SGI™ 1450 Server Maintenance Guide

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Cover design by Sarah Bolles, Sarah Bolles Design, and Dany Galgani, SGI Technical Publications.

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Contents

Figures xi

Tables xiii

About This Guide xv
Obtaining Publications xv
Reader Comments xv

1. Detailed Chassis Description 1
Chassis Features 2
Peripherals 9
Peripheral Bay 9
Device Bay 9
Media Bay 9
Hard Drive Bay 10
Power Subsystem 11
System Cooling 14
E-Bay 17
Chassis Front Controls and Indicators 18
Rear Panel I/O Ports and Features 19

2. Removing and Installing System Components 21
Tools and Supplies Needed 22
Pre-Installation Safety Precautions 22
Front Cover 23
Removing the Front Cover 23
Installing the Front Cover 24
Top Cover 25
Removing the Top Cover 25
Installing the Top Cover 25

Memory Retention Bar 26
Removing the Memory Retention Bar 26
Installing the Memory Retention Bar 27
Baseboard 27
Removing the Baseboard 28
Installing the Baseboard 31
Power Subsystem 33
Removing a Power Supply Module 35
Installing a Power Supply Module 35
Removing the Power Subsystem Bay 36
Installing the Power Subsystem Bay. 37
Cooling System 38
Removing the Fan Board Assembly 39
Installing the Fan Board Assembly 40
Replacing the Fan Board 40
Removing and Installing Individual Fans 42
Hard Drive Bay 42
Removing the Hard Drive Bay 43
Installing the Hard Drive Bay 44
Peripheral Devices 45
Removing a Drive from the Media Bay 45
Installing a Drive in the Media Bay 46
Replacing a Drive in the Device Bay. 46
SCSI Requirements 47

3. Removing and Installing Baseboard Components 49
Tools and Supplies Needed 50
Pre-Installation Safety Precautions 50
Baseboard Connector and Component Locations 52
Memory 53
Removing the Memory Module 55
Installing the Memory Module 55
Removing DIMMs 56
Installing DIMMs 56

Processors 57
Removing a Processor 59
Installing a Processor 59
Removing Processor Retention Mechanisms 59
Installing Processor Retention Mechanisms 60
Installing Processor Handles 60
Installing Processor Heatsinks 60
Voltage Regulator Modules (VRMs) 61
Removing a VRM 62
Installing a VRM 62
Backup Battery 63
Add-in Boards 65
Removing a 32-bit, 33-MHz Half-Length PCI Add-in Board 65
Installing a 32-bit, 33-MHz Half-Length PCI Add-in Board 66
Removing a 64-bit, 66/33-MHz Hot-Plug PCI Add-in Board 67
Installing a 64-bit, 66/33-MHz Hot-Plug PCI Add-in Board 69
ICMB Card 70
Installing an ICMB Card 71
Removing an ICMB Card 73

4. Solving Problems 75
Resetting the System 75
Initial System Startup 75
New Application Software 76
After the System Has Been Running Correctly 77

Specific Problems and Corrective Actions 77
Power Light Does Not Light 78
No Beep Codes. 78
No Characters Appear on Screen 79
Characters Are Distorted or Incorrect 79
System Cooling Fans Do Not Rotate Properly 80
Diskette Drive Activity Light Does Not Light 80
Hard Drive Activity Light Does Not Light 81
CD-ROM Drive Activity Light Does Not Light 81
Problems with Application Software 81
Error and Informational Messages 82
Equipment Log 84

A. Technical Reference 87
Internal Cables and Connectors 87
Connectors Accessible to the User 90
Keyboard and Mouse Ports 90
Serial Ports 90
Parallel Port 91
Video Port 92
Universal Serial Bus (USB) Interface. 93
ICMB Connectors 94
Ethernet Connector 94
Internal SCA-2 HDD Connector 95
External Adaptec Ultra 160/m SCSI. 97
AC Power Input 99
Peripheral Adapter Boards and Connectors. 100
CD-ROM Connectors 100
Floppy Connectors 103

Baseboard Connectors 105
Power Distribution Board Interface Connectors (J9B1, J9D1, J9B2) 107
Front Panel Interface (J9E3) 111
Hot-Plug PCI Indicator Board Interface (J3D1) 113
Memory Module Interface (J6F1) 115
Processor Module Connector (J7A1, J7B1, J7C1, J7D1) 119
Processor Termination, Regulation, and Power 123
Termination Card 125
Server Monitor Module Connector (J7H1) 125
SM Bus Connector (J9E4). 127
ICMB Connector (J1D2) 127
Auxiliary I²C Connector (J9E4) 128
Baseboard Fan Connectors (J3C1, J3A1, J4A1, J4C1) 128
Internal Disk Drive LED Connection 130
Baseboard Jumpers 131
Changing Jumper Settings 133
CMOS Clear Jumper 133
Password Clear Jumper 135
Recovery Boot Jumper 136
Interrupts 137
Video Modes 138

B. Physical Environment Specifications 141

Index 143

Figures

Figure 1-1	Server in Rack-Mountable Configuration	3
Figure 1-2	Front Cover Retaining Screws	4
Figure 1-3	Top Cover Thumbscrew	5
Figure 1-4	(Left) Server without Covers. (Right) Overhead View of E-Bay	6
Figure 1-5	Hard Drive in Drive Carrier	10
Figure 1-6	Power Subsystem	12
Figure 1-7	Fan Board Assembly	15
Figure 1-8	Fan LEDs	16
Figure 1-9	Front Panel Controls and Indicators	18
Figure 1-10	Rear Panel I/O Ports and Features	19
Figure 2-1	Memory Retention Bar	27
Figure 2-2	Power Supply AC Bracket	29
Figure 2-3	E-Bay Retaining Screws	30
Figure 2-4	Rear Retention Mechanism	31
Figure 2-5	Power Subsystem	34
Figure 2-6	Metal Plate Covering the Power Subsystem Bay	38
Figure 2-7	Fan Board Assembly Screw	39
Figure 2-8	Fan Assembly Rotated away From Its Base	41
Figure 2-9	Hard Drive Bay Tabs	43
Figure 2-10	Removing the Hard Drive Bay from the Chassis	44
Figure 2-11	Location of the Media Bay Screw	45
Figure 3-1	Baseboard Connector and Component Locations	52
Figure 3-2	Memory Module DIMM Installation Sequence	54
Figure 3-3	DIMM Orientation in a Memory Module	57
Figure 3-4	Processor Orientation and Components	58
Figure 3-5	Installing a VRM	63
Figure 3-6	Front Hot-Plug Retention Mechanism	68

Figure 3-7 ICMB Card 71
Figure 3-8 Example of an ICMB Card Attached to a Chassis 72
Figure 3-9 Internal Cable Attached to the ICMB Card 72
Figure 3-10 External Cable Attached to the Card 73
Figure A-1 Detailed Diagram of Connector Locations 105
Figure A-2 Baseboard Configuration Jumpers 131

Tables

Table 1-1	SGI 1450 Server Physical Specifications	2
Table 1-2	Chassis Feature Summary	7
Table 1-3	Hard Drive LED State Status	11
Table 1-4	AC Power LED State Status	14
Table 1-5	Fan LED State Status	16
Table 3-1	VRM/Processor Power Sequencing	61
Table 3-2	Processor/VRM Population Sequencing	61
Table 4-1	Resetting Commands	75
Table 4-2	Standard BIOS Port-80 Codes	82
Table 4-3	Recovery BIOS Port-80 Codes	83
Table 4-4	Equipment Log	84
Table A-1	SGI 1450 server Cables and Connectors	87
Table A-2	Keyboard and Mouse Connectors	90
Table A-3	Serial Ports	91
Table A-4	Parallel Port	91
Table A-5	Video Port	92
Table A-6	USB Connector	93
Table A-7	ICMB Connectors	94
Table A-8	Ethernet Connector	94
Table A-9	Internal SCA-2 HDD Connector	95
Table A-10	External Adaptec Ultra 160/m SCSI	97
Table A-11	CD-ROM Adapter Board 40 Position IDE Connector	100
Table A-12	CD-ROM Adapter Board Power Connector	101
Table A-13	Audio Connector	101
Table A-14	CD-ROM JAE Connector	101
Table A-15	34-Position Floppy Connector Pin-Out	103
Table A-16	Floppy Adapter Board Power Connector	104

Table A-17	FFC connector	104
Table A-18	Connector Description	106
Table A-19	Main Power Connector A (J9B1)	108
Table A-20	Main Power Connector B (J9D1)	109
Table A-21	Auxiliary Power Connector (J9B2)	110
Table A-22	Front Panel Connector (J9E3)	111
Table A-23	Hot-Plug Indicator Board Connector Pinout (J3D1)	114
Table A-24	Memory Module Interface	115
Table A-25	Processor Card Connector (J7A1, J7B1, J7C1, J7D1)	119
Table A-26	Processor VRM Connectors (J2A2, J2B1, J2C1)	123
Table A-27	Server Monitor Module Connector Pinout	126
Table A-28	SM Bus Connector (J9E4)	127
Table A-29	ICMB Connector (J1D2).	128
Table A-30	IMB Connector (J8F1)	128
Table A-31	Processor Fan Connector #1 (J3C1)	129
Table A-32	Processor Fan Connector #2 (J3A1)	129
Table A-33	Processor Fan Connector #3 (J4A1)	130
Table A-34	Processor Fan Connector #4 (J4C1)	130
Table A-35	Internal Disk Drive LED Connector	130
Table A-36	Configuration Jumper Settings	132
Table A-37	Configuration of Jumpers	132
Table A-38	Beep Codes	136
Table A-39	Interrupt Definitions	137
Table A-40	Standard VGA Modes	138
Table B-1	Environmental Specifications	141

About This Guide

This guide contains a detailed description of the SGI™ 1450 server chassis and provides information on removing and installing field-replaceable components.

The information in this guide is intended for trained service personnel.

The following topics are covered:

- Detailed Chassis Description
- Removing and Installing System Components
- Removing and Installing Baseboard Components
- Solving Problems

See the *SGI 1450 Server User's Guide* for information on installing customer-replaceable components and configuring software and utilities.

See the *SGI 1450 Server Mounting Instructions* for instructions on mounting the SGI 1450 server in a 19-inch rack.

See the *SGI 1450 Server Quick Start Guide* for information on setting up your system.

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Detailed Chassis Description

This chapter provides a detailed description of chassis features. For a general description, see the *SGI 1450 Server User's Guide*.

The following sections are covered:

- Chassis Features
- Peripherals
- Hard Drive Bay
- Power Subsystem
- System Cooling
- E-Bay
- Chassis Front Controls and Indicators
- Rear Panel I/O Ports and Features

Chassis Features

The SGI 1450 server is designed either to be mounted in a standard 19-inch rack (rack mode) or to stand upright (pedestal mode). Table 1-1 shows the physical specifications for the SGI 1450 server in rack mode.

For instructions on mounting the SGI 1450 server in a 19-inch rack, see the *SGI 1450 Server Mounting Instructions*.

Table 1-1 SGI 1450 Server Physical Specifications

Specification	Rack Mode
Height	4u (7 inches)
Width	17.5-inch rack
Depth	26.5 inches
Weight	57 lbs (26 kg), minimum configuration 88 lbs (40 kg), maximum configuration
Required front clearance	3 inches (inlet air temperature <35 °C / 95 °F)
Required rear clearance	6 inches (no airflow restriction allowed)
Required side clearance	1 inch

Figure 1-1 shows an SGI 1450 server in rack-mountable configuration.

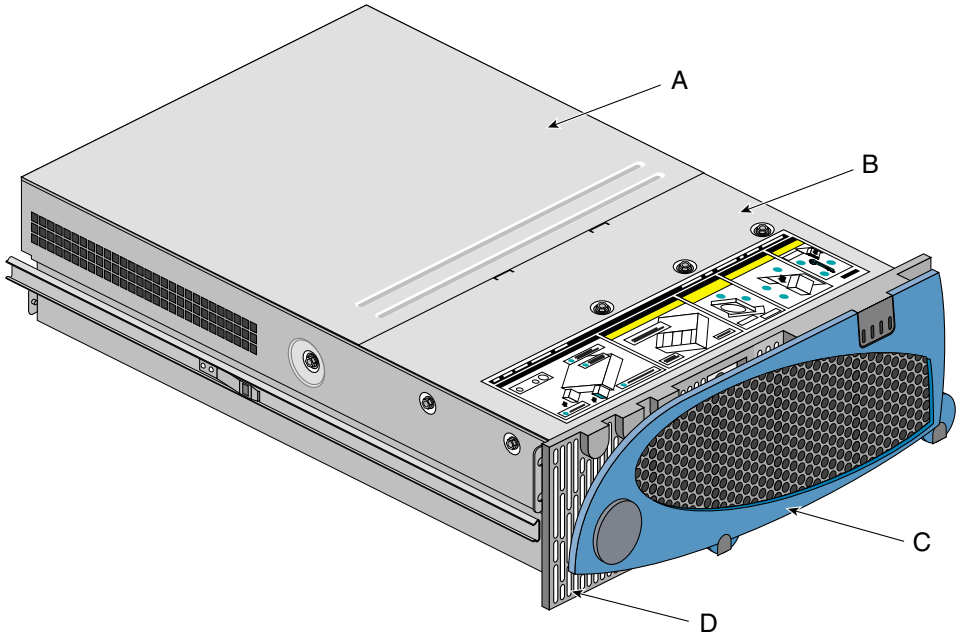

Figure 1-1 Server in Rack-Mountable Configuration

A. Top cover. The top cover protects the contents of the chassis.

B. Front cover. The front cover protects the peripheral devices.

C. Front bezel door. When this door is open, you can access hard drives and peripheral devices.

D. Front bezel.

The chassis has two covers: a front cover and a top cover. The front cover is held in place by three screws. The screws are noted by “A” in Figure 1-2.

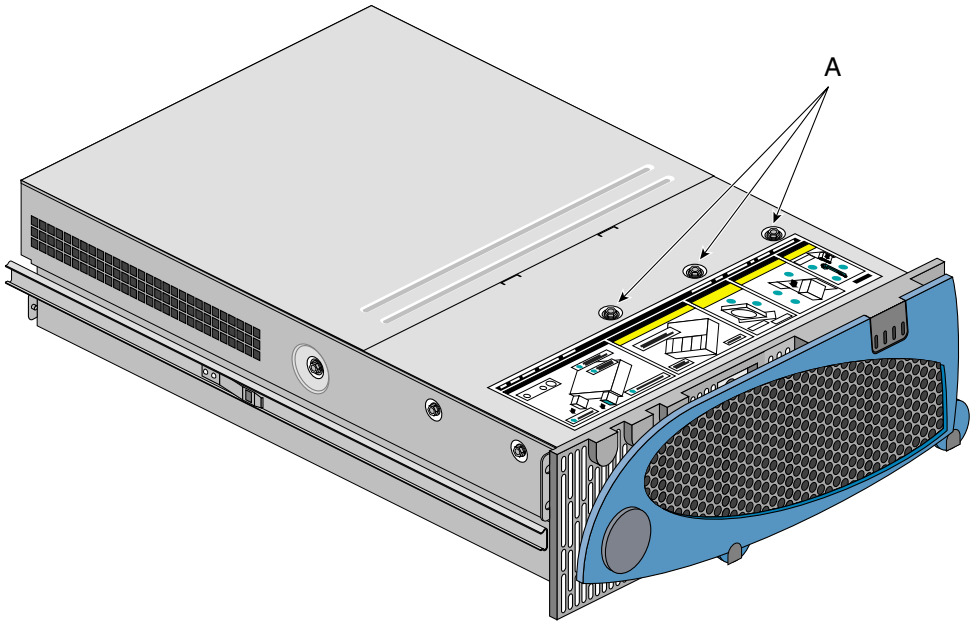

Figure 1-2 Front Cover Retaining Screws

The top cover is held in place by two thumbscrews, each located at the top rear corner of the chassis. One of two thumbscrews is noted by “A” in Figure 1-3.

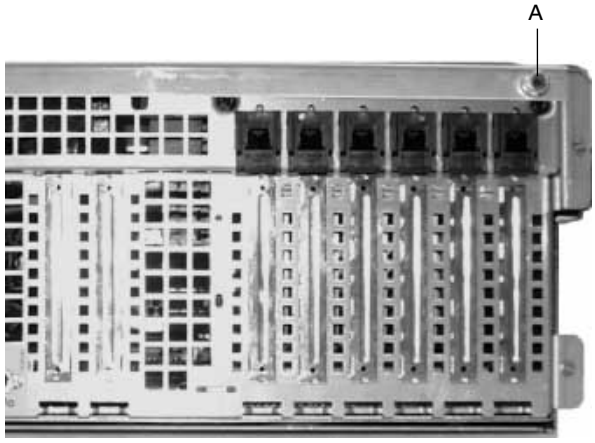

Figure 1-3 Top Cover Thumbscrew

A bezel snaps on to the front of the chassis and allows adequate airflow to cool the system components. The door in the bezel provides user access to hard drives and the peripheral bay. Access to the power supplies is provided by removing the front bezel completely.

Figure 1-4 gives an overhead view of the system with the top cover and front bezel removed.

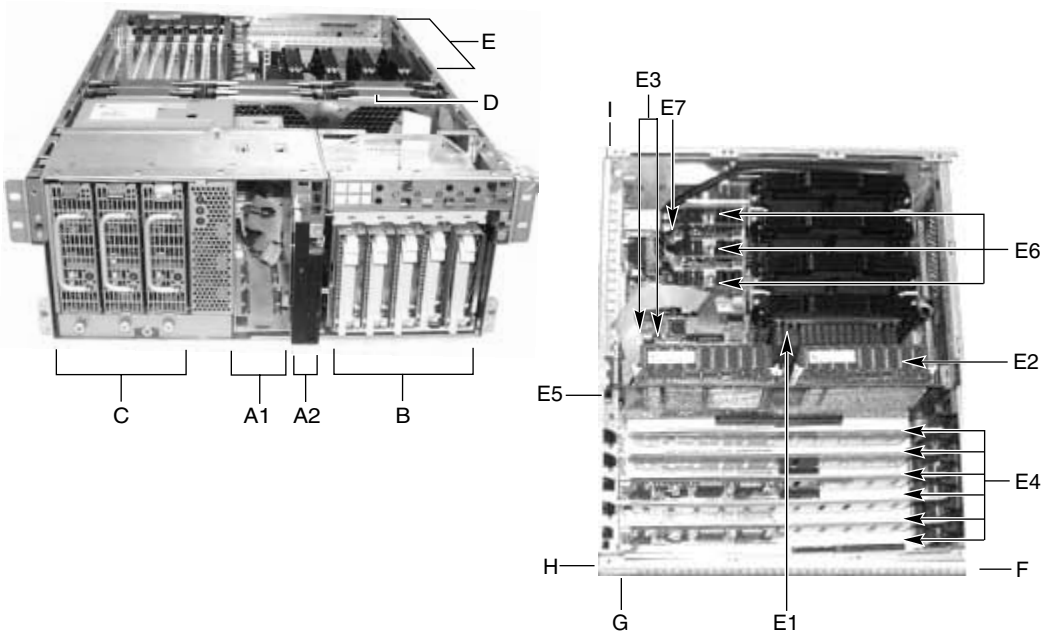

Figure 1-4 (Left) Server without Covers. (Right) Overhead View of E-Bay

Warning: The total power requirement for the SGI 1450 server exceeds the 240 VA energy hazard limit that defines an operator-accessible area. Only qualified service technicians should access the processor, memory, power subsystem, and non-hot-plug areas of the baseboard.

Table 1-2 summarizes the SGI 1450 server features, using the callouts provided in Figure 1-4.

Table 1-2 Chassis Feature Summary

Feature	Description
A.Peripheral Bay [A1 and A2]	A peripheral bay in the front of the system has a 5.25-inch device bay and a media bay.
A1. Peripheral Bay: Device Bay	The device bay can hold a 5.25-inch CD-ROM or DAT device.
A2. Peripheral Bay: Media Bay	The media bay holds a 0.5-inch slim-line floppy drive and a 0.5-inch slim-line CD-ROM drive.
B. Hard Drives	The hard drive bay supports up to five 1.0-inch hot-swap Ultra 160 SCSI hard drives. If the operating system supports hot-swapping of hard drives, these drives can be changed without shutting down the server.
C. Power Subsystem	Installed: A power subsystem bay that supports up to three 350-watt power supply modules in a (2+1) redundant configuration. The power subsystem bay is mounted at the front-left corner of the chassis and is shipped with three power supply modules. Each power supply can be changed without shutting down the server.
D. Cooling	Installed: Fan board assembly and six fans in a redundant (5+1) fan array. The fans cool the baseboard and other components. In a 5+1 configuration, a failed fan may be removed and installed without shutting down the server. This process is called hot-swapping. Hot-swapping fans can only be performed by a qualified service technician.

Table 1-2 (continued) Chassis Feature Summary

Feature	Description
E. Electronics Bay (E-Bay)	The E-Bay contains the baseboard. The baseboard has the following major components: Up to four Intel® Pentium® III Xeon™ processors Server Set™ III HE chipset Up to sixteen PC/100-compliant registered ECC SDRAM memory modules that support up to 16 gigabytes of Error Checking and Correcting (ECC) Synchronous Dynamic RAM 32-bit, 33-MHz, 5V PCI segment with two expansion slots and three embedded devices 64-bit, 66/33-MHz, 3.3V hot-plug PCI segment with two expansion slots and one embedded device 64-bit, 33-MHz, 5V hot-plug PCI segment with four expansion slots and three embedded devices Compatibility bus segment with three embedded devices Two externally accessible USB ports One IDE connector, supporting up to two ATA33 compatible devices One Adaptec® AIC-7880 SCSI controller One Adaptec AIC-7899 SCSI controller The processors, SDRAM memory modules, and hot-plug PCI components are listed individually below.
E1. Processors	The system supports up to four Intel Pentium III Xeon processors.
E2. Registered SDRAM Memory Expansion Slots	The memory expansion board holds up to sixteen Dual Inline Memory Module (DIMM) slots and supports up to 16 gigabytes of Error Checking and Correcting (ECC) Synchronous Dynamic RAM.
E3. PCI Add-In Slots	The baseboard contains two 32-bit 33-MHz non-hot-plug PCI slots. These boards are half-length boards only.
E4. PCI Hot-Plug Slots	The baseboard contains six hot-plug PCI slots. You can add, remove, or exchange a PCI add-in board from any hot-plug slot without shutting down the server. **NOTE**: At this time, the Linux® operating system does not support use of the PCI hot-plug (PHP) feature. If you are running Linux, your system must be turned off before installing or removing PCI boards. Windows 2000 requires drivers that are PHP compatible in order to use the PHP feature.

Table 1-2 (continued) Chassis Feature Summary

Feature	Description
E5. Baseboard	Form-factor, 16 (13 inches, ATX-style backpanel I/O) The baseboard is mounted horizontally in a subassembly called the E-Bay. The E-Bay is mounted towards the rear of the chassis. The baseboard contains connectors for installing up to four Pentium III Xeon processors in single-edge contact (SEC) cartridges.
E6. Voltage Regulator Module (VRM)	The baseboard contains three embedded VRMs and connectors to add three additional VRMs.
E7. Lithium Battery	This battery is used to power the system clock.
F. Front	This side is called the front of the E-Bay.
G. Right	This side is called the right of the E-Bay.
H. Back	This side is called the back of the E-Bay.
I. Left	This side is called the left of the E-Bay.

Peripherals

Peripheral Bay

The chassis contains one peripheral bay for CD-ROM, DAT, and floppy drives. The peripheral bay contains two smaller bays: a device bay and a media bay.

Device Bay

The device bay accommodates either a 5.25-inch CD-ROM or a DAT drive. We recommends not installing any device, such as a hard drive, requiring airflow cooling in the device bay. Installing such a device in this bay causes environmental conditions to exceed the cooling and electromagnetic interference (EMI) constraints of the system.

