DIGITAL Server 9100 Series

Service Guide

Part Number: ER-M2XWW-SG. A01

Digital Equipment Corporation

February 1998

Addendum

Introduction

The DIGITAL Server 9100 system is an external procurement from NCR Corporation. This server is based on NCR's Worldmark 4380 server. NCR uses the *Octascale* architecture to integrate two standard 4-way SMP Pentium-Pro Intel-based board designs into an 8-way SMP server design through the memory subsystem.

This addendum to the NCR WorldMark 4300 Service Guide is intended to assist service personnel by providing the following information:

- System features list
- Related material
- Latest product information and updates
- Recommended spares list
- Special notices

NOTE: The NCR Service Guide includes the WorldMark 4300 Server product. This product is not offered by DIGITAL. The WorldMark 4300 Server is referred to as "Release 1 (R1)" in the WorldMark 4300 Service Guide. The WorldMark 4380 Server (DIGITAL Server 9100) is referred to as "Release 2 (R2)".

System Features Summary

The following table summarizes the features of the DIGITAL Server 9100 system.

Feature	Description
Modular board set	System is intended for use with a modular board set based on Pentium Pro technology; it supports up to eight processors and up to 8 GB of memory.
Add-in board support	Rail and back panel slots support up to 18 add-in boards.
3.5-inch diskette drive	A 3.5-inch diskette drive is externally accessible.
12 locations for 3.5-inch SCSI-2 hard drives	Two backplanes each hold six 3.5-inch hot-swappable SCSI-2 hard drives (for a total of 12 SCSI drives). The drive bays are secure behind a lockable metal EMI door. You can swap drives in or out of the system with power on. The array of drives allows easy setup of RAID applications.
Hot-swappable backplane	A hot-swappable backplane is part of each 3.5-inch drive bay assembly for SCSI drives. The backplane is designed for wide and fast SCSI-2 devices that use the industry standard 80-pin Single Connector Attachment (SCA). Each backplane consists of two rows of three drive connectors. A system may contain one or two of these backplanes (supporting 6 or 12 drives).
Four locations for removable media drives	Four externally accessible 5.25-inch half-height bays are available for diskette, CD-ROM, and/or tape drives.
Power supply	From one to three hot-swappable 625-watt auto-ranging power supplies are easily removed and installed. The server configuration requires a minimum of two power supplies.
Cooling fans	Each power supply has an integral cooling fan. In addition, there are eight fans within the cabinet to provide cooling for boards and drives.
Security	Mechanical: Two metal padlock loops (at the back of each side panel). Two intrusion sensors (one on each side panel). A padlock loop and an intrusion sensor (at the metal EMI door). BIOS: Security menu offers a range of security options (for example, setting administrative and user passwords, Password on Boot, Video Blanking, Secure Mode Timer). SCU: Security Subsystems Group options available include, for example, Lockout Timer, Secure Boot Mode, Floppy Write Protect, Reset/Power Switch Locking).
Software-related utilities, setup	Diagnostic Partition, BIOS Setup Utility, System Configuration Utility (SCU), SCSISelect ™ Utility.
System management	Inter-Integrated Circuit interface (I2C) for diagnostic and intra-chassis communication.

Server Configurations

The following rules apply when **Product Family Names** and **Product Model Names** are assigned to DIGITAL Server products. These rules apply to all products developed in the NT Server Business Unit (NTSBU).

Server Naming Guidelines

- All products in a family carry the same name on the nameplate. (i.e. all products in the Entry space will carry the name DIGITAL SERVER 1000)

Family Name	**Segment**
DIGITAL SERVER 500	SUB ENTRY
DIGITAL SERVER 1000	ENTRY
DIGITAL SERVER 3000	DEPARTMENT
DIGITAL SERVER 5000	APPLICATION
DIGITAL SERVER 7000	ENTERPRISE
DIGITAL SERVER 9000	SUPER ENTERPRISE

- Products in a rackmount chassis will have an R after the Family Name (DIGITAL Server 9000R).
- Product models within a family will be differentiated by the Product Model Name. The Product Model Name will appear on a label on the rear of the product. Specific configurations within a model will carry the same Product Model Name and will be differentiated by the part number.

Product Model Numbering Convention

The following example describes the product model numbering convention:

DIGITAL SERVER 1234 5678A R

1 = PRODUCT FAMILY NAME (first character of family number)

2 = MAJOR PROCESSOR TECHNOLOGY DIFFERENTIATOR WITHIN THE FAMILY

This number will be assigned to each new platform based on the following matrix. Open numbers will be assigned as new processor technology is introduced. THIS FIELD IS NOT USED FOR SUB ENTRY PRODUCTS.

100 = Pentium Pro

200 = Pentium II – Slot 1

300 = EV5

400 = Pentium II – Slot 2

500 = EV6

600 = OPEN

700 = OPEN

800 = OPEN

900 = OPEN

3,4 = USED TO DIFFERENTIATE MODELS BASED UPON DIFFERENT PROCESSORS WITHIN A PROCESSOR TECHNOLOGY (I.E. CLOCK SPEED, CACHE SIZE) START AT 00 FOR FIRST MODEL AND INCREMENT BY 05 FOR EACH ADDITIONAL MODEL.

5 = CPU TYPE

BLANK = PENTIUM

1= PENTIUM PRO

2 = PENTIUM II/SLOT 1

3 = PENTIUM II/SLOT 2

4 = Open/Available for future processors

5 = Open/Available for future processors

6 = ALPHA EV56

7 = ALPHA PCA57

8 = ALPHA EV6

9 = ALPHA EV67

6, 7, 8, 9 = CPU CLOCK SPEED IN MHz

A = CPU VENDOR

INTEL = BLANK

ALPHA = A

AMD = K

R = CHASSIS TYPE

BLANK = STANDARD CHASSIS

R = RACKMOUNT CHASSIS

Related Material

The following related material is available:

Document or Software Title	Order Number	Description	NCR Manual (modified)
DIGITAL Server 9100 Documentation Kit	QC-06WAA-H8	Includes the DIGITAL Server 9100 documentation: Installation Guide, Site Preparation Guide, User's Guide, System Software Guide, and Warranty booklet.	N/A
Installation Guide	ER-M2XWW-IA (English only) ER-M2XWW-IM (Multilingual)	Provides information on connecting hardware cables and booting the server. This guide also explains how to use DIGITAL ServerWORKS Quick Launch to install an operating system, create driver and utility diskettes, and view on-line help and support documentation.	WorldMark 4300 Hardware Installation Guide
Site Preparation Guide	ER-M2XWW-AA (English) ER-M2XWW-AM (Multilingual)	Provides specific information on selecting and preparing the site for the server installation and basic instructions for handling, booting, and using the server. The Site Preparation Guide is available on the Quick Launch CD-ROM.	WorldMark 4300/4380 Site Preparation Guide
User's Guide	ER-M2XWW-UA (English)	Provides information on using the server's configuration utilities, installing peripherals and options, security, and troubleshooting. The User's Guide is available on the Quick Launch CD-ROM.	WorldMark 4380 Product Guide
System Software Guide	ER-M2XWW-GA (English)	Discusses the software utilities that reside on the Diagnostic Partition and on the Platform CD-ROM. The System Software Guide is available on the Quick Launch CD-ROM.	WorldMark Server Software Guide (OctaSCALE)
Platform CD-ROM	AG-RBEEA-BH	Contains utilities that enable you to configure the server, run diagnostics, or install the Diagnostic Partition.	WorldMark 4380 Platform CD-ROM
Warranty and Service Information	ER-PCWAR-CM (Multilanguage)*	Provides warranty information and a listing of phone numbers for technical support.	N/A

* Multilanguage includes: English, French, Italian, German, and Spanish

ADDENDUM

Document or Software Title	Order Number	Description
DIGITAL ServerWORKS software	QB-4WY9A-SA V3.7 (Multilanguage)*	Contains ServerWORKS Quick Launch and ServerWORKS Manager software and documentation. Quick Launch consists of a bootable CD-ROM disk and Getting Started guide. This program steps the user through the initial server setup and operating system installation. ServerWORKS Manager consists of two CD-ROMs and an Overview and Installation Guide and supporting documentation.
Product README and Revision History Information - Quick Launch CD-ROM	Refer to the Quick Launch CDROM in the DIGITAL ServerWORKS software kit	Provides additional product information and product change history.
Option documentation - Quick Launch CD-ROM	Refer to the Quick Launch CDROM in the DIGITAL ServerWORKS software kit	Provides postscript files that can be viewed and printed using Adobe Acrobat Reader software. These files are provided in PDF format on the Quick Launch CD-ROM.
Diagnostic Software - Quick Launch CD-ROM	Refer to the Quick Launch CDROM in the DIGITAL ServerWORKS software kit	Contains an advanced set of diagnostic utilities for identifying and correcting problems on the server. The diagnostic software can be used to verify proper hardware installation and isolate intermittent problems that are not detected by the Power On Self Test (POST).
PC Product Support Information Kit	QA-5RJAA-G8 (English only)	Provides all the latest product documentation for all NTSBU mobile, desktop, and server products.

* Multilanguage includes: English, French, Italian, German, and Spanish

Latest Product Information and Updates

Listed below is the current product information and update source locations.

Server Product Information

Family Name	Model Name	Part Number	Description	NCR Family Name
DIGITAL Server 9000	DIGITAL Server 9100 1200	FR-M2A2W-AX(1)	6200/512 (PP) - KERNAL, 4-way	WorldMark 4380 Deskside Server
DIGITAL Server 9000	DIGITAL Server 9105 1200	FR-M2A2W-BX(2)	6200/512 (PP) - KERNAL, 8-way	WorldMark 4380 Deskside Server
PowerGrade Chip Upgrade	DIGITAL Server 9100 PowerGrade Kit	FR-PCM2U-AA	6200/512 (PP) PowerGrade Chip Upgrade	N/A
PowerGrade Chip Upgrade	DIGITAL Server 9100 PowerGrade Kit	FR-PCM2U-AB	6200/1MB (PP) PowerGrade Chip Upgrade	N/A
System Kernal	DIGITAL Server 9100 4-way to 8-way SMP upgrade	FR-PCM2K-AA	4-way to 8-way SMP upgrade	N/A

(1) A 120 Vac, 15A NEMA 5-15R power cord (FR-PCM2P-AA) is valid for the DIGITAL Server 9100 (FR-M2A2W-AX) **only** and cannot be used on the DIGITAL Server 9105 (FR-M2A2W-BX).

(2) A 200 - 240 Vac, NEMA 6-15R power cord (FR-PCM2P-AB) must be used on the DIGITAL Server 9105 (FR-M2A2W-BX).

Software Updates

Current server utilities and technical support information is available on the Platform CD-ROM and the Quick Launch CD-ROM disc and the Internet.

For product information, use the address:

`http://www.windows.digital.com`

For technical support, use the address:

`http://www.windows.digital.com/support/support.asp`

For access directly to the software library for BIOS and driver updates, use the address:

`http://www.windows.digital.com/~ftp/00-index.stm`

ADDENDUM

Recommended Spares List

DIGITAL P/N	Description	Vendor P/N	Source
30-49534-01	Memory board 4GB MAX	3446-K107 (530-0042380)	NCR
30-50095-01	Primary Baseboard	530-0042739	NCR
30-50095-02	Secondary Baseboard	530-0042741	NCR
30-49525-01	Processor board, Monadic P6 200MHZ/512KB	3446-F901 (530-0043326)	NCR
30-49525-02	Processor board, Monadic P6 200MHZ/1 MB	3446-F029 (530-0043329)	NCR
30-49526-03	Processor board, Dyadic P6 200MHZ/512KB	3446-F902 (530-0043327)	NCR
30-49526-04	Processor board, Dyadic P6 200MHZ/ 1 MB	3446-F030 (530-0043328)	NCR
30-50095-15	Processor board without processors	530-0042803	NCR
30-50095-16	DIMM, 32MB, 60ns	006-3301599	NCR
30-50095-17	DIMM, 128MB, 60ns	006-3301481	NCR
30-50095-18	DIMM, 256MB, 60ns	006-3301351	NCR
30-50095-03	Assembly Terminator	530-0042358	NCR
30-50095-04	Processor Terminator	3446-K511 (530-0041313)	NCR
30-50095-05	Hot Plug HDD Backplane	530-0042933	NCR
30-50095-06	Power Supply Backplane	006-3301722	NCR
30-49527-02	625W Power Supply	3446-K611 (006-3302155)	NCR
30-50095-07	Cable Interlock	006-3301359	NCR
30-50095-08	Cable Baseboard	006-3301364	NCR
30-50095-09	Cable HDD SCSI	006-3301367	NCR
30-50095-10	Cable HDD Backplane	006-3301368	NCR
30-50095-11	Cable Media Power	006-3301369	NCR
30-50095-12	Cable HDD P.S.	006-3301370	NCR
30-50095-13	Cable Fan	006-3301371	NCR

DIGITAL P/N	Description	Vendor P/N	Source or Sub-source
30-50095-14	Drive Carrier	530-0043024	NCR
17-04784-01	Power Cord US 120v	3446-F059 (006-0086975)	NCR
17-04784-02	Power Cord US 208v	3446-F060 (006-3301859)	NCR
17-04784-03	Power Cord Denmark	3446-F055 (006-3301343)	NCR
17-04784-04	Power Cord UK/Ireland	3446-F054 (006-3502710)	NCR
17-04784-05	Power Cord Germany	3446-F051 (006-0086976)	NCR
17-04784-06	Power Cord Israel	3446-F058 (006-3502714)	NCR
17-04784-07	Power Cord Switzerland	3446-F052 (006-3502708)	NCR
17-04784-08	Power Cord Australia	3446-F057 (006-3502713)	NCR
17-04784-09	Power Cord Italy	3446-F053 (006-3502709)	NCR
17-04784-10	Power Cord South Africa	3446-F056 (006-3502712)	NCR
N/A	Nameplate	530-0043321	NCR

Saleable Options List at FRS

Saleable Option	DIGITAL P/N	NCR P/N	Description
FR-PCSMA-AH	30-49532-04	3446-K116 (530-0041300F116)	128MB Fast Page DIMM Kit (4 X 32)
FR-PCSMA-AJ	30-49532-05	3446-K119 (530-0041300F119)	512MB Fast Page DIMM Kit (4 X 128)
FR-PCSMA-BK	30-49532-06	3446-K120 (530-0041300F120)	1GB Fast Page DIMM Kit (4 X 256)
FR-PCM2M-AA	30-49534-01	3446-K107 (530-0042380)	Memory board, 4GB
FR-PCSMA-BM	30-49533-03	3446-K101 (530-0042659)	256KB LST Table
FR-PCSMA-BL	30-49533-04	3446-K103 (530-0042661)	1MB LST Table
FR-PCM2U-AA	N/A	3446-K902	200MHz/512KB CPU upgrade kit
FR-PCM2U-AB	N/A	3446-K030	200MHz/1MB CPU upgrade kit

Saleable Option	DIGITAL P/N	NCR P/N	Description
FR-CECBA-EA	30-50067-02	3446-K911 (530-0043341)	4GB 7200 RPM SCSI drive with drive carrier
N/A	RZ1CB-HS	N/A	4GB 7200 RPM SCSI drive
FR-CFCBA-EA	30-50066-02	3446-K912 (530-0043342)	9GB 7200 RPM SCSI drive with drive carrier
N/A	RZ1DB-HS	N/A	9GB 7200 RPM SCSI drive
FR-CGCBA-EA	30-50068-02	3446-K913 (530-0043343)	18GB 7200 RPM SCSI drive with drive carrier
N/A	RZ1EC-HB	N/A	18GB 7200 RPM SCSI drive
PCXRJ-AD	N/A	530-0043331	1.44MB diskette drive
FR-PCXLN-AA	N/A	530-0043350	2-button mouse
FR-PCXLA-NA	N/A	530-0043357	U.S. keyboard
FR-PCXCR-AR	30-48116-02	530-0041300F914	12X CD-ROM
FR-PCTAR-UB	30-47646-01	3446-F910 (530-0043347)	Cache Battery Back-up
FR-PCTAR-GA	30-49113-01	3446-F907 (530-0043344)	PCI 1 Channel Ultra SCSI Raid
FR-PCTAR-GB	30-49113-02	3446-F908 (530-0043345)	PCI 2 Channel Ultra SCSI Raid
FR-PCTAR-GC	30-49113-03	3446-F909 (530-0043346)	PCI 3 Channel Ultra SCSI Raid
FR-PCTAZ-EC	30-48127-01	3446-F905 (530-0043348)	PCI 2 Channel SCSI Adapter

Special Notes

Diagnostic Partition and Platform CD-ROM

All DIGITAL Server 9100 systems ship with a Diagnostic Partition and Platform CD-ROM. The Diagnostic Partition contains utilities that enable you to configure the server and run diagnostics. The Platform CD-ROM contains the same utilities as the Diagnostic Partition. In the case of a disk failure, where the Diagnostic Partition is not available, you can run these utilities from the CD-ROM and not load them on the boot disk; however, it is recommended that you run them from the Diagnostic Partition whenever possible. Some of the utilities save files to disk, and they are not able to do this when you run them from the CD-ROM.

The main purpose of the Platform CD-ROM is to enable you to install the Diagnostic Partition and its utilities (for example, if you have to replace the boot disk).

Refer to the DIGITAL Server 9100 Series System Software Guide for detailed information on software utilities.

Selecting a Fault Reporting Mechanism

The DIGITAL Server 9100 series uses a Fault Reporting mechanism called SAF-TE (SCSI Accessed Fault Tolerant Enclosure) for reporting hot-swap disk drive activity and status. All other DIGITAL Servers, as well as external Expansion Cabinets, use the DIGITAL Fault-Bus for reporting hot-swap disk drive activity and status. The Mylex RAID controllers provide support for both types of fault reporting and are shipped configured for SAF-TE when factory-installed or DIGITAL Fault-Bus when ordered as standalone options.

A RAID controller can be configured for SAF-TE or Fault-Bus but not both. Consequently, a RAID controller configuration with one channel connected to internal hot-swap disk drives (SAF-TE) and another channel connected to an expansion cabinet (Fault-Bus) is not supported.

DIGITAL ServerMaker

DIGITAL ServerMaker is an easy to use, interactive configuration tool for configuring and ordering DIGITAL Servers and rackmount. The ServerMaker tool guides you through a server configuration and minimizes errors. ServerMaker provides prompts and warnings as selections are made for adding options such as networking cards, RAID and SCSI adapters, hard drives, tapes, monitors, and operating systems. The result is a server parts list that can be printed or converted to an Excel spreadsheet. You can download ServerMaker from the following website location:

http://www.windows.digital.com/products/servermaker

Enhanced System Diagnostics

You can run the diagnostics from the Diagnostic Partition to isolate problems. Enhanced diagnostics are also available on the Quick Launch CD-ROM. You can create diagnostics diskettes from Quick Launch by using the *Utilities* option located under the *Installation & Utilities* button.

ADDENDUM

NCR WorldMark Service Guide

The following items are mentioned throughout the NCR WorldMark 4300 Service Guide included with this addendum. These items are not supported by DIGITAL:

- Manuals: AMIDiag Supplement, NCR Site System Log, WorldMark 4300 Installing MP-RAS, WorldMark 4300 Installing Windows NT Server, NCR PCI SCSI Host Adapter Service Guide, NCR Remote Services User Guide, WorldMark 4300 Server Management Product Guide
- Release 1 (R1) **-** the DIGITAL Server 9100 supports only R2 (OctaSCALE) system boards.
- UNIX operating system **-** the DIGITAL Server 9100 supports Windows NT Server only
- Server Management Module (SMM)
- Server Management Board (SMB)
- SIMM memory boards (2GB board)**-** the DIGITAL Server 9100 is a DIMM memory system only
- Internal battery backup
- Internal modem
- UPS
- NCR options list **-** use the DIGITAL Server 9100 supported options list
- Diagnostic Partition, Remote Support utility

NCR

WorldMark 4300

Deskside Service Guide

WorldMark 4300
Deskside Service Guide

BST0-2139-5500
11/97

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To maintain the quality of our publications, we need your comments on the accuracy, clarity, organization, and value of this book.

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Preface

Products Covered In This Book

This book applies to the following deskside servers:

- WorldMark 4300
- WorldMark 4380

Who Should Read This Book

This book is written for the person who services the servers listed above. The procedures in this book should be performed only by trained service personnel.

How To Use This Book

This book is organized as follows:

- Chapter 1 **-** provides procedures for removing and installing the covers and the front bezel
- Chapter 2 **-** provides procedures for removing and installing fans, the front panel control board, and the LCD and identifies locations of intrusion alarm switches and cables
- Chapter 3 **-** provides procedures for installing and removing drives and backplanes, setting backplane configuration jumpers, updating and recovering backplane firmware, and replacing the LED board
- Chapter 4 **-** provides procedures for removing and installing power system components
- Chapter 5**-** provides procedures for removing and installing processors, processor boards, and bus termination boards, and contains information on processor board configuration jumpers
- Chapter 6 **-** provides procedures for removing and installing the memory boards, SIMMs, DIMMs, and LST SIMMs
- Chapter 7 **-** provides procedures for removing and installing the R1 system board and configuration information for system board switches and jumpers
- Chapter 8 **-** provides procedures for removing and installing the R2 system boards and configuration information for system board switches and jumpers
- Chapter 9 **-** provides procedures for removing and installing add-in boards, the Server Monitor Module, and the Server Management Board
- Chapter 10 **-** provides descriptions of system memory and I/O mapping, board interrupts, direct memory access channels, PCI and EISA slot IDs, and connector pinouts for connectors used in the server
- Chapter 11 **-** provides some suggestions for troubleshooting problems with the server
- Appendix A **-** provides information about calculating system power requirements

Conventions Used In This Book

The following conventions are used in this book.

- The following definitions are used throughout this book:

  R1

  The 1-4 way SMP (symmetrical multi-processing) system board

  R2

  The OctaSCALE system board set

- The following style identifies text that you must enter exactly as shown:

  sf -l c:\files.txt

- The following type (Courier font) identifies messages displayed by the system:

  `Press <D> to boot the Diagnostic Partition`

- Path names and file names appear in **bold**. For example: The system transfers you to a DOS shell and places you in the **c:\tmp** directory.
- Utilities, commands, user names, and package names appear in **bold**. For example: Use the **rf** command to download files.
- Keys are displayed in capital letters. For example: Press the ENTER key.
- Menu selections appear in quotation marks. For example: Select “Run Utilities and Diagnostics” from the MS-DOS Startup Menu.
- The right arrow is used to indicate a selection sequence. For example: “Select Run Utilities and Diagnostics > Remote Support” is the same as “Select Run Utilities and Diagnostics, then select Remote Support.”

Related Publications

Refer to the following for additional information about the server:

- *WorldMark 4300 Site Preparation Guide*
- *WorldMark 4380 Site Preparation Guide*
- *WorldMark 4300 Deskside Product Guide*
- *WorldMark 4380 Product Guide*
- *Server Software Guide (4SMP)*
- *Server Software Guide (OctaSCALE)*
- *NCR System Site Log*
- *WorldMark 4300 Quick Hardware Installation*
- *WorldMark 4380 Deskside Hardware Installation Guide*
- *WorldMark 4300 Installing MP-RAS*
- *WorldMark 4300 Installing Windows NT Server*
- *AMIDiag User's Guide*
- *AMIDiag Supplement (4SMP)*
- *AMIDiag Supplement (OctaSCALE)*
- *NCR PCI SCSI Host Adapter Service Guide*
- *NCR Remote Services User Guide*
- *WorldMark 4300 Server Management Product Guide*

Chapter 1

Removing and Installing the Covers

This chapter contains procedures for removing and installing the:

- Side covers
- Top cover
- Front bezel

Tools and Supplies Needed

You need the following tools and supplies to perform the procedures described in this chapter:

- Phillips #1 and #2 screwdrivers
- Hexagonal-head nut driver
- Standard tip screwdriver
- Antistatic wrist strap, antistatic bag, and conductive foam pad (recommended)
- The *System Site Log*. This document contains forms for recording information on system equipment and components, hardware service, software products, and preventive maintenance activities. Use these forms as you set up your system for the first time, integrate new parts or software into the system, service or troubleshoot system problems, and perform preventive maintenance.

Warnings and Cautions

The following warnings and cautions apply throughout this chapter. Only a technically qualified person should integrate and configure the system.

Before performing the procedures in this chapter, turn off system power and disconnect the AC power cord.

Warnings

System power on/off: The DC push-button on/off switch (a convex 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 cord. Do not remove the side panels or internal cover panels unless the AC power cord has been unplugged. If the system has internal battery backup power, you must also turn the local battery disconnect switch on the back of the server to “Off.”

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

Cautions

Electrostatic discharge (ESD) and ESD protection: ESD can damage disk drives, boards, and other parts. This system can withstand normal levels of environmental ESD while you are hot-swapping SCSI hard drives. However, we recommend that you perform all procedures in this chapter only at an ESD 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 the system when handling parts.

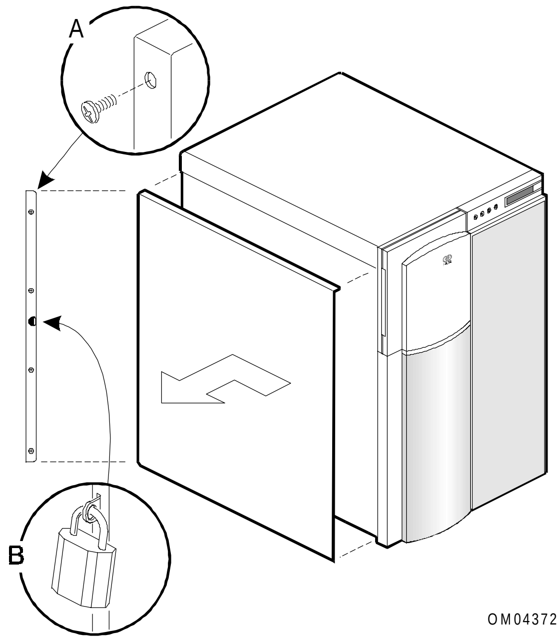
Chassis covers, proper cooling and airflow: For proper cooling and airflow, always install the chassis side and top covers before turning on the system. Operating it without these covers in place can damage system parts.

Removing and Installing a Side Cover

Removing a Side Cover

The following figure shows how to remove a side cover. The figure shows the left external side cover over the primary system board area; the procedure is the same for both side covers.

Removing a Side Cover



A	Retaining screw (four at back)
B	Padlock at back edge (if installed)

CAUTION: For proper cooling and airflow, always replace the side covers before turning on the system; operating it with the covers removed can damage system parts.

Do not damage or displace the electromagnetic interference (EMI) strips mounted on the frame as you remove and install the cover. Replace any damaged strips, or the system may not meet EMI requirements.

