Diskette Access	Controls access to the floppy disk drive if passwords are set. By default, this parameter is Supervisor.

Misc. Screen

The Misc. screen lets you configure miscellaneous system functions.

Table 3-4 Misc. Screen Parameters

Parameter	Description
Floppy Check	Controls whether the floppy disk drive type is verified during system boot. By default, this parameter is Disabled.
Summary Screen	Controls whether the system configuration is displayed during system boot. By default, this parameter is Disabled.
Boot-time Diagnostic Screen	Controls whether a diagnostic screen is displayed during system boot. By default, this parameter is Disabled.
Wakeup on Keyboard	Controls whether the system wakes from a soft-off state when it detects keyboard activity. By default, this parameter is Disabled.
Wakeup on LAN	Controls whether the system wakes from a soft-off state when notified by the network controller. By default, this parameter is Disabled.
Wakeup on Modem Ring	Controls whether the system wakes from a soft-off state when notified by an installed modem. By default, this parameter is Disabled.

Boot Screen

The Boot screen controls the order in which devices are checked during system boot. Available devices are listed on the screen in boot order. A + next to an item indicates multiple devices; a ! indicates that a device or set of devices is disabled (not checked during system boot).

You can:

- Press the up or down arrow key to select a device or list of devices.
- Press `enter` to expand or collapse a list of devices.
- Press `shift+1` to enable or disable a device or list of devices.
- Press + to move a device up in boot order.

- Press – to move a device down in boot order.

You can select to boot from removable devices, a specific hard disk drive, the CD-ROM drive, or a disk drive on the network.

Exit Screen

The Exit screen lets you control the changes made to the BIOS and exit from BIOS Setup.

Table 3-5 Exit Screen Parameters

Parameter	Description
Exit Saving Changes	Saves the changes you have made, exits the BIOS, and restarts the system to make these changes take effect.
Exit Discarding Changes	Leaves the previous BIOS settings intact, exits the BIOS, and continues with the operating system boot.
Load Setup Defaults	Returns all BIOS parameters to their original default settings (as shipped from the factory).
Discard Changes	Discards any changes you have made, but does not exit the BIOS.
Save Changes	Saves any changes you have made, but does not exit the BIOS.

Using CMOS Reset

CMOS reset instructs the BIOS to use factory settings, clears BIOS passwords, and runs BIOS Setup at system boot. See Chapter 2, “Components” for the location of the CMOS reset jumper connector on the system board.

To use CMOS reset:

1. Turn off system power and disconnect the system from AC power.
2. Install a jumper on the CMOS reset connector (J29) on the system board.
3. Connect the system to AC power and start the system. BIOS Setup runs automatically.
4. Reconfigure the BIOS parameter settings as needed.

5. Go to the Exit screen and select Save Changes. Do not select Exit Saving Changes or press `f10`.
6. Turn off system power (while still in BIOS Setup) and disconnect the system from AC power.
7. Remove the jumper from the CMOS reset connector (J29) on the system board.
8. Connect the system to AC power and start the system.

Updating the System BIOS

You can use a flash programming utility and a BIOS file to reprogram the system's BIOS. The utility and file are available in a system software product named `flashzx`. You can get the most recent version of `flashzx` from SGI's online services.

To update the system BIOS:

1. Download the `flashzx` product to a directory on your system.
2. Extract the BIOS file from the `flashzx` product to a bootable diskette.
3. Ensure the system is set to boot from a diskette in the floppy disk drive.
4. Restart the system with the boot diskette in the floppy disk drive.
5. When the A: prompt displays, run the `flash` utility from the boot diskette. See the `readme.txt` file included with the BIOS update for detailed instructions.
6. After the update process has completed and the system boots, verify that the new BIOS version displays (in the Main screen).

Resources

This chapter lists and describes system board resources.