Media Bay

The media bay accommodates a 0.5-inch slim line floppy drive and 0.5-inch slim line CD-ROM drive.

Hard Drive Bay

The chassis contains one hard drive bay. The hard drive bay accommodates up to five 3.5-inch by 1.0-inch hot-swap Ultra 160 SCSI SCA hard drives

You can access the hard drives by opening the front bezel door. As part of the hot-swap implementation, each hard drive requires a hard drive carrier. When you remove a hard drive from the system, you remove both the carrier and the hard drive. The drive is attached to the carrier by four screws. The carrier locks into the hard drive bay by a locking handle. Figure 1-5 shows the orientation of the drive in the carrier. The carrier is upside down in this figure.

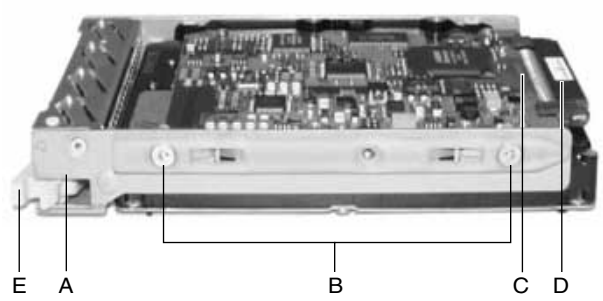

Figure 1-5 Hard Drive in Drive Carrier

A. Hard drive carrier

B. Four fasteners used to attach drive to carrier

C. Hard drive

D. Connector

E. Locking handle

Each hard drive is connected to an Ultra 160 SCSI hot-swap backplane. The backplane provides industry-standard 80-pin SCA-2 connectors for each hard drive and accepts 10,000 RPM or slower drives that consume up to 23 watts of power. If another type or slower Ultra 160 SCSI SCA drive is installed, make sure that the drive meets these backplane and carrier requirements.

An LED above each hard drive displays the status of that hard drive. Table 1-3 shows the hard drive LED status.

Table 1-3 Hard Drive LED State Status

LED State	Status
Solid green	The hard drive is present and powered on.
Flashing green	The hard drive is active.
Solid yellow	There is an asserted fault status on the hard drive.
Flashing yellow	A rebuild of the hard drive is in progress.
Off	The hard drive is not powered on.

The SCSI backplane boardset consists of two separate boards: the SCSI backplane board and the SCSI-accessed fault-tolerant enclosures specification (SAF-TE) board. The SCSI backplane board provides power distribution and SCSI interfacing of the hard drives. The SAF-TE board provides SAF-TE features and hard drive failure indicators.

Power Subsystem

The SGI 1450 server uses a universal input-switching power subsystem (PSBS). This subsystem provides up to 630 watts DC. The subsystem also minimizes the RMS current drawn from each AC line by providing power factor corrected AC input. The chassis can be configured with one, two, or three 350-watt power supply modules. Each module is designed to minimize electromagnetic interference (EMI) and radio frequency interference (RFI).

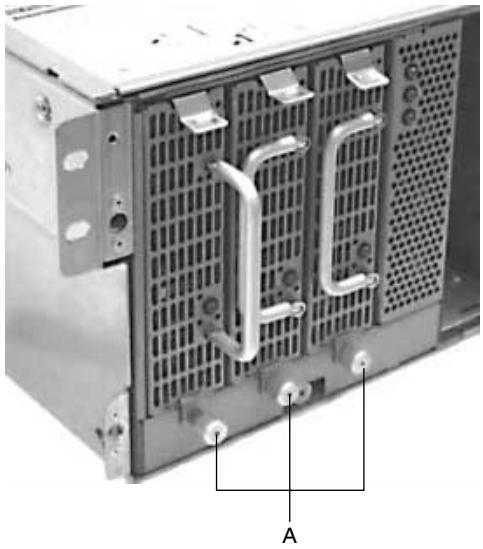

Figure 1-6 Power Subsystem

Warning: The total power requirement for the SGI 1450 server exceeds the 240 VA energy hazard limit that defines an operator-accessible area. Only qualified service technicians should access the processor, memory, power subsystem, and non-hot-plug areas of the baseboard.

The power subsystem consists of a power subsystem bay, with up to three power supply modules. The power supply modules are noted by "A" in Figure 1-6. The power subsystem bay contains a power distribution board, which manages the power delivered by all functional power supplies.

The power subsystem can operate in either a nonredundant or redundant manner. Nonredundant operation means that you are using only one or two power supply modules. If the module ceases to function normally, the server system cannot function properly, if at all. A minimal configuration supported by one module is one processor, four memory DIMMs, one hard drive slower than 10,000 PRM, one floppy drive, and one CD-ROM.

The SGI 1450 server uses a redundant (2+1) power subsystem. To form a (2+1) redundant power subsystem, the subsystem parallels the DC output of one power supply module with one or two other modules. If one module ceases to function normally, the remaining modules provide power to the server system and the system continues to function properly. Two power supply modules are required to provide power to a fully configured SGI 1450 server. The third module provides redundancy. A fully configured system includes four processors, sixteen gigabytes of memory, one floppy drive, one CD-ROM, five hard drives, and eight PCI add-in boards.

The baseboard contains three embedded voltage converters: two 5 V input and one 12 V input. The baseboard also provides three connectors supporting 8.3-compliant, plug-in voltage regulator modules (VRMs).

Each power subsystem auto-senses within the following voltage ranges and is rated as follows:

- 100-120 V~ at 50/60 Hertz (Hz); 11.0 A maximum
- 200-240 V~ at 50/60 Hz; 5.5 A maximum

The DC output voltages of each power supply module are:

- +3.3 V at 28 A max (total combined power of the +3.3 and +5 channels must not exceed 195 W)
- +5 V at 32 A max (total combined power of the +3.3 and +5 channels must not exceed 195 W)
- +12 V at 12.0 A with 15.0 A peak
- -12 V at 0.5 A
- +5 V standby at 2 A whenever AC power is supplied to the server system

The DC output voltages of the power subsystem with two or three modules are:

- +3.3 V at 50 A max (total combined power of the +3.3 and +5 channels must not exceed 351 W)
- +5 V at 58 A max (total combined power of the +3.3 and +5 channels must not exceed 351 W)
- +12 V at 22.0 A with 28.0 A peak
- -12 V at 0.5 A
- +5 V standby at 2 A

DC power is sourced through 20-pin and 24-pin power cables to the baseboard. Remote sensing signals are provided through one 14-pin auxiliary power cable to the baseboard.

The AC power status of each power supply module is indicated by an LED. The LED is located on the power supply module. Table 1-4 shows the AC power LED status.

Table 1-4 AC Power LED State Status

LED State	Status
Solid green	AC power is applied to the power subsystem and standby voltage is available.
Off	The LED is off when one of the following conditions occur: The power supply modules are disabled by the DC enable signal. The power supply module is disabled by another switch. The power supply module has been overstressed. The power supply module has failed and replacement of the unit is necessary.

There are also three standby channels and each has an LED called a standby LED. These LEDs are located on the right side of the power subsystem bay and each indicates the status of that standby channel.

Individual power supply modules are hot-swappable. In other words, you can remove and install a power supply module without shutting down the server. After a power supply module has been removed from the system, airflow patterns are disrupted within the system. To maintain correct airflow patterns within the chassis and to ensure that all components remain within specification under all system environmental conditions, power supply module hot-swap operations should not exceed two minutes in duration.

System Cooling

The SGI 1450 server uses up to six fans mounted in a fan board assembly in the middle of the chassis between the E-Bay and peripheral bays. The six fans are noted by “A” in Figure 1-7.

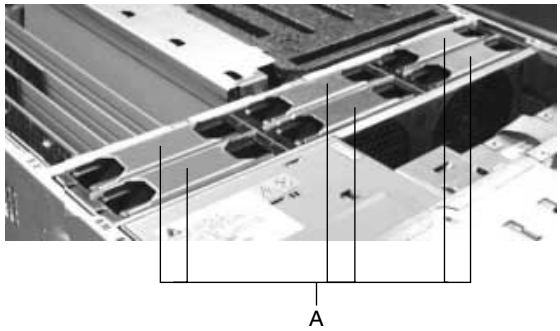

Figure 1-7 Fan Board Assembly

The cooling system supports either a non-redundant configuration or a redundant configuration. A non-redundant configuration includes just three fans. If any one of these three fans ceases to function normally, environmental conditions within the chassis may exceed the environmental regulations in this guide and the chassis may not function normally. Three fans support any system configuration but without fan redundancy.

The SGI 1450 server uses all six fans to form a redundant cooling system. If one of the six fans ceases to function normally, the remaining five fans adequately cool the system. Using six fans supports any configuration up to the maximum configuration.

Air flows in through the front bezel over the power subsystem bay, the peripheral bay, and the hard drive bay. The air then passes through the fan board assembly and the E-Bay. Finally, the air exhausts through the rear and left side of the chassis.

Individual fan status indicators are located on the fan board mounted in the fan board assembly. Fan failure is also indicated by the general fault LED located at the front of the chassis.

An LED above each cooling fan displays the status of that fan. The LEDs for two fans are noted by “A” in Figure 1-8. The LED on the left indicates the status of the fan pointed to by the left arrow. The LED on the right indicates the status of the fan pointed to by the right arrow.

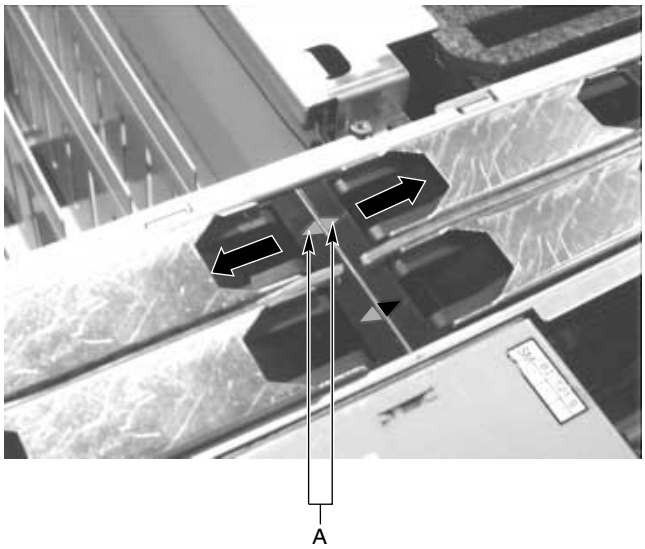

Figure 1-8 Fan LEDs

Table 1-5 shows the fan LED state status.

Table 1-5 Fan LED State Status

LED State	Status
Solid amber	There is a fault with the cooling fan or the cooling fan is not present.
Off	The cooling fan is functioning properly.

Caution: The top cover must be on the system for proper cooling.

Individual fans are hot-swappable. In other words, you can remove and install a fan without shutting down the server. After a fan has been removed from the system, airflow

patterns are disrupted within the system. To maintain correct airflow patterns within the chassis and to ensure that all components remain within specification under all system environmental conditions, fan hot-swap operations should not exceed two minutes in duration.

E-Bay

The E-Bay contains the baseboard with the following components:

- Up to four Intel Pentium III Xeon processors. The baseboard has four SC330.1 connectors; each supports a processor. There are also four embedded voltage regulator modules (VRM) and three VRM 8.3-compliant connectors to support up to four processors.
- The Server Set III HE chipset. This includes the HE North Bridge, Open South Bridge (OSB4), and I/O.
- Up to sixteen PC/100-compliant registered ECC SDRAM memory modules that support up to 16 gigabytes of Error Checking and Correcting (ECC) Synchronous Dynamic RAM.
- 32-bit, 33-MHz, 5 V PCI segment with two expansion slots and three embedded devices.
- 64-bit, 66/33-MHz, 3.3 V hot-Plug PCI segment with two expansion slots and one embedded device.
- 64-bit, 33-MHz, 5 V hot-Plug PCI segment with four expansion slots and three embedded devices.
- Compatibility bus segment with three embedded devices.
- Two externally accessible USB ports.
- One Adaptec AIC-7880 SCSI controller.
- One Adaptec AIC-7899 SCSI controller.

The Adaptec AIC-7899 SCSI controller has two channels called A and B. Channel A is connected to the HDD backplane. Channel B is connected to the back of the system to which external SCSI devices may be connected.

The Adaptec AIC-7880 SCSI controller supports both a legacy wide SCSI device and legacy narrow SCSI device.

Chassis Front Controls and Indicators

Figure 1-9 shows the front panel controls and indicators.

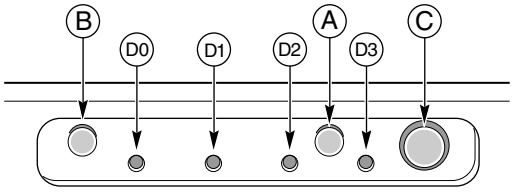

Figure 1-9 Front Panel Controls and Indicators

A. Power on/off button: If you press this button when the system is off, you turn on the power subsystem. If you press this button when the system is in sleep state, you activate it. If you hold down the button for more than 4 seconds, you override the ACPI mode and the power is turned off.

B. Reset button: If you press this button, you reset the system. If you hold down this button for 4 seconds or more, push on the power button, and then release both the reset and power buttons within one second of each other, the CMOS will be cleared.

Caution: The CMOS should be cleared only if it has been corrupted.

C. Sleep button: If the operating system supports ACPI and you press this button, the operating system goes into sleep state (S1). If you press this button during sleep state, the operating system becomes active. This system does not have a service mode.

D. Front panel LEDs from left to right:

D0. General System Fault LED: Yellow indicates a system failure.

D1. NIC activity LED: Green indicates NIC activity.

D2. HDD activity LED: Green indicates any system hard drive activity.

D3. Main power LED: Solid green indicates the presence of DC power in the server. Flashing green indicates that the system is in ACPI sleep mode.

Rear Panel I/O Ports and Features

Figure 1-10 shows a detailed view of the rear panel I/O ports and features.

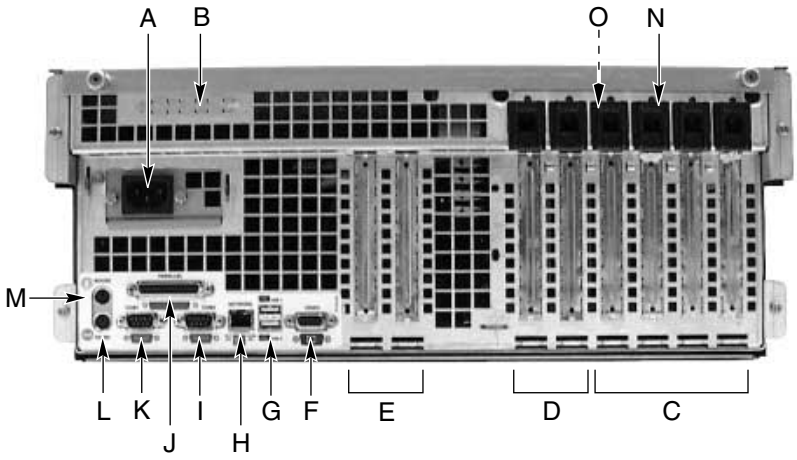

Figure 1-10 Rear Panel I/O Ports and Features

A. AC input power connector

B. External SCSI connector ports

C. Hot-plug 64-bit, 33-MHz PCI add-in board slots

D. Hot-plug 64-bit, 66/33-MHz PCI add-in board slots

E. Non-hot-plug 32-bit, 33-MHz PCI add-in board slots

These slots can also accept an Intelligent Chassis Management Bus (ICMB) SEMCONN 6-pin connector in/out

F. Video connector

G. USB ports 0 (upper) and 1 (lower), 4-pin connectors

H. NIC RJ45 connector

I. Serial port 2 (COM1), 9-pin RS-232 connector

J. IEEE 1284-compliant, 25-pin bi-directional parallel connector

K. Serial port 1 (COM1), 9-pin RS-232 connector

L. PS/2-compatible keyboard connector

M. PS/2-compatible mouse connector

N. HW push button

O. PCI green and amber LEDs (inside the chassis)

Removing and Installing System Components

This chapter provides information on removing and installing the following system components:

- Front Cover
- Top Cover
- Memory Retention Bar
- Baseboard
- Power Subsystem
- Cooling System
- Hard Drive Bay
- Peripheral Devices

Tools and Supplies Needed

The following tools and supplies will allow you to remove and install all the system components covered in this chapter:

- Phillips screwdriver (#1 and #2)
- Flat head screwdriver (#2)
- Jumper-removal tool or needle-nosed pliers
- Antistatic wrist strap and conductive foam pad (recommended)
- Pen or pencil
- Equipment log: as new parts are integrated into the system, add information about them to the equipment log (see "Equipment Log" on page 84). Record the model and serial number of the system, all installed options, and any other pertinent information specific to the system. Some of this information may be required when running the system setup utility (SSU).

Pre-Installation Safety Precautions

The following warnings and cautions apply whenever you remove the top and front covers of the system. Only a technically qualified person should integrate and configure the system.

Warning: Hazardous voltage, current, and energy levels are present inside the power subsystem. There are no user-serviceable parts inside it; servicing should be done by technically qualified personnel.

Warning: The total power requirement for the SGI 1450 server exceeds the 240 VA energy hazard limit that defines an operator-accessible area. Only qualified service technicians should access the processor, memory, power subsystem, and non hot-plug areas of the baseboard.

Caution: ESD can damage disk drives, boards, and other parts. It is recommended that all procedures in this chapter be performed only at an ESD-protected workstation. If one is not available, provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground—any unpainted metal surface—on your system when handling parts.

Caution: Always handle boards carefully. They can be extremely sensitive to ESD. Hold boards only by their edges. After removing a board from its protective wrapper or from the system, place it component-side UP on a grounded, static-free surface. If you place the baseboard on a conductive surface, the battery leads may short out. If they do, this will result in a loss of CMOS data and will drain the battery. Use a conductive foam pad if available but not the board wrapper. Do not slide the board over any surface.

Caution: For proper cooling and airflow, always install the front cover before turning on the system. Operating the system for an extended period of time without the top and front covers in place can damage system parts.

Caution: If the SGI 1450 server is turned on and has only three fans installed, make sure that you install the top cover within five minutes of removing it.

Front Cover

Follow the instructions in this section to remove and install the front cover.

Removing the Front Cover

To reach components inside the system, remove the front cover, and in some cases the front bezel. Facing the front of the system, the front cover is on top and towards the front of the rack-mounted chassis. See Figure 1-1 on page 3 for the location of the front cover. The following tasks require removal of the front cover:

- Removing and installing non-hot-swap drives in the media bay

- Removing and installing media devices in the device bay
- Removing and installing the fan board assembly
- Removing and installing the power subsystem bay
- Removing and installing a power supply module (front bezel only)

To remove the front cover, follow these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the front bezel by gently pulling it towards you. The ball studs will release from the chassis.
3. Remove the three screws located on the top of the chassis. These screws are noted by "A" in Figure 1-2 on page 4. Save these screws; you need them later to reattach the cover.
4. Using an even pull and pressing down, slide the cover back towards the front of the chassis about 0.75 inch.
5. Lift the front cover up and out of the chassis.

Installing the Front Cover

To install the front cover, follow these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Before replacing the front cover, check that no loose tools or parts were left inside the system.
3. Check that cables and other components are properly installed.
4. Position the cover over the chassis so that the rows of tabs align with slots in the chassis. Slide the cover toward the back of the system until the tabs on the cover firmly engage in the chassis.
5. Attach the cover to the chassis with the three screws removed earlier, and tighten them firmly.
6. Install the bezel by gently applying pressure towards the chassis. The ball studs snap into the chassis.

Top Cover

Follow the instructions in this section to remove and install the top cover.

Removing the Top Cover

To reach components inside the system, remove the top cover. Facing the front of the system, the top cover is on top and towards the back of the rack-mounted chassis. See Figure 1-1 on page 3 for the location of the top cover. The following tasks require removal of the top cover:

- Accessing baseboard components including but not limited to non-hot-plug PCI add-in boards, extension boards, memory slots, Voltage Regulator Modules (VRMs), and processors
- Exchanging individual fans
- Removing and installing the fan board assembly
- Removing and installing the power subsystem bay

To remove the top cover, perform the following steps.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Release the two thumbscrews located on the top rear of the chassis. One of two thumbscrews are noted by “A” in Figure 1-3 on page 5.
3. Using an even pull, press lightly on the top cover and slide it back until it stops.
4. Lift the entire cover upward and away from the chassis.

Installing the Top Cover

To install the top cover, follow these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Before replacing the top cover, check that no left loose tools or parts were left inside the system.
3. Check that cables, add-in boards, and other components are properly installed.

4. Position the cover over the chassis so that the rows of tabs align with slots in the chassis. Slide the cover toward the front of the system until the tabs on the cover firmly engage in the chassis.
5. Attach the cover to the chassis with the two thumbscrews released earlier, and tighten them firmly.
6. Connect any external cables.

Memory Retention Bar

When accessing baseboard components, you need to remove and install the memory retention bar.

Removing the Memory Retention Bar

To remove the memory retention bar, follow these steps:

1. Unscrew the captive screw located at the front of the E-Bay. The captive screw is noted by “A” in Figure 2-1.
2. Lift up the bar from the side located at the front of the E-Bay.
3. Release the clip located at the rear of the chassis. The clip is noted by “C” in Figure 2-1.

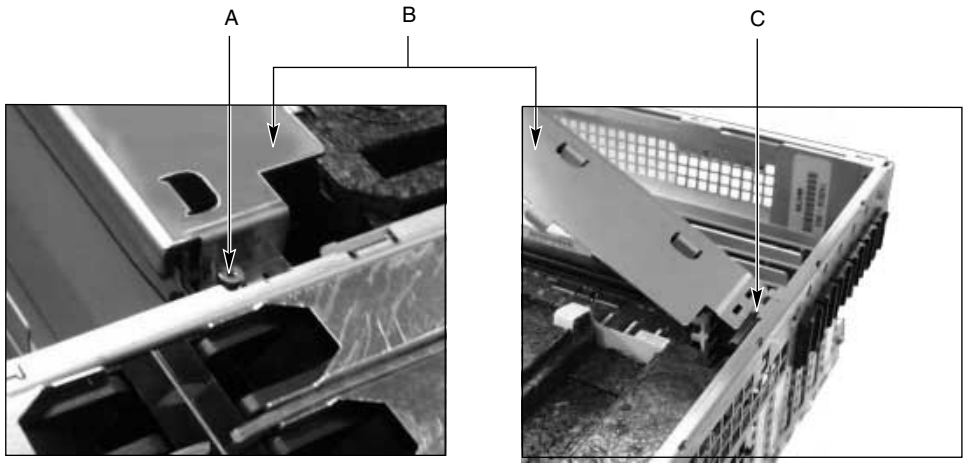

Figure 2-1 Memory Retention Bar

A. Captive screw

B. Memory retention bar

C. Clip at the rear of the chassis

Installing the Memory Retention Bar

1. Slip slots in the memory retention bar into the clip located at the rear of the chassis. The clip is noted by “C” in Figure 2-1.
2. Secure the other side of the memory retention bar with the captive screw, as shown in Figure 2-1.

Baseboard

This section covers the removal and installation of the baseboard, which requires the removal and installation of baseboard components. The baseboard resides in the E-Bay. The front, right, back, and left sides of the E-Bay are marked in Figure 1-4 on page 6.