To remove a side cover:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Unlock padlock (if present) and remove it.
3. Remove four screws from the back edge of the side cover, and save to reinstall the cover.
4. Grip the two built-in handles at the back edge of the cover.
5. Slide cover toward the back about an inch until it stops.
6. Pull cover out from the system to disengage the bottom and top rows of tabs from notches in the chassis. Set cover aside.

Installing a Side Cover

To install a side cover:

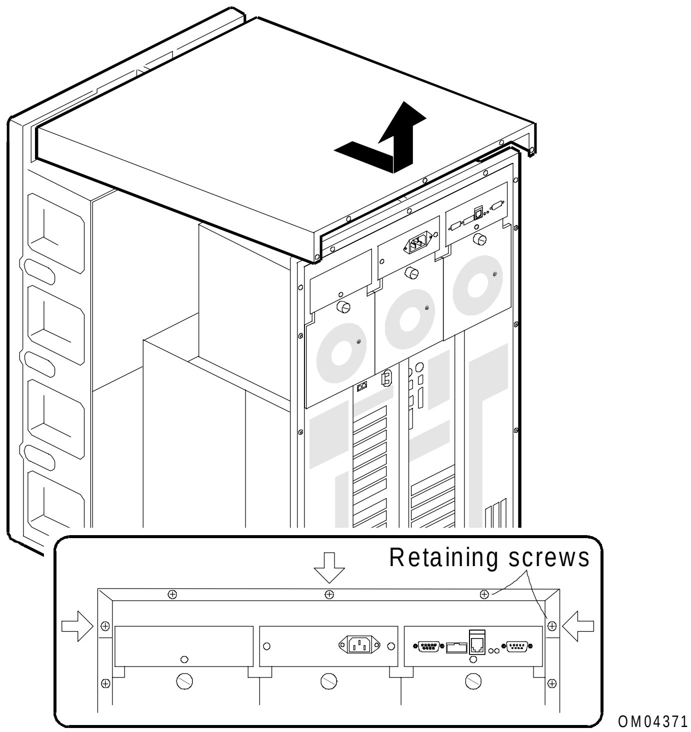
1. Before replacing a side cover, check that you have not left loose tools or parts inside the system. Check that cables, boards, and other components are properly installed.
2. Orient the cover so the padlock slot at the back edge fits over the loop at the back edge of the chassis. (The covers on each side are exact duplicates, but they install as a mirror image.)
3. Align the top and bottom rows of tabs on the cover with the slots in the chassis, and carefully push inward.
4. Slide the cover toward the front so the tabs engage firmly in the slots. If the cover does not slide freely all the way forward, make sure the padlock slot is correctly placed over the loop on the chassis back.
5. Attach the cover to the chassis with the four screws you removed earlier, and tighten firmly.
6. To prevent unauthorized access inside the system, insert and lock a padlock through the loop at the back (one at each side).

Removing and Installing the Top Cover

Removing the Top Cover

The following figure shows how to remove the top cover. To avoid damaging EMI strips, do not lift the cover much more than the 20-degree angle implied by the figure.

Removing the Top Cover



Important: Remove side covers first. You must remove both side covers before you can remove the top cover.

To remove the top cover:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove both side covers using the instructions in the previous section.
3. At the back, remove five retaining screws from the top cover.
4. Slide the top cover toward the rear approximately one inch. Lift the cover directly up and off of the frame.

Installing the Top Cover

To install the top cover:

1. Before replacing the top cover, check that you have not left loose tools or parts inside the system. Check that cables, boards, and other components are properly installed.
2. Lower the cover to about a 20-degree angle with the front edge about one inch back from the edge of the plastic bezel (front cover). The leading corners of the cover should be outside the chassis metal. Pull the cover toward the back slightly to make sure it is aligned evenly.
3. Carefully slide the front edge of the cover forward under the edge of the bezel.
4. Reinstall the five retaining screws at the back.
5. Reinstall the side and top covers as described in the previous sections.

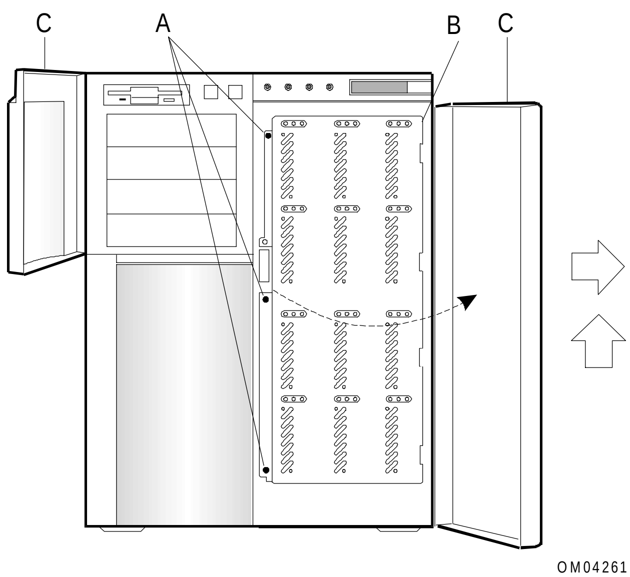
Removing and Installing the Front Bezel

Removing the Front Bezel

To remove the front bezel:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove side covers and the top cover as shown in the previous sections.
3. Open both front exterior doors of the bezel.
4. On the hinged metal EMI door, unscrew three thumbscrews as depicted in the following figure. (If you leave the door in place, you cannot angle the bezel out of the T-shaped slots in the chassis.)
5. Swing the EMI door out from the chassis. Lift it up slightly to free the hinge tabs from slots in the chassis, and remove the door.

Removing EMI Door to Remove Bezel



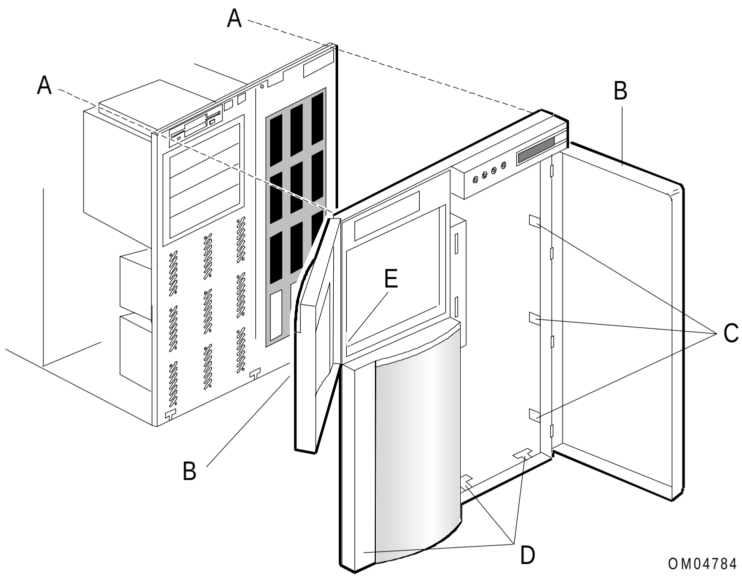
A	Three screws that secure door to chassis
B	Hinged side of metal EMI door
C	Front bezel doors open

6. Remove SCSI drives from the bottom three hot-swap bays so that it is easier to see the T-shaped tabs and slots at the bottom of the chassis and bezel.

7. At the top front corners of the server, from inside the chassis, remove two screws that secure the bezel to the chassis (see the exploded view in the following figure).

   Note: When removing the screw above the SCSI drive bays, be careful not to drop the screw. It might bounce under the metal frame of the drive bay and be difficult to retrieve. Save both screws to reinstall the bezel.

   Removing Two Bezel Screws and Releasing Seven Snap-in Tabs



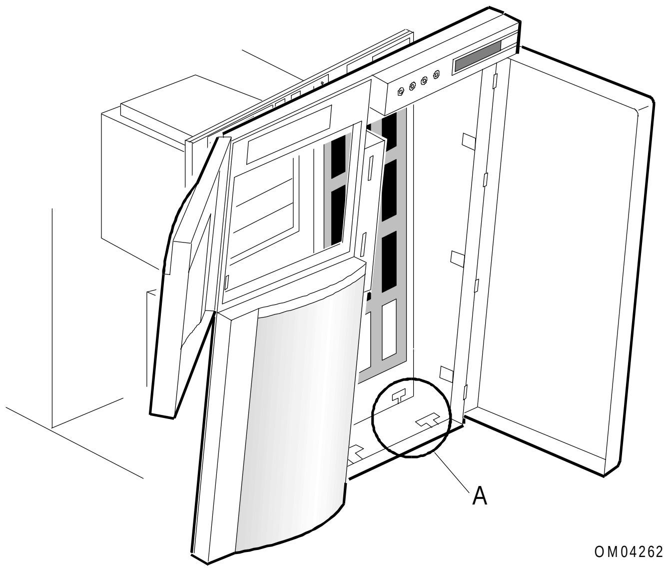
A	Location of two screws (accessed from inside chassis)
B	Two doors in bezel (shown open in this exploded view)
C	Six snap-in tabs, three on each side of the SCSI drive bays (three shown)
D	Three T-shaped tabs at bottom edge of bezel (two shown)
E	Location of snap-in tab to the left of the 5.25-inch removable media drive bays

8. In addition to the two screws, there are three snap-in tabs on each side of the SCSI drive bay opening and one to the left of the 5.25-inch drive bay. Work your way from top to bottom as you carefully press on these tabs and pull out slightly to free the tabs from the chassis.

9. Hold the bezel doors closed, and slightly tilt the bezel out at the top. Lift up and toward you to free the T-shaped tabs at the bottom of the bezel from the three slots at the bottom of the chassis.

   CAUTION: To avoid the risk of damaging the bezel doors and hinges, hold the doors closed as you tilt the bezel and lift it away from the chassis.

   Freeing Bezel from T-shaped Chassis Slots



A	T-shaped tab on bezel, T-shaped slot on chassis (one of each shown; three of each present at bottom of chassis) Exterior doors are shown open here but **should be held closed** as you lift the bezel up and out from the chassis.

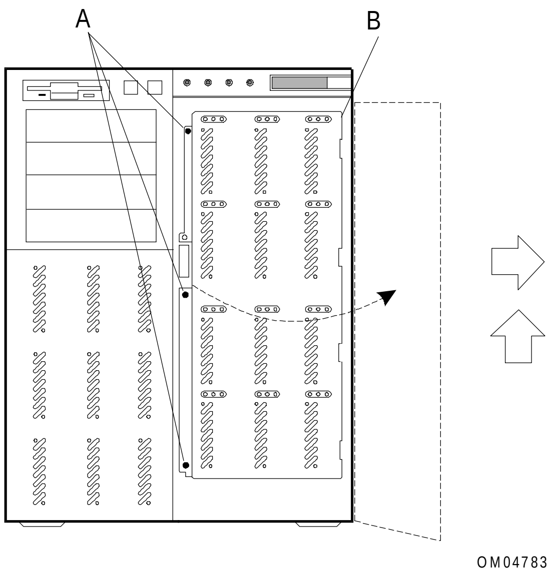
10. Lay the bezel aside, and protect it from damage or surface scratches.

Installing the Front Bezel

To install the front bezel:

1. On the EMI door, unscrew three thumbscrews as depicted in the following figure. (If you leave the door in place, you cannot angle the bezel into the T-shaped slots in the chassis.)
2. Swing the EMI door out from the chassis. Lift up slightly to free the hinge tabs from slots in the chassis, and remove the door.
3. If present, remove SCSI drives from the bottom three hot-swap bays so that it is easier to see and align the T-shaped tabs and slots at the bottom of the chassis and bezel.

Removing the EMI Door



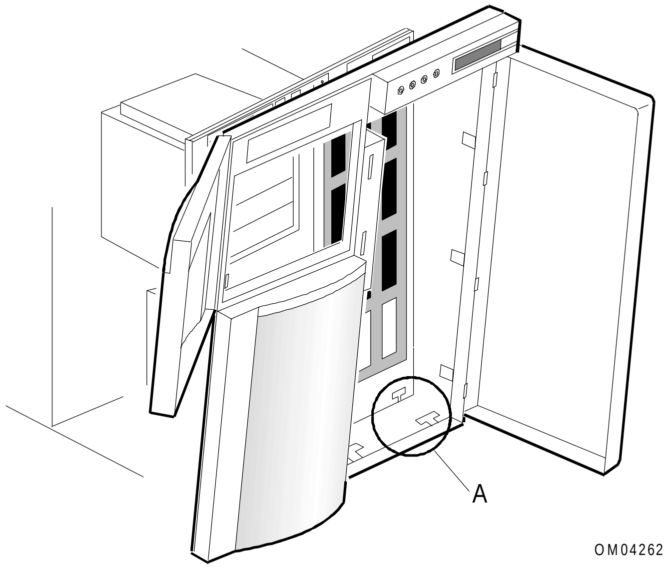
A	Three screws that secure door to chassis
B	Hinged side of EMI door Swing door out, then lift up slightly and remove from chassis.

4. Hold the bezel doors closed. Place bezel in front of the chassis, slightly tilting the bezel out at the top. At the bottom, align the three T-shaped horizontal bezel tabs with three vertical T-shaped slots in the chassis.

   CAUTION: To avoid damaging the bezel doors and hinges, hold the doors closed as you tilt the bezel to align the bottom tabs.

5. Slide the T-tabs into place. Hold the bezel up slightly so the tabs are against the tops of the slots as you rotate the bezel up toward a vertical position.

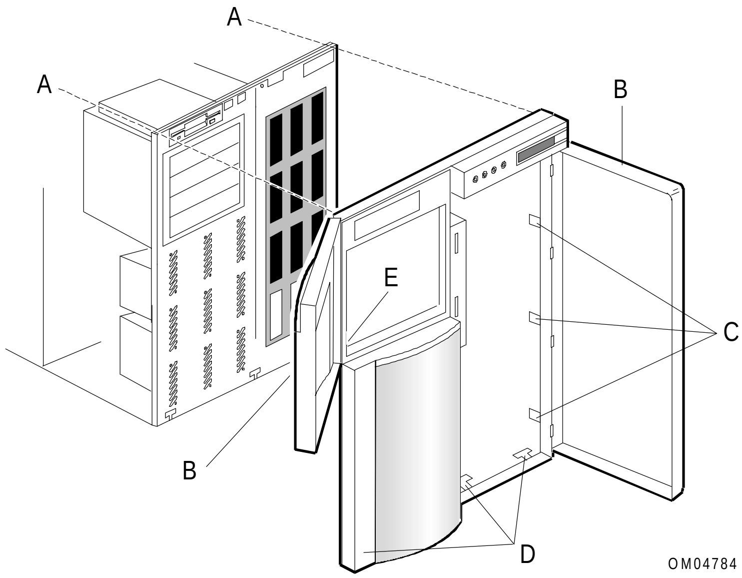
Installing Bezel Tabs in T-shaped Chassis Slots



A	T-shaped tab on bezel, T-shaped slot on chassis (one of each shown; three of each present)
	Exterior doors are shown open here but **should be held closed** as you tilt the bezel slightly and connect the bottom tabs.

6. Locate the seven snap-in tabs that help position the bezel over the chassis: three on each side of the SCSI drive bay opening and one to the left of the 5.25-inch removable media bay (see the following figure).

Installing Bezel on Chassis



A	Location of two screw holes to secure bezel to chassis (install screws from inside chassis into plastic channels in the back of the bezel)
B	Two bezel doors (shown open in this exploded view; should be held closed as you align the T-shaped tabs)
C	Six snap-in tabs, three on each side of the SCSI drive bays (three shown)
D	Three T-shaped tabs at back of bottom edge of bezel (two shown)
E	Location of snap-in tab to the left of the 5.25-inch removable media drive bays

Work your way from bottom to top as you carefully snap these tabs into the corresponding slots in the chassis. You do not need to force the tabs, so if you feel resistance, check to make sure each tab is correctly located over the corresponding chassis slot.

7. At the top front corners, install two screws from inside the chassis into the bezel to secure it. These are #6 thread-forming screws, not the standard #1 or #2 screws used elsewhere in this system.

   Note: When installing the screw above the SCSI drive bays, be careful not to drop the screw. It might bounce under the metal frame of the drive bay and be difficult to retrieve.

8. Reinstall these parts:

   - SCSI drives in the bottom hot-swap drive bays
   - EMI door over the SCSI drive bays
   - Top cover and both side covers

Chapter 2

Removing and Installing Fans, Intrusion Alarm, Front Panel Control Board, and LCD

This chapter describes the following:

- Removing and installing fans
- Intrusion alarm switch and cable locations
- Removing and installing the front panel control board
- Replacing the LCD

Tools and Supplies Needed

You need the following tools and supplies to perform the procedures described in this chapter:

- Phillips #1 and #2 screwdrivers
- Hexagonal-head nut driver
- Standard tip screwdriver
- Antistatic wrist strap and conductive foam pad (recommended)
- The *System Site Log*. This document contains forms for recording information on system equipment and components, hardware service, software products, and preventive maintenance activities. Use these forms as you set up your system for the first time, integrate new parts or software into the system, service or troubleshoot system problems, and perform preventive maintenance.

Updating the Configuration History File

Whenever you install or replace a system component, update the configuration history file on the Diagnostic Partition. To update the configuration history file:

1. Boot to the Diagnostic Partition.
2. Select “Run Utilities and Diagnostics” from the MS-DOS® Startup Menu.
3. Select “System Config Utils.”
4. Select “View Version Info.”
5. Select “Edit Config History.”

Warnings and Cautions

The following warnings and cautions apply throughout this chapter. Only a technically qualified person should perform the procedures described in this chapter.

None of these procedures can safely be done with the system power on. To perform any procedures inside the system, turn off the system power and disconnect the AC power cord.

Warnings

System power on/off: The DC push-button on/off switch (a convex 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 cord. If the system has internal battery backup power, you must also turn the local battery disconnect switch on the back of the chassis to “Off.”

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

Cautions

Electrostatic discharge (ESD) and ESD protection: ESD can damage disk drives, boards, and other parts. We recommend that you perform all procedures in this chapter only at an ESD 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 the system when handling parts.

ESD, handling boards and modules: 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. Use a conductive foam pad if available but not the board wrapper. Do not slide board over any surface.

Ensure complete board insertion: When installing add-in boards, be sure that the boards are completely and correctly seated in the system board connectors before applying power. Incomplete insertion can result in damage to the system board and the boards being inserted.

Board support panel, proper cooling and airflow: For proper cooling and airflow, always install the board support panel for the processor and memory boards before installing the chassis side and top covers and turning on the system. Operating the server without this support panel in place can damage system parts.

Chassis covers, proper cooling and airflow: For proper cooling and airflow, always install the chassis side and top covers before turning on the system. Operating it without these covers in place can damage system parts.

Removing and Installing Fans

The server contains identical dual removable chassis fans to cool the boards and removable media drives. The dual fan assembly provides redundant fan capability to maintain airflow in case of a single fan failure. An R2 system board configuration requires four dual fan assemblies. Some R1 systems contain two dual fan assemblies; others contain four dual fan assemblies.

CAUTION: If an R1 system contains two dual fan assemblies and you plan to install 10K RPM (or faster) disk drives, you must upgrade the system to four dual fan assemblies.

Replacement fans must be able to provide the same failure-sensing circuitry as the fans already installed.

Note: Each power supply has an integral fan, but these are not separately removable and are not described here.

Correct Airflow Direction

The removable fans pull air in from the front of the chassis so that it flows across the boards and out the back. Thus, the fans must be oriented for the correct airflow direction. Confirm correct fan orientation by checking the embossed arrows on the side of each fan as you place the fan in its bracket.

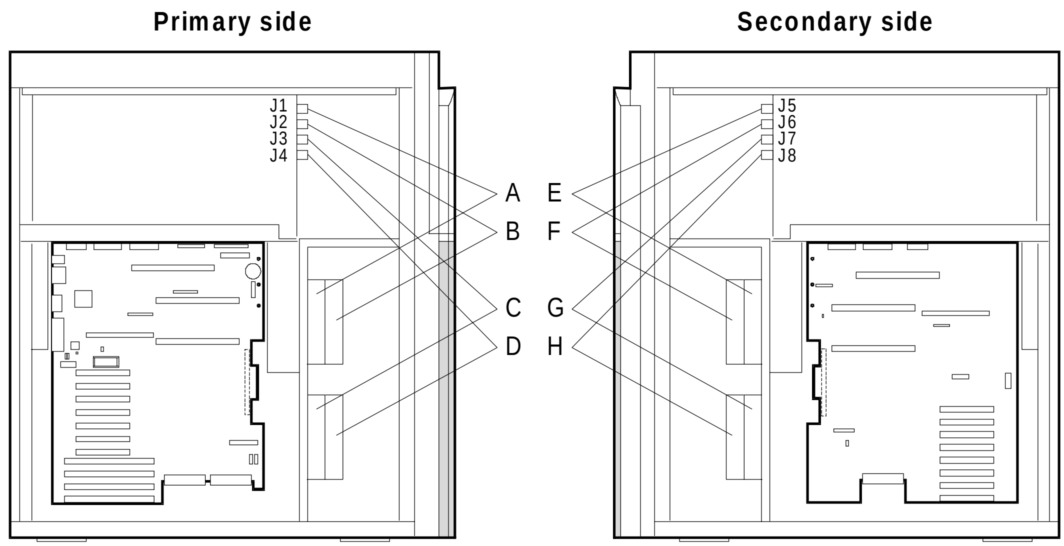
⇒ Arrow points horizontally toward back of chassis

⇑ Arrow points vertically up

Fan Locations

The following figure shows the locations of the removable fans and their power connectors.

Fan Locations



	Fan	Power Connector
A	Primary upper inside	J1
B	Primary upper outside	J2
C	Primary lower inside	J3
D	Primary lower outside	J4
E	Secondary upper inside	J5
F	Secondary upper outside	J6
G	Secondary lower inside	J7
H	Secondary lower outside	J8

Removing a Fan Assembly

Note: The inner fan in the assembly is not held together with screws. As you remove the assembly from the chassis, do not let the inner fan fall out.

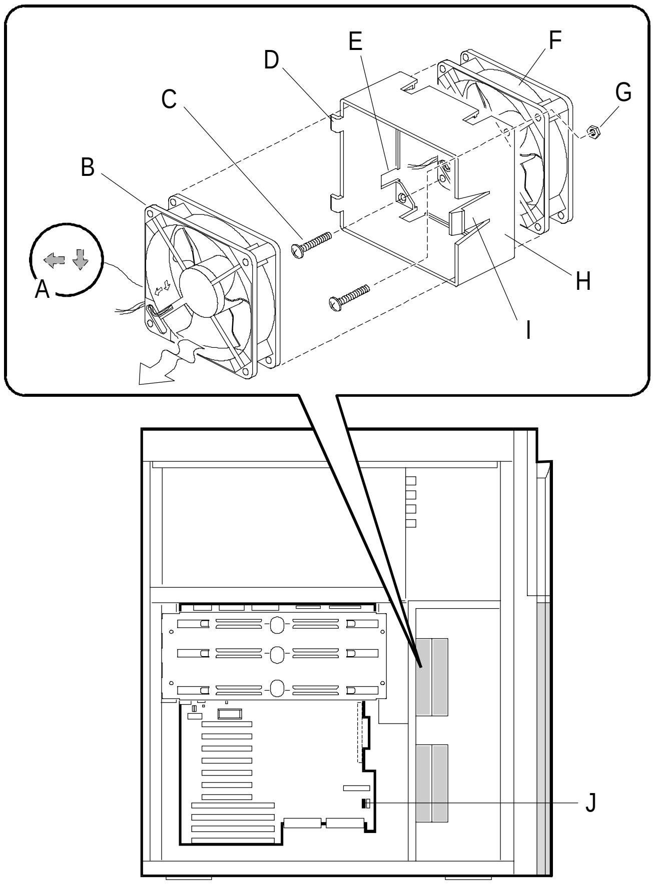
To remove a fan:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the side cover in accordance with directions specified in Chapter 1.
3. Disconnect the fan power cable from the connector on the power distribution backplane.
4. Press the release tab on the near edge of the fan bracket. Rotate the assembly outward from the bulkhead until the tabs on the far edge of the bracket clear the slots in the chassis.
5. Carefully remove the assembly from the chassis, and place it on a flat surface with the arrow facing UP.
6. Lift the inner fan out of the bracket, pulling up the cable around the grill.
7. Remove the screws mounting the outer fan from the bracket and remove the fan from the bracket. Refer to the “Installing a Fan” figure in the following section.

Installing a Fan

Refer to the following figure as you perform the procedure for installing a disassembled fan.

Installing a Fan

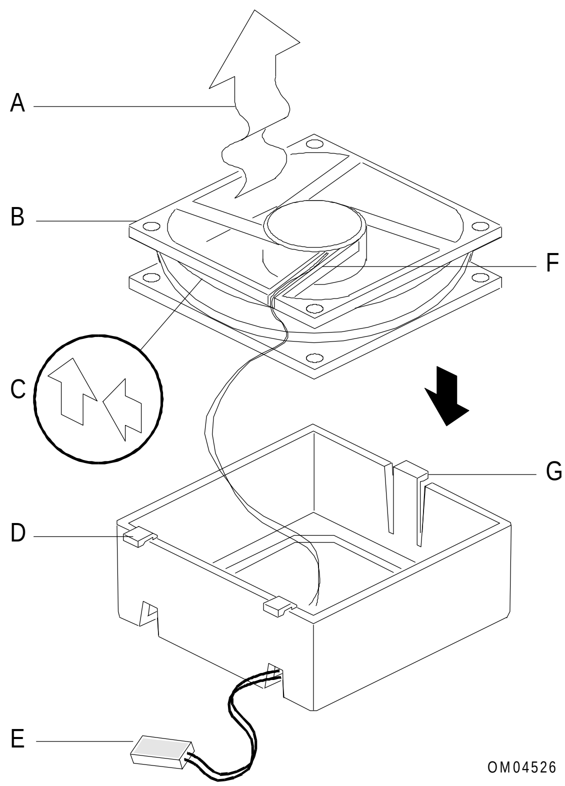


A	Airflow direction arrows on side of fan
B	Fan
C	Screws
D	Hinge tabs on inner edge of bracket
E	Slot in bracket for routing power cable (and through grommeted hole, not shown, beyond inner edge of bracket)
F	Fan
G	Nut
H	Plastic fan bracket
I	Bracket release tab
J	Fan fail connector on R2 primary system board (other end of fan status cable connects to J13 on the power distribution backplane).