ISA Interrupt Requests (IRQs)

Most Industry Standard Architecture (ISA) peripheral devices installed in the system require you to reserve an interrupt request (IRQ). Peripheral Component Interconnect (PCI) peripheral devices share system resources and can use the same IRQ. (See "PCI-to-ISA Interrupt Map" on page 52 in this chapter.) At least one IRQ must be unassigned for use with your system's PCI devices.

Table 4-1 ISA Interrupt Requests

IRQ	Assignment	IRQ	Assignment
0	Reserved (timer/counter)	8	Reserved (real-time clock)
1	Reserved (keyboard controller)	9	System Management Bus / ACPI
2	Reserved (interrupt controller)	10	PCI
3	Serial ports COM 2 / COM 4	11	PCI
4	Serial ports COM 1 / COM 3	12	PS/2 mouse
5	PCI / Audio	13	Hardware Monitor
6	Reserved (floppy disk controller)	14	Primary IDE
7	Parallel port LPT 1	15	Secondary IDE

To reserve an IRQ for an installed peripheral device:

1. Start or restart the system and run the BIOS Setup program.
2. Go to the Advanced Screen and select the PCI Configuration parameter.
3. Select and reserve the appropriate IRQ.
4. Save the changes and exit from BIOS Setup.

The system has a limited number of available IRQs. To install more ISA peripheral devices than you have available IRQs, you must disable one unused system port for each excess ISA device, unless the device does not require an IRQ.

Some older PCI device driver software cannot share an interrupt, which is a violation of the current PCI specification. If you install a device that uses such driver software, you must free an IRQ for the device to work in the system.

PCI-to-ISA Interrupt Map

PCI peripheral devices installed in the system require one or more PCI interrupt requests (PIRQ). Four interrupt lines—INTA, INTB, INTC, and INTD—are available for PCI interrupt requests.

Table 4-2 PCI-to-ISA Interrupt Map

Device	PCI Bus/Device	CF8h Value	INTA	INTB	INTC	INTD
SCSI A	Bus 0, Dev 1, Func 0	800008xx	PIRQ13			
SCSI B	Bus 0, Dev 1, Func 1	800009xx		PIRQ12		
Audio	Bus 0, Dev 2, Func 0	800010xx	PIRQ14			
PCI socket 1	Bus 0, Dev 3	800018xx	PIRQ00	PIRQ01	PIRQ02	PIRQ03
PCI socket 2	Bus 0, Dev 4	800020xx	PIRQ02	PIRQ03	PIRQ00	PIRQ01
PCI socket 3	Bus 0, Dev 5	800028xx	PIRQ04	PIRQ05	PIRQ13	PIRQ12
PCI socket 6	Bus 0, Dev 6	800030xx	PIRQ06	PIRQ07	PIRQ04	PIRQ05
Ethernet	Bus 0, Dev 7, Func 0	800038xx	PIRQ07			
AGP socket	Bus 1, Dev 1	800100xx	PIRQ01	PIRQ03		

Table 4-2 (continued) PCI-to-ISA Interrupt Map

Device	PCI Bus/Device	CF8h Value	INTA	INTB	INTC	INTD
PCI socket 4	Bus 2, Dev 1	800208xx	PIRQ08	PIRQ09	PIRQ10	PIRQ11
PCI socket 5	Bus 2, Dev 2	800210xx	PIRQ10	PIRQ11	PIRQ08	PIRQ09

Direct Memory Access (DMA) Channels

Table 4-3 DMA Channels

DMA Channel	Data Width	Assignment
0	8b or 16b	Open
1	8b or 16b	Second choice of ECP parallel port
2	8b or 16b	Floppy disk controller
3	8b or 16b	First choice of ECP parallel port

Input/Output (I/O) Map

Table 4-4 I/O Map

I/O Address (hex)	Assignment
0000 – 000F	DMA controller 1
0020 – 0021	Interrupt controller 1
0040 – 0043	Timer/counter 1
0048 – 004B	Timer/counter 2
0060	Keyboard controller
0061	NMI and speaker