Removing the Baseboard

To remove the baseboard, follow these steps:

Caution: The baseboard can be extremely sensitive to ESD and always requires careful handling. After removing it from the system, place it component-side UP on a non-conductive, static-free surface to prevent shorting out the battery leads. If you place the board on a conductive surface, the battery leads may short out. This will result in a loss of CMOS data and will drain the battery. Do not slide the baseboard over any surface.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Turn off all peripheral devices connected to the system.
3. Turn off the system power by pressing the power on/off button on the front panel, and unplug all AC power cords.
4. Label and disconnect all peripheral cables attached to the I/O panel on the back of the system.
5. Remove the front cover. See "Removing the Front Cover" on page 23.
6. Remove the top cover. See "Removing the Top Cover" on page 25.
7. Remove the foam cover that shields the E-Bay.
8. Remove the fan board assembly. See "Removing the Fan Board Assembly" on page 39.
9. Remove the memory retention bar. See "Removing the Memory Retention Bar" on page 26.
10. Remove the memory module. See "Removing the Memory Module" on page 55.
11. Disconnect internal cables to the baseboard. Cables and connectors include:
    - Three ribbon cables at the front of the E-Bay
    - Three power connectors
    - A ribbon cable located next to the non-hot-plug PCI add-in boards at the back of the E-Bay
    - A 13-pin AUX-IMB connector

12. Remove the 33-MHz half-length PCI add-in boards. See “Removing a 32-bit, 33-MHz Half-Length PCI Add-in Board” on page 65.
13. Follow these steps to remove the power supply AC bracket:
    a. Release the screw securing the connector. The screw is noted by “A” in Figure 2-2.
    b. Slide the bracket up and towards the inside of the chassis.
    c. Drape the AC bracket over the left side of the E-Bay assembly.

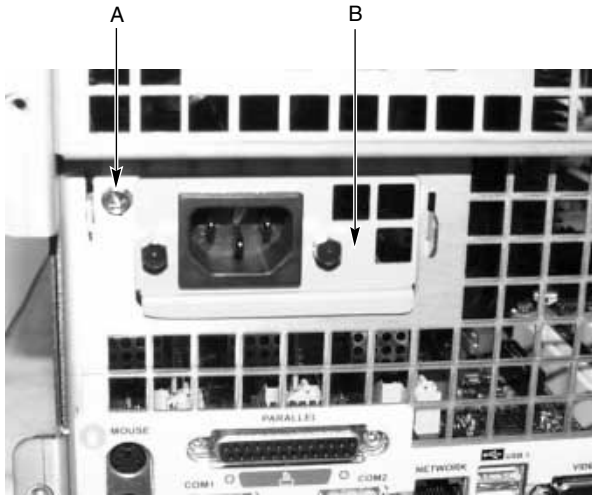

Figure 2-2 Power Supply AC Bracket

A. Screw securing the connector

B. Power supply inlet connector

14. Remove the voltage regulator modules (VRMs). See “Removing a VRM” on page 62.
15. Remove the processors and any termination processors. See “Removing a Processor” on page 59.
16. Remove the processor retention guides. See “Removing Processor Retention Mechanisms” on page 59.
17. Remove any hot-plug PCI add-in boards. See the *SGI 1450 Server User's Guide*.

18. Remove the plastic slot dividers. First, pull up on the end at the front of the E-Bay, and then slide the other end out of the back panel at the back of the E-Bay.
19. Remove the screws securing the baseboard to the chassis. There should be two of them.
20. Remove the four screws on the top and bottom edges of the rear subchassis. These screws attach the E-Bay to the chassis. Two of the four screws are noted as “A” in Figure 2-3.

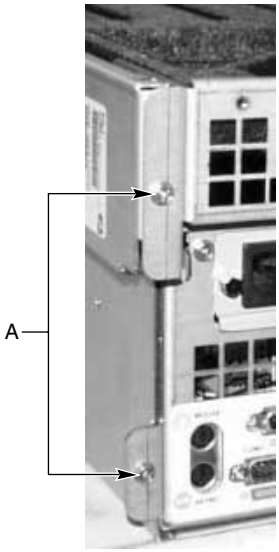

Figure 2-3 E-Bay Retaining Screws

21. Pull the E-Bay away from the chassis. As you separate the E-Bay away, make sure that the power cord does not become wedged between the two parts of the chassis.
22. Remove the rug from the E-Bay.
23. Using needlenose pliers, remove the plastic rear retention mechanism located at the front of the E-Bay. The rear retention mechanism is noted by “A” in Figure 2-4 on page 31.
24. Slide the baseboard towards the front of the chassis.
25. Lift the baseboard up and out on the side closest to the baseboard and VRM connectors.

Installing the Baseboard

To install the baseboard, follow these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Pull the E-Bay away from the chassis. As you separate the E-Bay away, make sure that the power cord does not become wedged between the two parts of the chassis.
3. Hold the baseboard on the side closest to the VRM connectors and processors. Slip the baseboard under the padding on the right side of the E-Bay and then under the back panel at the rear of the chassis.
4. Using needlenose pliers, install the plastic rear retention mechanism located at the front of the E-Bay. The rear retention mechanism is noted by “A” in Figure 2-4.

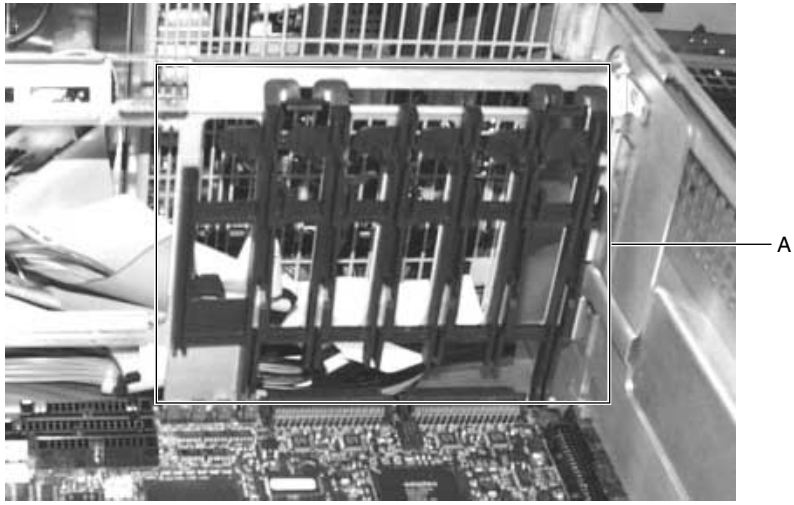

Figure 2-4 Rear Retention Mechanism

5. Place the rug at the bottom of the E-Bay.
6. Slide the E-Bay into the chassis. As you slide the E-Bay in, make sure that the power cord does not become wedged between the two parts of the chassis.
7. Attach the four screws on the top and bottom edges of the rear subchassis. See Figure 2-3 on page 30.

8. Attach the screws securing the baseboard to the chassis. There should be two of them.
9. Install the plastic slot divider. First, slide one end into the back panel, and then press the other end into the chassis.
10. Install any hot-plug PCI add-in boards. See the *SGI 1450 Server User's Guide*.
11. Install the processor retention guides. See "Installing Processor Retention Mechanisms" on page 60.
12. Install the processors and any termination processors. See "Installing a Processor" on page 59.
13. Install the voltage regulator modules (VRMs). See "Installing a VRM" on page 62.
14. Follow these instructions to install the power supply AC bracket. See Figure 2-2 on page 29.
    a. Slide the bracket through the back panel from inside the chassis.
    b. Once in place, slide the bracket down into the slot.
    c. Attach the screw securing the bracket, as shown in Figure 2-2 on page 29.
15. Add any 33-MHz half-length PCI add-in boards. See "Installing a 32-bit, 33-MHz Half-Length PCI Add-in Board" on page 66.
16. Connect internal cables to the baseboard. Cables and connectors include:
    - Three ribbon cables at the front of the E-Bay
    - Three power connectors
    - A ribbon cable located next to the non-hot-plug PCI add-in boards at the back of the E-Bay
    - A 13-pin AUX-IMB connector
17. Install the memory module. See "Installing the Memory Module" on page 55.
18. Install the memory retention bar. See "Installing the Memory Retention Bar" on page 27.
19. Install the fan board assembly. See "Installing the Fan Board Assembly" on page 40.
20. Place the foam cover over the E-Bay.
21. Install the top cover. See "Installing the Top Cover" on page 25.
22. Install the front cover. See "Installing the Front Cover" on page 24.

23. Connect all peripheral cables to the I/O panel on the back of the system.

Power Subsystem

Follow the instructions in this section to remove and install a power supply module and the power subsystem bay.

The SGI 1450 server can accommodate up to three power supply modules, each of which is enclosed in a power subsystem bay. The power subsystem bay contains a power distribution board (PDB). This board manages the power delivered by all functional power supply modules.

Figure 2-5 shows the power subsystem bay with three power supply modules installed.

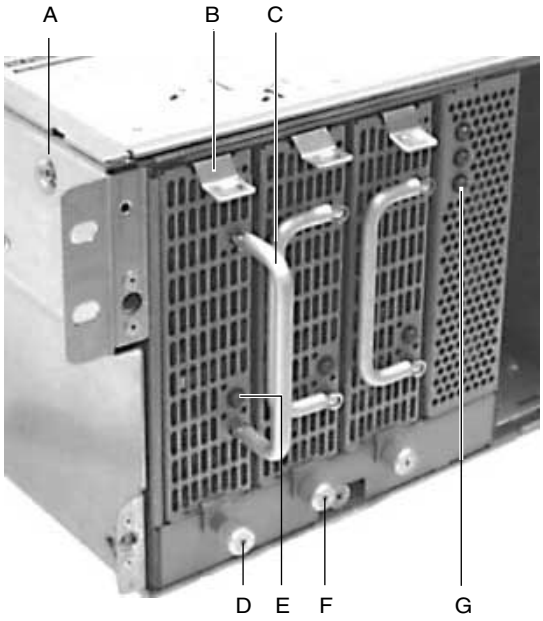

Figure 2-5 Power Subsystem

A. One of two screws on both sides of the chassis. When removing the power subsystem bay, remove these screws.

B. Tab

C. Handle for the power supply module

D. Thumbscrew on the power supply module. When removing the power supply module, loosen this screw.

E. Power supply module LED

F. Thumbscrew on the front of the power subsystem bay. When removing the power subsystem bay, loosen this screw.

G. Power supply module standby LED indicating that 5 V standby power is operational. Each module has one Standby LED. This LED corresponds to the power supply module on the far right.

Warning: Hazardous voltage, current, and energy levels are present inside the power subsystem. There are no user-serviceable parts inside it; servicing should be done by technically qualified personnel.

Caution: Once you remove a power supply, make sure you replace it within two minutes. If not possible in this time frame, re-insert the original unit. When a replacement unit is available, repeat the replacement procedure. Vacant spaces alter airflow patterns in the server system and may cause environmental conditions to exceed the environmental limits of the server.

Removing a Power Supply Module

To remove a power supply module, follow these steps:

1. Remove the front bezel by gently pulling on the edge of the front bezel. The ball studs of the bezel release. Check the LED for each power supply module to determine which power supply module needs to be replaced.
2. Loosen the power supply module retaining screw. See Figure 2-5 on page 34 for the location of the screw.
3. Press down on the power supply module tab. Gently pull the power supply module handle towards you and remove the power supply module from the power subsystem bay.

Caution: You might feel initial resistance in sliding out the power supply from its bay. Do not tilt or twist the supply; this can damage components. Resistance is caused by the power supply module disengaging from its connector. Use even, steady force to remove the supply.

Installing a Power Supply Module

To install a power supply module, follow these steps:

1. Remove the front bezel by gently pulling on the edge of the front bezel. The ball studs of the bezel will release.
2. Remove the non-functioning power supply according to the instructions in the preceding subsection.
3. Line up the new power supply module within the power subsystem bay.
4. Gently push the power supply module into the chassis until the tab snaps into place. The LED for the new functional power supply module should turn green.
5. Tighten the thumbscrew on the front of the power supply module.
6. Snap on the bezel.

Removing the Power Subsystem Bay

To remove the power subsystem bay, follow these steps:

Warning: The on/off button on the front panel DOES NOT turn off the system AC power. To remove power from system, unplug the AC power cords from the wall outlet or the system.

Warning: Hazardous voltage, current, and energy levels are present inside the power supply. There are no user-serviceable parts inside it; servicing should be done by technically qualified personnel.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove any DC power cables attached to the hard drive bay or the peripheral bay devices.
3. Remove the baseboard. See "Removing the Baseboard" on page 28.
4. Loosen the screw on the front of the chassis. This screw is noted by "F" in Figure 2-5 on page 34.
5. Release the two screws on each side of the chassis. One of the screws is noted by "A" in Figure 2-5 on page 34.
6. Lift the piece of sheet metal covering the top of the power subsystem bay. The metal plate is noted by "A" in Figure 2-6 on page 38.

7. Un-route the AC distribution cable from the chassis retention features.
8. With the power supplies securely fastened, pull the power subsystem bay out of the chassis.
9. Before shipping the power subsystem bay for service, remove all power supplies.

Installing the Power Subsystem Bay

To install the power subsystem bay, follow these steps:

Warning: The on/off button on the front panel DOES NOT turn off the system AC power. To remove power from system, unplug the AC power cords from the wall outlet or the system.

Warning: Hazardous voltage, current, and energy levels are present inside the power supply. There are no user-serviceable parts inside it; servicing should be done by technically qualified personnel.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the non-functioning power subsystem bay according to the instructions in the preceding subsection.
3. Place the power subsystem bay in the front of the chassis. The front of the power subsystem bay should be flush with the front of the system.
4. Tighten the screw on the front of the power subsystem bay. The screws are noted by "F" in Figure 2-5 on page 34.
5. Route the AC distribution cable into the chassis retention feature.
6. Attach the DC power cables to the hard drive bay and to any peripheral bay devices.
7. Install the baseboard. See "Installing the Baseboard" on page 31.
8. Place the piece of sheet metal that covers the top of the power subsystem bay so that the front of the sheet metal is flush with the front of the system. The metal plate is noted by "A" in Figure 2-6.

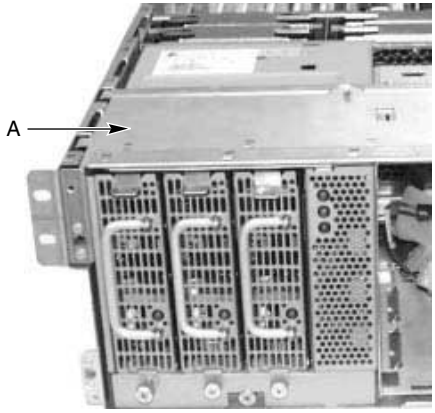

Figure 2-6 Metal Plate Covering the Power Subsystem Bay

9. Tighten the two screws on each side of the chassis. One of the screws for each side is noted by "A" in Figure 2-5 on page 34.
10. Securely fasten the power supply modules in the power subsystem bay. See "Installing a Power Supply Module" on page 35.
11. Install the top cover. See "Installing the Top Cover" on page 25.
12. Install the front cover. See "Installing the Front Cover" on page 24.

Cooling System

Follow the instructions in this section to remove and install the fan board assembly, the fan board, and each individual fan.

The fan board assembly is held in place by two screws, one on each side of the chassis. The fan board assembly holds up to six individual fans. The top of each fan has two finger holds, one on each side of the fan. A connector at the bottom of each fan fits into a connector in the fan board assembly. Before removing the fan board assembly, make sure that the replacement assembly is ready.

Removing the Fan Board Assembly

To remove the fan board assembly, follow these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Turn off the system by pressing the power on/off button on the front panel, and unplug all AC power cords.
3. Remove the front cover. See "Removing the Front Cover" on page 23.
4. Remove the top cover. See "Removing the Top Cover" on page 25.
5. Remove all individual fans from the assembly. See "Removing and Installing Individual Fans" on page 42.
6. Remove the two screws that secure the board assembly to the chassis. Set the screws aside. You will need them later in this procedure. One of the screws is noted by "A" in Figure 2-7.

Figure 2-7 Fan Board Assembly Screw

7. Lift the fan board assembly directly upward and rest it on the E-Bay assembly.
8. Disconnect the cables from the assembly. There are three cables, as follows:

- One ribbon cable that connects to the baseboard.
- One ribbon cable that connects to the front panel.
- One power cable that connects to the power subsystem bay.

Installing the Fan Board Assembly

To install the fan board assembly, follow these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Turn off the system by pressing the power on/off button on the front panel and unplug all AC power cords.
3. Place the new fan board assembly on top of the E-Bay assembly so that the connectors face the front of the system.
4. Connect the cables from the front panel, baseboard, and power system to the board assembly.
5. Slide the assembly into the chassis.
6. Attach the two screws that secure the board assembly to the chassis. See Figure 2-7 on page 39.
7. Install the individual fans. See "Removing and Installing Individual Fans" on page 42.
8. Install the top cover. See "Installing the Top Cover" on page 25.
9. Install the front cover. See "Installing the Front Cover" on page 24.

Replacing the Fan Board

To replace the fan board, follow these steps:

1. Remove the fan board assembly. See "Removing the Fan Board Assembly" on page 39.
2. Remove the screws securing the base from the upper portion of the fan bay assembly. Keep them in a safe place. You will need them later in the procedure.
3. Rotate the upper portion of the assembly away from the base. The upper portion is noted by "A" in Figure 2-8. The base is noted by "B".

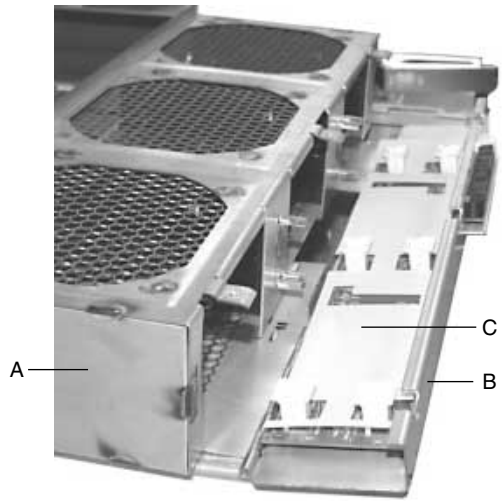

Figure 2-8 Fan Assembly Rotated away From Its Base

A. Upper portion of fan board assembly

B. Fan board assembly base

C. Plastic rug

4. Remove the plastic rug, which is noted by "C" in Figure 2-8.
5. Remove the screws that secure the fan board to the assembly.
6. Install the new fan board and attach the screws.
7. Place the plastic rug back into the assembly. The orientation of the rug is important. For the correct orientation, see Figure 2-8.
8. Rotate the assembly back towards its base.
9. Attach the screws that secure the base to the rest of the fan assembly.
10. Install the fan board assembly. See "Installing the Fan Board Assembly" on page 40.

Removing and Installing Individual Fans

To remove and install individual fans, follow these steps:

Caution: Once you remove an individual fan, make sure you replace it within two minutes. If you cannot replace it, insert the original unit. When you have the replacement unit, repeat the replacement procedure. Vacant spaces formerly occupied by fans alter air flow patterns in the server system and may cause environmental conditions to exceed the environmental limits of the server.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the top cover. See "Removing the Top Cover" on page 25.
3. Place your ring finger and thumb in the fingerholds of the fan in the chassis.
4. Gently pull the fan directly upward and out of the fan board assembly.
5. Slide the replacement fan into the fan board assembly.
6. When you start to feel some resistance, gently push down on the center of the fan until the connectors solidly join.
7. Install the top cover. See "Installing the Top Cover" on page 25.

Note: After removing an individual fan, the system takes a few seconds to recognize the absence of the fan. Before replacing the fan, make sure that the LED shows a fault and recognizes that the slot for the fan is vacant.

Hard Drive Bay

Follow the instructions in this section to remove and install the hard drive bay.

The chassis contains one hard drive bay. The hard drive bay accommodates up to five 3.5-inch by 1.0-inch hot-swap Ultra 160 SCSI SCA hard drives.

Removing the Hard Drive Bay

To remove the hard drive bay, follow these steps;

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the front cover. See "Removing the Front Cover" on page 23.
3. Remove the fan board assembly. See "Removing the Fan Board Assembly" on page 39.
4. Disconnect the four cables attached to the hard drive bay.
5. Remove the SCSI hard drives. See "Removing a SCSI Hard Drive" in the *SGI 1450 Server User's Guide*.
6. With a flat head screwdriver, press the two tabs inward on one side. Repeat this step for the two tabs on the other side. The two tabs are noted by "A" in Figure 2-9.

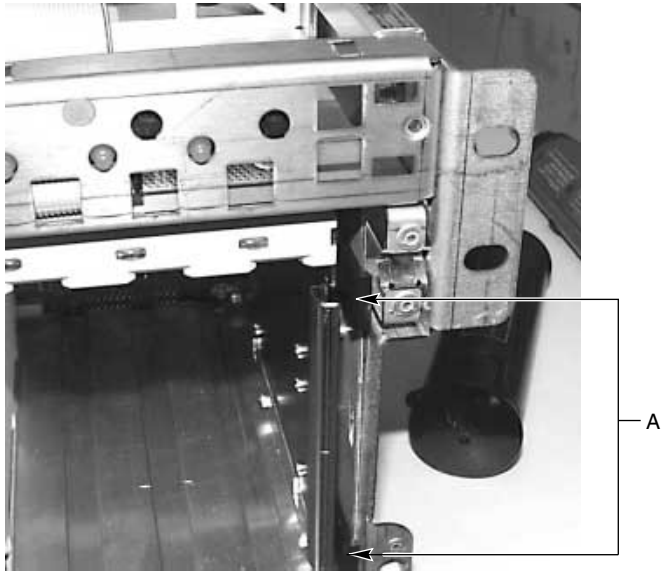

Figure 2-9 Hard Drive Bay Tabs

7. With a flat head screwdriver, pry the right side of the hard drive bay out of the chassis, as shown in Figure 2-10.

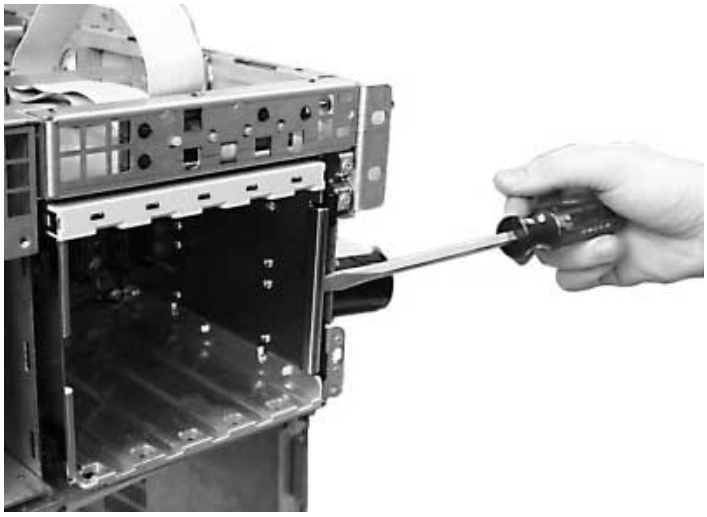

Figure 2-10 Removing the Hard Drive Bay from the Chassis

Installing the Hard Drive Bay

To install the hard drive bay, follow these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Slide the hard drive bay into the chassis until the tabs engage the slots on the chassis.
3. Connect the four cables to the hard drive bay.
4. Install the SCSI hard drives. See "Installing a SCSI Hard Drive" in the *SGI 1450 Server User's Guide*.
5. Install the fan board assembly. See "Installing the Fan Board Assembly" on page 40.
6. Install the top cover. See "Installing the Top Cover" on page 25.
7. Install the front cover. See "Installing the Front Cover" on page 24.

Peripheral Devices

The chassis contains one peripheral bay for CD-ROM, DAT, and floppy drives. The peripheral bay contains two smaller bays: a device bay and a media bay.

Follow the instructions in this section to replace drives in the media bay and the device bay.

Removing a Drive from the Media Bay

The media bay holds a 0.5-inch slim-line floppy and a 0.5-inch slim-line CD-ROM drive. The drives are secured to the media bay by a screw as shown in Figure 2-11. (Although Figure 2-11 shows a single 3.5-inch floppy disk drive, the SGI 1450 server is shipped with a 0.5-inch slim-line floppy and a 0.5-inch slim-line CD-ROM drive.)