To install a fan:

1. Attach the outer fan with the two screws and nuts as shown in the “Installing a Fan” figure.
2. Place the fan and bracket on a flat surface with the “open” side facing up, with two hinge tabs to the left and the single release tab to the right.
3. Orient the inner fan with the arrow facing UP. Keeping the arrow facing up ensures that the airflow direction is correct after you install the assembly in the chassis.
4. Secure the inner fan power cable wires in the groove on the fan housing (refer to the figure “Routing the Power Cable for a Fan”).
5. With the arrow facing up, place the inner fan in the bracket. Do not pinch the power cable between fan and bracket.
6. Thread the power cable through the slot next to the hinge tabs on the bracket. The following figure shows how to route the power cable for a fan.

Routing the Power Cable for a Fan



A	Wavy arrow indicates airflow direction
B	Fan
C	Airflow direction arrows embossed on side of fan
D	Hinge tabs on bracket
E	Power cable threaded through slot in side of bracket
F	Power cable wires clamped into groove on fan
G	Plastic release tab on far side of bracket

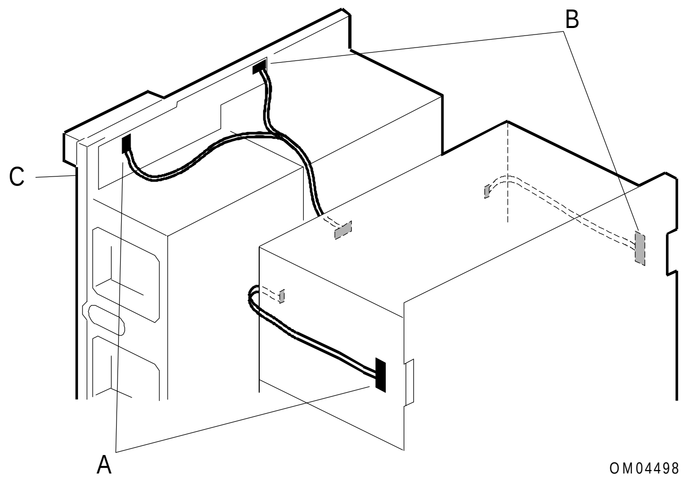
7. Hold the fan/bracket assembly together as you move it into the vertical position flat against the inner bulkhead. The inner fan faces the vertical bulkhead.
8. Holding the assembly with one hand, guide the hinge tabs into the chassis slots at the far edge of the fan opening. Make sure the power cable is not pinched. Rotate the assembly toward the bulkhead until the release tab snaps into place.
9. Route the fan power cables along the metal plate in the center of the chassis and secure with cable ties.
10. Connect the fans as shown in the "Fan Locations" figure to the connectors on the power distribution backplane:

Fan	Power Connector
Primary upper inside	J1
Primary upper outside	J2
Primary lower inside	J3
Primary lower outside	J4
Secondary upper inside	J5
Secondary upper outside	J6
Secondary lower inside	J7
Secondary lower outside	J8

Intrusion Alarm Switch and Cable Locations

The system has three intrusion alarm switches, one located inside each side cover near the back of the frame and one on the front panel behind the EMI door that covers the SCSI drive bays. The following figure shows cable routing for the switches near the back of the frame. The connectors are on the front-facing side of the front panel control board.

Alarm Switch Cable Routing



A	Connector J5 on front panel control board; switch located near the back of the frame
B	Connector J2 on front panel control board; switch located near the back of the frame
C	EMI door switch location (not shown here); direct contact, no cable

Note: You can disable chassis intrusion monitoring to allow scheduled cleaning with the power on. The Configuration Utility system board option “A/D Channel Enable” allows you to select the channels to monitor. The “Switch(V)” item controls the monitoring of chassis intrusion. Refer to the appropriate *Server Software Guide* for additional configuration information:

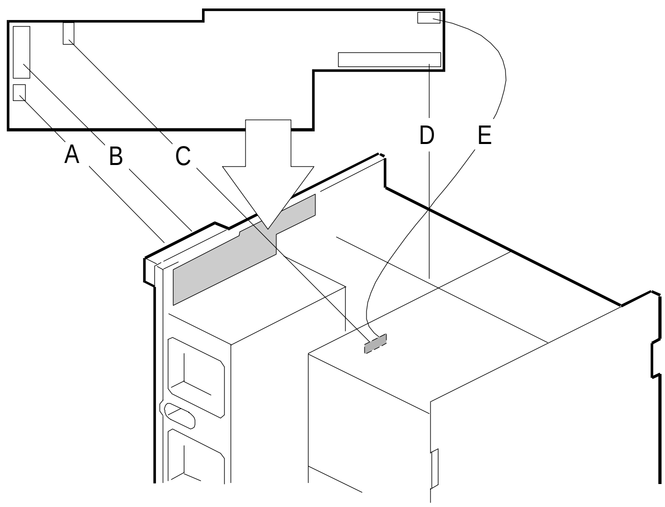
- *Server Software Guide (4SMP)*
- *Server Software Guide (OctaSCALE)*

Removing and Installing the Front Panel Control Board

Removing the Front Panel Control Board

The following figure shows the front panel control board cable connections. The connectors are on the front-facing side of the board.

Front Panel Control Board Cable Connections



A	J7, power cable to LCD, 3-pin connector
B	J2, signal cable to LCD, 14-pin connector
C	J6, signal cable to intrusion switch connector on power distribution backplane, 3-pin connector
D	J3, signal cable to system board, 40-pin connector (pin 17 removed)
E	J1, signal cable to intrusion switch connector on power distribution backplane, 3-pin connector

To remove the front panel control board:

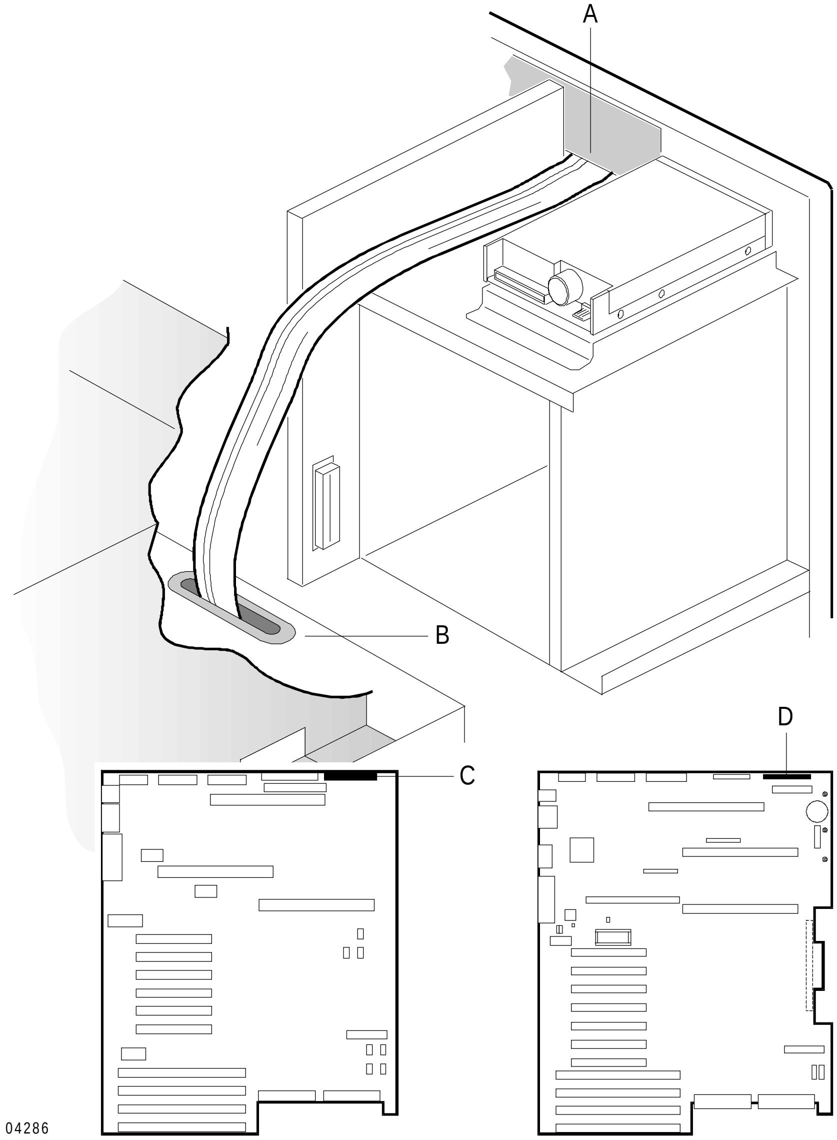
1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove both side covers and the top cover.
3. Locate the front panel control board above the SCSI drive bays.
4. Label all cables attached to the control board. Before removing the board, disconnect signal cable J6 (C in the “Front Panel Control Board Cable Connections” figure). Disconnect other cables after removing board (cable disconnection sequence is dictated by ease of access).
5. Remove and save two screws. The board is held in place by a snap fastener.
6. Hold the board by the top edge or upper corners. Pull it toward the back of the chassis to release it from the snap. Carefully lift board up and out of the chassis, and do not scrape it against other system components.
7. Disconnect any remaining cables from the board.

8. Place board component-side up on an antistatic surface.

Installing the Front Panel Control Board

The following figure shows front panel control board cable routing to the system board.

Cable Routing to System Board



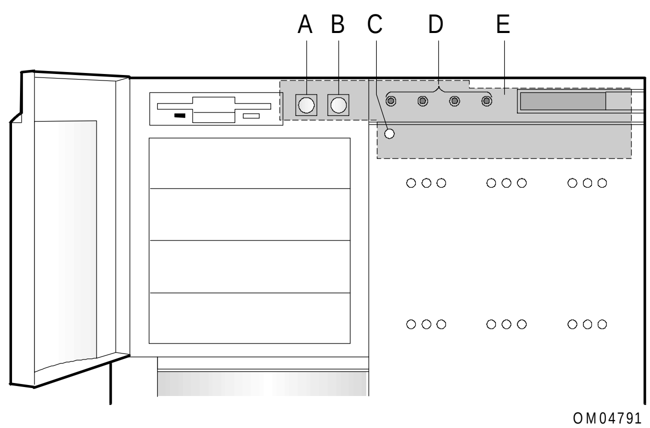
A	Front panel control board, signal cable from J3 (front side of board)
B	Access hole in horizontal bulkhead
C	Connector on R1 system board
D	Connector on R2 primary system board

To install the front panel control board:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Before installing the board, connect these cables while it is easy to access the connectors:
   - Signal cable to the system board
   - Signal cable to the intrusion switch above board area
   - Power and signal cables to the LCD

   Match key on connector to the socket, or match red stripe on the ribbon cable with pin 1 location on the board.
3. Hold the board by the top edge or upper corners, and do not scrape it against other system components. Place board inside the chassis, with the component side facing the front of the chassis. Keep cables out of the way of screw holes, switches, and indicators.
4. Before pressing the board onto the snap fastener, make sure the board features are aligned with the chassis and bezel openings.

   Aligning Front Panel Control Board Features with Chassis and Bezel Front Openings



A	Power on/off switch
B	Reset switch
C	NMI switch
D	Four status indicator LEDs
E	Approximate board location inside chassis

5. Press board onto the snap fastener. Reinstall two screws, using a Phillips #2 screwdriver.
6. Reconnect any remaining cables that you disconnected.
7. Reinstall the top cover and both side covers.

Restoring the Front Panel Control Board Vital Product Data

The front panel control board contains an embedded EEPROM which stores information about the server called the Vital Product Data (VPD). This information includes the vendor ID, chassis type, and product type. If you install a new front panel control board, you must restore the VPD.

The VPD is loaded from the Diagnostic Partition file **eeprom.dat** at the factory. If this file is present, you can use it to restore the VPD. If not, you must create it.

Perform the following steps to restore the VPD to the front panel control board.

1. Boot the Diagnostic Partition.
2. Escape to a DOS prompt by selecting "Run Utilities and Diagnostics > Remote Support > File Transfer Utils > File Download > Continue."
3. Change to the Configuration Utility directory by entering:

   cd *directory*

   where *directory* is **\scu** for an R1 system and **\model2\scu** for an R2 system.
4. Check for the presence of the **eeprom.dat** file by entering:

   type eeprom.dat

   If the file is present, you are ready to restore the VPD. If not, create the file using the DOS **edit** utility, adhering to the file format below.
5. Restore the VPD by entering:

   vpdwrite
6. Verify the VPD information by entering:

   vpdread test.dat

   There should be no error messages printed, and a **test.dat** file should be created which contains the same information as **eeprom.dat**.

eeprom.dat File Format

The **eeprom.dat** file has the following format:

version	1.0
chassisType	DESKSIDE
productType	4300
vendorId	NCR

eeprom.dat File Parameters

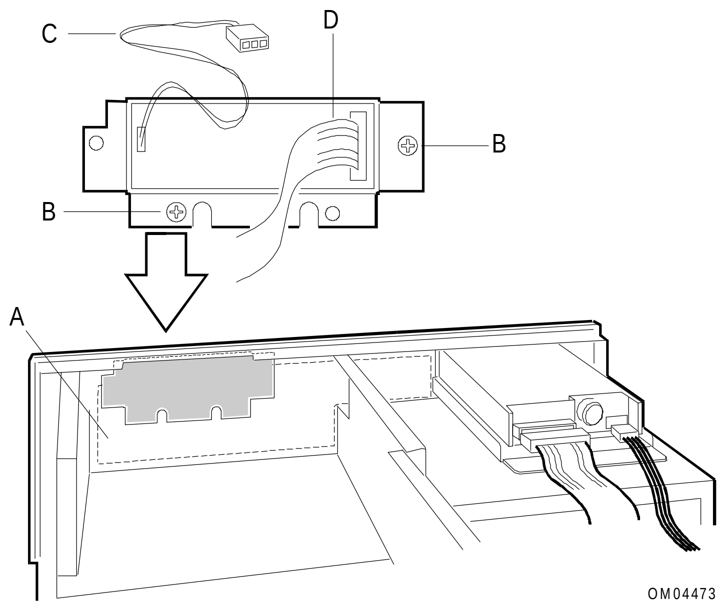
The following table lists valid values for the **eeprom.dat** file parameters.

Parameter	Valid Values
chassisType	DESKSIDE 8URACK 9URACK UNKNOWN
productType	4300 4700 9100 GENERIC UNKNOWN
vendorId	NCR GENERIC UNKNOWN

Replacing the LCD

An industry-standard LCD is installed in a carrier above the SCSI drive hot-swap bays. Refer to the following figure as you perform the procedure for replacing the LCD.

Replacing the LCD



A	Front panel control board
B	Two screws on LCD carrier
C	Backlight power connector from LCD to control board
D	Signal connector from LCD to control board

To replace the LCD:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove both side covers and remove the top cover.
3. Label and disconnect all cables from the front panel control board, and remove board from the chassis.
4. Remove and save the screws that secure the LCD carrier to the chassis.
5. From inside the chassis, pull the carrier assembly back out of the opening.
6. To remove the LCD from the carrier, pry out four plastic rivets that secure the display board to the carrier.
7. Put the replacement LCD on the carrier, and secure with four plastic rivets.
8. Orient the carrier assembly as shown above (14-pin connector to the right as seen from the back). This places the display screen right-side up for correct viewing.

9. From inside the chassis, place the carrier assembly back in the chassis opening. Make sure the carrier flanges make good contact with the chassis around the opening. (You may need to spread them out a little.)
10. Keep any cables out of the way as you reinstall two screws to secure the carrier to the chassis.
11. Connect the LCD power and signal cables to the front panel control board.
12. Reinstall the front panel control board, top cover, and both side covers.

Note: If the LCD is not working properly, refer to the *AMIDiag Supplement* for diagnostic information.

Chapter 3

Removing and Installing Drives and SCSI Backplanes

This chapter describes the following:

- Removing and replacing the 3.5-inch diskette drive
- Installing and removing 5.25-inch CD-ROM and tape drives
- Installing or swapping a SCSI drive in a hot-swap bay
- SCSI drive backplane connectors
- Connecting the SCSI drive backplane to the system board
- Removing and installing a SCSI drive backplane
- Setting SCSI backplane configuration jumpers
- Updating SCSI hot-swap backplane firmware
- Recovering SCSI hot-swap backplane firmware
- Replacing a SCSI drive status LED board

Tools and Supplies Needed

You need the following tools and supplies to perform the procedures described in this chapter:

- Phillips #1 and #2 screwdrivers, right angle
- Hexagonal-head nut driver
- Standard tip screwdriver
- Antistatic wrist strap and conductive foam pad (recommended)
- The *System Site Log*. This document contains forms for recording information on system equipment and components, hardware service, software products, and preventive maintenance activities. Use these forms as you set up your system for the first time, integrate new parts or software into the system, service or troubleshoot system problems, and perform preventive maintenance.

Updating the Configuration History File

Whenever you install or replace a system component, update the configuration history file on the Diagnostic Partition. To update the configuration history file:

1. Boot to the Diagnostic Partition.
2. Select “Run Utilities and Diagnostics” from the MS-DOS Startup Menu.
3. Select “System Config Utils.”
4. Select “View Version Info.”
5. Select “Edit Config History.”

Warnings and Cautions

The following warnings and cautions apply throughout this chapter. Only a technically qualified person should integrate and configure the system.

The only procedure in this chapter that can safely be done with the system power on is installing (or hot-swapping) a drive/carrier assembly in one of the SCSI hot-swap drive bays. For any other procedures inside the system, turn off system power and disconnect the AC power cord.

Warnings

System power on/off: The DC push-button on/off switch (a convex 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 cord. If the system has internal battery backup power, you must also turn the local battery disconnect switch on the back of the chassis to “Off.”

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

Cautions

Electrostatic discharge (ESD) and ESD protection: ESD can damage disk drives, boards, and other parts. This system can withstand normal levels of environmental ESD while you are hot-swapping SCSI hard drives. However, we recommend that you perform all procedures in this chapter only at an ESD 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 the system when handling parts.

ESD, handling boards and modules: 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. Use a conductive foam pad if available but not the board wrapper. Do not slide board over any surface.

Ensure complete board insertion: When installing add-in boards, be sure that the boards are completely and correctly seated in the system board connectors before applying power. Incomplete insertion can result in damage to the system board and the boards being inserted.

Board support panel, proper cooling and airflow: For proper cooling and airflow, always install the board support panel for the processor and memory boards before installing the chassis side and top covers and turning on the system. Operating it without this support panel in place can damage system parts.

Chassis covers, proper cooling and airflow: For proper cooling and airflow, always install the chassis side and top covers before turning on the system. Operating it without these covers in place can damage system parts.

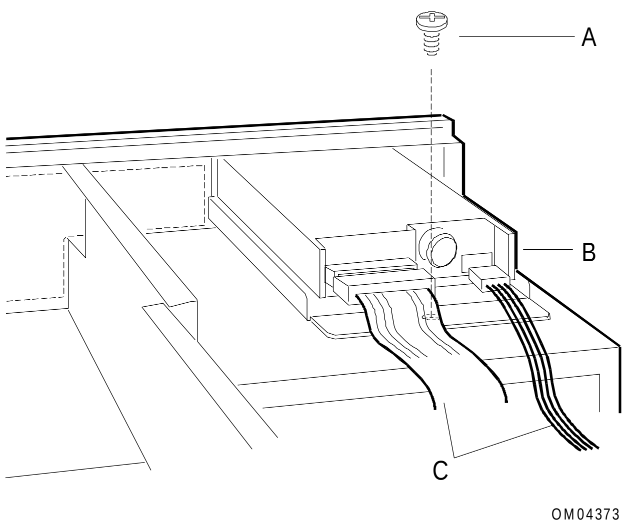
Removing and Replacing the 3.5-inch Diskette Drive

Removing the 3.5-inch Diskette Drive (Upper Left Bay)

To remove the 3.5-inch diskette drive:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove both side covers and the top cover.
3. Label and disconnect the diskette drive cables.
4. Remove and save the screw that secures the drive/bracket assembly to the chassis, and lift the assembly out of the chassis.

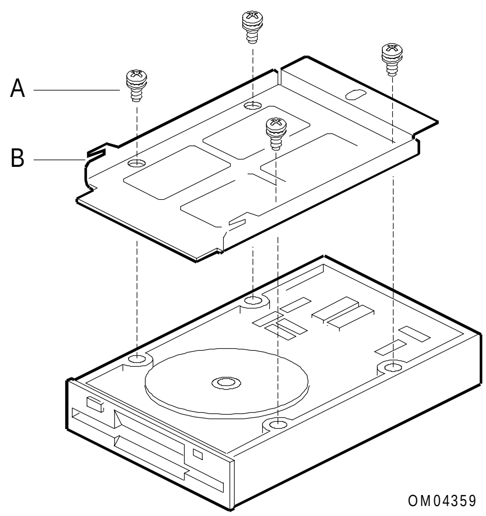
Removing Diskette Drive from Chassis



A	Chassis retaining screw
B	Drive/bracket assembly
C	Drive power and signal cables

5. Turn assembly upside down on an antistatic surface. Remove and save four screws that secure the bracket to the drive, and set bracket aside. Save screws and bracket to reinstall the same or a different 3.5-inch diskette drive.

Removing Bracket from Diskette Drive



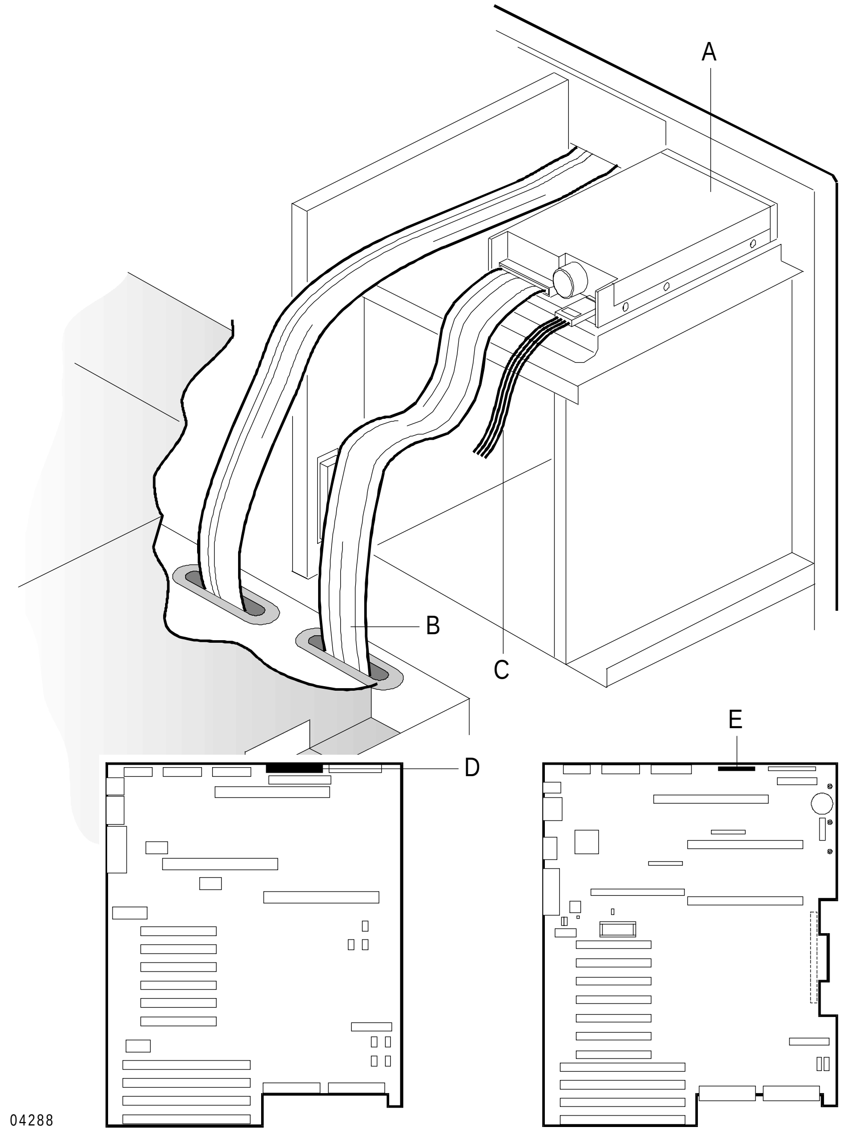
A	Four bracket retaining screws
B	Drive bracket

6. Place drive on an antistatic surface. If not reinstalling the same drive, place it in a protective wrapper.

Installing the 3.5-inch Diskette Drive (Upper Left Bay)

The following figure shows cable routing from the diskette drive to the system board. Be sure to route the cables properly when replacing the diskette drive.

Diskette Drive Cable Routing to System Board



A	Diskette drive
B	Signal cable routed through access hole in vertical bulkhead
C	Power cable (typical routing shown in “Routing 5.25-inch Drive Cables” figure)
D	Connector on R1 system board
E	Connector on R2 primary system board

To replace the 3.5-inch diskette drive:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Take the new 3.5-inch diskette drive from its protective wrapper, and place it component-side up on an antistatic surface. Record the drive model and serial numbers in your equipment log.
3. Set any jumpers or switches according to the instructions in the drive manufacturer's documentation.
4. Place the drive bracket on the component side of the drive, and align the four mounting holes.
5. Attach the bracket to the drive with four screws of the appropriate size and length (reuse the screws you removed before). Tighten the screws firmly (to 6.0 inch-pounds).
6. Put the drive/bracket assembly on the chassis; ensure that drive is aligned properly in the bay opening. The drive should protrude out of the chassis only about 5/8 inch.
7. Secure the assembly to the chassis with the screw you removed earlier, and tighten it firmly (to 8.0 inch-pounds).
8. Connect cables to the diskette drive. The connectors are keyed for easy alignment. The red stripe on the signal cable indicates pin 1.
9. Reinstall the top cover and side covers.
10. Close (and lock) the small front bezel door.

Installing and Removing 5.25-inch CD-ROM and Tape Drives

Drive Types and Placement

The system has four 5.25-inch half-height bays at the upper left front (behind the small front bezel door). These bays are intended to hold tape, CD-ROM, or other removable media drives.

Narrow SCSI drives in the 5.25-inch bays receive signals through a standard 50-pin terminated ribbon cable that connects to the SCSI B connector on the primary system board.

Service Notes

Active bus termination is needed for the 5.25-inch device cable. The narrow SCSI cable that connects to the 5.25-inch removable media drives is terminated at the end of the cable. Therefore, the SCSI bus terminations must be removed from the device.

Hard drives are not recommended in these bays. We do not recommend installing a hard disk drive in a 5.25-inch external bay, because the drive generates EMI and is more susceptible to ESD.