Table 4-4 (continued) I/O Map

I/O Address (hex)	Assignment
0064	Keyboard controller
0070 (bit 7)	Enable NMI
0070 (bits 0 – 6)	RTC address (maximum 128 bytes)
0072 – 0073	RTC CMOS bank 2 index/data
0080 – 008F	DMA page registers
0092	A20 control register
00A0 – 00A1	Interrupt controller 2
00C0 – 00DF	DMA controller 2
0170 – 0177	Secondary IDE channel
01F0 – 01F7	Primary IDE channel
0200 – 0207	Audio/game port
0220 – 022F	Audio (Sound Blaster compatible)
0240 – 024F	Audio (Sound Blaster compatible)
0278 – 027F	Parallel port LPT 2
02E8 – 02EF	Serial port COM 4
02F8 – 02FF	Serial port COM 2
0300 – 0301	MIDI
0330 – 0335	MIDI
0370 – 0375	Floppy disk drive channel 2
0376	Secondary IDE channel command
0377 write	Floppy disk drive channel 2 command
0377 bit 7 read	Floppy disk drive channel 2 disk change status
0377 bits 0 – 6	Secondary IDE channel status
0378 – 037F	Parallel port LPT 1

Table 4-4 (continued) I/O Map

I/O Address (hex)	Assignment
03B4 – 03B5	Add-in card; VGA
03BA	Add-in card; VGA
03BC – 03BF	Parallel port LPT 3
03C0 – 03CA	Add-in card; VGA
03CC	Add-in card; VGA
03CE – 03CF	Add-in card; VGA
03D4 – 03D5	Add-in card; VGA
03DA	Add-in card; VGA
03E8 – 03EF	Serial port COM 3
03F0 – 03F5	Floppy disk drive channel 1
03F6	Primary IDE channel command
03F7 write	Floppy disk drive channel 1 command
03F7 bit 7 read	Floppy disk drive channel 1 disk change status
03F7 bits 0 – 6	Primary IDE channel status
03F8 – 03FF	Serial port COM 1
040B	DMA ext. write mode register
04D0 – 04D1	Edge/level interrupt control register
04D6	DMA ext. write mode register
0500 – 050F	SMBus control registers
0510 – 055F	ACPI registers
0C00 – 0C01	PCI-to-IRQ mapping registers
0C06 – 0C08	Security registers
0C14	PCI error status register
0C49 – 0C4A	Rise-time counter register

Table 4-4 (continued) I/O Map

I/O Address (hex)	Assignment
0C50 – 0C52	General-purpose registers
0C6C – 0C6F	ISA control registers
0CD6 – 0CD7	Power management registers
0CF8 – 0CFB	PCI configuration address registers (DW access)
0CFC – 0CFF	PCI configuration data registers
0F50 – 0F58	General-purpose chip select

Memory Map

Table 4-5 Memory Map

Memory Address	Range	Description
0 K–640 K	00000000 – 0009FFFF	DOS conventional memory
640 K–768 K	000A0000 – 000BFFFF	VGA memory and BIOS
768 K–896 K	000C0000 – 000DFFFF	Expansion card BIOS and buffer
896 K–1024 K	000E0000 – 000FFFFF	System BIOS
1024 K–Top of memory	00100000 – Top of memory	Main memory
(4 G–20 M) – (4 G–19 M)	FEC00000 – FECFFFFF	APIC configuration space
(4 G–18 M) – (4 G–17 M)	FEE00000 – FEEFFFFF	APIC configuration space
(4 G–4 M) – 4 G	FFC00000 – FFFFFFFF	High system BIOS
4 G–8 G		Maximum allowable memory

Messages

This chapter describes POST tasks and beep codes, and system board error messages.

POST Tasks and Beep Codes

When you turn on power to or restart the system, the system's basic input/output system (BIOS) runs a number of tasks. These power-on self test (POST) tasks test and initialize the system hardware and then boot the operating system from the system's primary hard disk drive.