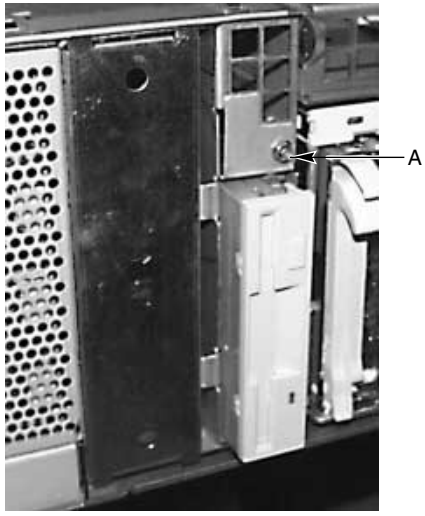

Figure 2-11 Location of the Media Bay Screw

To remove a drive from the media bay, follow these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Turn off the system by using the power on/off button on the front panel and unplug the AC power cord.

3. Remove the front cover. See "Removing the Front Cover" on page 23.
4. Disconnect the power and signal cables from the back of the drive.
5. Remove and save the screw that secures the drive to the bay. The screw is noted by "A" in Figure 2-11.
6. Slide the drive out. If the drive will be used again, place it in an antistatic protective wrapper.

Installing a Drive in the Media Bay

To install a drive in the media bay, follow these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the drive to be replaced according to the instruction in the preceding subsection.
3. Slide the new drive in the media bay.
4. Connect the power and signal cables to the drive.
5. Insert and tighten the screw that secures the drive to the bay. The screw is noted by "A" in Figure 2-11.
6. Install the front cover. See "Installing the Front Cover" on page 24.

Replacing a Drive in the Device Bay

To replace a drive in the device bay, follow these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the front cover. See "Removing the Front Cover" on page 23.
3. Turn off the system by pressing the power on/off button on the front panel, and unplug the AC power cord.
4. Disconnect the power and signal cables from the drive. The connectors are keyed for ease in reconnecting them to the drive.
5. Slide the drive out. If the drive will be used again, place it in an antistatic protective wrapper.
6. Slide the new drive into position using the guides in the device bay.

7. Connect the power and signal cables to the drive.
8. Install the front cover. See “Installing the Front Cover” on page 24.

SCSI Requirements

All SCSI devices must not be terminated except the peripheral at the end of the SCSI cable.

Note: Integrating the 5.25-inch peripheral bay can affect EMC compliance and is a regulated activity. Except as noted here, any changes to the bay configuration could result in noncompliance with EMC regulations.

Caution: To avoid damage to a 5.25-inch peripheral device, ensure the EMI gasketing provided in the device bay does not bridge any open circuits on the exposed peripheral device.

Removing and Installing Baseboard Components

This chapter provides information on removing and installing the following baseboard components:

- Memory
- Processors
- Voltage Regulator Modules (VRMs)
- Backup Battery
- Add-in Boards
- ICMB Card

The removal and installation procedures described in this chapter assume that the baseboard components are readily accessible. For information on removing the top cover and other items that may stand in the way of baseboard components, see Chapter 2, “Removing and Installing System Components”.

Tools and Supplies Needed

The following tools and supplies allow you to remove and install all the system components covered in this chapter:

- Phillips (cross-head) screwdriver (#1 and #2 bit).
- Phillips (cross-head) screwdriver with a long blade (#1 and #2 bit).
- Jumper removal tool or needle-nosed pliers.
- Antistatic wrist strap and conductive foam pad (recommended).
- Pen or pencil.
- Equipment log. As you integrate new parts into the system, add information about them to your equipment log (see page 84). Record the model and serial number of the system, all installed options, and any other pertinent information specific to the system. You will need this information when running the SSU.

Pre-Installation Safety Precautions

The following warnings and cautions apply whenever you work with the baseboard. Only a technically qualified person should integrate and configure the system.

Warning: The on/off button (a convex button) on the front panel does not turn off the system AC power. To remove power from system, you must unplug the AC power cords from the wall outlet or the system.

Warning: Hazardous electrical conditions may be present on power, telephone, and communication cables. Turn off the system and disconnect the power cords, telecommunications systems, networks, and modems attached to the system before opening it. Otherwise, personal injury or equipment damage can result.

Caution: ESD can damage disk drives, boards, and other parts. We recommend that you do all procedures in this chapter only at an ESD-protected workstation. If one is not available, provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground—any unpainted metal surface—on your system when handling parts.

Caution: Always handle boards carefully. They can be extremely sensitive to ESD. Hold boards only by their edges. After removing a board from its protective wrapper or from the system, place it component-side UP on a grounded, static-free surface. If you place the baseboard on a conductive surface, the battery leads may short out. If they do, this will result in a loss of CMOS data and will drain the battery. Use a conductive foam pad if available but not the board wrapper. Do not slide the board over any surface.

Caution: For proper cooling and airflow, always install the chassis access covers before turning on the system. Operating the system without this cover in place can damage system parts.

Caution: A jumper is a small, plastic-encased conductor that slips over two jumper pins. Newer jumpers have a small tab on top that you can grip with your fingertips or with a pair of fine, needle-nosed pliers. If your jumpers do not have such a tab, take care when using needle-nosed pliers to remove or install a jumper; grip the narrow sides of the jumper with the pliers. Never grip the wide sides of the jumpers. This can damage the contacts inside the jumper, causing intermittent problems with the function controlled by that jumper. Take care to gently grip, but not squeeze, with the pliers or other tool you use to remove a jumper; otherwise you might bend or break the stake pins on the board.

Baseboard Connector and Component Locations

Figure 3-1 shows a detailed view of the baseboard connectors and components.

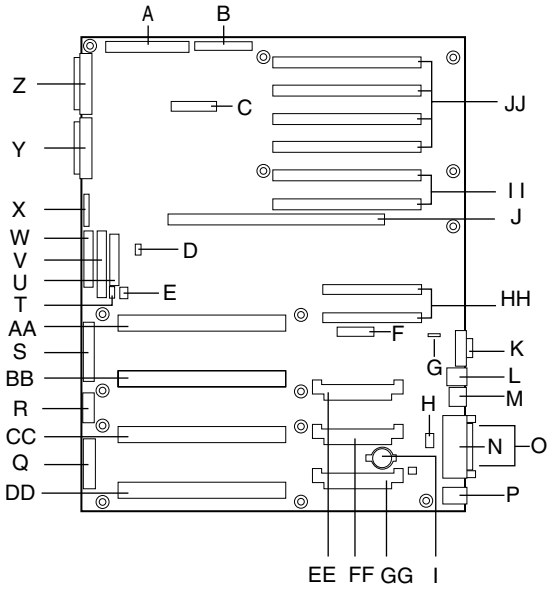

Figure 3-1 Baseboard Connector and Component Locations

A. Legacy Narrow SCSI
B. Legacy Wide SCSI
C. SMM Connector
D. IMB Connector
E. HDD Activity
F. HPIB Connector
G. ICMB Connector
H. Connector not Used
I. Lithium Battery
J. Memory Module Connector
K. Video Connector
L. USB, External Connector
M. Network Connector
N. Parallel Connector

O. COM1, COM2 Connector
P. Keyboard/Mouse
Q. Main Power 1
R. Auxiliary Power
S. Main Power 2
T. SMBus
U. Front Panel
V. IDE Connector
W. Floppy Connector
X. Configuration Jumpers
Y. Ultra 160 SCSI A
Z. Ultra 160 SCSI B
AA. Processor #1
BB. Processor #2
CC. Processor #3
DD. Processor #4
EE. Voltage Regulator Module (VRM) Connector #2
FF. Voltage Regulator Module (VRM) Connector #3
GG. Voltage Regulator Module (VRM) Connector #4
HH. 32-bit, 33-MHz Half-length PCI Slots
II. 64-bit, 66/33-MHz Hot-Plug PCI Slots
JJ. 64-bit, 33-MHz Hot-Plug PCI Slots

Memory

Follow the instructions in this section to remove and install the memory module and DIMMs.

Main memory resides on an add-in board, called a memory module. The memory module contains slots for 16 DIMMs, each of which must be at least 64 MB, and is attached to the baseboard through a 330-pin connector, called the memory expansion card connector (MECC). The memory module supports PC-100 compliant registered ECC SDRAM memory modules. The ECC used for the memory module is capable of correcting single-bit errors (SBEs), detecting 100 percent of double-bit errors over one code word, and detecting nibble errors.

System memory begins at address 0 and is continuous (flat addressing) up to the maximum amount of DRAM installed (exception: system memory is non contiguous in

the ranges defined as memory holes using configuration registers). The system supports both base (conventional) and extended memory.

- Base memory is located at addresses 00000h to 9FFFFh (the first 1 MB).
- Extended memory begins at address 0100000h (1 MB) and extends to 3FFFFFFFFh (16 GB), which is the limit of supported addressable memory. The top of physical memory is a maximum of 16 GB (to 3FFFFFFFFh).

DIMM memory sizes from 256 MB to 16 GB are supported, with a 64/72-bit four-way-interleaved pathway to main memory, which is also located on the module. Therefore, data transfers between MADPs and DIMMs are in four-way interleave fashion. Each of the four DIMMs must be populated in a bank. The 16 slots are divided into four banks of four slots each. They are labeled A through D.

Bank A contains DIMM sockets A1, A2, A3, and A4. Banks B, C, and D each contain 4 DIMM sockets and are named in the same fashion. There are silk screens on the module next to each DIMM socket to label its bank number. For the best thermal results, populate the banks from A to D. For example, populate bank A and then bank B. For best performance results, populate adjacent banks. For example, populate bank A and then bank C.

Figure 3-2 shows a detailed view of the memory module slots.

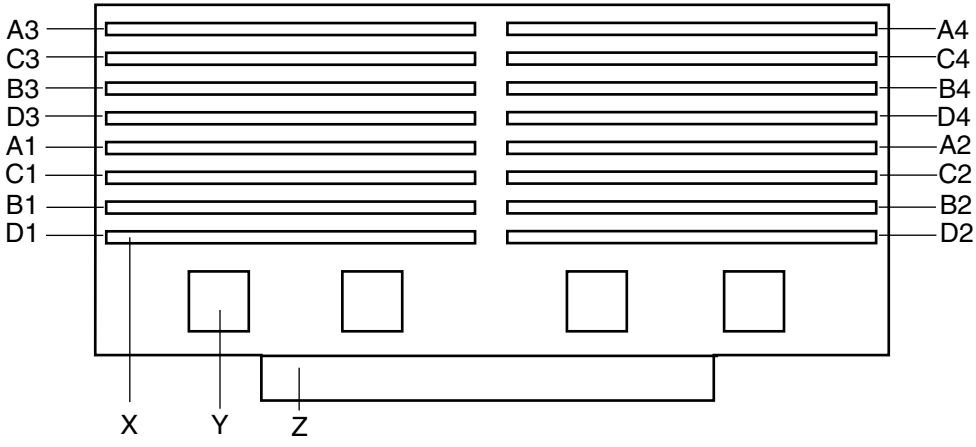

Figure 3-2 Memory Module DIMM Installation Sequence

X. One of sixteen DIMM sockets

Y. One of four memory address data paths (MADP)

Z. Memory expansion card connector (MECC)

Removing the Memory Module

The memory module is located on the baseboard as shown in Figure 3-1 on page 52. The DIMM locations are shown in Figure 3-2.

To remove the memory module, follow these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Pull the module upward slightly to disengage it from the baseboard connector.
3. Slide the module straight up and away from the baseboard until it clears the guide rails.
4. Place the module component-side up on a nonconductive, static-free surface.

Installing the Memory Module

To install the memory module, follow these steps:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Holding the memory module by its edges, align the module so its edge engages the guide rails at the back and front of the electronics bay.

Caution: The memory module is held in place by the 330-pin connector on the baseboard, the guide rails in the center of the electronics bay. You must support the module until it is fully seated in the connector.

3. Push the memory module toward the baseboard until it fully engages the connector on the baseboard.

Removing DIMMs

To remove DIMMs, follow these steps;

Caution: Use extreme care when removing a DIMM. Too much pressure can damage the socket slot. Apply only enough pressure on the plastic ejector levers to release the DIMM.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the memory module and place it component-side up on a nonconductive, static-free surface. See "Removing the Memory Module" on page 55.
3. Gently push the plastic ejector levers down to eject the DIMM from its socket.
4. Hold the DIMM only by its edges, being careful not to touch its components or gold edge connectors. Carefully lift it away from the socket and store it in an antistatic package.
5. Repeat to remove other DIMMs as necessary.

Installing DIMMs

To install DIMMs, follow these steps:

Caution: Use extreme care when installing a DIMM. Applying too much pressure can damage the socket. DIMMs are keyed and can be inserted in only one way.

Caution: Mixing dissimilar metals might cause memory failures later, resulting in data corruption. Install DIMMs with gold-plated edge connectors only in gold-plated sockets.

1. Holding the DIMM only by its edges, remove it from its antistatic package.
2. Orient the DIMM so that the two notches in the bottom edge of the DIMM align with the keyed socket on the memory module. See Figure 3-3.

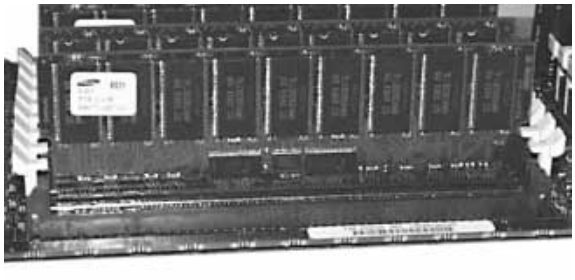

Figure 3-3 DIMM Orientation in a Memory Module

Note: DIMM slots on the memory module must be installed only in certain configurations. See the beginning of this section for requirements.

3. Insert the bottom edge of the DIMM into the socket, and then press down firmly on the DIMM until it seats correctly.
4. Gently push the plastic ejector levers on the socket ends to the upright position.
5. Repeat the steps to install each DIMM.

Processors

Follow the instructions in this section to remove and install a processor, the processor retention mechanisms, and processor heatsinks.

Caution: You might damage the system if you install a processor that is inappropriate for your system. Make sure your system can handle the thermal and power conditions of the newer, faster processor. For exact information about processor interchangeability, contact your customer service representative.

Caution: Reduce the risk of electrostatic discharge (ESD) damage to the processor by doing the following: (1) Touch the metal chassis before touching the processor or baseboard. Keep part of your body in contact with the metal chassis to dissipate the static charge while handling the processor. (2) Avoid moving around unnecessarily.

A processor has the following components:

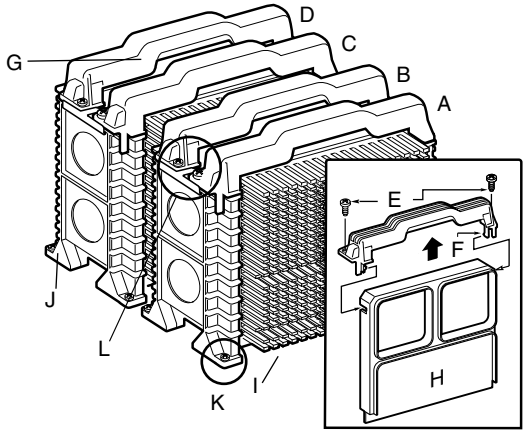

Figure 3-4 Processor Orientation and Components

A. Processor 1
B. Processor 2
C. Processor 3
D. Processor 4
E. Screws (2) at the top of the processor
F. Clip on processor handle
G. Processor handle
H. Termination module
I. Processor heat sink
J. Processor retention mechanism
K. Screws (2) for retention module guide rails
L. Note the handle/screw orientation for each processor pair

Removing a Processor

See Figure 3-4 for the location of processor components.

1. Observe the safety and ESD precautions at the beginning of this chapter and the additional cautions given in this section.
2. Remove the two screws that secure the handle to the processor.
3. Pull firmly and straight up on either side of the processor handle.
4. Put the processor on a piece of conductive foam and store it in an antistatic package.

Installing a Processor

See Figure 3-4 for the location of processor components.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the new processor from its antistatic package and place it on a grounded, static-free surface or conductive foam pad.
3. Attach the processor handle to the processor. For more information, see “Installing Processor Handles” on page 60.
4. If necessary, attach the heatsink to the processor. For more information, see “Installing Processor Heatsinks” on page 60.
5. Orient the processor correctly in the chassis. See Figure 3-4 on page 58 and Figure 3-1 on page 52.
6. Slide the processor into the guides on each side of the processor slot and press the processor downward firmly into the baseboard connector.
7. Insert and tighten two screws at the top of the processor handle.

Removing Processor Retention Mechanisms

See Figure 3-4 for the location of processor components.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Make sure that the processor has been removed from the baseboard. To remove the processor, see “Removing a Processor” on page 59.

3. With a long bladed screwdriver, remove the two screws at the base of the processor retention mechanism.
4. Remove the retention mechanism from the baseboard.

Installing Processor Retention Mechanisms

See Figure 3-4 for the location of processor components.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. With a long bladed screwdriver, tighten the two screws at the base of the processor retention mechanism.

Installing Processor Handles

Depending on your configuration, the handles for the processor might not be attached to the processor. In this case, you must attach a handle to each processor.

1. Orient the handle as shown in Figure 3-4 on page 58.
2. Press the handle into the processor until the handle snaps into place.

Installing Processor Heatsinks

Depending on your configuration, the heatsink for each processor might not be attached. In this case, you must attach one heatsink to each processor. If you are working with a processor terminator module, you do not install a heatsink.

See Figure 3-4 for the location of processor components.

1. Remove the heatsink from its protective cover.
2. Pull the tab on the bottom of the heatsink to remove the blue plastic film and expose the square of adhesive thermal grease that will help attach the heatsink to the processor.
3. Orient the heatsink on the correct side of the processor. For correct orientation, see Figure 3-4.
4. Because of the adhesive grease on the heatsink, be careful to orient the heatsink properly before placing it against the processor.

5. Attach the heatsink to the processor with five 6-32 X 3/8 screws, and tighten to 8-10 inch-pounds.

Voltage Regulator Modules (VRMs)

Follow the instructions in this section to remove and install a VRM.

Up to seven VRMs provide power for processors. Table 3-1 shows the relationship between VRMs and processors.

Table 3-1 VRM/Processor Power Sequencing

VRM #	VRM provides power for	Description
1 (Embedded)	Processor #1	Processor core power only
2 (Embedded)	Processor #1	GLT (FSB reference)
3 (Embedded)	Processor #1 and #2	L2 cache power only
4 (Embedded)	Processor #3 and #4	L2 cache power only
#2 Connector	Processor #2	Processor core power only
#3 Connector	Processor #3	Processor core power only
#4 Connector	Processor #4	Processor core power only

VRMs 1 through 4 are embedded in the baseboard. Additional VRMs plug into connectors 2 though 4 on the baseboard. You must use a specific number and connector population sequence of VRMs for each combination of processors and termination boards. Table 3-2 lists the required number and location of VRMs for each potential processor.

Table 3-2 Processor/VRM Population Sequencing

If you have a processor in connector	VRM in connector #
1	None. All required VRMs are embedded in the baseboard.
1 and 2	2

Table 3-2 Processor/VRM Population Sequencing

If you have a processor in connector	VRM in connector #
1, 2, and 3	3
1, 2, 3, and 4	4

Removing a VRM

To decide which VRM you need to remove, see Figure 3-1 on page 52.

Caution: You might damage the system if you install a VRM that is inappropriate for your system. For exact information about VRM and processor interchangeability, contact your customer service representative.

Caution: Reduce the risk of electrostatic discharge (ESD) damage to the VRM by doing the following: (1) Touch the metal chassis before touching the VRM or baseboard. Keep part of your body in contact with the metal chassis to dissipate the static charge while handling the VRM. (2) Avoid moving around unnecessarily.

1. Using a small flat-head screwdriver, push the plastic ejector levers on each end of the connector away from the VRM to eject it out of the connector. See Figure 3-5 for the location of the ejector levers.
2. Pull the VRM straight up and out of the baseboard.
3. Place the VRM on a nonconductive, static-free surface, or store it in an antistatic protective wrapper.

Installing a VRM

To decide on which connector you need to install a VRM, see Figure 3-1 on page 52.

1. Remove the VRM from its protective package.
2. Orient the VRM in the VRM connector correctly. See Figure 3-5.

3. Carefully insert the VRM in the connector on the baseboard. Make sure you do not bend the connector pins.
4. Push down firmly on both ends of the VRM until the ejector levers of the connector snap into place, locking the VRM in the connector.
5. Make sure that the ejector levers are firmly in place. If not, use a screwdriver to push them into place.

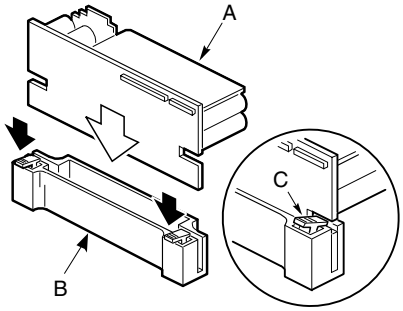

Figure 3-5 Installing a VRM

A. VRM

B. VRM connector on baseboard

C. Ejector lever

Backup Battery

Follow the instructions in this section to replace the lithium battery.

The lithium battery on the baseboard powers the real-time clock (RTC) for three to four years in the absence of power. When the battery weakens, it loses voltage and the system settings stored in CMOS RAM in the RTC (for example., the date and time) may be wrong. Contact your customer service representative or dealer for a list of approved devices.

Warning: If the system has been running, any installed PCI add-in board on the baseboard will be hot. To avoid the possibility of a burn, be careful when removing or installing baseboard components, especially those that are located near processors.

The following warning and translations are required by specific certifying agencies to be printed immediately adjacent to the procedure for removing the RTC.

Warning: There is a danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.

Advarsel!: Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

Advarsel: Lithiumbatteri - Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

Varning: Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

Varoitus: Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

Note the location of the lithium battery in Figure 3-1 on page 52.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the VRMs in VRM connectors 3 and 4. For more information, see "Removing a VRM" on page 62.

3. Insert the tip of a small flat-head screwdriver or equivalent under the plastic tab on the snap-on plastic retainer.
4. Gently push down on the screwdriver to lift the battery.
5. Remove the battery from its socket.
6. Dispose of the battery according to local ordinance.
7. Remove the new lithium battery from its package and, being careful to observe the correct polarity, insert it in the battery socket.

Add-in Boards

Follow the instructions in this section to remove and install add-in boards.

Figure 3-1 on page 52 identifies the add-in board locations. The baseboard contains the following eight PCI slots:

- Two 32-bit, 33-MHz half-length PCI slots
- Two 64-bit, 66/33-MHz hot-plug PCI slots
- Four 64-bit, 33-MHz hot-plug PCI slots

Typically, the hot-plug PCI add-in boards are held in the hot-plug slots by a front and rear hot-plug retention mechanism. See Figure 3-6 on page 68.

Note: At this time, the Linux operating system does not support use of the PCI hot-plug (PHP) feature. If you are running Linux, your system must be turned off before installing or removing PCI boards. Windows 2000 requires drivers that are PHP-compatible in order to use the PHP feature.

Removing a 32-bit, 33-MHz Half-Length PCI Add-in Board

The add-in boards for the half-length 33-MHz PCI slots are not hot-pluggable. In other words, you must turn off the AC power to the system first before installing boards at these locations.

Warning: If the system has been running, any installed PCI add-in board on the baseboard will be hot. To avoid the possibility of a burn, be careful when removing or installing baseboard components, especially those that are located near processors.

Warning: The on/off button on the front panel does not turn off the system AC power. To remove power from system, you must unplug the AC power cords from the wall outlet or the system.