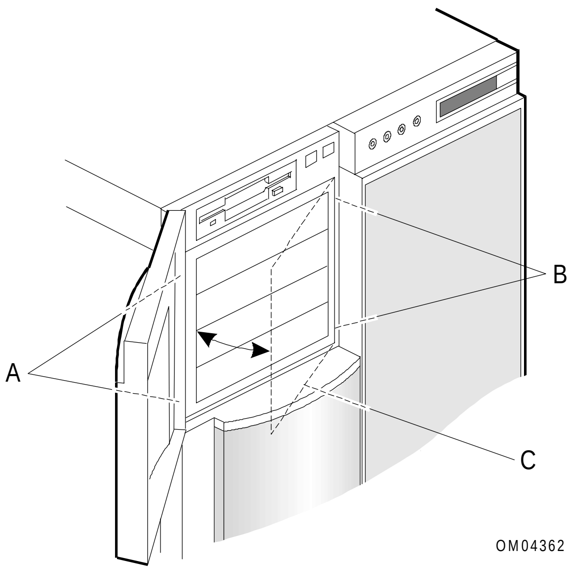
Save filler panels and EMI shields. System EMI integrity and cooling are both protected by having drives installed in the bays or filler panels and EMI shields covering the bays. When you install a drive, save the panel and shield to reinstall in case you should later remove the drive and not reinstall one in the same bay.

Installing 5.25-inch Drives (Removable Media)

To install a 5.25-inch drive:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the left side cover (as viewed from the front of the server).
3. Open the small front bezel door.
4. Each empty bay is covered with a plastic filler panel; the filler panels are in a plastic frame. To remove a panel from the frame, you must first remove the filler panel frame from the chassis. Reach in the side behind the bay, and press on two snap-in tabs (shown on the following figure).
5. Swing frame out to the right, and remove it from the chassis by disengaging the hinge tabs at the right edge of the frame. The following figure shows how to remove the plastic frame from 5.25-inch drive bays.

Removing Filler Panel Frame from 5.25-inch Drive Bays

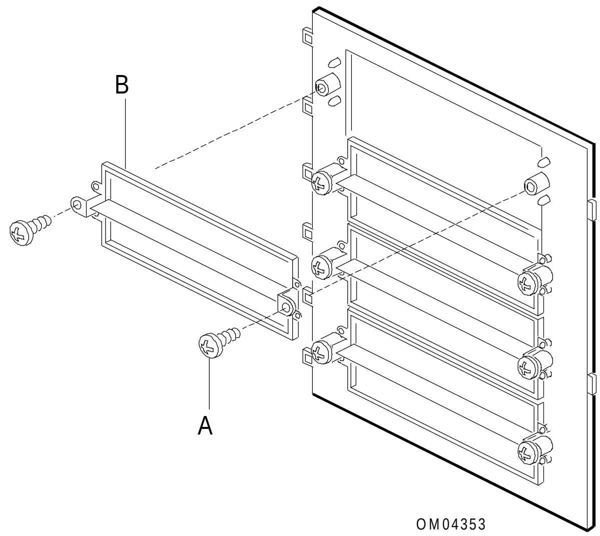


A	Two snap-in tabs that secure plastic frame (inside chassis, behind the bay)
B	Frame hinge tabs location (not shown)
C	Plastic filler panel frame

6. Place the frame face down on a soft surface to prevent marring it.

7. Remove the screws and filler panel from the bay in which you are installing a drive. The following figure shows how to remove the filler panel. Save the filler panel and screws to reuse (if you remove a drive from a bay later and do not reinstall one).

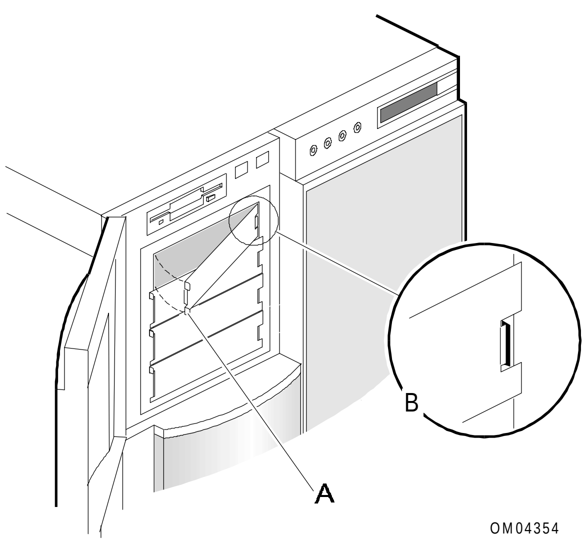
Removing Filler Panel from 5.25-inch Drive Bay



A	Screws
B	Filler panel

8. Remove the metal EMI shield from the bay opening by pushing the tabs (at the left side of the shield) slightly to the right while pulling out. Pull the right side hinge tabs out from the chassis slot. The following figure shows how to remove the EMI shield. Save the shield to reuse (if you remove a drive from a bay later and do not reinstall one).

Removing EMI Shield from 5.25-inch Drive Bay

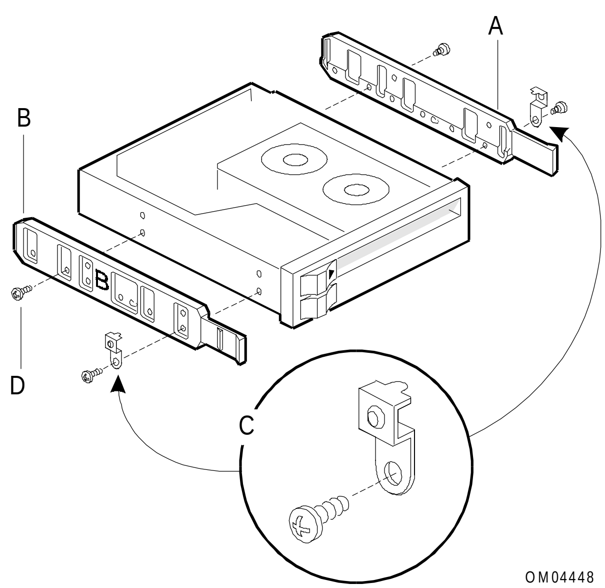


A	Tab on left edge of EMI metal shield
B	Right side hinge tabs, detail

9. Remove drive from protective wrapper and place on an antistatic surface.
10. Record the drive model and serial number in your equipment log.
11. Set any jumpers or switches according to the instructions in the drive manufacturer's documentation.
12. Attach two plastic snap-in slide rails to the drive, using two screws of the appropriate size and length (not supplied).
    - Attach slide rail A to the **right** side of the drive.
    - Attach slide rail B and an EMI/ESD grounding clip to the **left** side of the drive. Install the grounding clip under the screw head toward the front of the drive.

    The following figure shows how to attach the slide rails and grounding clips.

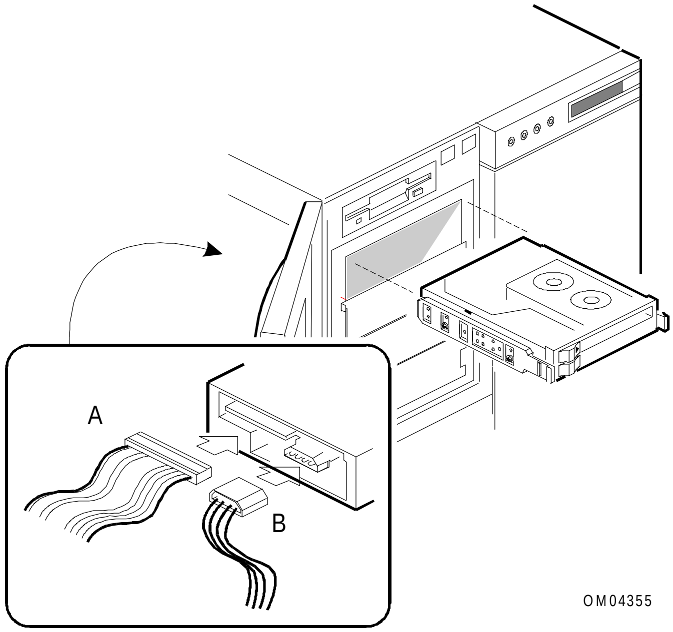
Attaching Slide Rails and Grounding Clips to Removable Media Drive



A	Snap-in slide rail A (right side of drive)
B	Snap-in slide rail B (left side of drive)
C	Grounding clips (attach at front screwholes on rails A and B)
D	Four screws (two per rail)

13. Engage the plastic slide rails in the bay guide rails. Push drive into the bay until the slide rails lock in place. The following figure shows how to install the drive in the bay.

Installing 5.25-inch Drive in Bay



A	Signal cable
B	Power cable

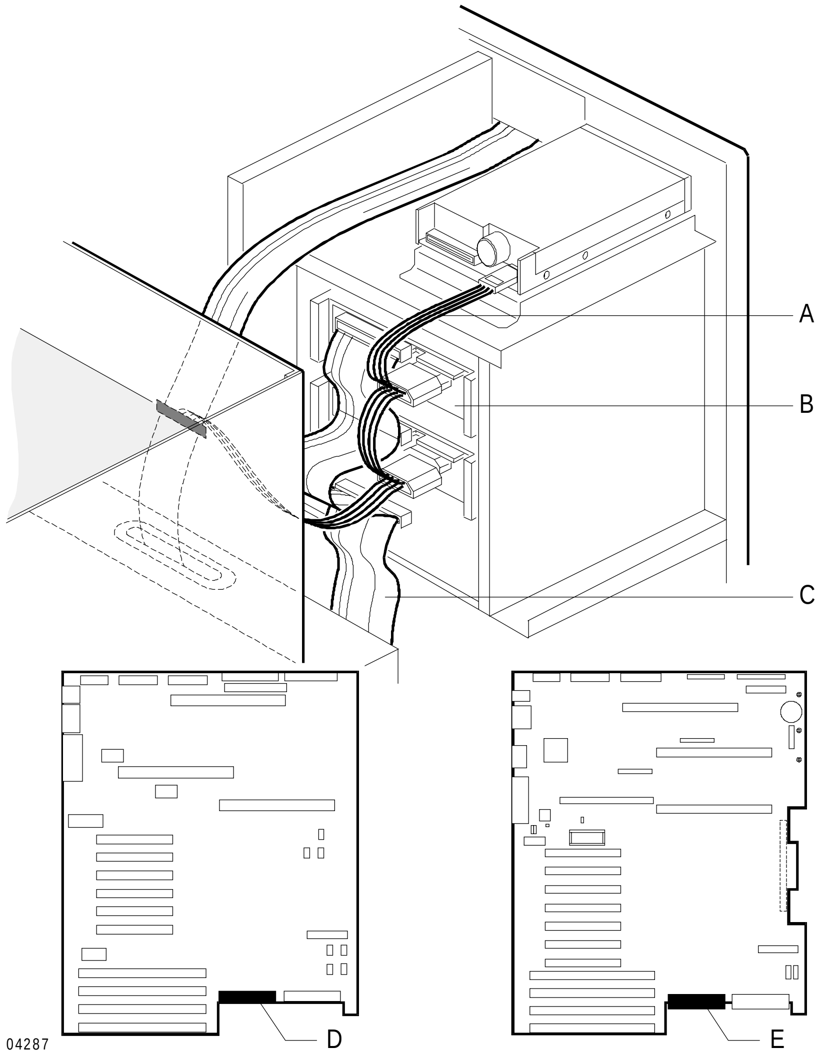
14. Connect a power cable to the back of the drive. Power cables are provided in the chassis for removable media drives (including the diskette drive that is factory-installed).

    These cables are interchangeable; you can connect any one of them to any device you install in the bays. The connectors are keyed and can be inserted in only one way.

15. Connect a signal cable to the back of the drive. If the narrow SCSI cable is already connected to devices in the 5.25-inch drive bays, add your drive to the cable. The narrow SCSI has active bus termination at the end of the cable, so you should remove termination from the drive. The following figure shows how cables are routed to a 5.25-inch drive.

16. Reinstall the filler panel frame and the side cover. Close the small bezel door.

Routing 5.25-inch Drive Cables



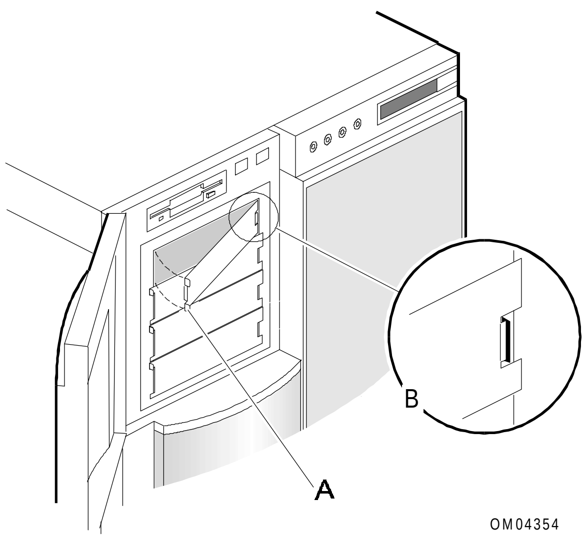
A	Power cable (example, only one shown)
B	Removable media drive at end of narrow SCSI cable
C	Narrow SCSI cable
D	SCSI channel B connector on R1 system board
E	SCSI channel B connector on R2 primary system board

Removing 5.25-inch Drives (Removable Media)

To remove 5.25-inch drives:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the left side cover (as viewed from the front).
3. Disconnect the signal and power cables from the back of the drive.
4. Slide drive out the front of the bay, and place on an antistatic surface.
5. Remove and save plastic snap-in slide rails, grounding clip, and screws (refer to the “Attaching Slide Rails and Grounding Clips to Removable Media Drive” figure in the previous section).
6. Place drive in an antistatic wrapper.
7. If you are not reinstalling the same or another drive, perform the following steps:
    a. Install a metal EMI shield to cover the empty bay. On the right edge of the shield, engage the middle hinge tab in the chassis slot at the right side of the bay.
    b. The upper and lower hinge tabs should lie outside the chassis. Push in the left side of the shield until the left side tabs snap into place. The following figure shows how to install an EMI shield.

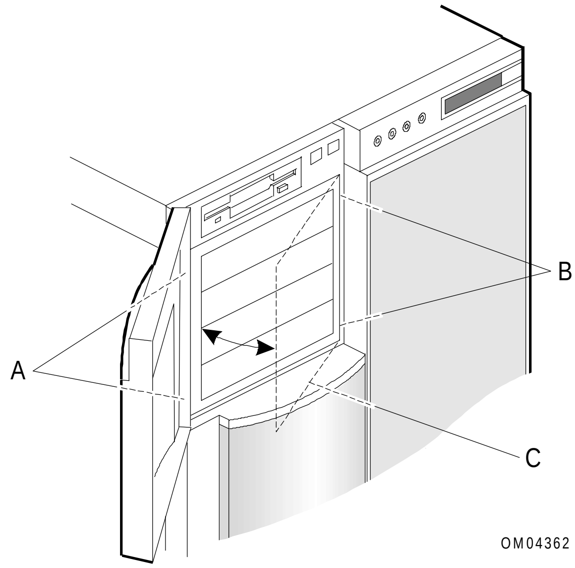
Installing EMI Shield on 5.25-inch Drive Bay



A	Tab on left edge of EMI metal shield
B	Detail of right side hinge tabs

    c. Install a filler panel in the bay frame. First remove the frame from the chassis. Reach from the side behind the bay, and press on two snap-in tabs. Swing frame out to the right.
    d. Remove frame by disengaging the hinge tabs at the right edge of the frame. The following figure shows how to remove the frame.

Removing Plastic Frame from 5.25-inch Drive Bays

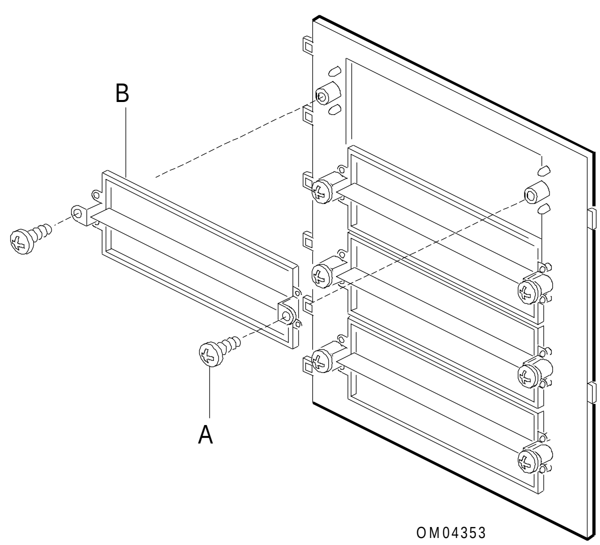


A	Two snap-in tabs that secure plastic frame (inside chassis, behind the bay)
B	Frame hinge tabs location (not shown)

e. Place the frame face down on a soft surface to prevent marring the front of it.

f. Use two screws to install a filler panel in the opening corresponding to the empty bay. The following figure shows how to install a filler panel.

Adding Filler Panel to 5.25-inch Frame



A	Screws
B	Filler panel

g. Reinstall the filler panel frame and the side cover. Close and lock the small front bezel door.

Installing or Swapping a SCSI Drive in a Hot-Swap Bay

This section describes installing a new drive in or swapping out a faulty drive from one of the 12 hot-swap drive bays.

General Guidelines

Note the following general guidelines before installing or swapping SCSI drives:

- The 3.5-inch SCSI drives must use the industry standard 80-pin Single Connector Attach (SCA) connector.
- Each drive must be installed in the carrier supplied with the drive, which enables hot-swapping. The drive is mounted in the carrier, and the carrier is inserted in the drive bay. The carrier has a locking handle that secures the drive/carrier assembly in the SCSI bay.
- If installing new drives, follow an installation scheme starting with the top left drive. Fill the bays left to right, across the top row, and then move down a row.
- **For 9 GB SCA drives with the following model number only**, make sure the jumper on the front of the drive is removed before installing the drive:

  ST19171WC

Ultra SCSI Drive Considerations

Note the following special considerations for Ultra SCSI drives:

- Depending on the type of controller, enable the appropriate option (see the following table) for each SCSI channel that connects to a backplane populated with Ultra SCSI drives. Disable the appropriate option for each channel that connects to a backplane populated with non-Ultra SCSI drives.

If the controller is…	Then enable this option for Ultra SCSI support…
Onboard SCSI channel A, B, or C or an add-in Adaptec™ controller	"Support for Ultra SCSI Speed" through the Adaptec SCSI*Select*™ Utility
Mylex® RAID	"20MHz" through the DACCFG Utility (Advanced Functions menu)

- If you enable Ultra SCSI support for a SCSI channel (SCSI IDs 0 through 6), then all drives on that SCSI I/O bus must be Ultra SCSI drives. It is possible, however, for one internal backplane to contain all Ultra SCSI drives and the other internal backplane to contain all non-Ultra SCSI drives.

CAUTION: Use supported Ultra SCSI drives only. Use of unsupported drives may result in data corruption. Ultra SCSI is supported for drives with part numbers 006-3301726 or greater. Ultra SCSI is not supported for drives with the following model numbers:

st32550WC
st15150WC

Identifying a Faulty Drive

If a fault LED (yellow light) above a SCSI drive is on steadily, this indicates that the drive below it has been flagged as faulty by the SCSI host controller. Follow the procedure described in this section to remove the faulty drive and swap in a good one.

Drive Installation Cautions

Electrostatic discharge (ESD) and ESD protection. ESD can damage disk drives, boards, and other parts. This system can withstand normal levels of environmental ESD while you are hot-swapping SCSI hard drives. However, we recommend that you perform all procedures in this chapter only at an ESD workstation or provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground—any unpainted metal surface—on the system when handling parts.

Install or swap SCSI drives without turning off power. This is one of the few system procedures that is safe to do with the system power left on. This is true only for the drive/carrier assemblies in the hot-swap bays, **not for drives in any other bays**.

Wait until the drive spins down. When the fault LED above a SCSI drive indicates a drive fault (steady yellow light), you can remove the drive and swap in a replacement at any time when the drive is not being accessed, without needing to power down the system. However, drive manufacturers caution against moving a drive that is still spinning because of possible damage to the spindles. Allow 1 minute for a drive to spin down and rest before removing it.

Use the correct drive carrier. Some drives use plastic drive carriers. Other drives require aluminum drive carriers. Be sure to use the drive carrier provided in the drive kit. Performance is degraded if you use a plastic drive carrier with a drive that requires an aluminum drive carrier.

SCSI Drive Status LEDs

If you are swapping out a faulty SCSI drive, you can pinpoint which drive to remove by checking the status LEDs that occur in sets of three above each of the 12 drive bays.

The following table shows the meaning of the three LEDs that are located above each drive, from left to right.

Note: This table assumes that a SCSI host controller is installed to send SAF-TE control signals to the drive fault LED.

Power LED (green)	Activity LED (green)	Fault LED (yellow)	Description
◎ On	○ Off	○ Off	Drive powered on, no activity
◎ On	✳ Blink	○ Off	Drive powered on and being accessed
○ Off	○ Off	◎ On	Drive powered off; fault condition. Drive CAN BE replaced at this time.
◎ On	○ Off	✳ Slow Blink	Drive powered on, in recovery mode (that is, the drive array is being rebuilt). Drive SHOULD NOT be replaced at this time.
○ Off	○ Off	○ Off	There is no drive installed in the bay.

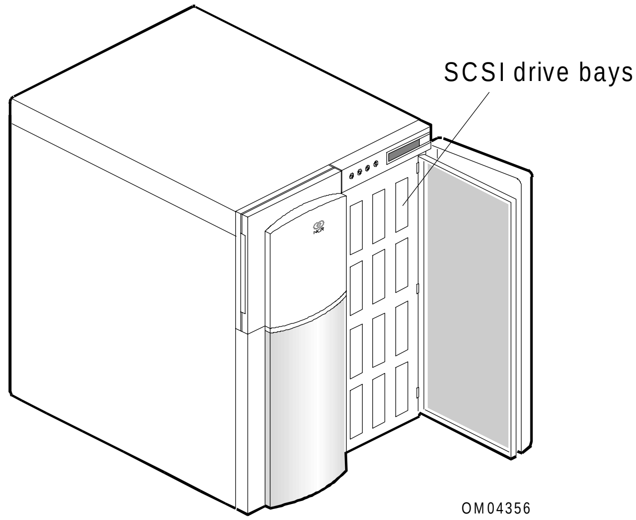
Installing or Hot-Swapping SCSI Drives

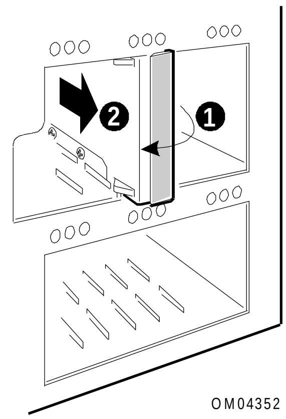
The procedure is basically the same to swap a drive or to install one for the first time. Perform the following steps:

1. Observe the drive installation cautions listed at the beginning of this section.
2. Open the right front exterior door (refer to the “Removing a Drive” figure).
3. Open the EMI metal panel in accordance with instructions in the “Installing the Front Bezel” section in Chapter 1.
4. If you are hot-swapping a SCSI drive, continue to step 5. If you are only installing a new drive, go to step 10.
5. Determine which drive has been flagged as faulty by reading the LEDs located above each drive bay.

6. Grasp the drive carrier and pull its locking handle toward you to release it from the bay.

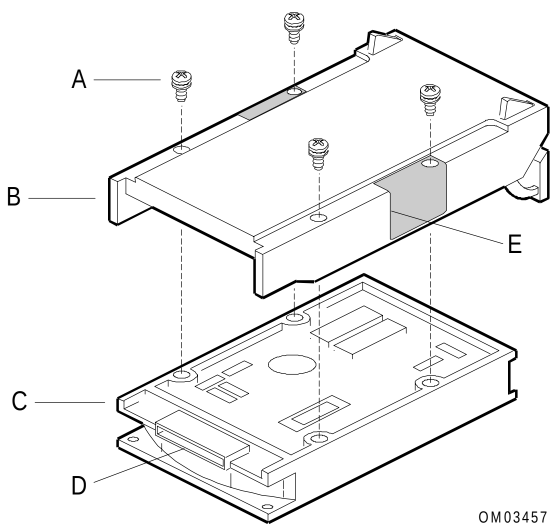
   Removing a Drive





7. Lay the unit on a flat surface, carrier side up.
8. Remove the four screws that hold the drive in the carrier. See the following figure for reference.

   Installing 3.5-inch SCSI Drive in Carrier for Hot-Swap Bays



A	Four screws
B	Drive carrier
C	Hard disk drive
D	Drive power and signal connector
E	EMI/ESD grounding clip (integral part of carrier)

9. Dispose of the drive appropriately. Save the screws and drive carrier for reuse.

   CAUTION: Some drives require an aluminum drive carrier. Be sure to use the aluminum drive carrier provided in the drive kit for these drives. Performance is degraded if you use a plastic drive carrier with a drive that requires an aluminum drive carrier.

10. Remove the new drive from its protective wrapper, and place it on an antistatic surface.
11. Record the drive model and serial number in the *System Site Log*.
12. Install the new drive in the drive carrier as follows.
    a. Orient the drive so the power and signal connector is on the top side.
    b. Place the carrier on top of the drive. Attach carrier using four screws of appropriate size and length (screws not supplied). The carrier includes EMI/ESD grounding clips that make contact with the drive through two of the screws.

    Note: Label all new SCSI drives.

13. Align drive/carrier assembly so it engages the guide rails in the bay.
14. Gently push the assembly into the bay until the drive docks with the backplane connector.
15. Push the locking handle on the carrier to the right until it locks around the small metal posts.
16. Close the EMI metal panel, and secure with three thumbscrews.
17. Close the front exterior panel.

SCSI Drive Backplane Connectors

The server can have both an upper and a lower SCSI drive backplane or an upper SCSI drive backplane only. The upper and lower SCSI drive backplanes are identical.

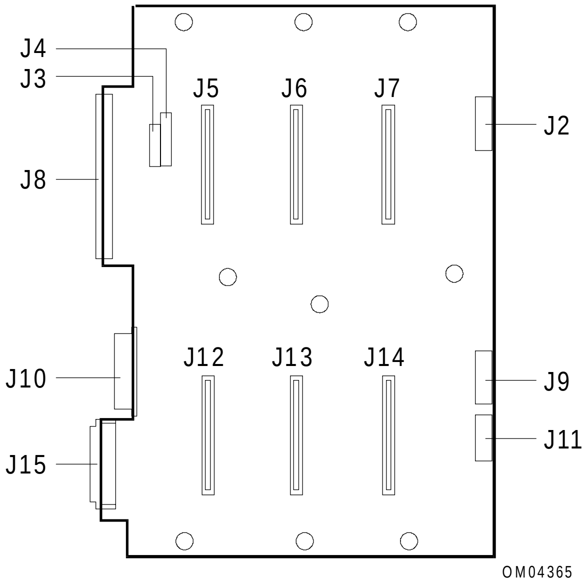
A SCSI drive backplane:

- Is configured as a SCSI bus
- Automatically terminates the full 16-bit-wide bus
- Gets power at J10 from the power distribution backplane
- Gets signal input at J15 from one of the following sources:
  - SCSI Channel A on the primary system board
  - SCSI Channel C on the secondary system board
  - An add-in SCSI adapter or RAID controller

The SCSI drives get signal input and power from connectors J5 through J7 and J12 through J14 on the backplane.