At the beginning of each POST task, the BIOS sends a test-point error code to input/output (I/O) port 80h. Programmers and technicians use this code during troubleshooting to establish at what point the system failed and what POST task was being run. If the BIOS detects a terminal error condition, it issues a terminal-error beep code, attempts to display the error code on screen, and stops POST. If the system hangs before the BIOS can process the error, the value displayed at I/O port 80h is the last POST task run. In this case, the error code does not display on screen.

The following is a list of test point codes written to I/O port 80h at the start of each task. The tasks are arranged by test point number in the BIOS code. The beep codes are listed for terminal errors, and are short groups of beeps that represent the terminal error code in four two-bit groups.

Table 5-1 Test Point Codes

Code	Beeps	POST Routine Description
01h		BIOS has started execution
02h		Verify Real Mode
03h		Disable Non-Maskable Interrupt (NMI)
04h		Get CPU type

Table 5-1 (continued) Test Point Codes

Code	Beeps	POST Routine Description
06h		Initialize system hardware
08h		Initialize chipset with initial POST values
09h		Set IN POST flag
0Ah		Initialize CPU registers
0Bh		Enable CPU cache
0Ch		Initialize caches to initial POST values
0Eh		Initialize I/ O component
0Fh		Initialize the local bus IDE
10h		Initialize Power Management
11h		Load alternate registers with initial POST values
12h		Restore CPU control word during warm boot
13h		Initialize PCI Bus Mastering devices
14h		Initialize keyboard controller
16h	1- 2- 2- 3	BIOS ROM checksum
17h		Initialize cache before memory autosize
18h		8254 timer initialization
1Ah		8237 DMA controller initialization
1Ch		Reset Programmable Interrupt Controller
20h	1- 3- 1- 1	Test DRAM refresh
22h	1- 3- 1- 3	Test 8742 Keyboard Controller
24h		Set ES segment register to 4 GB
26h		Enable A20 line
28h	1- 3- 3- 1	Autosize DRAM
29h	1- 3- 3- 2	Initialize POST Memory Manager

Table 5-1 (continued) Test Point Codes

Code	Beeps	POST Routine Description
2Ah		Clear 512 KB base RAM
2Ch	1- 3- 4- 1 or 1- 1- 1- 1	RAM failure on address line *xxxx* *
2Eh	1- 3- 4- 3	RAM failure on data bits *xxxx* * of low byte of memory bus
2Fh		Enable cache before system BIOS shadow
30h	1- 4- 1- 1	RAM failure on data bits *xxxx* * of high byte of memory bus
32h		Test CPU bus clock frequency
33h		Initialize Phoenix Dispatch Manager
36h		Warm start shut down
38h		Shadow system BIOS ROM
3Ah	1- 4- 3- 3	Autosize cache
3Ch		Advanced configuration of chipset registers
3Dh		Load alternate registers with CMOS values
42h		Initialize interrupt vectors
45h		POST device initialization
46h	2- 1- 2- 3	Check ROM copyright notice
48h		Check video configuration against CMOS
49h		Initialize PCI bus and devices
4Ah		Initialize all video adapters in system
4Bh		QuietBoot start (optional)
4Ch		Shadow video BIOS ROM
4Eh		Display BIOS copyright notice
50h		Display CPU type and speed
51h		Initialize EISA board

Table 5-1 (continued) Test Point Codes

Code	Beeps	POST Routine Description
52h		Test keyboard
54h		Set key click if enabled
58h	2- 2- 3- 1	Test for unexpected interrupts
59h		Initialize POST display service
5Ah		Display prompt "Press F2 to enter SETUP"
5Bh		Disable CPU cache
5Ch		Test RAM between 512 and 640 KB
60h		Test extended memory
62h		Test extended memory address lines
64h		Jump to UserPatch1
66h		Configure advanced cache registers
67h		Initialize Multi Processor APIC
68h		Enable external and CPU caches
69h		Setup System Management Mode (SMM) area
6Ah		Display external L2 cache size
6Bh		Load custom defaults (optional)
6Ch		Display shadow area message
6Eh		Display possible high address for UMB recovery
70h		Display error messages
72h		Check for configuration errors
76h		Check for keyboard errors
7Ch		Set up hardware interrupt vectors
7Eh		Initialize coprocessor if present
80h		Disable onboard Super I/ O ports and IRQs