Caution: Slot covers must be installed on all vacant expansion slots. This maintains the electromagnetic emissions characteristics of the system and ensures proper cooling of system components.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Disconnect any cables attached to the PCI board you are removing.
3. Remove and save the screw that attaches the existing board retaining bracket to the chassis.
4. Holding the board by its top edge or upper corners, carefully pull it out. Do not scrape the board against other components.
5. Store the board in an antistatic protective wrapper.
6. If you are not reinstalling a board in the same slot, install a slot cover over the vacant slot. The tapered foot of the cover must fit into the mating slot in the expansion slot frame.

Installing a 32-bit, 33-MHz Half-Length PCI Add-in Board

To install a 32-bit, 33-MHz half-length PCI add-in board, follow these steps:

Warning: If the system has been running, any installed PCI add-in board on the baseboard will be hot. To avoid the possibility of a burn, be careful when removing or installing baseboard components, especially those that are located near processors.

Warning: The on/off button on the front panel does not turn off the system AC power. To remove power from the system, you must unplug the AC power cords from the wall outlet or the system.

Caution: Do not overload the baseboard by installing add-in boards that draw excessive current.

Caution: Add-in boards can be extremely sensitive to ESD and always require careful handling. After removing the board from its protective wrapper or from the baseboard, place it component-side up on a grounded, static-free surface or conductive foam pad, if available. Do not slide the board over any surface.

1. Remove the add-in board from its protective wrapper. Be careful not to touch the components or gold edge connectors. Place the board component-side up on an antistatic surface.
2. Record the serial number of the add-in board in your equipment log. See "Equipment Log" on page 84.
3. Set jumpers or switches on the PCI board according to the manufacturer's instructions.
4. Remove and save the screw that attaches the existing board or expansion slot cover to the chassis.
5. Remove and save the expansion slot cover.
6. Hold the add-in board by its top edge or upper corners. Firmly press it into an expansion slot on the baseboard. The tapered foot of the board-retaining bracket must fit into the mating slot in the expansion slot frame. Install a PCI board component-side **down**.
7. Use the screw removed earlier to fasten the new board-retaining bracket to the chassis. Tighten the screw firmly (6.0 inch-pounds). Attach cables if necessary.

Removing a 64-bit, 66/33-MHz Hot-Plug PCI Add-in Board

See Figure 3-6 for an illustration of the front hot-plug retention mechanism.

Warning: If the system has been running, any installed PCI add-in board on the baseboard will be hot. To avoid the possibility of a burn, be careful when removing or installing baseboard components, especially those that are located near processors.

Caution: Slot covers must be installed on all vacant expansion slots. This maintains the electromagnetic emissions characteristics of the system and ensures proper cooling of system components.

Note: At this time, the Linux operating system does not support use of the PCI hot-plug (PHP) feature. If you are running Linux, your system must be turned off before installing or removing PCI boards. Windows 2000 requires drivers that are PHP-compatible in order to use the PHP feature.

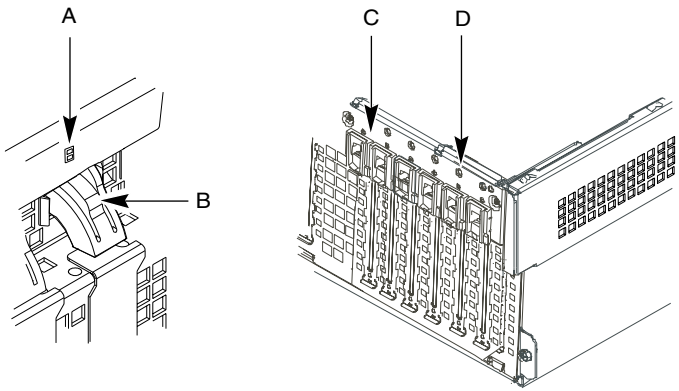

Figure 3-6 Front Hot-Plug Retention Mechanism

A. Green and amber LEDs

B. Press here on the inside of the chassis and then rotate to release the PCI board

C. PHP retention mechanism from the outside of the chassis

D. HW push-button

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Make sure that the slot is powered off. If the slot is powered on, turn the power to the slot off through the PCI hot-plug application on your system, or by pressing the HW push-button.
3. Disconnect any cables attached to the board you are removing.
4. If there is a front and rear hot-plug retention mechanism, release it.
5. Remove the PCI board by pulling straight up.
6. Store board in an antistatic protective wrapper.
7. If you are not reinstalling a board in the same slot, install a slot cover over the vacant slot. The tapered foot of the cover must fit into the mating slot in the expansion slot frame.

Installing a 64-bit, 66/33-MHz Hot-Plug PCI Add-in Board

To install a 64-bit, 33/66-MHz hot-plug PCI add-in board, follow these steps:

Warning: If the system has been running, any installed PCI add-in board on the baseboard will be hot. To avoid the possibility of a burn, be careful when removing or installing baseboard components, especially those that are located near processors.

Caution: Do not overload the baseboard by installing add-in boards that draw excessive current.

Caution: Add-in boards can be extremely sensitive to ESD and always require careful handling. After removing the board from its protective wrapper or from the baseboard, place it component-side up on a grounded, static-free surface or conductive foam pad, if available. Do not slide the board over any surface.

Note: At this time, the Linux operating system does not support use of the PCI hot-plug (PHP) feature. If you are running Linux, your system must be turned off before installing or removing PCI boards. Windows 2000 requires drivers that are PHP-compatible in order to use the PHP feature.

1. Remove the add-in board from its protective wrapper. Be careful not to touch the components or gold edge connectors. Place the board component-side up on an antistatic surface.
2. Record the serial number of the add-in board in your equipment log. See "Equipment Log" on page 84.
3. Make sure that the slot is powered off. Power off the add-in board through the PCI hot-plug application on your system, or by pressing the HW push-button.
4. Set jumpers or switches on the board according to the manufacturer's instructions.
5. If necessary, remove and save the expansion slot cover.
6. Hold the add-in board by its top edge or upper corners. Firmly press it into an expansion slot on the baseboard. The tapered foot of the board-retaining bracket must fit into the mating slot in the expansion slot frame. Install a PCI board component-side **down**.
7. If there is a front and rear hot-plug retention mechanism, engage it.
8. Use the screw removed earlier to fasten the new board to the chassis. Tighten the screw firmly (6.0 inch-pounds).
9. Attach cables if necessary.
10. Power on the add-in board through the PCI hot-plug application on your system, or by pressing the HW push-button.

ICMB Card

Follow the instructions in this section to remove and install a ICMB card.

The ICMB card allows two servers to communicate through a serial connection. An ICMB card is installed in each server; the cards are connected through a serial cable.

Establishing communication between servers using the ICMB card is a two-step process. First, install the ICMB card in each server. Then, make sure that the software required for the card is in place. Software for the ICMB card includes firmware on the card and software already included in the ISC software. ISC software is included in the server software kit accompanying the baseboard.

Figure 3-7 shows an ICMB card. A filler panel is attached to the ICMB card with two screws. The panel, noted by "B", is identical to any filler panel for a PCI add-in board. You attach the filler panel to the rear of a chassis in the same way that you would attach a PCI add-in board.

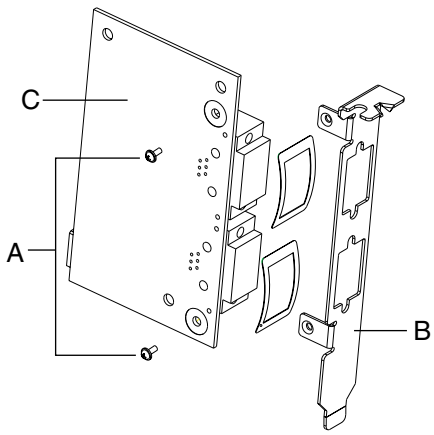

Figure 3-7 ICMB Card

Installing an ICMB Card

To install an ICMB card, follow these steps:

1. Remove the ICMB card and internal cable from their protective wrapper.
2. Designate a PCI slot for the ICMB card. The card does not plug into the connector on the baseboard, but the card does use the opening at the rear of the chassis.
3. Secure the filler panel to the chassis. On most systems, you use one screw. The screw is noted by "A" in Figure 3-8.

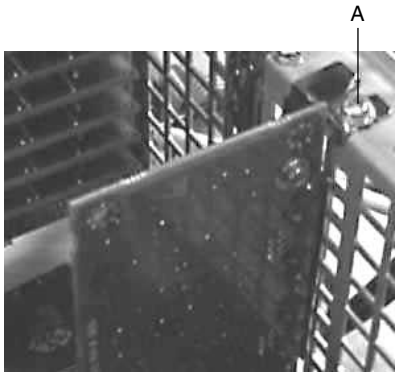

Figure 3-8 Example of an ICMB Card Attached to a Chassis

4. Attach the internal cable to the internal connector on the ICMB card. The internal cable connection to the card is noted by “A” in Figure 3-9.

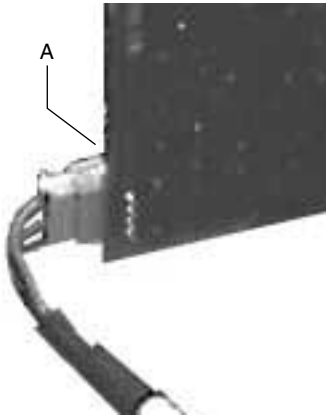

Figure 3-9 Internal Cable Attached to the ICMB Card

5. Connect the other end of the cable to the ICMB connector on the baseboard. The location of the connector is shown in Figure 3-1 on page 52.
6. The ICMB kit contains an external cable. The cable attaches to the card's external connector. The external cable connection to the card is noted by “A” in Figure 3-10.

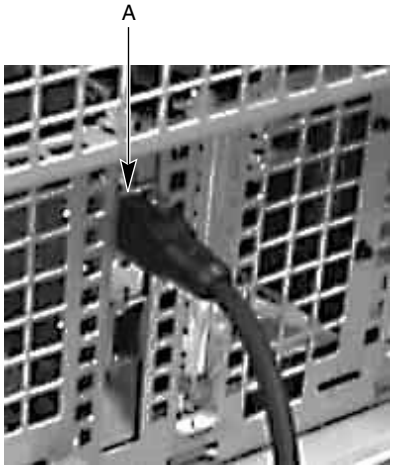

Figure 3-10 External Cable Attached to the Card

Removing an ICMB Card

To remove an ICMB card, follow these steps:

1. Disconnect the internal and external cables from the card and the baseboard.
2. Remove the screw securing the card to the chassis. The screw is noted by "A" in Figure 3-8 on page 72.
3. Remove the ICMB card from the server.

Solving Problems

This chapter helps you identify and solve problems that might occur while you are using the system.

Resetting the System

Table 4-1 shows the commands used to reset the system.

Table 4-1 Resetting Commands

To do this:	Press:
Clear system memory, restart POST, and reload the operating system.	Reset button or <Ctrl+Alt+Del>
Cold boot reset, which clears system memory, restarts POST, reloads the operating system, and stops power to all peripherals.	Power off/on

Initial System Startup

Problems that occur at initial system startup are usually caused by incorrect installation or configuration. Hardware failure is a less frequent cause. Use the following check list to troubleshoot Startup problems:

- Are all cables correctly connected and secured?
- Are the processors fully seated in their slots on the baseboard?
- Are all PCI add-in boards fully seated in their slots on the baseboard?
- Are all switch and jumper settings on the baseboard correct?
- Are all jumper and switch settings on add-in boards and peripheral devices correct? To check these settings, see the manufacturer's documentation. If applicable, ensure

that there are no conflicts (for example, two add-in boards sharing the same interrupt).

- Are all DIMMs installed correctly?
- Are all peripheral devices installed correctly?
- If the system has a hard drive, is it properly formatted or configured?
- Are all device drivers properly installed?
- Are the configuration settings made with the SSU correct?
- Is the operating system properly loaded? See the operating system documentation.
- Did you press the system power on/off button on the front panel to turn the server on (the power-on light should be lit)?
- Are the system power cords properly connected to the system and plugged into a NEMA 6-15R outlet for 100-120 V~ or for 200-240 V~?
- Is AC power available at the wall outlet?
- If these items are correct but the problem recurs, see "Specific Problems and Corrective Actions" on page 77.

New Application Software

Problems that occur when you run new application software are usually related to the software. Faulty equipment is much less likely, especially if other software runs correctly. Use the following checklist to troubleshoot application software problems;

- Does the system meet the minimum hardware requirements for the software? See the software documentation.
- Is the software an authorized copy? If not, get one. Unauthorized copies often do not work.
- If you are running the software from a diskette, is it a good copy?
- If you are running the software from a CD-ROM disk, is the disk scratched or dirty?
- If you are running the software from a hard drive, is the software correctly installed? Were all necessary procedures followed and files installed?
- Are the correct device drivers installed?
- Is the software correctly configured for the system?

- If the problems persist, contact the software vendor's customer service representative.

After the System Has Been Running Correctly

Problems that occur after the system hardware and software have been running correctly often indicate equipment failure. Often the simple solutions for these problems, however, can cause additional problems. Sometimes problems stem from changes made to the system, such as hardware or software that has been added or removed. Use the following checklist to trouble shoot such problems:

- If you are running the software from a diskette, try a new copy of the software.
- If you are running the software from a CD-ROM disk, try a different disk to see if the problem occurs on all disks.
- If you are running the software from a hard drive, try running it from a diskette. If the software runs correctly, there may be a problem with the copy on the hard drive. Reinstall the software on the hard disk, and try running it again. Make sure all necessary files are installed.
- If the problems are intermittent, there may be a loose cable, dirt in the keyboard (if keyboard input is incorrect), a marginal power supply, or other random component failures.
- If you suspect that a transient voltage spike, power outage, or brownout might have occurred, reload the software and try running it again.

Note: Symptoms of voltage spikes include random errors in data files, a flickering video display, unexpected system reboots, and lack of response to user command. If you are experiencing any of these symptoms, you may want to install a surge suppressor between the power outlet and the system power cords.

Specific Problems and Corrective Actions

This section provides possible solutions for the following problems:

- Power light does not light.

- No beep codes.
- No characters appear on screen.
- Characters on the screen appear distorted or incorrect.
- System cooling fans do not rotate properly.
- Diskette drive activity light does not light.
- Hard drive activity light does not light.
- CD-ROM drive activity light does not light.
- Problems with application software.

Try the solutions in the order given. If you cannot correct the problem, contact your service representative or authorized dealer.

Power Light Does Not Light

Check the following:

- Are all the power supplies plugged in? Is the power turned on to the power strip or outlet? Do you have a blown fuse or breaker?
- Is the system functioning normally? If so, the power LED may be defective, the cable from the front panel to the fan board may be loose, or the cable from the fan board to the baseboard may be loose.

If all items are correct and problems persist, contact your service representative or authorized dealer.

No Beep Codes

If the system operates normally, but there was no beep, the speaker may be defective. If the speaker is enabled, but the speaker does not function, contact your service representative or authorized dealer.

Record the beep code emitted by POST, and see "Error and Informational Messages" on page 82.

No Characters Appear on Screen

Check the following:

- Is the keyboard working? Check to see that the “Num Lock” light is functioning.
- Is the video monitor plugged in and turned on? Many modern video monitors shut down when inactive and may require a moment to warm up when activated.
- Are the brightness and contrast controls on the video monitor properly adjusted?
- Are the video monitor switch settings correct?
- Is the video monitor signal cable properly installed?
- Is the onboard video controller enabled?

If you are using an add-in video controller board, follow these steps:

1. Verify that the video controller board is fully seated in the baseboard connector. Also verify that the video monitor is plugged in to the **active** video controller.
2. Reboot the system so that changes take effect.
3. If there are still no characters on the screen after you reboot the system and POST emits a beep code, write down the beep code. This information is useful for your service representative. See “Error and Informational Messages” on page 82.
4. If you do not receive a beep code and characters do not appear, the video display monitor or video controller may have failed. You can verify this by trying the monitor on another system or trying a different monitor on this system. Contact your service representative or authorized dealer.

Characters Are Distorted or Incorrect

Check the following:

- Are the brightness and contrast controls properly adjusted on the video monitor? See the manufacturer's documentation.
- Are the video monitor signal and power cables properly installed?
- Is the correct monitor/video board installed for your operating system?

If the problem persists, the video monitor may be faulty or it may be the incorrect type. Contact your service representative or authorized dealer.

System Cooling Fans Do Not Rotate Properly

If the system cooling fans are not operating properly, system components could be damaged.

Check the following:

- Is AC power available at the wall outlet?
- Are the system power cords properly connected to the system and the wall outlet?
- Did you press the power on/off switch?
- Is the power-on light lit?
- Did any of the fan motors stop. (Use the server management subsystem to check the fan status.)
- Is the cable from the fan board connected to the baseboard?
- Are the power supply cables properly connected to the baseboard and the fan board assembly?
- Are there any shorted wires caused by pinched cables or power connector plugs forced into power connector sockets the wrong way?

If the switches and connections are correctly installed and AC power is available at the wall outlet, contact your service representative or authorized dealer.

Diskette Drive Activity Light Does Not Light

Check the following:

- Are the diskette drive power and signal cables properly installed?
- Are all relevant switches and jumpers on the diskette drive set correctly?
- Is the diskette drive properly configured?
- Is the diskette drive activity light always on? If so, the signal cable may be plugged in incorrectly.

If you are using the onboard diskette controller, use the SSU to make sure that "Onboard Floppy" is set to `Enabled`. If you are using an add-in diskette controller, make sure that "Onboard Floppy" is set to `Disabled`. To run the SSU, see "Using the System Setup Utility" in the *SGI 1450 Server User's Guide*.

If the problem persists, there may be a problem with the diskette drive, baseboard, or drive signal cable. Contact your service representative or authorized dealer.

Hard Drive Activity Light Does Not Light

If you installed one or more hard drives in your system, check the following:

- Are the power and signal cables to the drive properly installed?
- Are all relevant switches and jumpers on the hard drive and adapter board set correctly?
- Is the hard drive properly configured?

CD-ROM Drive Activity Light Does Not Light

Check the following:

- Are the power and signal cables to the CD-ROM drive properly installed?
- Are all relevant switches and jumpers on the drive set correctly?
- Is the drive properly configured?
- Is the onboard IDE controller enabled?

Note: The hard drive activity light on the front panel lights when a SCSI device controlled by the onboard SCSI host controller is in use. This LED does not display CD-ROM activity.

Problems with Application Software

Check the following:

- Verify that the software is properly configured for the system. See the software installation and operation documentation for instructions on setting up and using the software.
- Try a different copy of the software.
- Make sure all cables are installed correctly.

- Verify that the baseboard jumpers are set correctly. See “Changing Jumper Settings” on page 133.
- If other software runs correctly on the system, contact your vendor about the failing software.

If the problem persists, contact the software vendor's customer service representative.

Error and Informational Messages

When you turn on the system, POST displays messages that provide information about the system. If a failure occurs, POST emits beep codes that indicate errors in hardware, software, or firmware. If POST can display a message on the video display screen, it causes the speaker to beep twice as the message appears.

Table 4-2 shows the standard BIOS Port-80 codes.

Table 4-2 Standard BIOS Port-80 Codes

CP	Beeps	Reason
xx	1-1-1-1	There are no processors present in the system, or the processors are so incompatible (for example, mismatched cache voltages) that the system BIOS cannot be run
16	1-2-2-3	BIOS ROM checksum
20	1-3-1-1	Test DRAM refresh
22	1-3-1-3	Test 8742 keyboard controller
28	1-3-3-1	Autosize DRAM, system BIOS stops execution here if the BIOS does not detect any usable memory DIMMs
2C	1-3-4-1	Base RAM failure, BIOS stops execution here if entire memory is bad
46	2-1-2-3	Check ROM copyright notice
58	2-2-3-1	Test for unexpected interrupts
98	1-2	Search for option ROMs. One long, two short beeps on checksum failure
B4	1	One short beep before boot

Table 4-3 shows the recovery BIOS Port-80 codes.

Table 4-3 Recovery BIOS Port-80 Codes

CP	Beeps	Reason
xx	1-1-1-1	There are no processors present in the system, or the processors are so incompatible that the system BIOS cannot be run (like mismatched cache voltages).

Equipment Log

Use the blank equipment log in Table 4-4 to record information about the system. Some of this information may be required when running the system setup utility (SSU).

Table 4-4 Equipment Log

Item	Manufacturer Name	Model Number	Serial Number	Date Installed
System				
Baseboard				
Processor speed and cache				
Video display				
Keyboard				
Mouse				
Diskette drive A				
Diskette drive B				
Tape drive				
CD-ROM drive				
Hard drive 1				
Hard drive 2				
Hard drive 3				
Hard drive 4				
Hard drive 5				

Table 4-4 (continued) Equipment Log

Item	Manufacturer Name	Model Number	Serial Number	Date Installed

Technical Reference

This appendix provides a description of the rear panel I/O ports, the peripheral adapter board and connectors, and the baseboard connectors and jumpers.

Internal Cables and Connectors

Table A-1 describes all cables and connectors of the SGI 1450 server.

Table A-1 SGI 1450 server Cables and Connectors

Type	Qty	From	To	Interconnect Description
32-bit PCI, 5 V	2	Baseboard	PCI adapter card	120-pin card edge connect
64-bit PCI, 5 V	4	Baseboard	PCI adapter card	184-pin card edge connect
64-bit PCI, 3.3 V	2	Baseboard	PCI adapter card	184-pin card edge connect
Keyboard	1	Baseboard	External interface	Keyboard device
Mouse	1	Baseboard	External interface	Mouse device
System control	1	Baseboard	Fan distribution board	2x15 flat ribbon cable
S/M feature	1	Baseboard	Intel S/M card	2x13 flat ribbon cable
Narrow SCSI	1	Baseboard	5.25-inch device	2x25 flat ribbon cable
Floppy	1	Baseboard	Floppy device	2x17 flat ribbon cable
IDE	1	Baseboard	CD-ROM device	2x20 flat ribbon cable
HPIB	1	Baseboard	HPIB board	2x10 flat ribbon cable
Auxiliary processor fans	4	Baseboard	N/A	1x3-pin connector, NOT USED FOR SGI 1450 SERVER
Parallel port	1	Baseboard	External interface	25-pin parallel port connector

Table A-1 (continued) SGI 1450 server Cables and Connectors

Type	Qty	From	To	Interconnect Description
Serial	2	Baseboard	External interface	9-pin serial port connector
Ethernet	1	Baseboard	External interface	RJ45 connector port
Internal wide Ultra 160/m SCSI, channel A	1	Baseboard	HDD backplane	68-pin solid core flat ribbon cable
External wide Ultra 160/m SCSI, Channel B	1	Baseboard	External interface	68-pin solid core twisted pair cable to panel mounted external interface connector
SE wide SCSI	1	Baseboard	5.25-inch device	68-pin connector
Auxiliary IMB	1	Baseboard	HDD backplane	1x3-pin connector on baseboard discrete cabled to a 1x4-pin connector on HDD backplane (one pin left floating)
S/M bus	1	Baseboard	N/A	NOT USED FOR SGI 1450 SERVER
ICMB internal	1	Baseboard	ICMB board	1x7-pin cable
ICMB external	2	ICMB board	External interface	1x6-pin ICMB cable
USB	2	Baseboard	External interface	1x4-pin USB cables
Internal USB	1	Baseboard	Internal interface	1x4-pin cable
EBB	1	Baseboard	Internal interface	1x3-pin cable
Video	1	Baseboard	External interface	15-pin, monitor device
VRM	3	Baseboard	VRM module	50-pin
Main power 1	1	Power supply cage	Baseboard	2x10-pin discrete cable
Main power 2	1	Power supply cage	Baseboard	2x12-pin discrete cable
Auxiliary power	1	Power supply cage	Baseboard	2x7-pin discrete cable

Table A-1 (continued) SGI 1450 server Cables and Connectors

Type	Qty	From	To	Interconnect Description
Slot 2	4	Baseboard	Processor module	330-pin card edge connect
Memory	1	Baseboard	Memory module	330-pin card edge connect
DIMM	16	Memory module	DIMM	168-pin card edge connect
SCA-2 HDD	5	HDD Backplane	External interface	80-pin SCA-2 compatible device
Auxiliary HDD fans	2	HDD backplane	N/A	1x3-pin connector, NOT USED FOR SGI 1450 SERVER
SAFE-TE	1	HDD backplane	SAF-TE board	120-pin card edge connect
HDD power	2	Power supply cage	HDD backplane	1x4-pin discrete cable
Front panel	1	front panel	Fan board assembly	2x12-pin flat ribbon cable
Fan power	1	Power supply cage	Fan board assembly	2x3-pin discrete cable
System fans	6	Fan board assembly	Fan modules	2x2-pin blind mate connector
Peripheral power	1	Power supply cage	Floppy device (adapter board) & half height device	1x4-pin connectors (daisy chained)
.5-inch floppy signal	1	.5-inch floppy adapter board	.5-inch floppy device	26-pin flat cable
.5-inch CD-ROM power	1	Peripheral power	.5-inch CD-ROM adapter board	1x2-pin, cable also provides another 1x4pin connector for an additional half height device
.5-inch CD-ROM signal	1	.5-inch CD-ROM adapter board	.5-inch CD-ROM device	2x25-pin connector

Table A-1 (continued) SGI 1450 server Cables and Connectors

Type	Qty	From	To	Interconnect Description
AC distribution	1	Power cord	Power supply cage	3-pin PVC double insulated power cordage
AC power	1	AC distribution	External interface	Recommend 3-pin SJT power cord

Connectors Accessible to the User

This section describes the rear panel I/O ports.