The following figure shows the connector locations on the SCSI drive backplane. Refer to this figure as you perform installation and removal procedures.

SCSI Drive Backplane Connector Locations



J3, J4	Drive ID and configuration jumper blocks	
J8	Narrow SCSI cable, output (not used)	
J10	Power and ground from power distribution backplane	
J15	Wide SCSI cable, input from SCSI channel A, SCSI channel C, or add-in SCSI adapter (PCI or EISA)	
J2	LED connector cable for drives 1, 2, 3	
J9	LED connector cable for drives 4, 5, 6	
J11	I^2C bus connector	
J5	Wide SCSI drive bay	Drive 1, ID 0 (default)
J6	Wide SCSI drive bay	Drive 2, ID 1 (default)
J7	Wide SCSI drive bay	Drive 3, ID 2 (default)
J12	Wide SCSI drive bay	Drive 4, ID 3 (default)
J13	Wide SCSI drive bay	Drive 5, ID 4 (default)
J14	Wide SCSI drive bay	Drive 6, ID 5 (default)

Connecting the SCSI Drive Backplanes to the System Boards

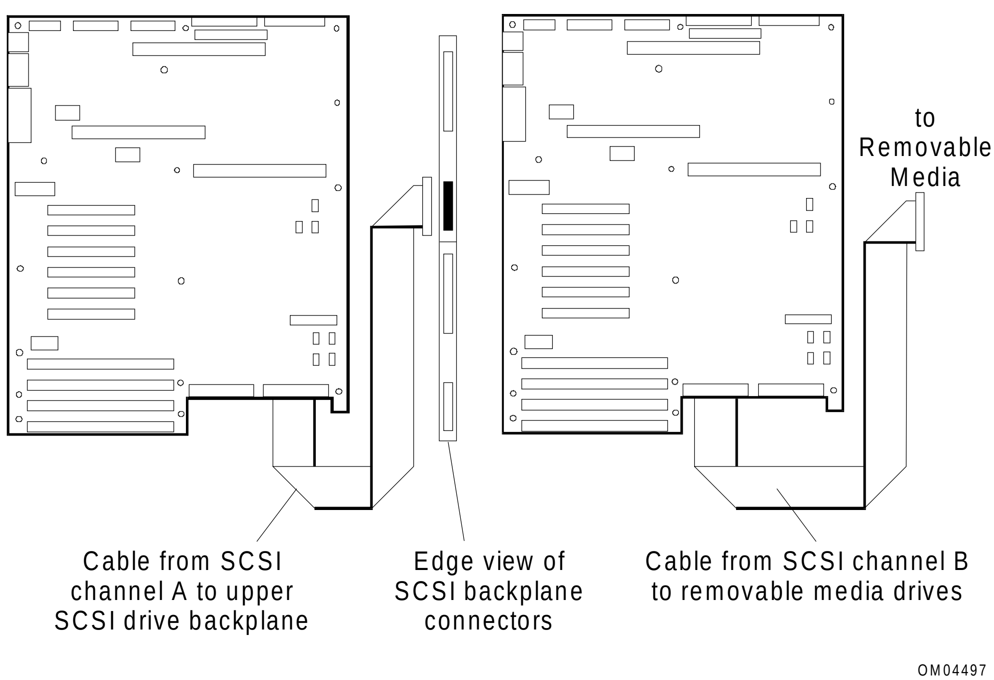
This section illustrates five ways of connecting the SCSI drive backplanes to the system board(s):

- One SCSI drive backplane connected to the onboard Adaptec controller
- One SCSI drive backplane connected to a Mylex RAID controller
- Two SCSI drive backplanes, one connected to the onboard Adaptec controller and the other connected to an Adaptec host adapter
- Two SCSI drive backplanes connected to a Mylex RAID controller
- Two SCSI drive backplanes connected to onboard Adaptec controllers

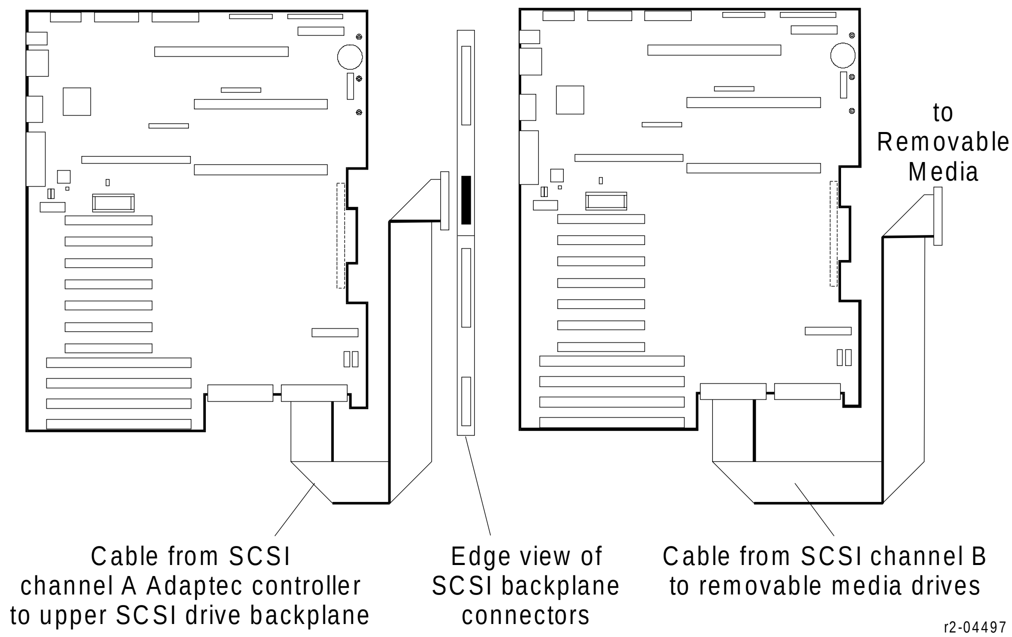
One SCSI Drive Backplane Connected to Onboard Adaptec Controller

If there is a single SCSI drive backplane, you can connect it to the Adaptec controller on the primary system board. The following figures show cable routing from SCSI channels A and B on the R1 and R2 system boards.

Cable Routing from R1 System Board to Upper SCSI Backplane and Removable Media



Cable Routing from R2 Primary System Board to Upper SCSI Backplane and Removable Media

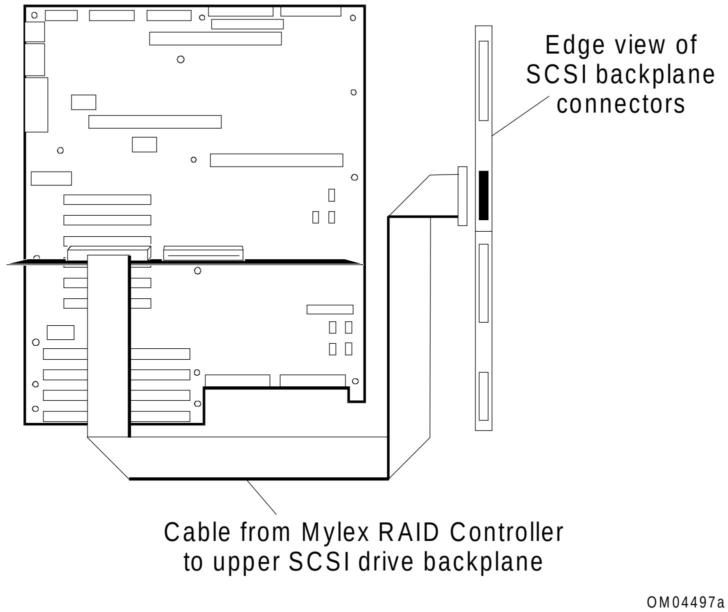


One SCSI Drive Backplane Connected to a RAID Controller

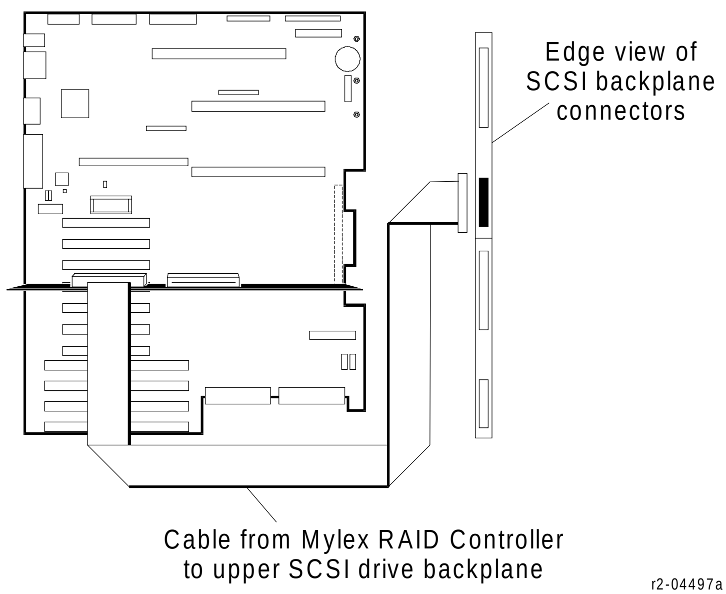
You can connect a single SCSI drive backplane to channel 1 of a RAID Controller (Mylex) rather than to the onboard Adaptec (SCSI channel A). The following figures show cable routing from the Mylex RAID Controller to the upper SCSI drive backplane.

Important: If the server is running UNIX® MP-RAS and the RAID controller is controlling the boot disk, the RAID controller **must be** in the fourth PCI slot from the top on the primary system board.

Cable Routing from R1 System Board (Mylex RAID Controller) to Upper SCSI Drive Backplane



Cable Routing from R2 Primary System Board (Mylex RAID Controller) to Upper SCSI Drive Backplane



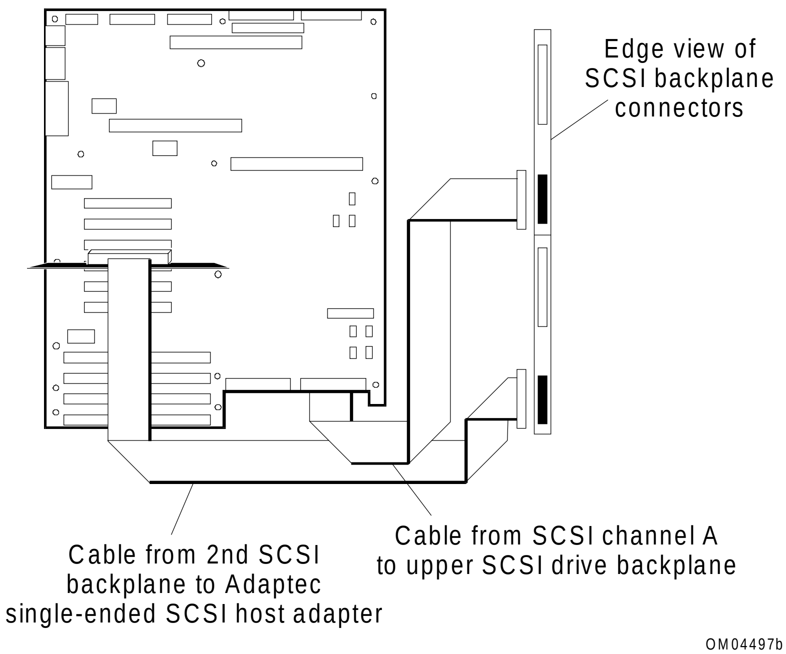
Two SCSI Drive Backplanes with Add-In Adaptec Supporting Second Backplane

One method of connecting two SCSI drive backplanes is as follows:

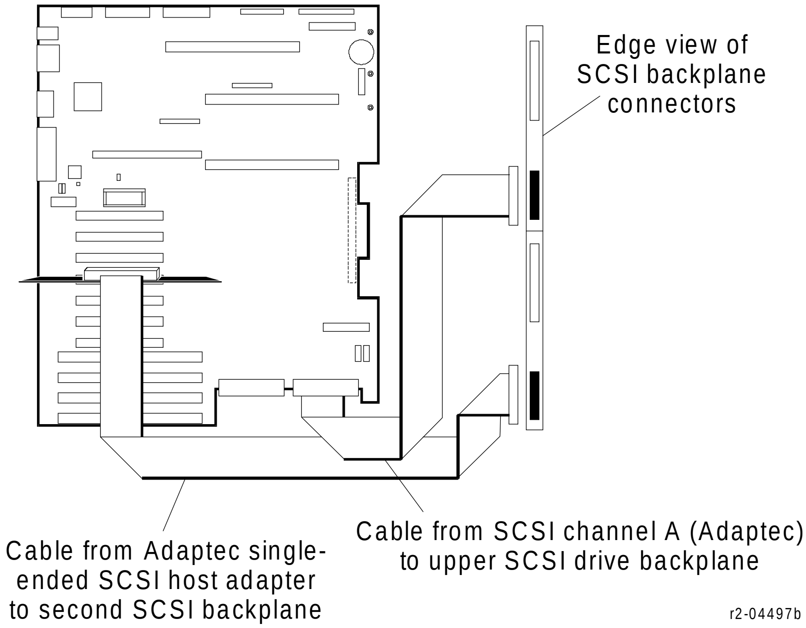
- Upper SCSI drive backplane connected to the onboard Adaptec controller (SCSI channel A)
- Lower SCSI drive backplane connected to an Adaptec single-ended SCSI host adapter. If the server is running UNIX MP-RAS and this adapter is controlling the boot disk, the adapter **must be** in the fourth PCI slot on the primary system board.

The following figures show cable routing from the onboard Adaptec controller to the upper SCSI backplane and from an Adaptec adapter in the fourth slot on the primary system board to the lower SCSI drive backplane.

Cable Routing from R1 System Board (Adaptec) to Two SCSI Drive Backplanes



Cable Routing from R2 Primary System Board (Adaptec) to Two SCSI Drive Backplanes

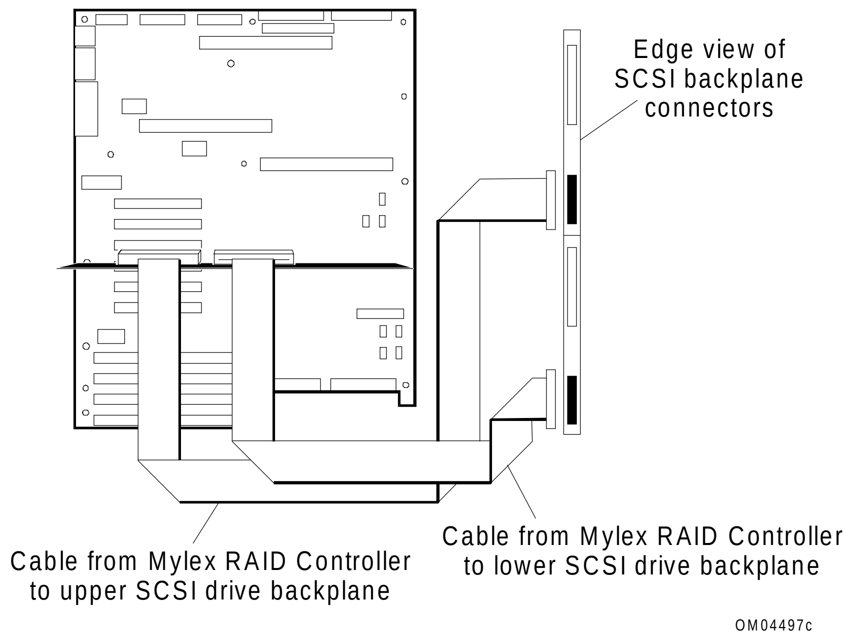


Two SCSI Drive Backplanes Connected to a RAID Controller

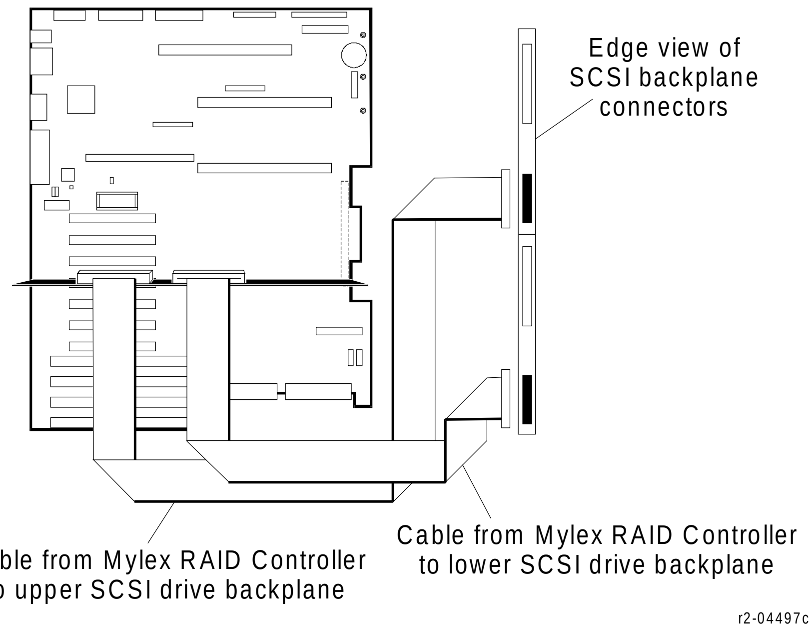
If there are two SCSI drive backplanes, you can connect both to a Mylex RAID Controller. If the server is running UNIX MP-RAS, the RAID Controller must be in the fourth PCI slot on the primary system board.

The following figures show cable routing from a Mylex RAID Controller (channels 1 and 2) to the upper and lower SCSI drive backplanes, respectively.

Cable Routing from Mylex RAID Controller to Upper and Lower SCSI Drive Backplanes (R1 System Board)



Cable Routing from Mylex RAID Controller to Upper and Lower SCSI Drive Backplanes (R2 Primary System Board)



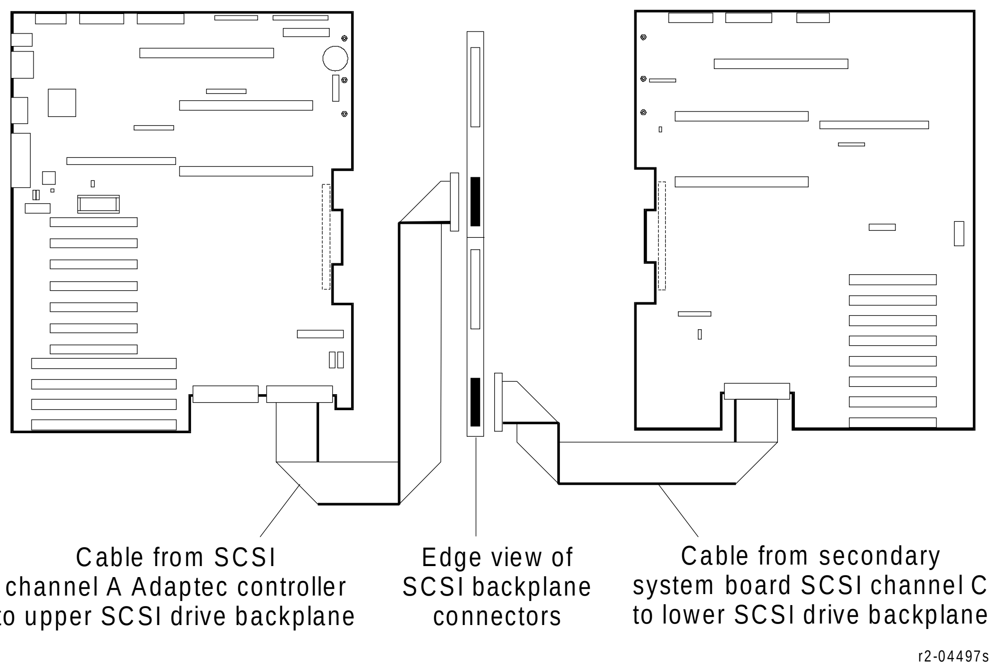
Two SCSI Backplanes Connected to Onboard Adaptec Controllers (R2 System Boards Only)

If the server has both the R2 primary and secondary system boards, you can connect two SCSI drive backplanes as follows:

- Upper SCSI drive backplane to the onboard Adaptec controller on the primary system board (SCSI channel A)
- Lower SCSI drive backplane to the onboard Adaptec controller on the secondary system board (SCSI channel C)

The following figure shows this type of connection.

Cable Routing from R2 Primary and Secondary System Boards to Upper and Lower SCSI Backplanes



Removing and Installing a SCSI Drive Backplane

The "SCSI Drive Backplane Connector Locations" figure in the "SCSI Drive Backplane Connectors" section shows the connector locations on a SCSI drive backplane. Refer to this figure when performing the procedures in this section.

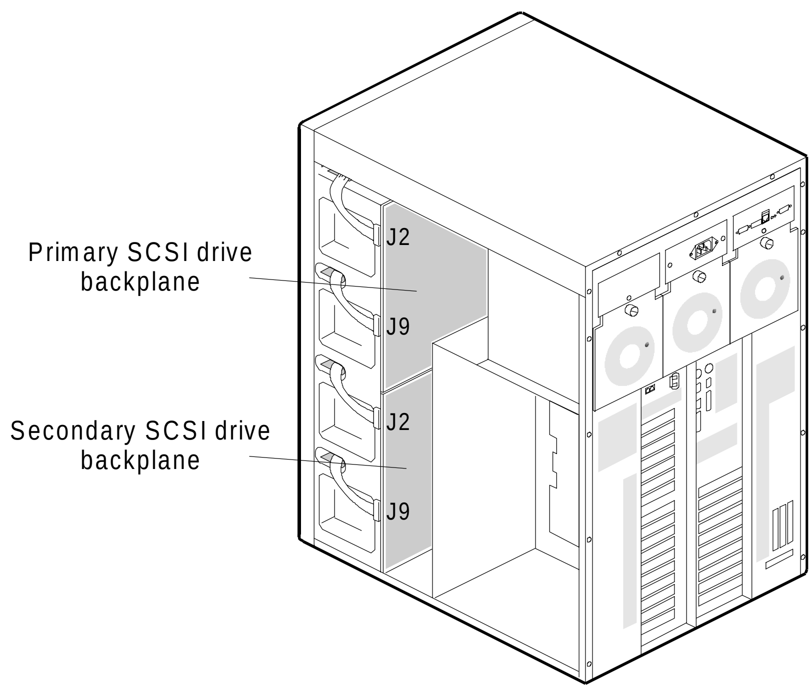
Removing a SCSI Drive Backplane

To remove a SCSI drive backplane:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove all SCSI drive/carrier assemblies from the bays that connect to the backplane you are removing. To remove an assembly, pull its locking handle toward you to release it from the bay. Lay each unit on a flat, antistatic surface.

   Note: Label all SCSI drives for proper reinstallation.
3. Remove the side cover from the side of the chassis where the SCSI hard drives are located (the right side, if viewed from the front).

   Location of SCSI Drive Backplanes



4. Carefully remove the fan assemblies on this side from the chassis. Do not let the inner fan fall out of the fan assembly.
5. Label and disconnect all cables attached to the SCSI backplane (at least four cables).
6. Remove and save nine screws from the SCSI backplane. Use a right-angle #2 Phillips screwdriver to access the three screws nearest the chassis center. (Refer to the figure in the following subsection for an illustration of screw locations.)

7. Lift the backplane off the two locator pins at the top. Hold it by the top edge or upper corners, being careful not to scrape it against other system components. Place the board component-side up on an antistatic surface.

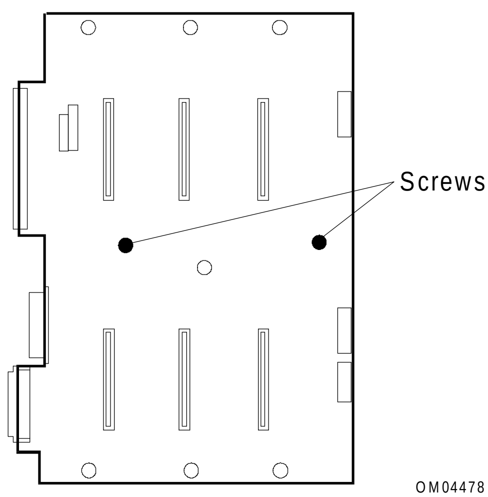
Installing a SCSI Drive Backplane

To install a SCSI drive backplane:

1. Before installing a SCSI drive backplane, verify the following jumper settings:
   - SCSI drive ID jumpers at J3 and J4 are set to their factory default settings
   - Secondary jumper at J4 is set correctly (primary if you are installing the upper backplane, secondary if you are installing the lower backplane)

   See the following section, "Setting SCSI Backplane Configuration Jumpers," for details.
2. Position the backplane on the SCSI drive chassis, using the screwholes as guides.
3. To align the backplane correctly, first install the two screws (marked "Screws A") across the middle of the backplane, as highlighted in the following figure. Then install the remaining seven screws. Use a right-angle #2 Phillips screwdriver to insert and tighten the three screws nearest the chassis center.

   Secure SCSI Backplane Beginning With Screws A



4. Reconnect all cables to the backplane. The SCSI signal cables have precise folds that are intended to help the cables fit in the space allowed and to correctly orient the pin 1 side of the cable(s) (red stripe).
5. Reinstall any boards you needed to remove to gain access to the backplane connectors.
6. Reinstall the fans.
7. Reinstall the side cover.
8. Install SCSI drives in the bays that connect to the backplane in accordance with instructions in an earlier section, "Installing or Swapping a SCSI Drive in a Hot-Swap Bay."
9. Run the SCSI*Select* Utility to check system function.

Setting SCSI Backplane Configuration Jumpers

This section contains information about the following SCSI backplane configuration jumpers:

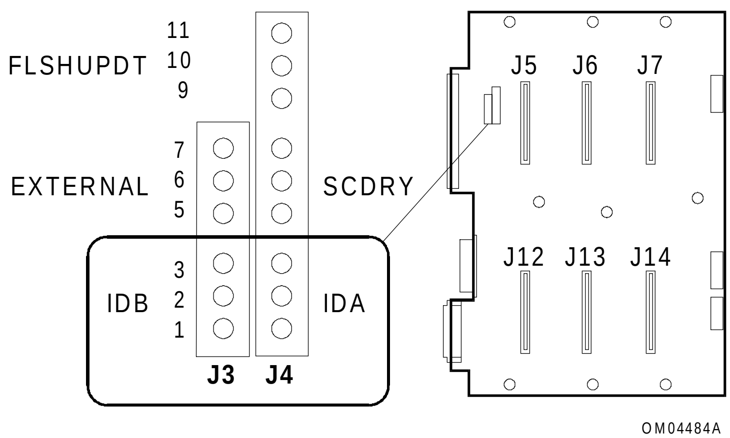
- SCSI Drive ID jumpers
- SCSI Flash Update jumper
- External Backplane jumper
- Secondary jumper

SCSI Drive ID Jumpers, J3 and J4

Program control must read the drive ID to correlate a drive fault message to the appropriate fault light over a drive bay. The SCSI microcontroller on the SCSI backplane is always set to SCSI ID 6. The various configurations allow unused SCSI IDs to be used for narrow SCSI devices like a CD-ROM or tape backup drive.