Table 5-1 (continued) Test Point Codes

Code	Beeps	POST Routine Description
81h		Late POST device initialization
82h		Detect and install external RS232 ports
83h		Configure non-MCD IDE controllers
84h		Detect and install external parallel ports
85h		Initialize PC-compatible PnP ISA devices
86h		Re-initialize onboard I/ O ports.
87h		Configure Motherboard Configurable Devices (optional)
88h		Initialize BIOS Data Area
89h		Enable Non-Maskable Interrupts (NMIs)
8Ah		Initialize Extended BIOS Data Area
8Bh		Test and initialize PS/ 2 mouse
8Ch		Initialize floppy controller
8Fh		Determine number of ATA drives (optional)
90h		Initialize hard disk controllers
91h		Initialize local bus hard disk controllers
92h		Jump to UserPatch2
93h		Build MPTABLE for multiprocessor boards
95h		Install CD ROM for boot
96h		Clear huge ES segment register
97h		Fixup Multi Processor table
98h	1- 2	Search for option ROMs. One long, two short beeps on checksum failure
99h		Check for SMART Drive (optional)
9Ah		Shadow option ROMs
9Ch		Set up Power Management

Table 5-1 (continued) Test Point Codes

Code	Beeps	POST Routine Description
9Dh		Initialize security engine (optional)
9Eh		Enable hardware interrupts
9Fh		Determine number of ATA and SCSI drives
A0h		Set time of day
A2h		Check key lock
A4h		Initialize Typematic rate
A8h		Erase F2 prompt
AAh		Scan for F2 key stroke
ACh		Enter SETUP
AEh		Clear Boot flag
B0h		Check for errors
B2h		POST done, prepare to boot operating system
B4h	1	One short beep before boot
B5h		Terminate QuietBoot (optional)
B6h		Check password (optional)
B9h		Prepare Boot
BAh		Initialize DMI parameters
BBh		Initialize PnP Option ROMs
BCh		Clear parity checkers
BDh		Display MultiBoot menu
BEh		Clear screen (optional)
BFh		Check virus and backup reminders
C0h	4- 1- 1- 1	Try to boot with INT 19
C1h		Initialize POST Error Manager (PEM)

Table 5-1 (continued) Test Point Codes

Code	Beeps	POST Routine Description
C2h		Initialize error logging
C3h		Initialize error display function
C4h		Initialize system error handler
C5h		PnPnd dual CMOS (optional)
C6h		Initialize notebook docking (optional)
C7h		Initialize notebook docking late
C8h		Force check (optional)
C9h		Extended checksum (optional)
D2h		Unknown interrupt

If the BIOS detects error 2C, 2E, or 30 (base 512 KB RAM error), it displays an additional word-bitmap (*xxxx*) indicating the address line or bits that failed. For example, 2C 0002 means address line 1 (bit one set) has failed; 2E 1020 means data bits 12 and 5 (bits 12 and 5 set) have failed in the lower 16 bits.

Error Messages

You may encounter the following processor- or memory-related error messages.

Table 5-2 Error Messages

Message	Description
02F8: Microcode update failed to load on CPU *n*	Processor microcode update is not present or failed to load on the processor
02F9: Memory interleave is missing in bank *n*	Only one memory module was seen in bank *n*
02FA: Memory population error: all banks are filled	More than six memory modules are installed; memory DIMMs may be installed in Bank 1

Table 5-2 (continued) Error Messages

Message	Description
02FC: Memory does not have registered inputs in bank *n*	Memory in bank *n* is the wrong type
02FD: Memory is not supported in bank *n*	Memory in bank *n* does not meet minimum requirements
02FE: Memory types do not match in bank *n*	Two different type memory modules in bank *n*
02FF: Memory test failed; total memory expected (MB in hex) = *nnn*	Extended memory test failed; not all memory is being used by the system