Keyboard and Mouse Ports

These identical PS/2-compatible ports share a common housing. The top one is the mouse and the bottom one is the keyboard. Table A-2 shows the cable pinout assignments for the keyboard and mouse connectors.

Table A-2 Keyboard and Mouse Connectors

Mouse Pin	Signal	Keyboard Pin	Signal
1	MSEDAT (mouse data)	1	KEYDAT (keyboard data)
2	No connection	2	No connection
3	GND (ground)	3	GND (ground)
4	Fused VCC (+5 V)	4	Fused VCC (+5 V)
5	MSECLK (mouse clock)	5	KEYCLK (keyboard clock)
6	No connection	6	No connection

Serial Ports

The baseboard provides two RS-232C serial ports (COM1 is to the left, COM2 is to the right). They are D-subminiature 9-pin connectors. Each serial port can be enabled separately with the configuration control provided on the baseboard.

The COM2 serial port can be used either as an emergency management port or as a normal serial port. Table A-3 shows the cable pinout assignments for the serial ports.

Table A-3 Serial Ports

Pin	Signal
1	DCD (carrier detect)
2	RXD (receive data)
3	TXD (transmit data)
4	DTR (data terminal ready)
5	GND
6	DSR (data set ready)
7	RTS (request to send)
8	CTS (clear to send)
9	RIA (ring indicator)

Parallel Port

The IEEE 1284-compatible parallel port, used primarily for a printer, sends data in parallel format. The parallel port is accessed through a D-subminiature 25-pin connector. Table A-4 shows the cable pinout assignments for the parallel port.

Table A-4 Parallel Port

Pin	Signal	Pin	Signal
1	STROBE_L	14	AUFDXT_L (auto feed)
2	Data bit 0	15	ERROR_L
3	Data bit 1	16	INIT_L (initialize printer)
4	Data bit 2	17	SLCTIN_L (select input)
5	Data bit 3	18	GND (ground)
6	Data bit 4	19	GND

Table A-4 (continued) Parallel Port

Pin	Signal	Pin	Signal
7	Data bit 5	20	GND
8	Data bit 6	21	GND
9	Data bit 7	22	GND
10	ACK_L (acknowledge)	23	GND
11	BUSY	24	GND
12	PE (paper end)	25	GND
13	SLCT (select)		

Video Port

The video port interface is a standard VGA-compatible 15-pin connector. Onboard video is supplied by an ATI RAGE IIC VT4 video controller with 2 MB of onboard video SGRAM. Table A-5 shows the cable pinout assignments for the video port.

Table A-5 Video Port

Pin	Signal
1	Red (analog color signal R)
2	Green (analog color signal G)
3	Blue (analog color signal B)
4	No connection
5	GND
6	GND
7	GND
8	GND
9	Fused VCC (+5V)
10	GND

Table A-5 (continued) Video Port

Pin	Signal
11	No connection
12	DDCDAT
13	HSYNC (horizontal sync)
14	VSYNC (vertical sync)
15	DDCCLK

Universal Serial Bus (USB) Interface

The baseboard provides two stacked USB ports (port 0 on top, port 1 on bottom). The built-in USB ports permit the direct connection of two USB peripherals without an external hub. If more devices are required, an external hub can be connected to either of the built-in ports. Table A-6 shows the cable pinout assignments for the USB connector.

Table A-6 USB Connector

Pin	Signal
A1	Fused VCC (+5V /w overcurrent monitor of both port 0 and 1)
A2	DATAL0 (differential data line paired with DATAH0)
A3	DATAH0 (differential data line paired with DATAL0)
A4	GND
B1	Fused VCC (+5V /w overcurrent monitor of both port 0 and 1)
B2	DATAL1 (differential data line paired with DATAH1)
B3	DATAH1 (differential data line paired with DATAL1)
B4	GND

ICMB Connectors

The external Intelligent Chassis Management Bus (ICMB) provides external access to ICMB devices that are within the chassis. This allows you to externally access chassis management functions, alert logs, post-mortem data, and so on. It also provides a mechanism for chassis power control. Optionally, the server can be configured with an ICMB adapter board. This board provides two SEMCONN 6-pin connectors to allow daisy-chained cabling. Table A-7 shows the cable pinout assignments for the ICMB connectors.

Table A-7 ICMB Connectors

Pin	Signal
1	No connection
2	No connection
3	B (negative)
4	A (positive)
5	No connection
6	No connection

Ethernet Connector

The system supports one on-board Ethernet connection. Table A-8 shows the cable pinout assignments for the Ethernet connector.

Table A-8 Ethernet Connector

Pin	Signal
1	TX+
2	TX-
3	RX+
4	NIC termination
5	NIC termination

Table A-8 (continued) Ethernet Connector

Pin	Signal
6	RX-
7	NIC termination
8	NIC termination
9	Speed LED signal
10	+3.3 V standby (for LED)
11	Activity LED signal
12	+3.3 V standby (for LED)
13	GND
14	GND

Internal SCA-2 HDD Connector

An SCA-2 connector is used on the primary side of the HDD backplane. The pinout is the same as SCA-1. Table A-9 shows the cable pinout assignments for the internal SCA-2 HDD connector.

Table A-9 Internal SCA-2 HDD Connector

Pin	Signal Name	Type	Pin	Signal Name	Type
1	12 V Charge	(L)	41	12 V Ground	(L)
2	12 V	(S)	42	12 V Ground	(L)
3	12 V	(S)	43	12 V Ground	(L)
4	12 V	(S)	44	Mated 1	(S)
5	Reserved/ESI-1	(S)	45	-EFW	(L)
6	Reserved/ESI-2	(S)	46	DIFFSNS	(L)
7	-DB(11)	(S)	47	+DB(11)	(S)
8	-DB(10)	(S)	48	+DB(10)	(S)

Table A-9 (continued) Internal SCA-2 HDD Connector

Pin	Signal Name	Type	Pin	Signal Name	Type
9	-DB(9)	(S)	49	+DB(9)	(S)
10	-DB(8)	(S)	50	+DB(8)	(S)
11	-I/O	(S)	51	+I/O	(S)
12	-REQ	(S)	52	+REQ	(S)
13	-C/D	(S)	53	+C/D	(S)
14	-SEL	(S)	54	+SEL	(S)
15	-MSG	(S)	55	+MSG	(S)
16	-RST	(S)	56	+RST	(S)
17	-ACK	(S)	57	+ACK	(S)
18	-BSY	(S)	58	+BSY	(S)
19	-ATN	(S)	59	+ATN	(S)
20	-DB(P)	(S)	60	+DB(P)	(S)
21	-DB(7)	(S)	61	+DB(7)	(S)
22	-DB(6)	(S)	62	+DB(6)	(S)
23	-DB(5)	(S)	63	+DB(5)	(S)
24	-DB(4)	(S)	64	+DB(4)	(S)
25	-DB(3)	(S)	65	+DB(3)	(S)
26	-DB(2)	(S)	66	+DB(2)	(S)
27	-DB(1)	(S)	67	+DB(1)	(S)
28	-DB(0)	(S)	68	+DB(0)	(S)
29	-DB(P1)	(S)	69	+DB(P1)	(S)
30	-DB(15)	(S)	70	+DB(15)	(S)
31	-DB(14)	(S)	71	+DB(14)	(S)
32	-DB(13)	(S)	72	+DB(13)	(S)

Table A-9 (continued) Internal SCA-2 HDD Connector

Pin	Signal Name	Type	Pin	Signal Name	Type
33	-DB(12)	(S)	73	+DB(12)	(S)
34	5 V	(S)	74	Mated 2	(S)
35	5 V	(S)	75	5 V ground	(L)
36	5 V charge	(L)	76	5 V ground	(L)
37	Spindle sync	(L)	77	Active LED out	(L)
38	MTRON	(L)	78	DLYD_START	(L)
39	SCSI ID (0)	(L)	79	SCSI ID (1)	(L)
40	SCSI ID (2)	(L)	80	SCSI ID (3)	(L)

External Adaptec Ultra 160/m SCSI

As an option, the server system can support a shielded external SCSI connection. This connection is on Channel B of the Adaptec AIC-7899 SCSI Ultra 160 controller. Table A-10 shows the cable pinout assignments for the external Adaptec Ultra 160/m SCSI.

Table A-10 External Adaptec Ultra 160/m SCSI

Pin	Signal Name	Pin	Signal Name
1	DP(12)	35	DM(12)
2	DP(13)	36	DM(13)
3	DP(14)	37	DM(14)
4	DP(15)	38	DM(15)
5	DAPHP	39	DAPHM
6	DP(0)	40	DM(0)
7	DP(1)	41	DM(1)
8	DP(2)	42	DM(2)
9	DP(3)	43	DM(3)

Table A-10 (continued) External Adaptec Ultra 160/m SCSI

Pin	Signal Name	Pin	Signal Name
10	DP(4)	44	DM(4)
11	DP(5)	45	DM(5)
12	DP(6)	46	DM(6)
13	DP(7)	47	DM(7)
14	DAPLP	48	DAPLM
15	GND	49	GND
16	DIFFSENSE	50	GND
17	TERMPWR	51	TERMPWR
18	TERMPWR	52	TERMPWR
19	NC	53	NC
20	GND	54	GND
21	ATNP	55	ATNM
22	GND	56	GND
23	BSYP	57	BSYM
24	ACKP	58	ACKM
25	RSTP	59	RSTM
26	MSGP	60	MSGM
27	SELP	61	SELM
28	CDP	62	CDM
29	REQP	63	REQM
30	IOP	64	IOM
31	DP(8)	65	DM(8)
32	DP(9)	66	DM(9)

Table A-10 (continued) External Adaptec Ultra 160/m SCSI

Pin	Signal Name	Pin	Signal Name
33	-DP(10)	67	-DM(10)
34	-DP(11)	68	-DM(11)

AC Power Input

A single IEC320-C13 receptacle is provided at the rear of the server. Use an appropriately sized power cord and AC main.

Peripheral Adapter Boards and Connectors

The peripheral adapter boards convert the 50-pin JAE and FFC signal interface connectors of the 0.5-inch slim line peripherals to a standard 40-pin IDE and 34-pin floppy cable pinouts. Two unique boards are required, one for the floppy and one for the CD-ROM.

CD-ROM Connectors

The 40-pin connector for the CD-ROM adapter board is the standard IDE pinout, as shown in Table A-11.

Table A-11 CD-ROM Adapter Board 40 Position IDE Connector

Pin	Signal	Pin	Signal
1	RSTDRV	2	GROUND
3	DD7	4	DD8
5	DD6	6	DD9
7	DD5	8	DD10
9	DD4	10	DD1
11	DD3	12	DD12
13	DD2	14	DD13
15	DD1	16	DD14
17	DD0	18	DD15
19	GROUND	20	KEY PIN
21	DRQ	22	GROUND
23	DIOW	24	GROUND
25	DIOR	26	GROUND
27	IORDY	28	CSEL
29	DACK	30	GROUND

Table A-11 (continued) CD-ROM Adapter Board 40 Position IDE Connector

Pin	Signal	Pin	Signal
31	IRQ	32	No connection
33	DA1	34	No connection
35	DA0	36	DA2
37	CS1P_L	38	DS3P_L
39	DHACT_L	40	GROUND

Table A-12 shows the cable pinout assignments for the CD-ROM adapter board power connector.

Table A-12 CD-ROM Adapter Board Power Connector

Pin	Signal
1	GND
2	+5 Power

Table A-13 shows the cable pinout assignments for the audio connector.

Table A-13 Audio Connector

Pin	Signal
1	Audio left
2	GND
3	Audio right

Table A-14 shows the cable pinout assignments for the CD-ROM JAE connector.

Table A-14 CD-ROM JAE Connector

Pin	Signal	Pin	Signal
1	Audio L-Ch	2	Audio R-Ch
3	Audio GND	4	GND

Table A-14 (continued) CD-ROM JAE Connector

Pin	Signal	Pin	Signal
5	RESET-	6	DD8
7	DD7	8	DD9
9	DD6	10	DD10
11	DD5	12	DD11
13	DD4	14	DD12
15	DD3	16	DD13
17	DD2	18	DD14
19	DD1	20	DD15
21	DD0	22	DMARQ
23	GND	24	/DIOR
25	DIOW-	26	GND
27	IORDY	28	/DMACK
29	INTRQ	30	/IOCS16
31	DA1	32	/PDIAG
33	DA0	34	DA2
35	/CS1FX	36	/CS3FX
37	/DASP	38	+5 V
39	+5 V	40	+5 V
41	+5 V	42	+5 V
43	GND	44	GND
45	GND	46	GND
47	CSEL	48	GND
49	RESERV	50	RESERV

Floppy Connectors

Table A-15 shows the cable pinout assignments for the 34-position floppy connector.

Table A-15 34-Position Floppy Connector Pin-Out

Pin	Signal	Pin	Signal
1	NC	2	HD In/ HD Out/ Open
3	NC	4	N/C
5	NC	6	N/C
7	GND	8	FD_INDEX_L
9	GND	10	Drive select 0
11	GND	12	Drive select 1
13	GND	14	N/C
15	GND	16	Motor on
17	GND	18	Direction select
19	GND	20	STEP
21	GND	22	Write data
23	GND	24	Write gate
25	GND	26	Track 00
27	GND	28	Write protect
29	GND	30	Read data
31	GND	32	Side one Select
33	GND	34	Disk change/ready

Table A-16 shows the cable pinout assignments for the floppy adapter board power connector.

Table A-16 Floppy Adapter Board Power Connector

Pin	Signal
1	+5 power
2	GND
3	GND
4	No connection

Table A-17 shows the cable pinout assignments for the FFC connector.

Table A-17 FFC connector

Pin	Signal	Pin	Signal
1	+5 V	2	INDEX
3	+5 V	4	DRIVE SELECT
5	+5 V	6	DISK CHANGE
7	NC	8	READY
9	HD OUT (HD AT HIGHT LEVEL)	10	MOTOR ON
11	NC	12	DIRECT SELECT
13	NC	14	STEP
15	GND	16	WRITE DATA
17	GND	18	WRITE GATE
19	GND	20	TRACK 00
21	NC	22	WRITE PROTECT
23	GND	24	READ DATA
25	GND	26	SIDE ONE SELECT

Baseboard Connectors

Figure A-1 shows connector locations on the baseboard. This section provides pin information about the baseboard connectors.

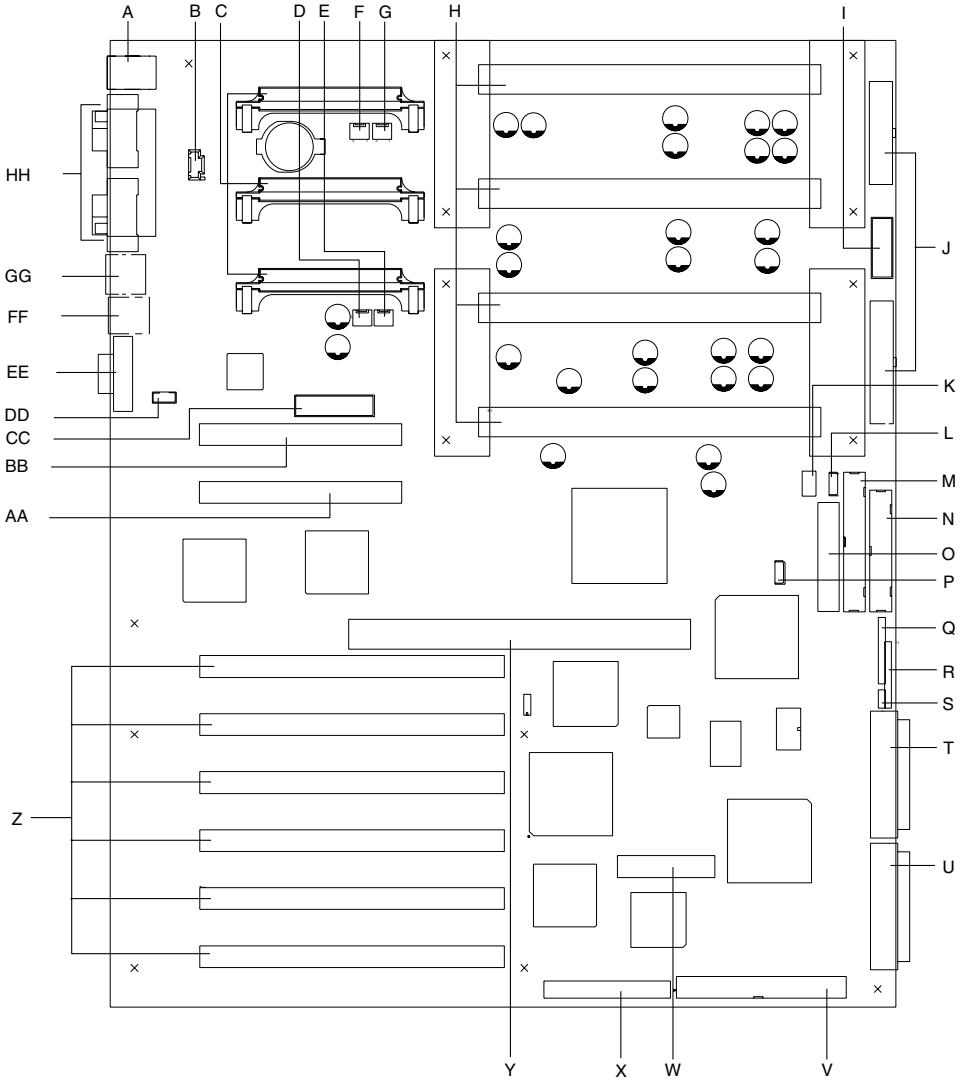

Figure A-1 Detailed Diagram of Connector Locations

Table A-18 provides a description of baseboard connectors.

Table A-18 Connector Description

Item	Connector	Description	Item	Connector	Description
A.	J1A1	Keyboard and Mouse Connector	R.	J9F2	Jumper Block
B.	J1B3	Internal USB	S.	J9G1	Jumper Block
C.	J2B1	VRM Connector #3	T.	J9G2	Ultra 160 Wide SCSI Channel B
	J2A2	VRM Connector #4 (VRM above)	U.	J9H1	Ultra 160 Wide SCSI Channel A
	J2C1	VRM Connector #2 (VRM below)	V.	J7J1	Legacy Narrow SCSI Connector
D.	J3C1	Fan Connector #1	W.	J7H1	SMM Feature Connector
E.	J4C1	Fan Connector #4	X.	J6J1	Legacy Wide SCSI
F.	J3A1	Fan Connector #2	Y.	J6F1	Memory Expansion Card Connector
G.	J4A1	Fan Connector #3	Z.	(Top to bottom)	
H.	(Top to bottom)			J4F1	PCI Slot #3 P64-A1
				J4G1	PCI Slot #4 P64-A2
	J7A1	Processor Connector #4		J4G2	PCI Slot #5 P64-B1
	J7B1	Processor Connector #3		J4H1	PCI Slot #6 P64-B2
	J7C1	Processor Connector #2		J4H2	PCI Slot #7 P64-B3
	J7D1	Processor Connector #1		J4J1	PCI Slot #8 P64-B4
I.	J9B2	Auxiliary Power Connector			
J.	(Top to bottom)		AA.	J2E1	PCI Slot #2 P32-C1
	J9B1	Main Power Connector A	BB.	J2D1	PCI Slot #1 P32-C2
	J9D1	Main Power Connector B	CC.	J3D1	Hot Plug Indicator Board Connector (HPIB)

Table A-18 (continued) Connector Description

Item	Connector	Description	Item	Connector	Description
K.	J9E1	IDE Activity Input Connector	DD.	J1D2	ICMB Connector
L.	J9E4	SMBus Connector	EE.	J1D1	Video
M.	J9E5	IDE Connector	FF.	J1C2	USB
N.	J9E6	Floppy Connector	GG.	J1C1	NIC
O.	J9E3	Front Panel Connector	HH.	(Top to bottom)	
P.	J8F1	IMB Connector		J1A2	Serial Port A
Q.	J9F1	Jumper Block		J1B2	Parallel Port
				J1B1	Serial Port B

Power Distribution Board Interface Connectors (J9B1, J9D1, J9B2)

The Baseboard receives its main power through two primary and one auxiliary power connectors. The two main power connectors are identified as J9B1 and J9D1. The auxiliary power connector, identified as J9B2, provides a power subsystem communication path, control signals, power supply sense connections, and other miscellaneous signals that are defined in Table A-19.

Note: The type of connector (in, out, in/out, power, ground) indicated in the following tables is described from the perspective of the baseboard.

Table A-19 describes the main power connector A (J9B1).

Table A-19 Main Power Connector A (J9B1)

Pin	Signal	Type	Current Carrying Capability	Description
1	12 V	Power	6 A	Power supply 12 V
2	Ground	Ground	6 A	Ground return connection
3	Ground	Ground	6 A	Ground return connection
4	Ground	Ground	6 A	Ground return connection
5	Ground	Ground	6 A	Ground return connection
6	VCC	Power	6 A	Power supply 5 V
7	VCC	Power	6 A	Power supply 5 V
8	VCC	Power	6 A	Power supply 5 V
9	VCC	Power	6 A	Power supply 5 V
10	VCC	Power	6 A	Power supply 5 V
11	SB5V	Power	6 A	Power supply 5 V standby
12	Ground	Ground	6 A	Ground return connection
13	Ground	Ground	6 A	Ground return connection
14	Ground	Ground	6 A	Ground return connection
15	Ground	Ground	6 A	Ground return connection
16	VCC	Power	6 A	Power supply 5 V
17	VCC	Power	6 A	Power supply 5 V
18	VCC	Power	6 A	Power supply 5 V
19	VCC	Power	6 A	Power supply 5 V
20	VCC	Power	6 A	Power supply 5 V

Table A-20 describes the main power connector B (J9D1).