The following figure shows the location of the jumper block on the SCSI backplane. The table shows the ID configuration choices for each drive.

SCSI Drive ID Jumper Blocks on SCSI Drive Backplane



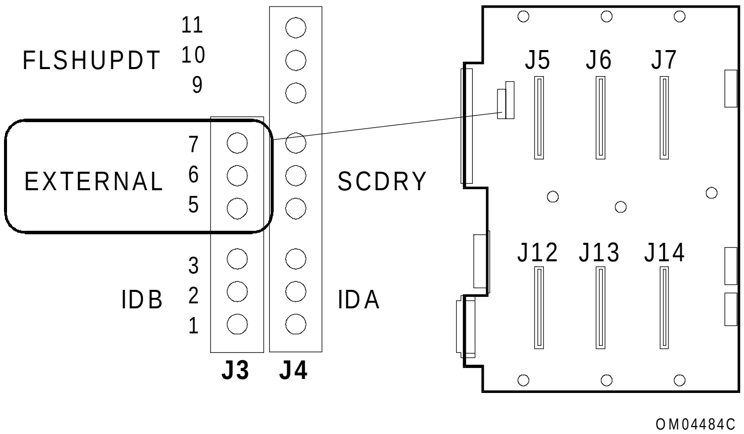
Jumper pins at		To select SCSI IDs for drives:					
J3	J4	Drive 1 (J5)	Drive 2 (J6)	Drive 3 (J7)	Drive 4 (J12)	Drive 5 (J13)	Drive 6 (J14)
1-2*	**2-3***	**0**	**1**	**2**	**3**	**4**	**5**
1-2	1-2	0	1	10	3	4	13
2-3	2-3	8	9	2	11	12	5
2-3	1-2	8	9	10	11	12	13

*** Factory default settings shown in boldface.**

External Backplane Jumper, J3

The following figure shows the location of the external backplane jumper block on the SCSI backplane.

External Backplane Jumper Block



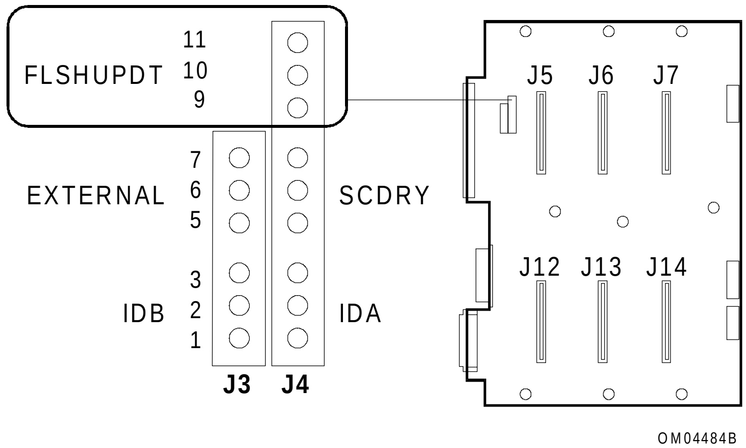
Pins	Description
5-6	Internal backplane, factory default
6-7	External backplane

A jumper should be on pins 5 and 6 on J3 when the backplane is located in the host server chassis. A jumper should on pins 6 and 7 when the backplane is located in an external chassis (for example, a peripherals-only chassis). In the latter case, the jumper setting enables the backplane to assume basic enclosure services associated with the front panel. Such services are normally done by the system board in the host chassis.

SCSI Flash Update Jumper, J4

The following figure shows the location of the Flash Update jumper block on the SCSI backplane.

SCSI Flash Update Jumper Block



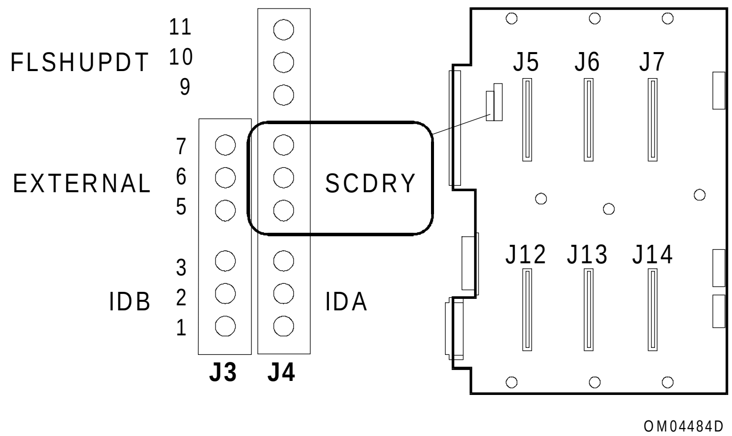
Pins	Description
9-10	Normal, factory default
10-11	SCSI flash update recovery

For normal operation, the jumper should be on pins 9 and 10 at J4. To allow a SCSI update to be flashed into ROM on the backplane, move the jumper to pins 10 and 11 at J4.

Secondary Jumper, J4

The following figure shows the location of the secondary jumper block on the SCSI backplane.

Secondary Jumper Block



Pins	Description
5-6	Primary, factory default
6-7	Secondary

If there is only one SCSI backplane in a server chassis, the backplane is jumpered as primary; this backplane is in the upper bay position. If there is more than one SCSI backplane in the chassis, the upper backplane is jumpered as primary so that it controls the single front panel fault light and reports other enclosure functions to the host system board. The second, lower backplane must be jumpered as secondary. The secondary backplane reports its functions to the primary backplane.

Updating SCSI Hot-Swap Backplane Firmware

The SCSI backplane firmware is stored in nonvolatile memory on the backplane. You can easily update the firmware without replacing the memory device. This section describes the normal procedure for updating the backplane firmware with the **HSUPDAT** Utility.

Once a firmware update has begun, it must be completed. The transfer immediately overwrites existing data. If an update is prematurely terminated, the normal operation mode of the backplane processor may not work correctly. A partial update may prevent entry into firmware transfer mode. You must then perform a recovery procedure (see “Recovering SCSI Hot-Swap Backplane Firmware” later in this chapter).

Command Line Format

Use the following command line format when running the **HSUPDAT** Utility:

HSUPDAT *<switches> source_file*

The following table provides information about variables that you can use in the command line:

Item	Description	
HSUPDAT	Name of the utility.	
<switches>	Not case-sensitive; defined as follows:	
	-b	Source file is in binary. The utility defaults to Intel® Hex 86 format if the -b switch is not specified.
	-p1, -p2	Specifies the hot-swap backplane to be updated. -p1 indicates primary controller; -p2 indicates secondary controller. Default (no -p*X* switch specified) is to program both.
source_file	Name of the source file to be used for the update. If you do not specify the source file, the utility prints the status and version information about the processors.	

Using the Correct Version of the Utility and Source File

When you update the SCSI backplane, make sure you use the correct version of the source file and **HSUPDAT** utility.

The name of the update source file is in the format **hs***xxyy***.hex**, where *xx* is the major operational code version number and *yy* is the minor version. For example, the source file name for firmware version 1.11 would be **hs0111.hex**.

The source file you use for the update must have the same major operational code version number as the current backplane firmware. The following table shows the versions of the **HSUPDAT** Utility and the source file required to update different levels of firmware:

If the backplane firmware version is…	Then use HSUPDAT Utility Version…	and source file version…
1.*yy*	1.*yy* or 2.*yy*	**hs01*yy*.hex**
2.*yy*	2.*yy*	**hs02*yy*.hex**

Note: R2 systems require SCSI drive backplanes which support firmware version 2.10 or later. A SCSI drive backplane replacement is required to update from 1.*yy* firmware to 2.*yy* firmware.

CAUTION: Do not attempt to use **HSUPDAT** Utility version 1.01 to update a SCSI drive backplane with 2.*yy* firmware. Doing so makes it necessary to replace the SCSI backplane. Use **HSUPDAT** Utility version 2.03 or greater to update a SCSI drive backplane with 2.*yy* firmware. Version 2.03 also supports 1.*yy* firmware updates.

Update Procedure

To update the SCSI backplane firmware:

1. Get an update from your customer sales representative or dealer and copy the files to a DOS-bootable diskette. You do not need to remove drives or boards for a normal update.
2. Insert the update diskette in the A: drive and reboot the system.
3. Enter the following at the DOS prompt to display a list of the files on the diskette:

   dir
4. Enter the following command to display current version information for the update utility and the firmware on both backplanes:

   HSUPDAT

   Two sets of firmware version information display, one for the Operating Code and one for the FLASH Loader. The FLASH Loader code is permanent and does not get updated.

   Note: If the following message is displayed, ignore it:

   `Improper filename on the command line`

   Note: If for some reason the FLSHUPDT jumper on the SCSI backplane is in the update recovery position (pins 10-11 on J4), the system does not display the Operating Code version. The jumper must be in the normal (default) position (pins 9-10 on J4) for the system to display the Operating Code Version.

   CAUTION: After you run the **HSUPDAT** Utility, do not attempt to access the hard disk drives until you power-cycle the system. If you attempt to access Mylex drives before power-cycling the system, the system marks the drives as “dead” and you must run the Mylex utilities to put them back on-line. If you attempt to access non-Mylex drives, the system displays the `Abort, Retry, Fail` message.
5. If the **HSUPDAT** Utility is compatible with the current firmware, enter one of the following commands to update the SCSI backplane firmware:

Enter the following...	To...
`HSUPDAT hs`*`xxyy`*`.hex`	Update the firmware on both backplanes
`HSUPDAT -p1 hs`*`xxyy`*`.hex`	Update the primary backplane firmware
`HSUPDAT -p2 hs`*`xxyy`*`.hex`	Update the secondary backplane firmware

If the **HSUPDAT** Utility is **not** compatible with the current firmware, obtain the correct version from your customer sales representative or dealer.

6. Verify that the correct firmware version is now installed by entering the following command to display the version information for the firmware on both backplanes:

   HSUPDAT

   The Operating Code version should match that of the **.hex** file.

   Note: If the following message is displayed, ignore it:

   `Improper filename on the command line`

7. When the update process completes, remove the diskette from A: drive and power-cycle the system (turn the power off, wait a few seconds, and then turn the power on).

Recovering SCSI Hot-Swap Backplane Firmware

This section describes the procedure for recovering SCSI backplane firmware. For the normal SCSI firmware update procedure, see the previous section.

Once a firmware update has begun, it must be completed. The transfer immediately overwrites existing data. If an update is prematurely terminated, the normal operation mode of the backplane processor may not work correctly. A partial update may prevent entry into firmware transfer mode. You must then perform a recovery procedure.

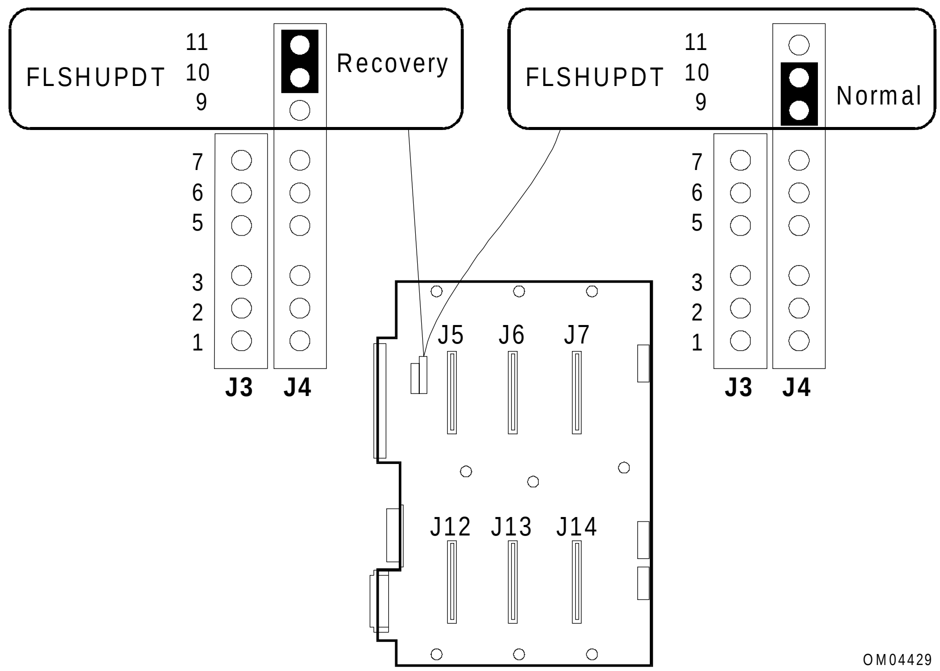
Recovery Procedure

To recover the SCSI backplane firmware:

1. Observe safety and ESD precautions at the beginning of this chapter.
2. If you have not already done so, create a bootable MS-DOS diskette and copy the update to the diskette.
3. Turn off the system, unplug the AC power cord, and turn the local battery disconnect switch to “Off.”
4. Open the right front exterior door and the metal EMI panel.
5. Remove SCSI hard drive 1 from the upper left drive bay of the primary (top) backplane. To create more working space, you may also want to remove hard drive 2. Refer to the “Installing or Swapping a SCSI Drive in a Hot-Swap Bay” section in this chapter for removal and reinstallation instructions.

6. Using a pen light and looking through the front of the empty drive bay, locate the configuration jumper block on the backplane. At J4 move the FLSHUPDT jumper from pins 9 and 10 to pins 10 and 11 to allow for SCSI flash update recovery.

FLSHUPDT Jumper, Recovery and Normal Positions



7. Reinstall the hard drive(s).
8. Insert the update diskette in A: drive.
9. Plug in the AC power cord and turn on the system. Follow the displayed prompts.
10. Run the **HSUPDAT** Utility by entering commands as follows:

Enter the following...	To...
`HSUPDAT`	Retrieve and display the version information for the firmware on both backplanes; only the FLASH Loader version information may be displayed **Note:** If the following message is displayed, ignore it: `Improper filename on the command line`
`HSUPDAT hs`*`xxyy`*`.hex`	Update the firmware on both backplanes
`HSUPDAT -p1 hs`*`xxyy`*`.hex`	Update the primary backplane firmware
`HSUPDAT -p2 hs`*`xxyy`*`.hex`	Update the secondary backplane firmware

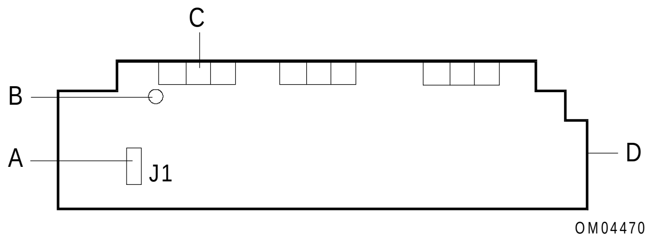
11. Turn off the system and unplug the AC power cord.
12. Remove the diskette from the A: drive.
13. Remove SCSI hard drive 1 from the upper left bay.
14. At J4, move the FLSHUPDT jumper from pins 10 and 11 back to pins 9 and 10.
15. Reinstall the hard drive(s).
16. Plug in the AC power cord, turn the local battery disconnect to “On,” and turn on the system.
17. Run **hsupdat.exe,** according to instructions in the previous section, to verify that the Operating Code is now the latest version.

Replacing a SCSI Drive Status LED Board

The system has four LED boards. Each provides status for three SCSI drives installed in the hot-swap bays.

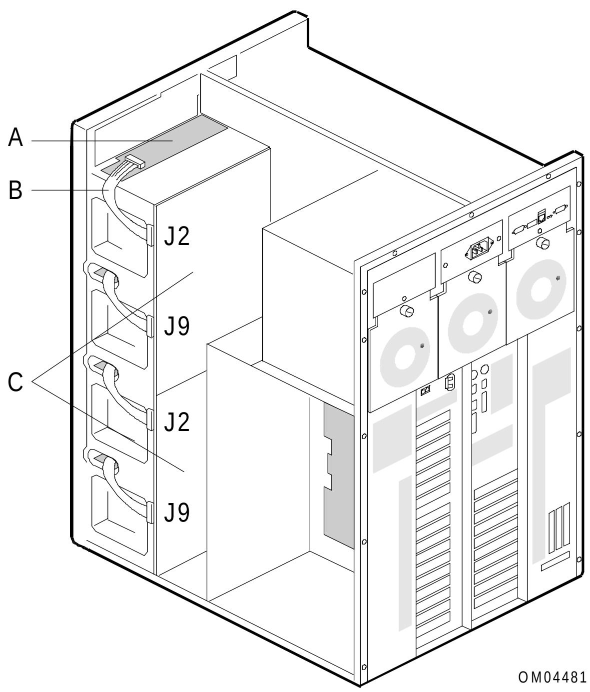
The following figures show the layout of the SCSI drive status LED board and its location.

Layout of the SCSI Drive Status LED Board



A	J1, cable to SCSI backplane
B	Hole for snap-in standoff
C	Status LEDs (three sets of three); insert board so these display in slots in front EMI panel
D	End facing slot in center divider

Location of SCSI Drive Status LED Boards



A	Status LED board (one board over each row of SCSI drives)
B	Cable from J1 on status LED board to J2 or J9 on SCSI backplane (one cable per LED board)
C	SCSI backplanes, upper and lower

Removing a SCSI Drive Status LED Board

To remove a SCSI drive status LED board:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the side cover from the SCSI drive bay side of the chassis.
3. Remove the top cover.
4. Label and disconnect the cable that goes from J1 on the status LED board to J2 or J9 on the SCSI backplane.
5. Pull up on the outside edge of the board to pop it off the standoff.
6. Slide board out of the bay area.

Installing a SCSI Drive Status LED Board

To install a SCSI drive status LED board:

1. Slide board into bay area with the LEDs facing forward. Make sure the left edge fits into the slot in the chassis center divider.
2. Place board so you can see the LEDs through the front openings. Press down the protruding end of the board to secure it on the standoff.
3. Connect the labeled cable from J1 on the LED board to J2 (for the upper two rows of drives) or J9 (lower rows) on the backplane.
4. Replace side and top covers.

Chapter 4

Power System

This chapter contains the following:

- Removing and installing power supplies
- Power subsystem specifications
- Battery support system
- Removing and installing the battery charger module
- Removing and installing batteries
- Removing and installing the battery disconnect switch assembly
- Removing and installing the power distribution backplane
- Removing and installing fuses

Tools and Supplies Needed

You need the following tools and supplies to perform the procedures described in this chapter:

- Phillips #1 and #2 screwdrivers
- Hexagonal-head nut driver
- Standard tip screwdriver
- #6 metric or socket wrench
- #8 metric or socket wrench
- Antistatic wrist strap and conductive foam pad (recommended)
- The *System Site Log* contains forms for recording information on system equipment and components, hardware service, software products, and preventive maintenance activities. Use these forms as you set up your system for the first time, integrate new parts or software into the system, service or troubleshoot system problems, and perform preventive maintenance.

Updating the Configuration History File

Whenever you install or replace a system component, update the configuration history file on the Diagnostic Partition. To update the configuration history file:

1. Boot to the Diagnostic Partition.
2. Select “Run Utilities and Diagnostics” from the MS-DOS Startup Menu.
3. Select “System Config Utils.”
4. Select “View Version Info.”
5. Select “Edit Config History.”

Warnings and Cautions

The following warnings and cautions apply throughout this chapter. Only a technically qualified person should integrate and configure the system.

You can install (or hot-swap) a power supply or the battery charger module while the power is on. For any other procedures discussed in this chapter, turn off system power and disconnect the AC power cord.

Warnings

System power on/off: The DC push-button on/off switch (a convex 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 cord from the wall outlet. If the system has internal battery backup power, you must also turn the local battery disconnect switch on the back of the chassis to “Off.”

Hazardous conditions, power supply: 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.

Hazardous conditions, power distribution backplane: Hazardous energy levels are present behind the protective cover over the power distribution backplane. There are no user-serviceable parts; servicing should be done by technically qualified personnel.

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

Cautions

Electrostatic discharge (ESD) and ESD protection: ESD can damage disk drives, boards, and other parts. We recommend that you perform all procedures in this chapter only at an ESD 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 the system when handling parts.

ESD, handling boards and modules: 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. Use a conductive foam pad if available but not the board wrapper. Do not slide board over any surface.

Ensure complete board insertion: When installing add-in boards, be sure that the boards are completely and correctly seated in the system board connectors before applying power. Incomplete insertion can result in damage to the system board and the boards being inserted.

Board support panel, proper cooling and airflow: For proper cooling and airflow, always install the board support panel for the processor and memory boards before installing the chassis side and top covers and turning on the system. Operating it without this support panel in place can damage system parts.

Chassis covers, proper cooling and airflow: For proper cooling and airflow, always install the chassis side and top covers before turning on the system. Operating it without these covers in place can damage system parts.

Removing and Installing Power Supplies

The power supplies are hot-pluggable. You do not need to remove AC power before removing or installing a power supply. However, if you remove a power supply with the power on, the server must have a redundant power supply configuration. Otherwise, an overload condition can occur and cause the system to shut down. Refer to Appendix A, “Power Supply Configuration.”

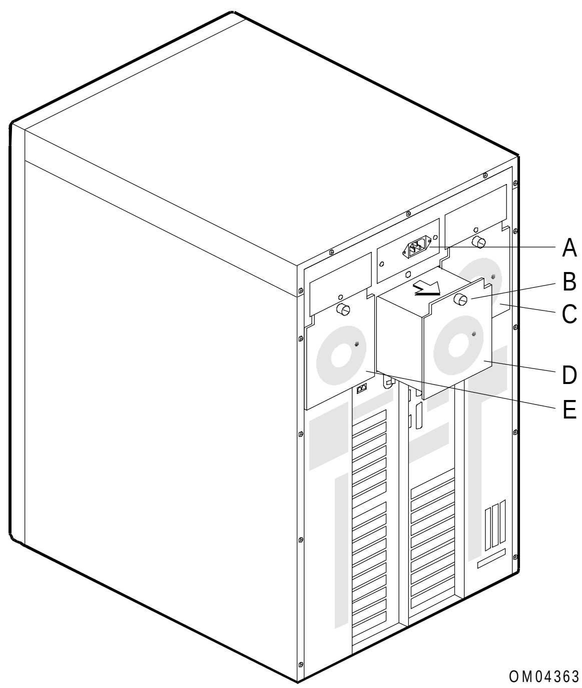
Removing a Power Supply

To remove a power supply:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Disengage the power supply by turning the thumbscrew at the top.
3. Carefully slide the power supply out of the chassis and place it on an antistatic surface.

The following figure shows the power supply modules.

Power Supply Modules



A	AC input module/connector for AC power cord
B	Thumbscrew
C	Hot-pluggable power supply 3
D	Hot-pluggable power supply 2
E	Hot-pluggable power supply 1

Installing a Power Supply

To install a power supply:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Slide the new or replacement power supply into the chassis.
3. Turn the thumbscrew to engage the power supply with the system (the thumbscrew controls the engagement of the power supply with the system).

CAUTION: Use hand tools only when inserting or removing a power supply. Do not use power tools.

Power Subsystem Specifications

The power subsystem consists of the following:

- Sheet metal rack that holds the power supplies
- Power distribution backplane
- Hot-pluggable power supplies
- AC input module
- Battery charger module
- Connections for internal batteries

A minimally loaded system runs adequately with one power supply. As you add memory, processors, and add-in-boards, you may want to consider adding an additional power supply.

The following table shows server power supply specifications:

Description	Specification
DC power	+3.3 V @ 33 A
	+5.1 V @ 46 A
	+12 V @ 28 A
	-5 V @ 0.5 A
	-12 V @ 1.5 A
	+5 V standby @ 1.0 A
AC line voltage (autoranging)	100-120 VAC
	200-240 VAC
AC line frequency	50/60 Hz
AC input current	4.0 A @ 100-120 VAC
	2.0 A @ 200-240 VAC

Note: Only single system board configurations can run on 100-120 VAC. Dual system board configurations require 200-240 VAC.

Maximum and Minimum VDC Output Load Rating, Each Supply

The following table shows the maximum and minimum VDC output load rating for each supply:

	+5.1	+12	+3.3	-12	-5	+5 V stand-by
Max	46 A	28 A	33 A	1.5 A	0.5 A	1.0 A
Min	1 A	3 A	0 A	0 A	0 A	0 A

Battery Support System

The battery support system consists of the following:

- Battery charger module
- Batteries
- Battery disconnect switch
- Battery cables

The following sections explain how to install and remove these parts.

Note: The battery support system allows the system to dump memory to disk if AC power is removed. If the system contains more than 1.5 GB of memory, an Uninterruptible Power Source (UPS) is recommended.

Removing and Installing the Battery Charger Module

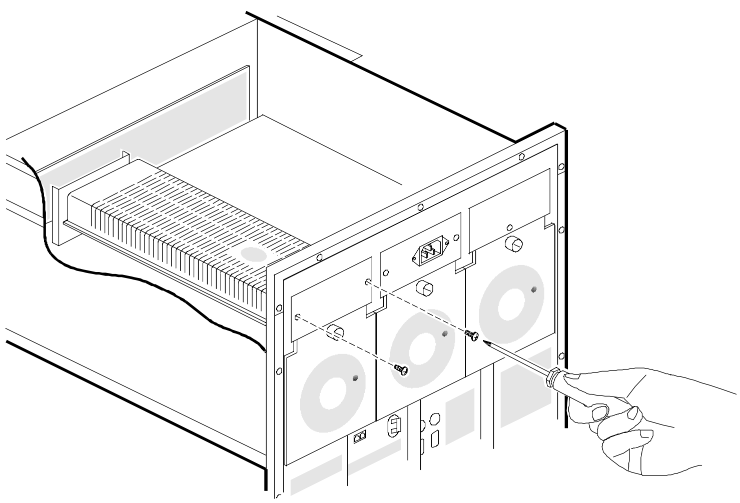
The battery charger module is hot-pluggable. You do not need to remove AC power before removing or installing the battery charger module.

Removing the Battery Charger Module

To remove the battery charger module:

1. Locate the battery charger module in the back of the server in the upper left area of the power supply rack (see following figure).
2. Loosen the two screws on the battery charger. These are captive screws; when you loosen them the battery charger module disengages from the mating connector.
3. When the screws disengage, slide the battery charger module out of the power supply rack.
4. Place battery charger module on an antistatic surface.