Table A-20 Main Power Connector B (J9D1)

Pin	Signal	Type	Current Carrying Capability	Description
1	VCC3	Power	6 A	Power supply 3.3 V
2	VCC3	Power	6 A	Power supply 3.3 V
3	VCC3	Power	6 A	Power supply 3.3 V
4	VCC3	Power	6 A	Power supply 3.3 V
5	VCC3	Power	6 A	Power supply 3.3 V
6	VCC3	Power	6 A	Power supply 3.3 V
7	Ground	Ground	6 A	Ground return connection
8	Ground	Ground	6 A	Ground return connection
9	Ground	Ground	6 A	Ground return connection
10	Ground	Ground	6 A	Ground return connection
11	Ground	Ground	6 A	Ground return connection
12	12 V	Power	6 A	Power supply 12 V
13	VCC3	Power	6 A	Power supply 3.3 V
14	VCC3	Power	6 A	Power supply 3.3 V
15	VCC3	Power	6 A	Power supply 3.3 V
16	VCC3	Power	6 A	Power supply 3.3 V
17	VCC3	Power	6 A	Power supply 3.3 V
18	VCC3	Power	6 A	Power supply 3.3 V
19	Ground	Ground	6 A	Ground return connection
20	Ground	Ground	6 A	Ground return connection
21	Ground	Ground	6 A	Ground return connection
22	Ground	Ground	6 A	Ground return connection

Table A-20 (continued) Main Power Connector B (J9D1)

Pin	Signal	Type	Current Carrying Capability	Description
23	Ground	Ground	6 A	Ground return connection
24	12 V	Power	6 A	Power supply 12 V

Table A-21 describes the auxiliary power connector.

Table A-21 Auxiliary Power Connector (J9B2)

Pin	Signal	Type	Current Carrying Capability	Description
1	Ground	Ground		Ground return connection
2	5 V Sense	Out	N/A	Sense line feedback to power supply
3	3.3 V Sense	Out	N/A	Sense line feedback to power supply
4	BMC FAN SPD CTL	Out	N/A	
5	SM PRI 5VSB SCL	In/Out	N/A	Server management I2C bus - clock
6	SM PRI 5VSB SDA	In/Out	N/A	Server management I2C bus - data
7	Ground	Ground		Ground return connection
8	PWRGD PS	In	N/A	Signal from power subsystem indicating power is stable
9	PS PWR ON_L	Out	N/A	Control signal from baseboard to power supply
10	Ground	Ground		Ground return connection
11	-12 V	power		Power supply negative 12 V
12	Key		N/A	
13	12 V	power		Power supply 12 V
14	Ground	Ground		Ground return connection

Front Panel Interface (J9E3)

The front panel attaches to a 30-pin header on the baseboard. The header contains reset, NMI, sleep, and power control buttons, LED indicators, and an IPMB connection. The table below summarizes the front panel signal pins, including the signal mnemonic, name, and brief description.

Note: The type of connector (in, out, in/out, power, ground) indicated in Table A-22 is described from the perspective of the baseboard.

Table A-22 Front Panel Connector (J9E3)

Pin	Signal	Type	Description
1	SPKR_FP	Out	SPEAKER DATA for the front panel/chassis mounted speaker.
2	GROUND	Ground	GROUND is the power supply ground.
3	CHASSIS_INTRUSION	In	CHASSIS INTRUSION is connected to the BMC and indicates that the chassis has been opened. CHASSIS_INTRUSION is pulled high to +5 V standby on the baseboard.
4	FP_HD_ACT*	Out	HARD DRIVE ACTIVITY indicates there is activity on one of the hard disk controllers in the system.
5	+5V	Power	+5 V is the 5 volt power supply.
6	FP_SLP_BTN*	In	FRONT PANEL SLEEP is connected to the BMC and causes the system to sleep if supported by the operating system. FP_SLP_BTN* is pulled high to +5 V on the baseboard and is intended to be connected to a momentary-contact push button (connected to GROUND when pushed) on the system front.
7	COOL_FLT_LED*	Out	COOLING FAULT LED indicates that either a fan failure has occurred or the system is approaching an over-temperature situation. COOL_FLT_LED* is an output of the BMC.
8	PWR_LED*	Out	POWER PRESENT LED.

Table A-22 (continued) Front Panel Connector (J9E3)

Pin	Signal	Type	Description
9	PWR_FLT_LED*	Out	SYSTEM FAULT indicates that either a power fault or SCSI drive failure has occurred in the system.
10	GROUND	Ground	GROUND is the power supply ground.
11	SM_IMB_SDA	In/Out	I2C DATA is the data signal for the IPMB.
12	FP_NMI_BTN*	In	FRONT PANEL NMI is connected to a BMC input port, allowing the front panel to generate an NMI. FP_NMI_BTN* is pulled high to +5 V on the baseboard and is intended to be connected to a momentary-contact push button (connected to GROUND when pushed) on the system front panel.
13	SM_IMB_SCL	In/Out	I2C CLOCK is the clock signal for the IPMB.
14	FP_RST_BTN*	In	FRONT PANEL RESET is connected to the BMC and causes a hard reset to occur, resetting all baseboard devices except for the BMC and BMC. FP_RST_BTN* is pulled high to +5V on the baseboard, and is intended to be connected to a momentary-contact push button (connected to GROUND when pushed) on the system front panel.
15	+5V standby	power	+5 V STANDBY is the standby 5 volt power supply.
16	FP_PWR_BTN*	In	FRONT PANEL POWER CONTROL is connected to the BMC and causes the power to toggle (on → off, or off → on). FP_PWR_BTN* is pulled high to +5 V standby on the baseboard and is intended to be connected to a momentary-contact push button (connected to GROUND when pushed) on the system front panel.
17	SM_FP_ISOL	In	SM_FP_ISOL, when asserted, isolates the front panel SM bus.
18	GROUND	Ground	GROUND is the power supply ground.
19	FAN_TACH(0)	In	FAN_TACH signal is connected to the BMC to monitor the FAN speed.
20	FAN_TACH(1)	In	FAN_TACH signal is connected to the BMC to monitor the FAN speed.

Table A-22 (continued) Front Panel Connector (J9E3)

Pin	Signal	Type	Description
21	FAN_TACH(2)	In	FAN_TACH signal is connected to the BMC to monitor the FAN speed.
22	FAN_TACH(3)	In	FAN_TACH signal is connected to the BMC to monitor the FAN speed.
23	FAN_TACH(4)	In	FAN_TACH signal is connected to the BMC to monitor the FAN speed.
24	FAN_TACH(5)	In	FAN_TACH signal is connected to the BMC to monitor the FAN speed.
25	FAN_TACH(6)	In	FAN_TACH signal is connected to the BMC to monitor the FAN speed.
26	FAN_TACH(7)	In	FAN_TACH signal is connected to the BMC to monitor the FAN speed.
27	RJ45_ACTLED_R	In	NIC activity LED.
28	Reserved	-	Reserved.
29	SM_PRI_SCL	In/Out	I2C CLOCK is the clock signal for the primary Private bus.
30	SM_PRI_SDA	In/Out	I2C DATA is the data signal for the primary Private bus.

Hot-Plug PCI Indicator Board Interface (J3D1)

The hot-plug PCI indicator board (HPIB) contains the necessary LEDs and push button switches to help the user run PCI hot-plug (PHP) operations.

To indicate slot status, each PHP slot contains a green LED and amber LED. The actual interpretation of the LEDs depends on the operating system running on the system.

Each PHP slot also has a momentary switch. When you press this switch, the baseboard notifies the operating system that a PHP operation on the respective slot is requested. If a PHP operation is supported by the operating system, the user momentarily presses the switch and then waits for the operating system to signal via the LEDs that the PHP slot has been disabled. The user can then perform the desired PHP operation on the slot, such as replacing, removing, or adding a PCI adapter. When the user wants the operating

system to enable and initialize the PHP slot, the user momentarily presses the switch again.

Note: At this time, the Linux operating system does not support use of the PCI hot-plug (PHP) feature. If you are running Linux, your system must be turned off before installing or removing PCI boards. Windows 2000 requires drivers that are PHP compatible in order to use the PHP feature.

This (active low) switch for the respective slot is routed to the PRSNT1# input to the PCI hot-plug Controller (PHPC). This switch should not be confused with slot-interlock switches, which are used in conjunction with mechanical lever designs to prevent access to an energized PHP slot. The slot interlock inputs into the PHPC are permanently pulled down to ground and are not accessible through the hot-plug PCI indicator board interface.

Note: The HW push-button is located on the hot-plug indicator board. Do not use this button to turn power on and off to the PCI slot. In some instances, pressing this button interrupts normal operation of the operating system. Instead, turn power off using a hot-plug PCI application.

The hot-plug PCI indicator board (HPIB) interface contains the necessary signals to drive the LEDs and receive the push-button signals.

A 20-pin connector is provided on the baseboard for connection to the external HPIB. Table A-23 shows the cable pinout assignments for the this connector.

Table A-23 Hot-Plug Indicator Board Connector Pinout (J3D1)

Connector Contact	Signal Name	Connector Contact	Signal Name
1	Vcc	2	GROUND
3	P64_A_SWITCH<0>	4	P64_A_GRN_LED<1>
5	P64_A_AMB_LED<0>	6	P64_A_SWITCH<1>
7	P64_A_GRN_LED<1>	8	P64_A_AMB_LED<1>
9	P64_B_SWITCH<0>	10	P64_A_GRN_LED<0>

Table A-23 (continued) Hot-Plug Indicator Board Connector Pinout (J3D1)

Connector Contact	Signal Name	Connector Contact	Signal Name
11	P64_B_AMB_LED<0>	12	P64_B_SWITCH<1>
13	P64_B_GRN_LED<1>	14	P64_A_AMB_LED<1>
15	P64_B_SWITCH<2>	16	P64_A_GRN_LED<2>
17	P64_A_AMB_LED<2>	18	P64_B_SWITCH<3>
19	P64_A_GRN_LED<3>	20	P64_A_AMB_LED<3>

Memory Module Interface (J6F1)

Table A-24 describes the cable pinout assignments for the memory module interface.

Table A-24 Memory Module Interface

Pin**	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A001	GND	B001	PIN_B1	A084	GND	B084	MAA9
A002	GND	B002	VCC3	A085	MAA10	B085	VCC3
A003	GND	B003	SYNTH_OUT_ MADPCLK	A086	MAA11	B086	MAA12
A004	GND	B004	VCC3	A087	GND	B087	MAA13
A005	ASCLK	B005	VCC3	A088	MAA14	B088	VCC3
A006	CMD0	B006	ASDATA	A089	MCD_MUXSEL	B089	VCC3
A007	GND	B007	CMD16	A090	GND	B090	VCC3
A008	CMD1	B008	VCC3	A091	BSCLK	B091	VCC3
A009	CMD2	B009	CMD3	A092	MECC12	B092	BSDATA
A010	GND	B010	CMD19	A093	GND	B093	MECC14
A011	CMD17	B011	VCC3	A094	MECC13	B094	VCC3
A012	CMD4	B012	CMD20	A095	MECC15	B095	CMD97

Table A-24 (continued) Memory Module Interface

Pin**	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A013	GND	B013	CMD6	A096	GND	B096	CMD96
A014	CMD18	B014	VCC3	A097	CMD112	B097	VCC3
A015	CMD5	B015	CMD21	A098	CMD113	B098	CMD98
A016	GND	B016	CMD23	A099	GND	B099	CMD99
A017	CMD8	B017	VCC3	A100	CMD114	B100	VCC3
A018	CMD7	B018	CMD22	A101	CMD100	B101	CMD116
A019	GND	B019	CMD9	A102	GND	B102	CMD115
A020	CMD25	B020	VCC3	A103	CMD101	B103	VCC3
A021	CMD26	B021	CMD24	A104	CMD117	B104	CMD102
A022	GND	B022	CMD10	A105	GND	B105	CMD103
A023	CMD12	B023	VCC3	A106	CMD118	B106	VCC3
A024	CMD28	B024	CMD11	A107	CMD119	B107	CMD104
A025	GND	B025	CMD27	A108	GND	B108	CMD120
A026	CMD29	B026	VCC3	A109	CMD105	B109	VCC3
A027	CMD14	B027	CMD30	A110	CMD121	B110	CMD106
A028	GND	B028	CMD13	A111	GND	B111	CMD107
A029	CMD15	B029	VCC3	A112	CMD122	B112	VCC3
A030	CMD31	B030	MECC0	A113	CMD123	B113	CMD108
A031	GND	B031	MECC1	A114	GND	B114	CMD124
A032	MECC2	B032	VCC3	A115	CMD109	B115	VCC3
A033	MECC3	B033	CKE_0	A116	CMD125	B116	CMD110
A034	GND	B034	0_RAS	A117	GND	B117	CMD126
A035	0_WE*	B035	VCC3	A118	GND	B118	VCC3
A036	0_CAS	B036	0_CS0	A119	GND	B119	VCC3

Table A-24 (continued) Memory Module Interface

Pin**	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A037	GND	B037	0_CS1	A120	CMD111	B120	VCC3
A038	0_CS2	B038	VCC3	A121	CMD127	B121	CKE_1
A039	0_CS3	B039	0_MCDOE*	A122	GND	B122	1_RAS
A040	GND	B040	MEMPRSNT	A123	1_WE*	B123	VCC3
A041	0_MCDSEL*	B041	VCC3	A124	1_CAS	B124	1_CS0
A042	GND	B042	TMD0	A125	GND	B125	1_CS1
A043	GND	B043	VCC3	A126	1_CS2	B126	VCC3
A044	CMD34	B044	VCC3	A127	1_CS3	B127	1_MCDOE*
A045	CMD50	B045	CMD49	A128	GND	B128	1_MCDSEL*
A046	GND	B046	CMD54	A129	CMD80	B129	VCC3
A047	CMD52	B047	VCC3	A130	MECC8	B130	MECC10
A048	CMD51	B048	CMD33	A131	GND	B131	CMD64
A049	GND	B049	CMD32	A132	CMD81	B132	VCC3
A050	CMD40	B050	VCC3	A133	MECC9	B133	MECC11
A051	CMD38	B051	CMD53	A134	GND	B134	CMD65
A052	GND	B052	CMD36	A135	CMD66	B135	VCC3
A053	CMD35	B053	VCC3	A136	CMD82	B136	CMD85
A054	CMD42	B054	CMD58	A137	GND	B137	CMD67
A055	GND	B055	CMD39	A138	CMD83	B138	VCC3
A056	GND	B056	VCC3	A139	CMD84	B139	CMD68
A057	GND	B057	VCC3	A140	GND	B140	CMD71
A058	CMD55	B058	VCC3	A141	CMD87	B141	VCC3
A059	CMD37	B059	CMD43	A142	CMD70	B142	CMD86
A060	GND	B060	CMD57	A143	GND	B143	CMD69

Table A-24 (continued) Memory Module Interface

Pin**	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A061	CMD56	B061	VCC3	A144	CMD73	B144	VCC3
A062	CMD62	B062	CMD63	A145	CMD89	B145	CMD72
A063	GND	B063	CMD61	A146	GND	B146	CMD88
A064	CMD44	B064	VCC3	A147	CMD76	B147	VCC3
A065	CMD60	B065	CMD41	A148	CMD92	B148	CMD75
A066	GND	B066	MECC6	A149	GND	B149	CMD91
A067	CMD47	B067	VCC3	A150	CMD74	B150	VCC3
A068	CMD48	B068	CMD59	A151	CMD90	B151	CMD78
A069	GND	B069	CMD45	A152	GND	B152	CMD77
A070	CMD46	B070	VCC3	A153	CMD94	B153	VCC3
A071	MECC7	B071	MECC4	A154	CMD93	B154	CMD79
A072	GND	B072	MECC5	A155	GND	B155	CMD95
A073	GND	B073	VCC3	A156	GND	B156	VCC3
A074	MADPCLK_FB_DLY	B074	VCC3	A157	GND	B157	VCC3
A075	GND	B075	BCLK_MADP_OUT	A158	GND	B158	VCC3
A076	MAA0	B076	VCC3	A159	GND	B159	VCC3
A077	MAA1	B077	VCC3	A160	GND	B160	VCC3
A078	GND	B078	SDRDCLK_HE_DLY	A161	GND	B161	VCC3
A079	MAA2	B079	VCC3	A162	GND	B162	RESERVED162
A080	MAA3	B080	MAA4	A163	GND	B163	VCC
A081	GND	B081	MAA5	A164	GND	B164	VCC

Table A-24 (continued) Memory Module Interface

Pin**	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A082	MAA6	B082	VCC3	A165	PIN_A165	B165	VCC
A083	MAA7	B083	MAA8	A166	NC	B166	NC

*Signal active low.

**Pins are numbered with respect to the module edge connector. Axx signals appear on the front (processor side) of the processor card.

Processor Module Connector (J7A1, J7B1, J7C1, J7D1)

Table A-25 describes the cable pinout assignments for the processor card connector.

Table A-25 Processor Card Connector (J7A1, J7B1, J7C1, J7D1)

Pin**	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A001	RESERVED (nc)	B001	PWR_EN1	A084	GND	B084	RESERVED (nc)
A002	VCC_TAP	B002	VCCP	A085	D11*	B085	VCCP
A003	RESERVED (nc)	B003	OCVR_OK*	A086	D10*	B086	D17*
A004	GND	B004	TEST_VSS_B4	A087	GND	B087	D15*
A005	VTT	B005	VCCP	A088	D14*	B088	VCCP
A006	VTT	B006	VTT	A089	D9*	B089	D12*
A007	SELFSB1	B007	VTT	A090	GND	B090	D7*
A008	RESERVED_A8	B008	VCCP	A091	D8*	B091	VCCP
A009	RESERVED_A9	B009	RESERVED (nc)	A092	D5*	B092	D6*
A010	GND	B010	FLUSH*	A093	GND	B093	D4*
A011	TEST_GND (pd)	B011	VCCP	A094	D3*	B094	VCCP
A012	IERR*	B012	SMI*	A095	D1*	B095	D2*
A013	GND	B013	INIT*	A096	GND	B096	D0*

Table A-25 (continued) Processor Card Connector (J7A1, J7B1, J7C1, J7D1)

Pin**	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A014	A20M*	B014	VCCP	A097	BCLK	B097	VCCP
A015	FERR*	B015	STPCLK*	A098	TEST_VSS (pd)	B098	RESET*
A016	GND	B016	TCK	A099	GND	B099	FRCERR
A017	IGNNE*	B017	VCCP	A100	BERR*	B100	VCCP
A018	TDI	B018	SLP*	A101	A33*	B101	A35*
A019	GND	B019	TMS	A102	GND	B102	A32*
A020	TDO	B020	VCCP	A103	A34*	B103	VCCP
A021	PWRGOOD	B021	TRST*	A104	A30*	B104	A29*
A022	GND	B022	RESERVED (nc)	A105	GND	B105	A26*
A023	TEST_25 (pu)***	B023	VCCP	A106	A31*	B106	VCCL2
A024	THERMTRIP*	B024	RESERVED (nc)	A107	A27*	B107	A24*
A025	GND	B025	RESERVED (nc)	A108	GND	B108	A28*
A026	OCRV_EN	B026	VCCP	A109	A22*	B109	VCCL2
A027	INTR	B027	TEST_VCCP (pu)	A110	A23*	B110	A20*
A028	GND	B028	NMI	A111	GND	B111	A21*
A029	PICD0	B029	VCCP	A112	A19*	B112	VCCL2
A030	PREQ*	B030	PICCLK	A113	A18*	B113	A25*
A031	GND	B031	PICD1	A114	GND	B114	A15*
A032	BP3*	B032	VCCP	A115	A16*	B115	VCC_L2
A033	BMP0*	B033	BP2*	A116	A13*	B116	A17*
A034	GND	B034	RESERVED (nc)	A117	GND	B117	A11*
A035	BINIT*	B035	VCCP	A118	A14*	B118	VCC_L2
A036	DEP0*	B036	PRDY*	A119	GND	B119	A12*

Table A-25 (continued) Processor Card Connector (J7A1, J7B1, J7C1, J7D1)

Pin**	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A037	VSS	B037	BPM1*	A120	A10*	B120	VCCL2
A038	DEP1*	B038	VCCP	A121	A5*	B121	A8*
A039	DEP3*	B039	DEP2*	A122	GND	B122	A7*
A040	GND	B040	DEP4*	A123	A9*	B123	VCCL2
A041	DEP5*	B041	VCCP	A124	A4*	B124	A3*
A042	DEP6*	B042	DEP7*	A125	GND	B125	A6*
A043	GND	B043	D62*	A126	RESERVED (nc)	B126	VCCL2
A044	D61*	B044	VCCP	A127	BNR*	B127	AERR*
A045	D55*	B045	D58*	A128	GND	B128	REQ0*
A046	GND	B046	D63*	A129	BPRI*	B129	VCCL2
A047	D60*	B047	VCCP	A130	TRDY*	B130	REQ1*
A048	D53*	B048	D56*	A131	GND	B131	REQ4*
A049	GND	B049	D50*	A132	DEFER*	B132	VCCL2
A050	D57*	B050	VCCP	A133	REQ2*	B133	LOCK*
A051	D46*	B051	D54*	A134	GND	B134	DRDY*
A052	GND	B052	D59*	A135	REQ3*	B135	VCCL2
A053	D49*	B053	VCCP	A136	HITM*	B136	RS0*
A054	D51*	B054	D48*	A137	GND	B137	HIT*
A055	GND	B055	D52*	A138	DBSY*	B138	VCCL2
A056	CPU_SENSE	B056	VCCP	A139	RS1*	B139	RS2*
A057	GND	B057	L2_SENSE	A140	GND	B140	RP*
A058	D42*	B058	VCCP	A141	BR2*	B141	VCCL2
A059	D45*	B059	D41*	A142	BR0*	B142	BR3*

Table A-25 (continued) Processor Card Connector (J7A1, J7B1, J7C1, J7D1)

Pin**	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A060	GND	B060	D47*	A143	GND	B143	BR1*
A061	D39*	B061	VCCP	A144	ADS*	B144	VCCL2
A062	TEST_25 (pu)***	B062	D44*	A145	AP0*	B145	RSP*
A063	GND	B063	D36*	A146	GND	B146	AP1*
A064	D43*	B064	VCCP	A147	VID2_CORE	B147	VCCL2
A065	D37*	B065	D40*	A148	VID1_CORE	B148	RESERVED (nc)
A066	GND	B066	D34*	A149	GND	B149	VID3_CORE
A067	D33*	B067	VCCP	A150	VID4_CORE	B150	VCCL2
A068	D35*	B068	D38*	A151	RESERVED (nc)	B151	VID0_CORE
A069	GND	B069	D32*	A152	GND	B152	VID0_L2
A070	D31*	B070	VCCP	A153	VID2_L2	B153	VCCL2
A071	D30*	B071	D28*	A154	VID1_L2	B154	VID4_L2
A072	GND	B072	D29*	A155	GND	B155	VID3_L2
A073	D27*	B073	VCCP	A156	VTT	B156	VCCL2
A074	D24*	B074	D26*	A157	VTT	B157	VTT
A075	GND	B075	D25*	A158	GND	B158	VTT
A076	D23*	B076	VCCP	A159	SA2	B159	VCCL2
A077	D21*	B077	D22*	A160	VCC3.3	B160	SCLK
A078	GND	B078	D19*	A161	GND	B161	SDAT
A079	D16*	B079	VCCP	A162	SA1	B162	VCCL2
A080	D13*	B080	D18*	A163	SA0	B163	RESERVED (nc)
A081	GND	B081	D20*	A164	GND	B164	RESERVED (nc)

Table A-25 (continued) Processor Card Connector (J7A1, J7B1, J7C1, J7D1)

Pin**	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A082	TEST_VTT (pu)	B082	VCCP	A165	PWR_EN0	B165	RESERVED (nc)
A083	RESERVED (nc)	B083	RESERVED (nc)				

* Signal is active low.

** Pins are numbered with respect to the module edge connector. Axx signals appear on the front (processor side) of the processor card.