Battery Charger Module



Installing the Battery Charger Module

To install the battery charger module:

1. Insert the battery charger module into position in the upper left area of the power supply rack.
2. Secure the module with two screws.

Removing and Installing Batteries

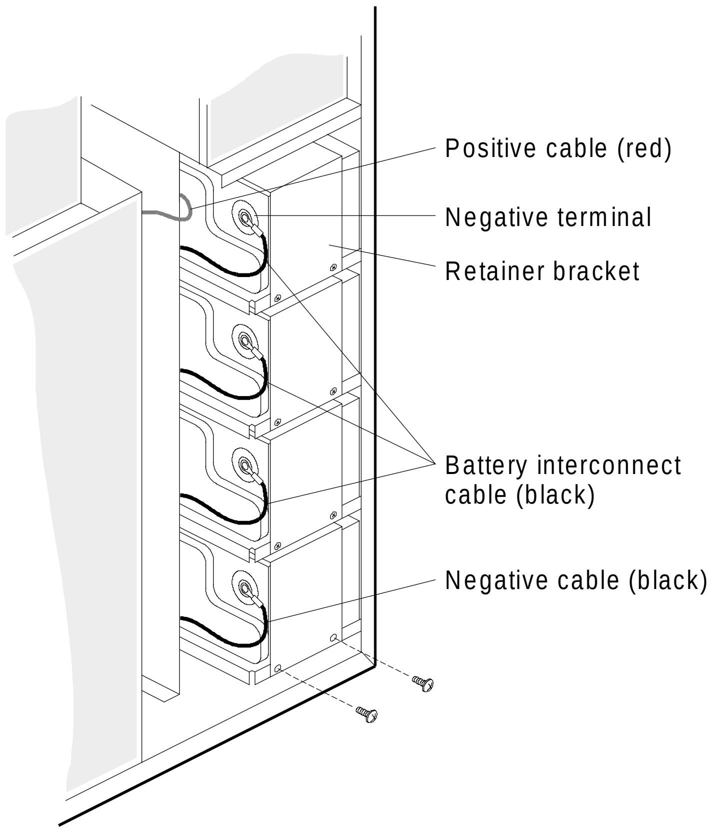
WARNING: Before servicing the batteries, turn the system off, unplug the AC power cord from the wall outlet, and switch the local battery disconnect switch on the back of the chassis to the “Off” position.

Removing Batteries

To remove the batteries:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the left side cover (as viewed from the front of the unit). See the following figure for the location of the batteries.

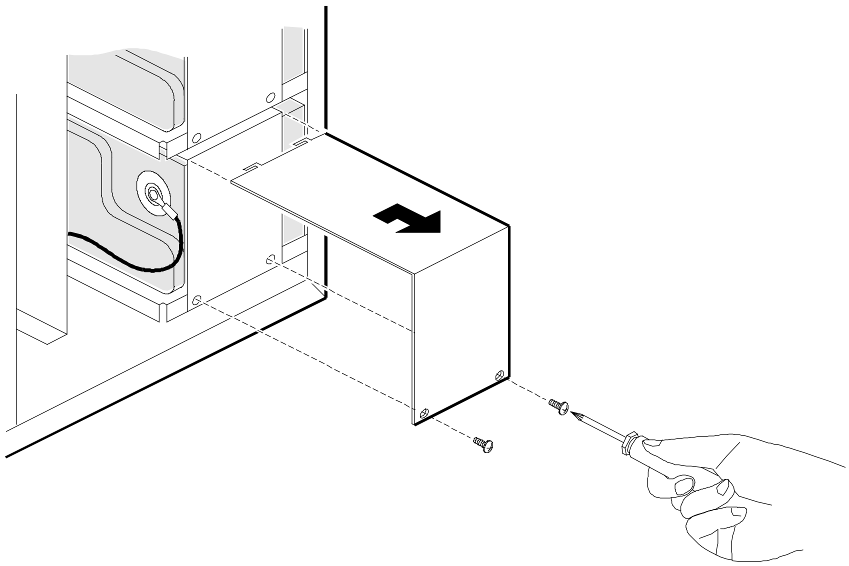
Batteries



3. Disconnect the negative cable (black) from the bottom battery negative terminal. Use either a #6 or #8 metric or socket wrench, depending on the size of the nut.
4. Remove and save the two screws that secure the battery retainer bracket.

5. Slide the retainer bracket toward the front of the server approximately ½ inch. This releases the retainer bracket from the frame. Slide the retainer bracket off the battery (see the following figure).

   Sliding Retainer Bracket Off the Battery



6. Repeat Steps 4 and 5 to remove the three remaining retainer brackets.
7. Disconnect the cable from the negative terminal of the second battery from the bottom of the unit. You can now remove the bottom battery from the unit. Use caution when removing the battery.
8. Repeat Step 7 for the next two batteries and remove them.
9. Slide the top battery out of the battery rack. Disconnect the cable from the positive terminal of this battery. Remove the battery.
10. Disconnect all cables from the batteries and save them for the installation of new batteries.

Installing Batteries

To install the batteries:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Connect the positive cable (red) to the positive terminal of the first battery to be installed. Insert this battery into the top rack position.
3. Connect one end of a battery interconnect cable (black) to the positive terminal of the second battery. Install this battery in the next battery position. Connect the other end of the battery interconnect cable to the negative terminal of the top (first) battery.
4. Connect one end of a battery interconnect cable (black) to the positive terminal of the third battery. Install this battery in the next battery position. Connect the other end of the battery interconnect cable to the negative terminal of the second battery.
5. Connect one end of a battery interconnect cable (black) to the positive terminal of the fourth battery. Install this battery in the next battery position. Connect the other end of the battery interconnect cable to the negative terminal of the third battery.
6. Connect the negative cable from the battery disconnect switch to the negative terminal of the fourth battery.
7. Install the battery retainer brackets for each battery. Slide the retainer bracket over the top of the battery and engage the tabs on the back of the retainer with the slots in the frame. Slide the retainer ½ inch toward the back of the server to lock into position. Secure the retainer with the two screws.
8. Replace the side and top covers.

Removing and Installing the Battery Disconnect Switch Assembly

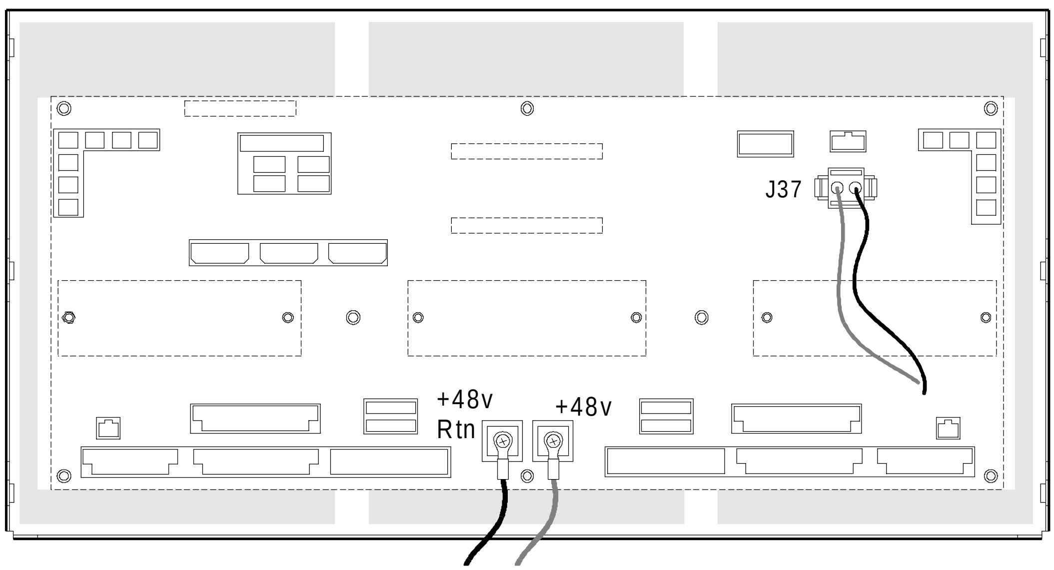
WARNING: If batteries are installed in the system, make sure the local battery disconnect switch is in the "Off" position before performing these procedures.

Removing the Battery Disconnect Switch Assembly

To remove the battery disconnect switch assembly:

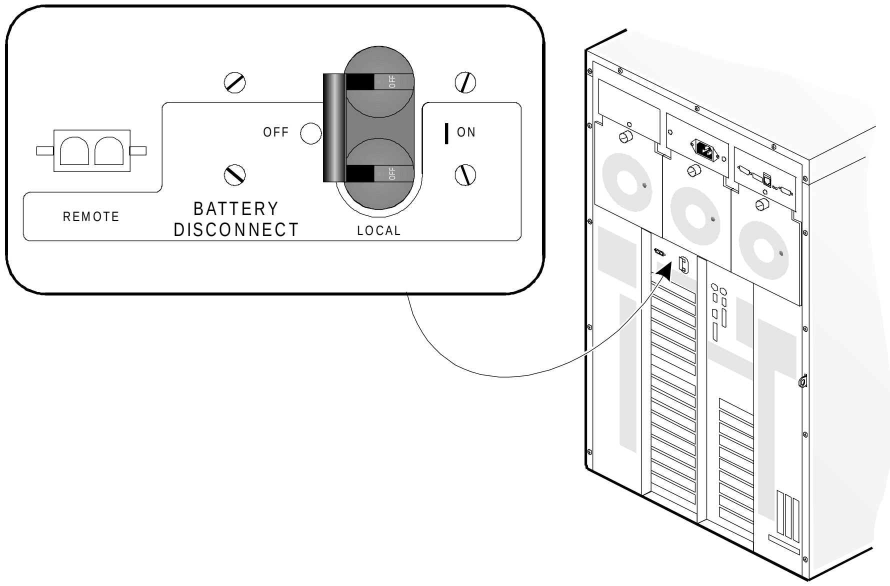
1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the left and right side covers and the top cover.
3. On the left side of the unit (viewed from the front), locate and disconnect the negative (black) cable from the bottom battery in the battery rack using a #6 or #8 metric or socket wrench.
4. On the power distribution backplane, locate and disconnect the cable from the +48 volt Rtn connection (see the following figure).

Cables to Power Distribution Backplane



5. Unplug the cable from J37 (two-pin mate and lock connector) on the power distribution backplane.
6. Locate the battery disconnect switch in the middle of the chassis back below the middle power supply. The following figure shows the location of the battery disconnect switch.
7. Remove and save the four screws that mount the switch to the frame.
8. Remove (cut) the cable ties that hold the battery cable to the frame.
9. Remove the two-pin mate and lock connector from the frame.
10. Carefully remove the black battery cable that is routed down the center of the unit to the bottom of the battery rack.
11. Remove the battery disconnect switch and attached cables from the unit.

Battery Disconnect Switch



Installing the Battery Disconnect Switch Assembly

To install the battery disconnect switch assembly:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove side covers and top cover. The battery disconnect switch is located in the middle of the chassis back below the middle power supply “see the Battery Disconnect Switch” figure.

Note: If a battery disconnect switch has not previously been installed, you must first remove the knock-outs for the battery disconnect switch and the mate and lock connector from the frame. You can do this with a standard flat-blade screwdriver.

3. Install the battery disconnect switch by inserting the switch lever through the frame opening. Align the holes in the switch with the holes in the frame. Secure the switch to the frame with four 6-32 screws previously removed or provided with the kit.
4. Insert the mate and lock connector through the frame opening. It should snap into position.
5. Route the cables along the top of the frame (inside the card rack) and secure with two tie wraps. Route the cables through the horizontal cable access hole in the frame (front of the card rack).
6. Connect the short black cable to the +48 volt Rtn terminal on the power supply backplane. Secure with a 10-32 screw previously removed or provided with the kit.

7. Route the longer cable down the center of the unit and to the bottom of the battery rack on the left side of the unit (as viewed from the front). Route the wire through the existing cable ties or secure with two cable ties.

   WARNING: If batteries are installed in the system, make sure the battery disconnect switch is in the “Off” position.

8. Connect the cable to the negative terminal of the bottom battery in the battery rack.

9. Install the top and side covers.

Removing and Installing the Power Distribution Backplane

Removing the Power Distribution Backplane

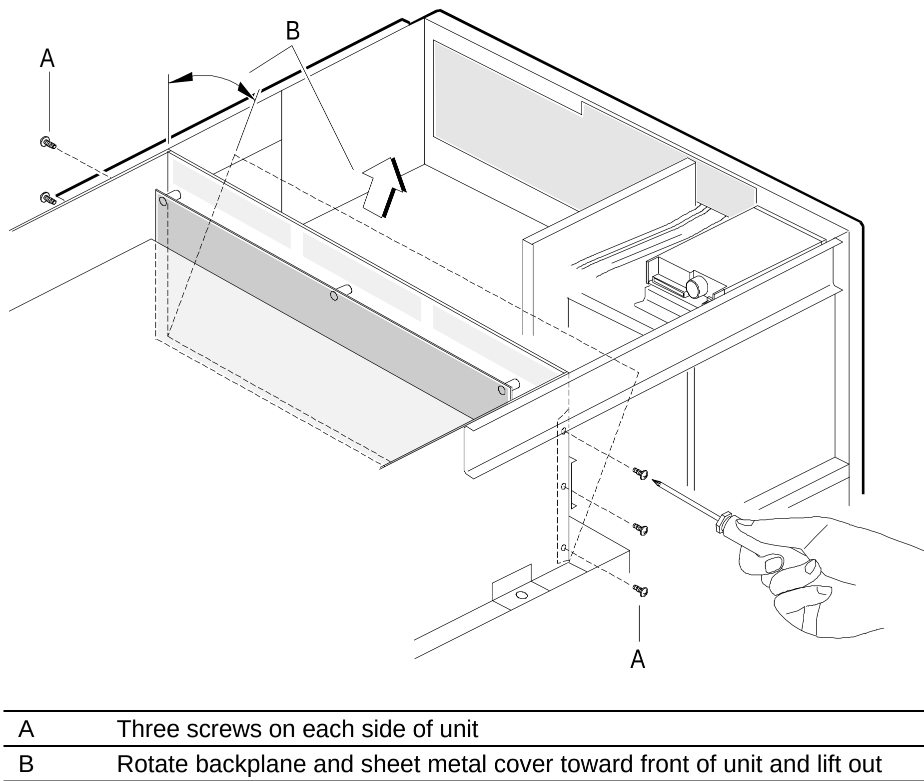
WARNING: Hazardous energy levels are present in the power distribution backplane area. Make sure that the AC power cord is disconnected and the local battery disconnect switch on the back of the server is turned off before working in this area.

To remove the power distribution backplane:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the power supplies from the rack at the back of the chassis (refer to “Removing a Power Supply” earlier in this chapter).
3. Remove both side covers and the top cover.
4. Disconnect all cables from the backplane and label, if necessary.
5. Remove three screws on each side of the unit.
6. Rotate the backplane and sheet metal cover towards the front of the unit and lift out.

The following figure shows the procedure for removing the power distribution backplane.

Removing the Power Distribution Backplane



A	Three screws on each side of unit
B	Rotate backplane and sheet metal cover toward front of unit and lift out

Installing the Power Distribution Backplane

To install the power distribution backplane:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove both side covers and the top cover.
3. Insert the backplane and sheet metal cover into the chassis and align with screw holes (see the “Removing the Power Distribution Backplane” figure).
4. Install three screws on each side of the unit.
5. Reconnect all cables.
6. Replace top cover and side covers.
7. Re-install the power supplies in the rack at the back of the chassis.

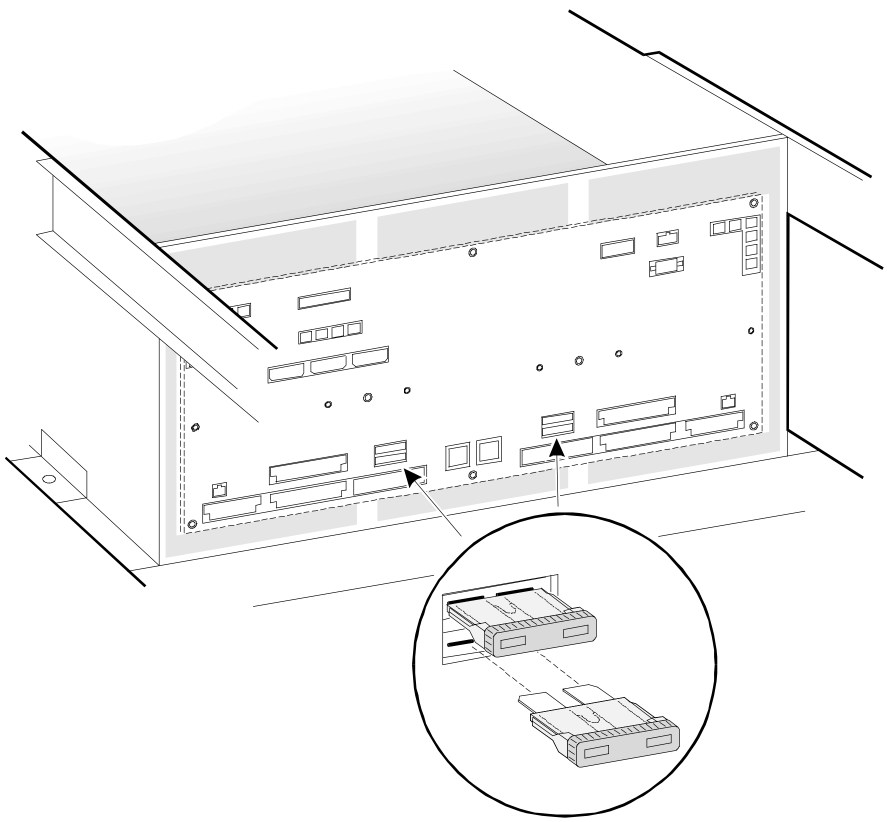
Removing and Installing Fuses

Removing Fuses

The fuses are located on the power distribution backplane. To remove a fuse:

1. Observe the warnings and cautions listed at the beginning of this chapter.
2. Remove the side covers and the top cover.
3. Locate the fuses at the bottom of the power distribution backplane.
4. Grasp the fuse to be removed and pull it out from the backplane.

Removing a Fuse



Installing Fuses

To install a fuse:

1. Observe the warnings and cautions listed at the beginning of this chapter.
2. Locate the fuses at the bottom of the power distribution backplane.
3. Insert the fuse in an empty slot.
4. Replace the top cover and side covers.

Chapter 5

Processor Boards

This chapter describes the following:

- Removing and installing the board support panels
- Processor board overview
- Processor board layout
- Removing and installing processor boards
- Processor activity LEDs
- Installing and removing processors
- Removing and installing a bus termination board
- Processor board configuration jumpers

Tools and Supplies Needed

You need the following tools and supplies to perform the procedures described in this chapter:

- Phillips # 2 screwdriver
- Standard tip screwdriver
- Needle-nosed pliers
- IC (integrated circuit) removal tool
- Heat sink removal tool (603-9013455)
- Thermal compound to apply between a processor and heat sink (supplied with the processor kit)
- Antistatic wrist strap, antistatic bags and conductive foam pad (recommended)
- The *System Site Log*. This document contains forms for recording information on system equipment and components, hardware service, software products, and preventive maintenance activities. Use these forms as you set up your system for the first time, integrate new parts or software into the system, service or troubleshoot system problems, and perform preventive maintenance.

Updating the Configuration History File

Whenever you install or replace a system component, update the configuration history file on the Diagnostic Partition. To update the configuration history file:

1. Boot to the Diagnostic Partition.
2. Select “Run Utilities and Diagnostics” from the MS-DOS Startup Menu.
3. Select “System Config Utils.”
4. Select “View Version Info.”
5. Select “Edit Config History.”

Warnings and Cautions

The following warnings and cautions apply throughout this chapter. Only qualified service personnel should install and configure processors and processor boards.

Warnings

System power on/off: The DC push-button on/off switch (a convex 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 cord. Do not remove the side panels or internal cover panels unless the you unplug the AC power cord. If the system has internal battery backup power, you must also turn the local battery disconnect switch on the back of the chassis to “Off.”

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

Cautions

Electrostatic discharge (ESD) and ESD protection: ESD can damage disk drives, boards, and other parts. We recommend that you perform all procedures in this chapter only at an ESD 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 the system when handling parts.

ESD and handling boards: 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. Use a conductive foam pad if available but not the board wrapper. Do not slide board over any surface.

Ensure complete board insertion: When installing processor boards or a bus termination board, before closing the board ejector handles, confirm visually that the board edge connectors are correctly oriented at the system board connector—not too low or too high. Then, after closing the handles, make sure the boards are completely seated in the system board connectors before applying power. Incomplete insertion can result in damage to the system board and the boards being inserted.

Board support panel, proper cooling and airflow: For proper cooling and airflow, always install the board support panel for the processor and memory boards before installing the chassis side and top covers and turning on the system. Operating it without this support panel in place can damage system parts.

Chassis covers, proper cooling and airflow: For proper cooling and airflow, always install the chassis side and top covers before turning on the system. Operating it without these covers in place can damage system parts.

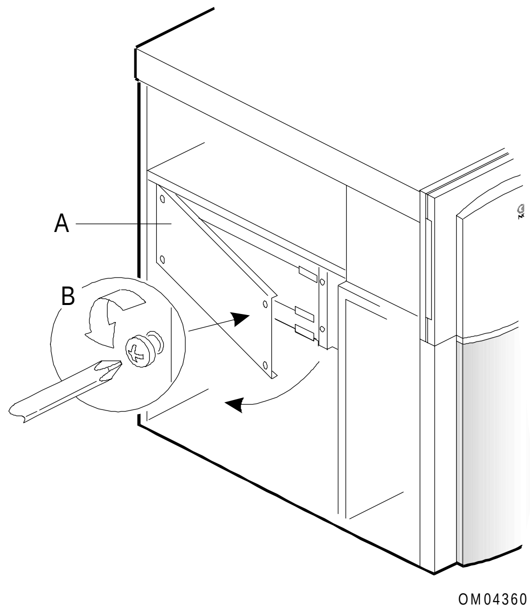
Removing and Installing the Board Support Panels

The board support panels support the processor boards and memory board on either side of the chassis.

Removing a Board Support Panel

You must remove the board support panel to gain access to the system board set. The following figure shows how to remove the board support panel on the primary side. The procedure is the same for removing the board support panel on the secondary side.

Removing the Board Support Panel on the Primary Side



A	Board support panel
B	Screws (four total) (structural details of panel not shown here)

To remove the board support panel:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the side cover.
3. Remove four screws from the support panel and save.
4. Remove panel by pulling the back edge tabs out of three slots in the chassis. Set panel aside.

Installing a Board Support Panel

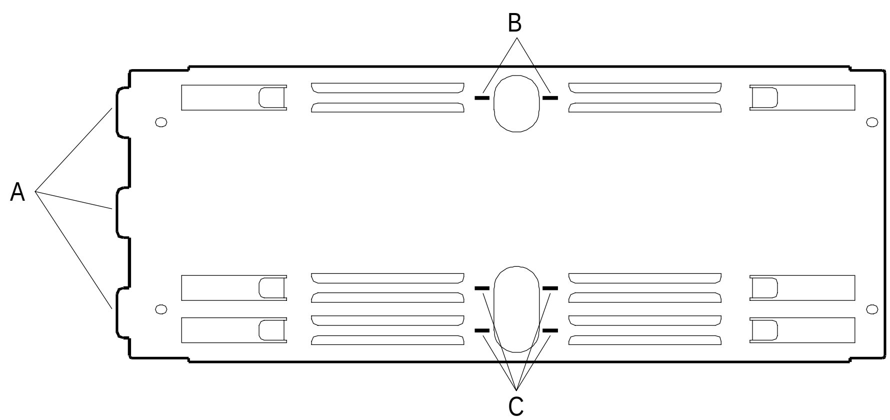
CAUTION: Always install the board support panel. To prevent damage to a system board from partially inserted memory and processor boards and to provide proper cooling and airflow, always install the metal board support panel before installing the chassis side and top covers and turning on the system. Operating the system without this support panel in place can damage system parts.

To install a board support panel:

1. Place the support panel in position so the three tabs are toward the chassis back. Fit the tabs in the three slots in the chassis back.
2. Swing panel closed. Check to make sure the boards in the slots behind the panel align with the scribe marks on the panel.
3. Secure with four screws.
4. Reinstall the side cover.

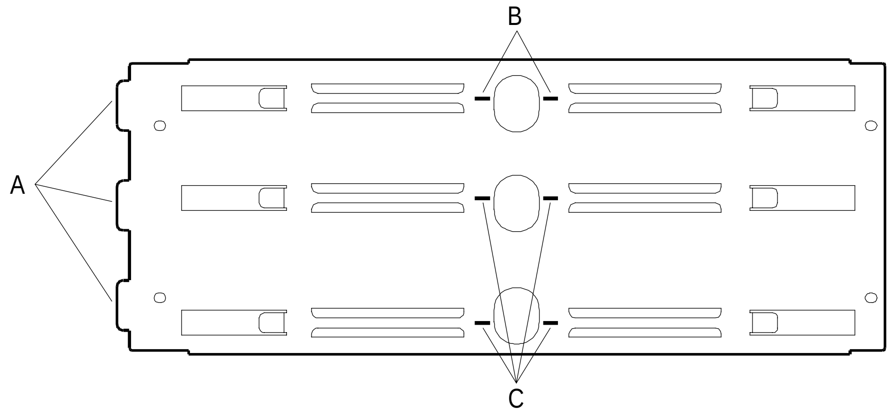
The board support panels are different for R1 and R2 systems. The following figures show the R1 and R2 board support panels.