***Signals that have no connection except for a pull-up resistor to 2.5 V are labeled with the signal mnemonic followed by "(pu)."

Processor Termination, Regulation, and Power

The termination circuitry required by the Intel Pentium III Xeon processor bus (AGTL+) signaling environment and the circuitry to set the AGTL+ reference voltage are implemented directly on the processor cards. The baseboard provides 1.5 V AGTL+ termination power (VTT), and VRM 8.3-compliant DC-to-DC converters to provide processor power (VCCP) at each connector.

The baseboard provides four embedded VRMs and three VRM sockets to power the processors, which derive power from the 5 V and 12 V supplies. Each processor has a separate VRM to power its core; however, two processors share a VRM to power their cache.

Table A-26 shows the cable pinout assignments for the three VRM connectors.

Table A-26 Processor VRM Connectors (J2A2, J2B1, J2C1)

Pin	Signal	Type*
A1	P5VIN1	POWER
A2	P5VIN2	POWER
A3	P5VIN3	POWER
A4	P12VIN1	POWER

Table A-26 (continued) Processor VRM Connectors (J2A2, J2B1, J2C1)

Pin	Signal	Type*
A5	P12VIN3	POWER
A6	P1SHARE	
A7	VID0	OUT
A8	VID2	OUT
A9	VID4	OUT
A10	VCCP1	POWER
A11	VSS1	POWER
A12	VCCP2	POWER
A13	VSS2	POWER
A14	VCCP3	POWER
A15	VSS3	POWER
A16	VCCP4	POWER
A17	VSS4	POWER
A18	VCCP5	POWER
A19	VSS5	POWER
A20	VCCP6	POWER
B1	P5VIN4	POWER
B2	P5VIN5	POWER
B3	P5VIN6	POWER
B4	P12VIN2	POWER
B5	RES	
B6	OUTEN	OUT
B7	VID1	OUT
B8	VID3	OUT

Table A-26 (continued) Processor VRM Connectors (J2A2, J2B1, J2C1)

Pin	Signal	Type*
B9	PWRGOOD	
B10	VSS6	POWER
B11	VCCP7	POWER
B12	VSS7	POWER
B13	VCCP8	POWER
B14	VSS8	POWER
B15	VCCP9	POWER
B16	VSS9	POWER
B17	VCCP10	POWER
B18	VSS10	POWER
B19	VCCP11	POWER
B20	VSS11	POWER

*Type (in/out) is from the perspective of the baseboard.

Termination Card

You must install a termination card in any vacant processor card slot to ensure reliable system operation.

The termination card contains AGTL+ termination circuitry, clock signal termination, and test access port (TAP) bypassing for the vacant connector. The system does not boot unless all slots are occupied with a processor or termination card.

Server Monitor Module Connector (J7H1)

The baseboard supports the server monitor module (SMM) feature connector. Table A-27 shows the pinout of the 26-pin baseboard connector.

On the baseboard, pins 1, 9, 15, and 17 are connected to SMI_L, NMI, SECURE_MODE, and CHASSIS_INTRUSION. Some server systems do not monitor these signals.

Note: The type of connector (in, out, in/out, power, ground) indicated in Table A-27 is described from the perspective of the baseboard.

Table A-27 Server Monitor Module Connector Pinout

Pin	Signal	Type	Description-Implementation
1	SMI_L	Out	System management interrupt: not supported on SMM
2	I2C_SCL	In	I2C clock line
3	CONP_L	Out	Connector present: tied to ground on the baseboard
4	Reserved		Reserved pin: NC on baseboard
5	PWR_CNTL_L	In	Power supply on/off control: allows SMM to control system power
6	I2C_SDA	In/Out	I2C serial data line
7	5VSTNDBY	Out	+5 V standby: monitored by SMM to determine if AC power is applied
8	Reserved		Pulled up to 5 V through 10k on baseboard
9	NMI	Out	Non-maskable interrupt: not supported on SMM
10	HOST_AUX	Out	Baseboard voltage monitored by SMM card: connected to 3.3 V
11	RESET_L	In	Baseboard reset signal from SMM
12	GROUND	Ground	Ground
13	GROUND	Ground	Ground
14	Key		No connect on baseboard
15	SECURE_MODE	Out	Secure mode indication: not supported on SMM
16	GROUND	Ground	Ground
17	CHASSIS_INTRUSION	Out	Chassis intrusion indication: not supported on SMM

Table A-27 (continued) Server Monitor Module Connector Pinout

Pin	Signal	Type	Description-Implementation
18	Reserved		Reserved pin: NC on baseboard
19	Reserved		Reserved pin: NC on baseboard
20	GROUND	Ground	Ground
21	Reserved		Reserved pin: NC on baseboard
22	Reserved		Reserved pin: NC on baseboard
23	Reserved		Reserved pin: NC on baseboard
24	Reserved		Reserved pin: NC on baseboard
25	Key		No connect on baseboard
26	Reserved		Reserved pin: NC on baseboard

SM Bus Connector (J9E4)

This connector allows connection to the Memory Module I2C bus on which the DIMMs EEPROMs reside. A shorted I2C connection at the SM Bus I2C connector will prevent the system BIOS from sizing and configuring main memory. Table A-28 shows the cable pinout assignments for the SM bus connector.

Table A-28 SM Bus Connector (J9E4)

Pin	Signal	Description
1	Local I2C SDA	OSB4 SM bus data line
2	GROUND	
3	Local I2C SCL	OSB4 SM bus data line

ICMB Connector (J1D2)

The external Intelligent Chassis Management Bus (ICMB) provides external access to ICMB devices that are within the chassis. For example, you can externally access chassis management functions, alert logs, and post-mortem data. The ICMB connector also

provides a mechanism for chassis power control. As an option, you can configure a server with an ICMB adapter board to provide two SEMCONN 6-pin connectors for daisy-chained cabling. Table A-29 shows the cable pinout assignments for the ICMB connector.

Table A-29 ICMB Connector (J1D2)

Pin	Signal	Type	Description
1	SDA	signal	IPMB I2C Data
2	Ground	power	
3	SCL	signal	IPMB I2C Clock
4	5 V standby	power	

Auxiliary I²C Connector (J9E4)

The baseboard provides a 3-pin auxiliary I²C connector for OEM access to the IPMB. This connector is not isolated when power is off. Any devices connected must remain powered in this state or the BMC will not work properly.

A shorted I²C connection at the auxiliary I²C connector will prevent restoration of main power because the BMC needs the bus to boot the server from standby power. Table A-30 shows the cable pinout assignments for the IMB connector.

Table A-30 IMB Connector (J8F1)

Pin	Signal	Description
1	Local I²C SDA	BMC IMB 5VSTNDBY clock line
2	GROUND	
3	Local I²C SCL	BMC IMB 5VSTNDBY data line

Baseboard Fan Connectors (J3C1, J3A1, J4A1, J4C1)

There are four fan connectors located on the baseboard. Use these connectors are for additional processor cooling.

The baseboard only supports monitoring a total of eight tachometer fan inputs. The front panel connector provides connections to all eight tachometer fan inputs. The tachometer signals from these four processor fan connectors are connected to the same tachometer fan signals FAN_TACH(4), FAN_TACH(5), FAN_TACH(6), and FAN_TACH(7) provided on the front panel connector J9E3. Therefore, make sure that only one connection is used at any given time.

Note: The type of connector (in, out, in/out, power, ground) indicated in the following tables is described from the perspective of the baseboard.

Table A-31 describes the processor fan connector #1 (J3C1).

Table A-31 Processor Fan Connector #1 (J3C1)

Pin	Signal	Type	Description
1	Ground	power	GROUND is the power supply ground
2	12V	power	Power supply 12 V
3	Fan Tach	Out	FAN_TACH signal is connected to the BMC to monitor the FAN speed

Table A-32 describes the processor fan connector #2 (J3A1).

Table A-32 Processor Fan Connector #2 (J3A1)

Pin	Signal	Type	Description
1	Ground	power	GROUND is the power supply ground
2	12V	power	Power supply 12 V
3	Fan Tach	Out	FAN_TACH signal is connected to the BMC to monitor the FAN speed

Table A-33 describe the processor fan connector #3 (J4A1).

Table A-33 Processor Fan Connector #3 (J4A1)

Pin	Signal	Type	Description
1	Ground	Power	GROUND is the power supply ground
2	12V	Power	Power supply 12 V
3	Fan Tach	Out	FAN_TACH signal is connected to the BMC to monitor the FAN speed

Table A-34 describe the processor fan connector #4 (J4C1).

Table A-34 Processor Fan Connector #4 (J4C1)

Pin	Signal	Type	Description
1	Ground	Power	GROUND is the power supply ground
2	12V	Power	Power supply 12 V
3	Fan Tach	Out	FAN_TACH signal is connected to the BMC to monitor the FAN speed

Internal Disk Drive LED Connection

Table A-35 shows the cable pinout assignment for the internal disk drive LED connector.

Table A-35 Internal Disk Drive LED Connector

Pin	Signal	Description
1	NC	No connect
2	Activity signal	5 V, high true activity signal
3	Activity signal	Same as pin 2 (Shorted to pin 2)
4	NC	No connect

Baseboard Jumpers

One 15-pin, one 11-pin, and one 3-pin single inline header provide a total of eight 3-pin jumper blocks that control various configuration options. The jumper locations are shown in Figure A-2. The shaded areas show default jumper placement for each configurable option.

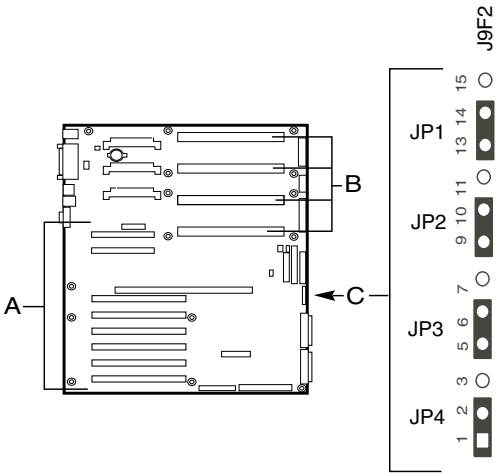

Figure A-2 Baseboard Configuration Jumpers

A. PCI Add-in slots

B. Processors

C. Configuration jumpers

Table A-36 identifies jumpers JP1, JP2, JP3, and JP4.

Table A-36 Configuration Jumper Settings

Callout	Name	State	Location
JP1	BMC boot block write Enable	Disable	13 - 14
		Enable	14 - 15
JP2	BIOS recovery boot	Disable	9 - 10
		Enable	10 - 11
JP3	Password clear	Protect	5 - 6
		Erase	6 - 7
JP4	CMOS clear	BMC control	1 - 2
		Force erase	2 - 3

Table A-37 describes the jumper settings for jumpers JP2, JP3, and JP4.

Table A-37 Configuration of Jumpers

Option	Description
CMOS	If pins 1 and 2 of J9F2 are jumpered (default), NVRAM contents are preserved through system reset unless the user clears them through the front panel (by pressing the power and reset buttons at the same time for four seconds). If pins 2 and 3 of J9F2 are jumpered, NVRAM contents are set to manufacturing default during system reset. If the jumper is removed, NVRAM contents are preserved through system reset.
Password	If pins 5 and 6 of J9F2 are jumpered (default), the current system password is maintained during system reset. If pins 6 and 7 are jumpered, the password is cleared on reset.
BIOS recovery	If pins 9 and 10 of J9F2 are jumpered (default), BIOS jumps to a protected area of the flash part containing the "Recovery BIOS." If the normal BIOS gets corrupted, and you are unable to reload a fresh copy from the floppy disk, install the jumper between pins 10 and 11 of J9F2, which enables the system to boot from the Recovery BIOS. This code expects a fresh copy of the normal BIOS to be located on a floppy disk in the floppy drive.

Changing Jumper Settings

Follow the instructions in this section to change the settings for the CMOS clear jumper (JP4), the password clear jumper (JP3), and the recovery boot jumper (JP2).

Observe the following safety and ESD precautions before changing jumper settings:

Caution: ESD can damage disk drives, boards, and other parts. We recommend that you do all procedures in this chapter only at an ESD-protected workstation. If one is not available, provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground—any unpainted metal surface—on your system when handling parts.

Caution: Always handle boards carefully. They can be extremely sensitive to ESD. Hold boards only by their edges. After removing a board from its protective wrapper or from the system, place it component-side upon a grounded, static-free surface. If you place the baseboard on a conductive surface, the battery leads may short out. If they do, this will result in a loss of CMOS data and will drain the battery. Use a conductive foam pad if available but not the board wrapper. Do not slide the board over any surface.

Caution: A jumper is a small, plastic-encased conductor that slips over two jumper pins. Newer jumpers have a small tab on top that you can grip with your fingertips or with a pair of fine, needle-nosed pliers. If your jumpers do not have such a tab, take care when using needle-nosed pliers to remove or install a jumper; grip the narrow sides of the jumper with the pliers. Never grip the wide sides because this can damage the contacts inside the jumper, causing intermittent problems with the function controlled by that jumper. Take care to gently grip, but not squeeze, with the pliers or other tool you use to remove a jumper; you might bend or break the stake pins on the board.

CMOS Clear Jumper

The jumper at pins 1, 2, and 3 controls whether settings stored in CMOS nonvolatile memory (NVRAM) are retained during a system reset. The jumper is used to restore the system's CMOS and RTC to default values, as follows:

There are two methods to restore the default values.

Method 1

1. Hold down the system's reset button down for five seconds.
2. While continuing to hold down the system's reset button, press the power button.
3. Release both the reset and power buttons at the same time.

Method 2

1. Observe the safety and ESD precautions at the beginning of this section.
2. Turn off all connected peripherals, turn off system power, and disconnect all AC power cords.
3. If the baseboard is installed in a system, remove access covers so that you have access to the baseboard.
4. Remove the memory module. See “Removing the Memory Module” on page 55.
5. Locate the configuration jumpers at the edge of the baseboard next to the memory expansion card connector (MECC). See Figure A-2 on page 131 for the location of the configuration jumpers.
6. Move the CMOS jumper from pins 1 and 2 to pins 2 and 3 (the `Clear CMOS memory` position).
7. If the baseboard is installed in a system, reinstall the access covers, connect the power cords, and turn on the system for the change to take effect.
8. You may need to repeat these steps to move the jumper back to its original setting, depending on the jumper function.
9. Wait for POST to complete and for the messages `NVRAM cleared by jumper` and `Press F1 to resume, Press F2 to Setup` to be displayed. This automatically reprograms CMOS and RTC to their default settings, except for the password.
10. Enter Setup and make any changes necessary (for example, changing the boot device). Press **`F10`** to save the new Setup configuration and exit Setup.
11. Turn off the system, and disconnect all AC power cords from the system.
12. Move the jumper from pins 2 and 3 back to pins 1 and 2 (the Protect CMOS memory position).

13. If the baseboard is installed in a system, reinstall the access covers, connect the power cords, and turn on the system for the change to take effect.
14. Run BIOS Setup or the SSU to verify the correct settings. See Chapter 3 in the *SGI 1450 Server User's Guide*.

Password Clear Jumper

The jumper at pins 5, 6, and 7 controls whether a stored password is retained or cleared during a system reset.

Follow these steps to clear the current password and then enter a new one:

1. Observe the safety and ESD precautions at the beginning of this section.
2. Turn off all connected peripherals, turn off system power, and disconnect all AC power cords.
3. If the baseboard is installed in a system, remove access covers so that you have access to the baseboard.
4. Remove the memory module. See "Removing the Memory Module" on page 55.
5. Locate the configuration jumpers at the edge of the baseboard next to the memory expansion card connector (MECC). See Figure A-2 on page 131 for the location of the configuration jumpers.
6. Move the password jumper from pins 5 and 6 to pins 6 and 7.
7. If the baseboard is installed in a system, reinstall the access covers, connect the power cords, and turn on the system for the change to take effect.
8. Wait for POST to complete and for the message `Press F1 to resume, Press F2 to Setup` to be displayed.
9. Turn off the system, and disconnect all AC power cords from the system.
10. Move the jumper from pins 6 and 7 back to pins 5 and 6.
11. If the baseboard is installed in a system, reinstall the access covers, connect the power cords, and turn on the system for the change to take effect.
12. Run BIOS Setup or the SSU to specify a new password. See Chapter 3 in the *SGI 1450 Server User's Guide*.

Recovery Boot Jumper

The jumper at pins 9, 10, and 11 controls whether the system attempts to boot using the BIOS programmed in flash memory.

Follow these steps to disable recovery booting:

1. Observe the safety and ESD precautions at the beginning of this section.
2. Turn off all connected peripherals, turn off system power, and disconnect all AC power cords.
3. If the baseboard is installed in a system, remove access covers so that you have access to the baseboard.
4. Remove the memory module. See "Removing the Memory Module" on page 55.
5. Locate the configuration jumpers at the edge of the baseboard next to the memory expansion card connector (MECC). See Figure A-2 on page 131 for the location of the configuration jumpers.
6. Move the recovery boot jumper from pins 9 and 10 to pins 10 and 11.
7. If the baseboard is installed in a system, reinstall the access covers, connect the power cords, and turn on the system for the change to take effect.
8. Turn on the system, and insert the Flash Memory Update Utility diskette in drive A. After the system boots, the recovery process starts. This takes about three minutes. When the recovery process completes, the speaker emits two beeps.

While in the recovery mode, there is no screen display on the monitor. The keyboard is disabled as the system automatically recovers the BIOS. Table A-38 lists the beep code messages.

Table A-38 Beep Codes

Beep Code	Message
2	Successful completion, no errors.
4	The system could not boot from the diskette. The diskette may not be bootable.
Continuous series of low beeps	The wrong BIOS recovery files are being used and/or the flash memory jumper is in the wrong position.

9. Wait for POST to complete and for the message `Press F1 to resume, Press F2 to Setup` to be displayed.
10. Turn off the system, and disconnect all AC power cords from the system.
11. Move the jumper from pins 6 and 7 back to pins 5 and 6.
12. If the baseboard is installed in a system, reinstall the access covers, connect the power cords, and turn on the system for the change to take effect.
13. After running the special recovery mode, run the SSU to specify a new password. See Chapter 3 in the *SGI 1450 Server User's Guide*.

Interrupts

Table A-39 recommends the logical interrupt mapping of interrupt sources; it reflects a typical configuration, but a user can change these interrupts. Use the information to determine how to program each interrupt. The actual interrupt map is defined using configuration registers in the OSB4 I/O controller. I/O redirection registers in the I/O APIC are provided for each interrupt signal; the signals define hardware interrupt signal characteristics for APIC messages sent to local epics.

Note: If you plan to disable the IDE controller to reuse the interrupt for that controller, you must physically unplug the IDE cable from the board connector (IDE0) if a cable is present. Simply disabling the drive by configuring the SSU option does not make the interrupt available.

Table A-39 Interrupt Definitions

ISA Interrupt	Description
INTR	Processor interrupt
NMI	NMI to processor
IRQ1	Keyboard interrupt
IRQ3	Serial port A or B interrupt from SIO device, user-configurable
IRQ4	Serial port A or B interrupt from SIO device, user-configurable
IRQ5	Parallel port

Table A-39 (continued) Interrupt Definitions

ISA Interrupt	Description
IRQ6	Floppy disk
IRQ7	Parallel port
IRQ8_L	Active low RTC interrupt
IRQ9	
IRQ10	
IRQ11	
IRQ12	Mouse interrupt
IRQ14	Compatibility IDE interrupt from primary channel IDE devices 0 and 1
IRQ15	Reserved
SMI	System Management Interrupt. General purpose indicator is sourced by the OSB4 and BMC to the processors
SCI	

Video Modes

The RAGE IIC chip supports all standard IBM® VGA modes. Table A-40 shows all the modes that this implementation supports, including the number of colors, resolution, and refresh rates.

Table A-40 Standard VGA Modes

Resolution	Refresh Rate (Hz)	Colors
640x480	200	256
800x600	200	256
1024x768	150	256
1152x864	120	256
1280x1024	100	256

Table A-40 (continued) Standard VGA Modes

Resolution	Refresh Rate (Hz)	Colors
1600x1200	76	256
640x480	200	65K
800x600	200	65K
1024x768	150	65K
1152x864	120	65K
1280x1024	100	65K
1600x1200	76	65K
640x480	200	16.7M
800x600	160	16.7M

Physical Environment Specifications

Table B-1 details the environmental specifications for the SGI 1450 server.

Table B-1 Environmental Specifications

Temperature:	
Non-operating	-40° to 70 °C (-104° to 158 °F)
Operating	5° to 35 °C (41° to 95 °F)
Altitude	5,000 ft. max
Humidity	95% relative humidity (non condensing) at 25 °C (77 °F) to 30 °C (86 °F)
Shock:	
Operating	2.0 g, 11 msec, 1/2 sine, 100 pulses in each direction
Packaged	Trapezoidal, 30 g, 170 inches/sec. delta V, 3 drops in each direction on each of the three axes
Acoustic noise	< 55 dBA with three power supplies at 28 °C +/- 2 °C
Electrostatic discharge (ESD)	Tested to 15 kilovolts (kV) air discharge and up to 8 kV contact discharge
System AC input power:	
100-120 V~	6 A, 50/60 Hz
200-240 V~	4 A, 50/60 Hz

Index

A

AC power, LED state status, 14
add-in board
  installing 32-bit, 33 MHz half-length PCI board, 66
  installing 64-bit, 66/33 MHz hot-plug PCI board, 69
  removing 32-bit, 33 MHz half-length PCI board, 65
  removing 64-bit, 66/33 MHz hot-plug PCI board, 67
address
  base memory, 54
  extended memory, 54

B

base memory, 54

D

DC power cables, 14
DIMM (memory)
  bank population, 54
  installing, 56
  removing, 56

E

extended memory, 54

F

fan LED state status, 16

H

hard drive backplane
  boardset, 11
  requirements, 10
hard drive, LED state status, 11

I

ICMB card
  description, 70
  installing, 71
  removing, 73
ICMB connectors, 94
installing
  32-bit, 33 MHz half-length PCI board, 66
  64-bit, 66/33 MHz hot-plug PCI board, 69
  baseboard, 31
  DIMMs, 56
  drive in media bay, 46
  fan board assembly, 40
  fans, 42
  front cover, 24
  hard drive bay, 44
  ICMB card, 71
  memory module, 55

memory retention bar, 27
power subsystem bay, 37
power supply module, 35
processor, 59
processor handles, 60
processor heatsink, 60
processor retention mechanism, 60
top cover, 25
VRMs, 62
interrupt, mapping, 137

J

jumpers
changing settings, 133
configuration, 132
location on baseboard, 131

L

LED state status
AC power, 14
fans, 16
hard drive, 11

M

memory
addresses, 53
bank population, 54
base, 54
capacity, 54
extended, 54
installing DIMMs, 56
installing memory module, 55
minimum configuration, 53
removing DIMMs, 56
removing memory module, 55

P

peripheral adapter boards, 100
processor
installing, 59
installing handles, 60
installing heatsink, 60
installing retention mechanism, 60
removing, 59
removing retention mechanism, 59
termination card, 125

R

removing
32-bit, 33 MHz half-length PCI board, 65
64-bit, 66/33 MHz hot-plug PCI board, 67
baseboard, 28
DIMMs, 56
drive from media bay, 45
fan board assembly, 39
fans, 42
front cover, 23
hard drive bay, 43
ICMB card, 73
memory module, 55
memory retention bar, 26
power subsystem bay, 36
power supply module, 35
processor, 59
processor retention mechanism, 59
top cover, 25
VRMs, 62
replacing
drive in device bay, 46
fan board, 40
resetting, commands, 75

S

SCSI
  controllers, 17
  optional external connector, 97

T

Technical Publications Library, obtaining SGI
    documentation, xv

V

voltage regulator modules
  installing, 62
  removing, 62
  VRM/processor population sequencing, 61