R1 Board Support Panel

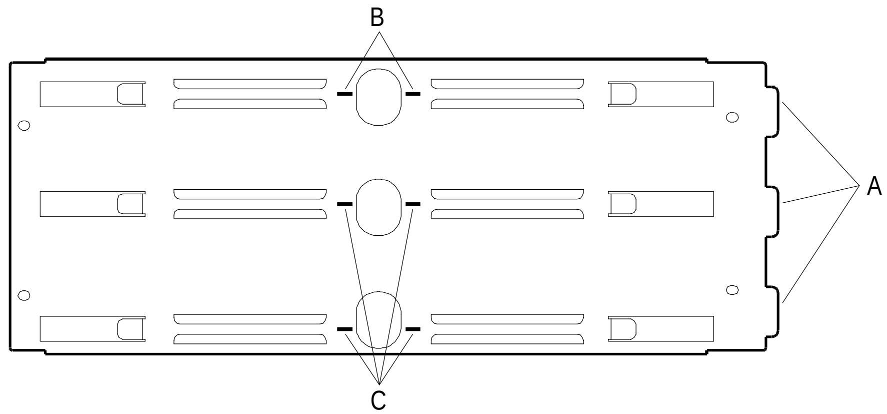


A	Tabs to fit in slots in chassis back
B	Scribe marks to check alignment of memory board
C	Scribe marks to check alignment of processor boards or processor board and bus termination board

R2 Primary Side Board Support Panel



R2 Secondary Side Board Support Panel



Processor Board Overview

This section provides an overview of system processor boards. It discusses the following:

- System board connectors
- Processor board configuration models
- Arranging processors in a dual system board configuration

System Board Connectors

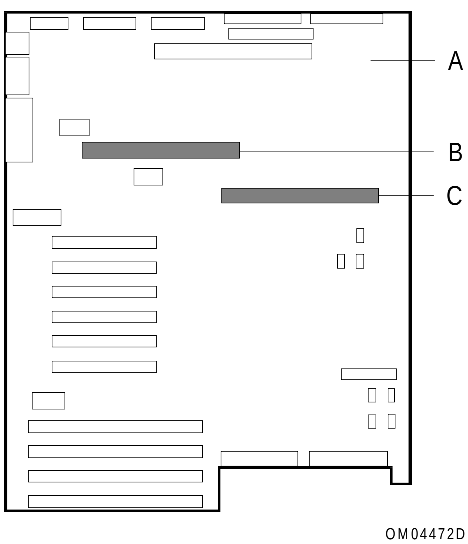
This subsection illustrates the processor board connectors on each of the following:

- R1 system board
- R2 system boards

R1 System Board

The following figure shows the processor board connectors on the R1 system board.

Processor Board Connectors on the R1 System Board



A	R1 system board
B	CPU 2 – Connector for secondary processor board or bus termination board
C	CPU 1 – Connector for primary processor board

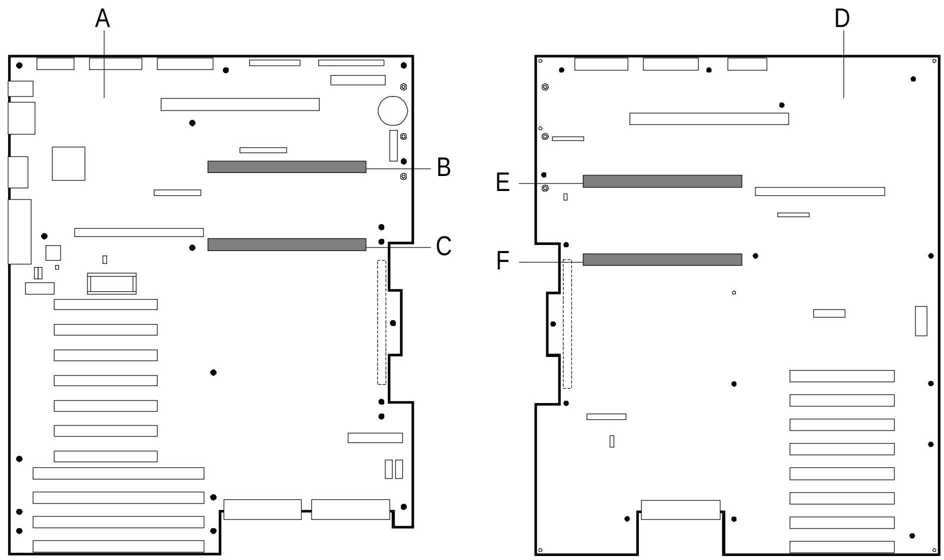
R2 System Boards

Each of the R2 system boards has two connectors for processor boards:

- CPU 1 and CPU 2 on the primary system board
- CPU 3 and CPU 4 on the secondary system board

The following figure shows these connectors.

Processor Board Connectors on the R2 System Boards



A	R2 primary system board
B	CPU 2 – Connector for secondary processor board or bus termination board
C	CPU 1 – Connector for primary processor board
D	R2 secondary system board
E	CPU 4 – Connector for secondary processor board or bus termination board
F	CPU 3 – Connector for primary processor board or bus termination board

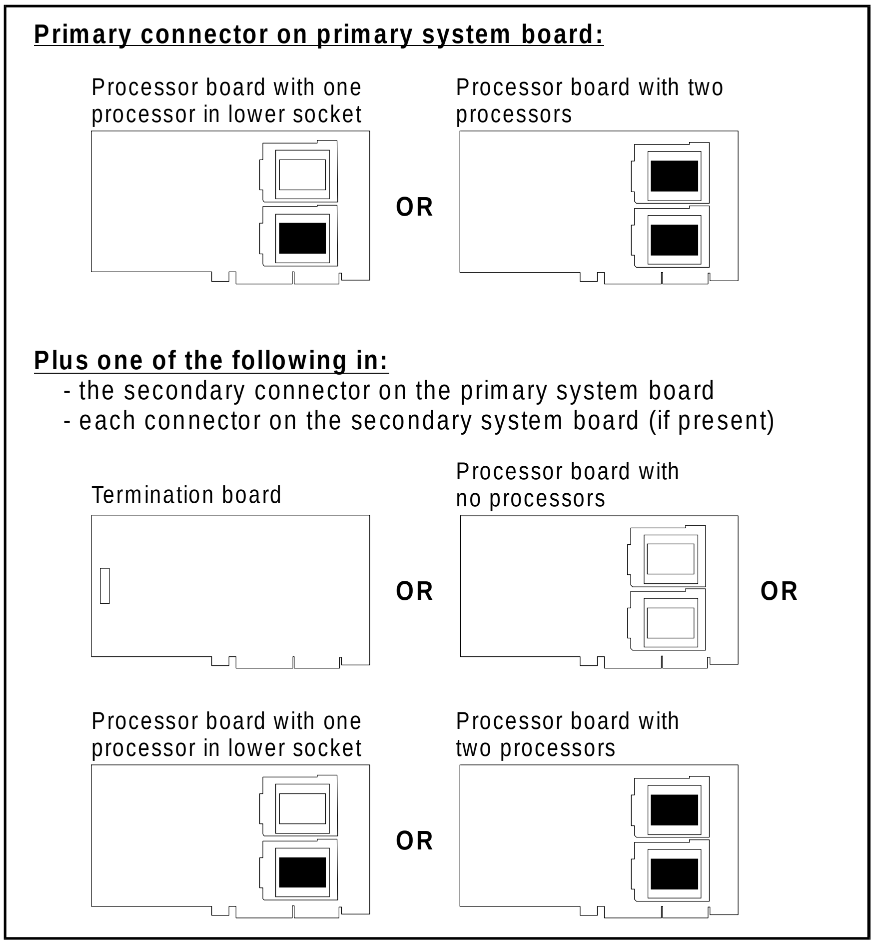
Processor Board Configuration Models

The primary processor board on the primary system board must have one or two processors installed. All other processor boards can have zero, one, or two processors installed.

A processor board must be installed in CPU 1 (the primary processor board connector on the primary system board). All other processor board connectors must contain either a processor board or a bus termination board.

The following figure shows different configuration possibilities.

Processor Board and Processor Configuration Models



Arranging Processors In an R2 Dual System Board Configuration

In general, if the server has an R2 dual system board configuration, you obtain best performance by placing most of the processors on the side that contains the most memory. For example:

If…	Then…
only the primary side contains a memory board	put most of the processors on the primary side.
there are two memory boards, but the primary side contains more memory	put most of the processors on the primary side.
there are two memory boards with equal memory	distribute processors equally between the primary and secondary side.

Note: These are general guidelines only. They may not apply in every situation.

Processor Board Layout

This section shows the layout for the following types of processor boards:

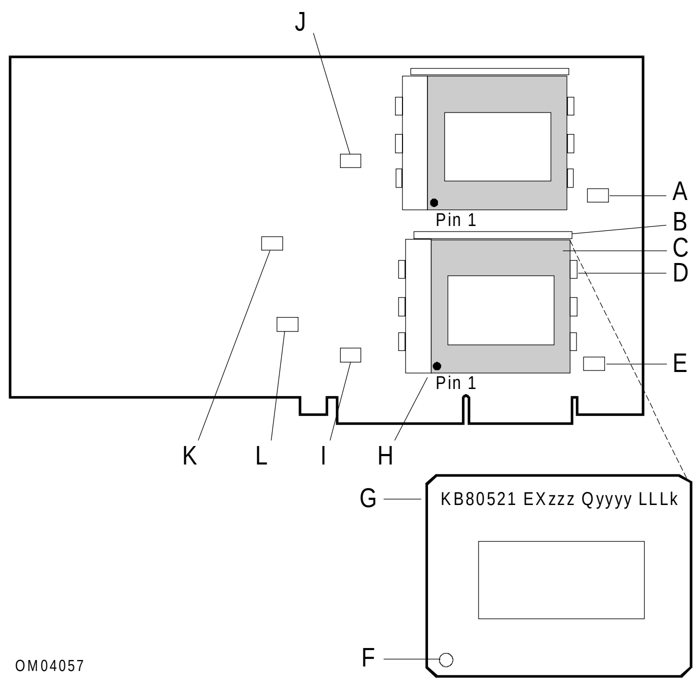
- Dyadic 200 MHz 512K cache processor board
- Dyadic 200 MHz 1 MB cache processor board

Dyadic 200 MHz 512K Cache Processor Board Layout

The following figure shows the location of the sockets, jumper blocks, and connectors on the dyadic 200 MHz 512K cache processor board. This processor board supports the following processors:

- 166 MHz 512K cache
- 200 MHz 512K cache

Dyadic 200 MHz 512K Cache Processor Board Layout



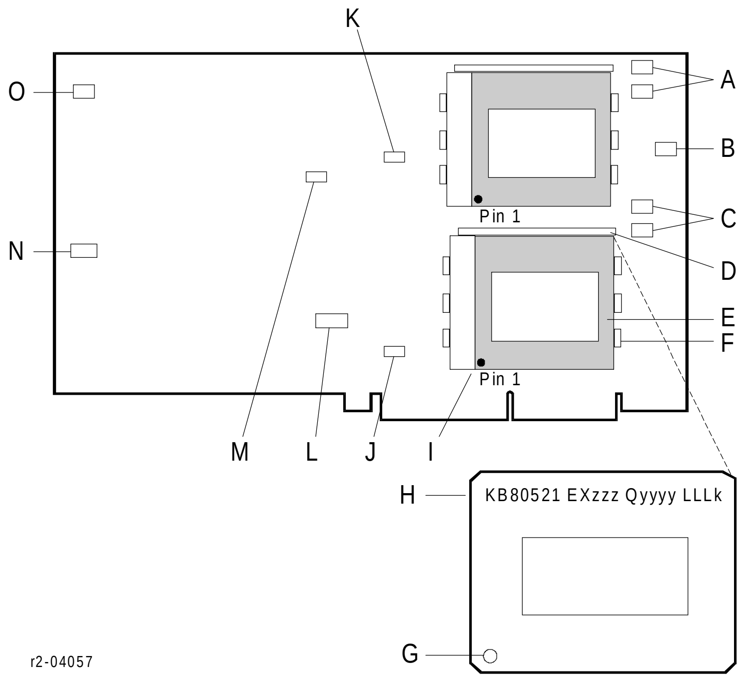
A	J102, connector for a fan sink (not used)
B	Socket lever
C	Socket for 1st processor
D	Tabs on socket for heat sink clips (2 tabs used on each side)
E	J107, connector for a fan sink (not used)
F	Small dot on processor to show pin 1 location
G	Processor product code, KB80521 EXzzz Qyyy LLLk, where
	zzz = processor speed (MHz) yyy = sample specification number LLL = L2 cache size
H	Pin 1 position of socket
I	J106, scan jumper block for 1st processor
J	J101, scan jumper block for 2nd processor
K	J103, VID jumper block
L	J105, frequency select jumper block

Dyadic 200 MHz 1 MB Cache Processor Board Layout

The following figure shows the location of the sockets, jumper blocks, and connectors on the dyadic 200 MHz 1 MB cache processor board. This processor board supports the following processors:

- 166 MHz 512K cache
- 200 MHz 512K cache
- 200 MHz 1 MB cache

Dyadic 200 MHz 1 MB Cache Processor Board Layout



A	J8A1 and J8A2, connectors for fan sinks (not used)
B	J9B1, fan fail connector (not used)
C	J8C1 and J8C2, connectors for fan sinks (not used)
D	Socket lever
E	Socket for 1st processor
F	Tabs on socket for heat sink clips (2 tabs used on each side)
G	Small dot on processor to show pin 1 location
H	Processor product code, KB80521 EXzzz Qyyy LLLk, where
	zzz = processor speed (MHz) yyy = sample specification number LLL = L2 cache size
I	Pin 1 position of socket
J	J6D1, scan jumper block for 1st processor
K	J6B1, scan jumper block for 2nd processor
L	J4D1, frequency select jumper block
M	J4B1, active/passive jumper block
N	J1C1, processor cache jumper block
O	J1A1, fan fail connector (not used)

Removing and Installing Processor Boards

Removing a Processor Board

WARNING: If the system has been running, any processors and heat sinks already installed on the board are hot. To avoid the possibility of a burn while removing an existing processor or installing an additional one, let the components cool for 10 minutes before continuing with the procedure described here.

To remove a processor board or a bus termination board:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the board support panel.
3. Rotate the board's ejector handles outward to a 90-degree angle from the board. This eases the board free from the system board connector.
4. Holding the board by the corners where the handles are located, carefully pull it out until the edge connectors are free.
5. Be careful not to touch components or gold edge connectors on the board as you remove it from the slot. Place the board component-side up on an antistatic surface.
6. Store board in an antistatic protective wrapper if you are not installing or removing a processor at this time.

Installing a Processor Board

To install a processor board:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the board support panel.
3. Be careful not to touch components or gold edge connectors on the board as you remove it from its protective wrapper. Place board component-side up on an antistatic surface.
4. If you plan to add processors to the board, verify that configuration jumpers are set correctly. See the "Processor Board Configuration Jumpers" section later in this chapter.

5. On the appropriate system board, locate the correct processor board connector. See "System Board Connectors" in this chapter for a diagram of connector locations.

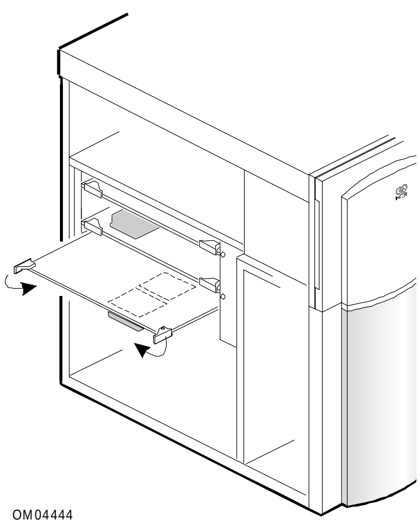
System Board	Processor Board Connectors
R1	• First processor board: use primary connector. Align with the component-side down. • Second processor board (or bus termination board): use secondary connector. Align with the component-side up.
R2 primary	• First processor board: use CPU 1 connector. Align with the component-side down. • Second processor board (or bus termination board): use CPU 2 connector. Align with the component-side down.
R2 secondary	• First processor board (or bus termination board): use CPU 3 connector. Align with the component-side up. • Second processor board (or bus termination board): use CPU 4 connector. Align with the component-side up.

6. Hold the board by the corners with the ejector handles turned outward to a 90-degree angle from the board.

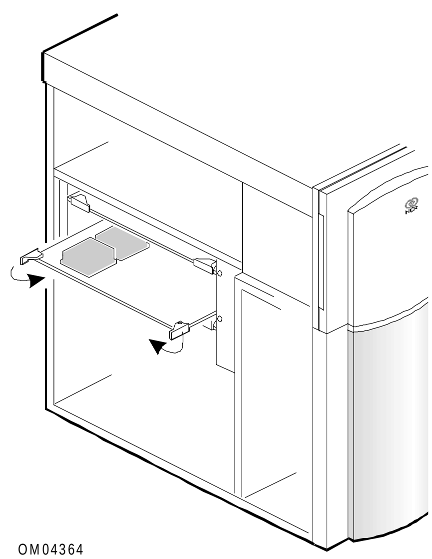
7. Do not press in on the board yet! Ease board into the correct slot guides until it is just touching the connector on the system board. The following figure shows how to install the processor boards on the R1 system board.

Installing Processor Boards on the R1 System Board

1st processor board, primary connector, installed component-side down

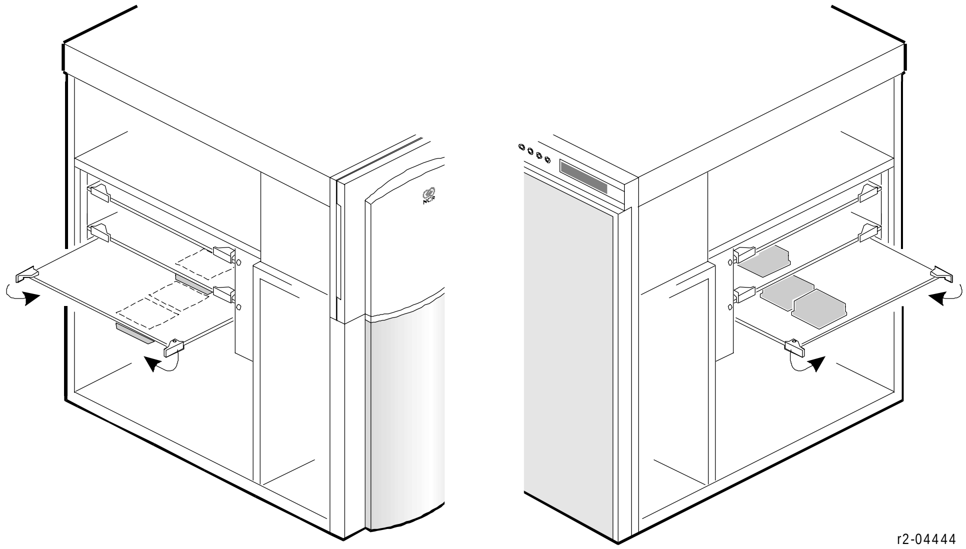


2nd processor board, secondary connector, installed component-side up



Installing Processor Boards on the R2 System Boards

Primary system board - both processor boards installed component-side down	Secondary system board - both processor boards installed component-side up



1

CAUTION: Before closing handles, check board connector. Before closing the board handles, confirm visually that the board edge connectors are correctly oriented—not too low or high—at the system board connector.

8. Press board carefully but firmly into the system board connector, and rotate the handles closed (flush with front edge of board) to seat the board.

   CAUTION: Before applying power, perform one more check. After closing the handles, make sure the board is completely seated in the system board connector before applying power. Incomplete insertion can result in damage to the system board and to the board you have installed.

9. Reinstall the board support panel, doing a last alignment check with the scribe marks in the panel.

Processor Activity LEDs

Each of the R2 system boards contains a group of 4 LEDs that indicate processor activity. Each LED corresponds to a specific processor. When a processor is running, the corresponding LED flashes. If a processor is installed and the corresponding LED does not flash or remains lit constantly, the processor might have failed. Check the Event Log to confirm processor failure.

R2 Primary System Board LEDs

The following table lists the LEDs and the corresponding processors on the R2 primary system board.

LED	Processor
DS1	CPU 2, processor 2
DS2	CPU 1, processor 1
DS3	CPU 1, processor 2
DS4	CPU 2, processor 1

R2 Secondary System Board LEDs

The following table lists the LEDs and the corresponding processors on the R2 secondary system board.

LED	Processor
DS1	CPU 4, processor 1
DS2	CPU 4, processor 2
DS3	CPU 3, processor 1
DS4	CPU 3, processor 2

Installing and Removing Processors

In a single system board configuration, you can install up to four microprocessors, two on each of two processor boards. In a dual system board configuration, you can install up to eight microprocessors on four processor boards. **All processors installed in the system must be identical.**

Processor Upgrade Kits

The following table lists kit numbers for processor upgrade kits.

Kit Number	Description
3446-K025	166 MHz Pentium® Pro Processor with 512K cache
3446-K028	200 MHz Pentium Pro Processor with 512K cache
3446-K031	200 MHz Pentium Pro Processor with 1 MB cache

All processor upgrade kits include heat sinks, thermal compound, and installation instructions.

Note: A dyadic 200 MHz 1 MB cache processor board is required for the 200 MHz 1 MB processor.

General Warnings and Cautions about Installing a Processor

Before you install a processor please read this section. This is a lengthy section with a number of warnings, cautions, detailed steps, and illustrations about installing a processor. Performing the procedures incorrectly can cause damage.

WARNING: Wear rubber gloves when installing thermal compound. If compound contacts skin, wash hands with soap and water. Use isopropyl alcohol and cloth wipes to remove compound residue.

WARNING: If the system has been running, any processors and heat sinks already installed on the board are hot. To avoid the possibility of a burn while removing an existing processor or installing an additional one, let the components cool for 10 minutes before continuing with the procedures described here.

CAUTION: Use care when handling processors. Do not touch or bend the processor's exposed pins.

Reduce the risk of electrostatic discharge (ESD) damage to the processor and boards by performing the following precautions:

- Touch the metal chassis before touching the processor or system board. Keep part of your body in contact with the metal chassis to dissipate the static charge while handling the processor.
- Avoid moving around unnecessarily.

CAUTION: Processors must be identical. You may damage the system if you install an additional processor that is different from the one already installed. Use the same speed, cache size, and stepping (revision) as those of the processor already installed. Processor internal and external clock frequencies must be identical. Also, make sure the processor board and system can handle a newer, faster processor (thermal and power considerations).

CAUTION: Heat sink must be the right one. One common reason to remove a processor is to install an upgrade (faster) device. A faster processor generates more heat and may require a larger heat sink. Make sure you have the correct heat sink for the processor you are installing; you may not be able to reuse the heat sink that was used with the old processor.

CAUTION: Use care when removing/installing retention clips. Although the processor board has ZIF sockets (zero-insertion-force) for the processors, the heat sink retention clips are under tension. You must be careful when removing or installing the processor assembly. Use a heat sink removal tool for the clips to minimize the risk of damage to the processor, to the plastic tabs on the socket, and to circuit traces on the board near the socket. You must also be careful not to let the clips scrape against the board, the socket, or other components.

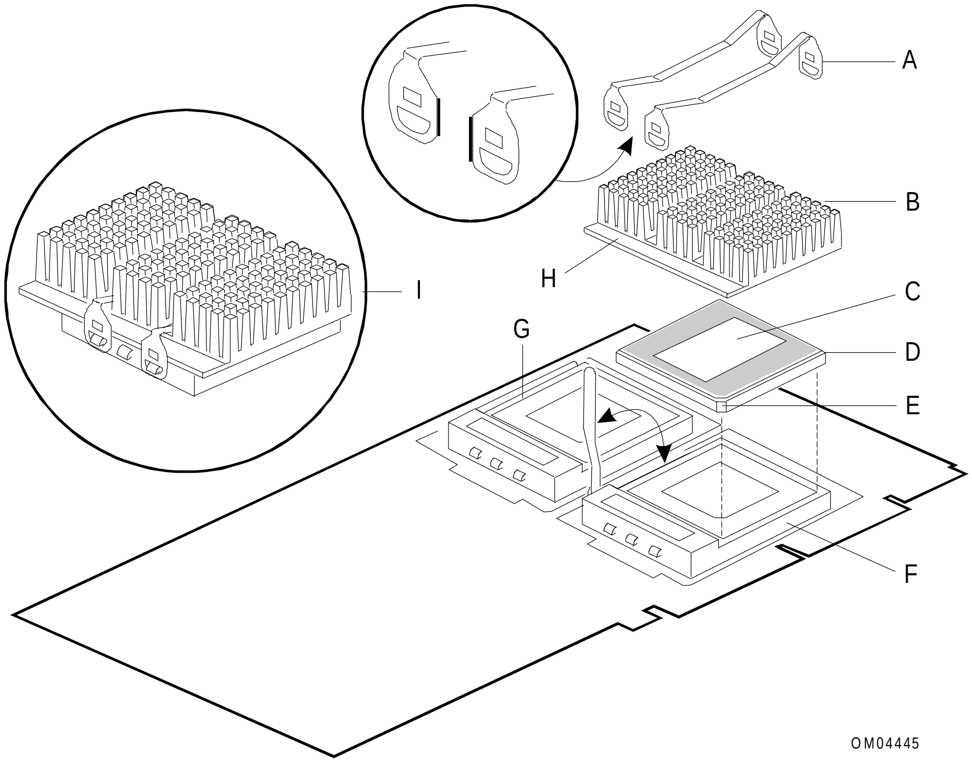
Overview of Processor Installation

Installing a processor is basically a three-part procedure, summarized below and described in step-by-step detail in the next few subsections:

- **Part 1, installing the processor:** the steps tell you to locate the correct socket and raise the socket lever; to orient the pin 1 position of the processor correctly; and to install the processor in the socket and lower the socket lever.
- **Part 2, applying thermal compound:** the steps tell you to place thermal (heat-conductive) compound on the metal plate that is on the processor installed in the socket.
- **Part 3, installing the heat sink and clips:** the steps tell you to lower the heat sink into position on top of the processor and to install two retention clips to keep the processor/heat sink assembly securely in the socket.

The two processor sockets on each processor board are identical. The following figure shows only one with details. The first processor is installed in the lower socket; the second processor is installed in the upper socket.

Processor, Heat Sink, and Clip on a Processor Board



A	Two heat sink retention clips
B	Heat sink
C	Metal heat-dissipation plate on processor; thermal compound must be applied to cover the metal plate
D	Processor
E	Pin 1 location indicated by small dot on top of processor and printing on board next to socket corner
F	1st processor socket (shown with lever in open, vertical position)
G	2nd processor socket, empty (shown with lever in closed, horizontal position)
H	Extended lip on heat sink; must be oriented toward back end of socket as shown
I	Completed assembly (heat sink extends beyond edges of processor)

Installing a Processor in a Socket

WARNING: If the system has been running, any processors and heat sinks already installed on the board are hot. To avoid the possibility of a burn while removing an existing processor or installing an additional one, let the components cool for 10 minutes before continuing with the procedures described here.

To install a processor in a socket:

1. Observe the safety and ESD precautions listed at the beginning of this chapter and in this section.
2. Remove the correct processor board from the system, and locate the correct socket on the processor board according to the figures noted below:
   - The “Processor Board and Processor Configuration Models” figure in the “Overview of the Processor Board” section
   - The figure of the processor board in the “Processor Board Layout” section.

   As you work, place boards and processors on a grounded, static-free surface or conductive foam pad.

   If adding a second or replacement processor to an existing processor board, remove that board from the system.

   If adding a second processor board, remove the bus termination board from the connector on the system board.

   CAUTION: Move socket lever to correct position. Damage can occur if socket lever is not fully opened to the vertical position before you insert the processor.
3. Raise socket lever to vertical, open position.
4. Remove the processor from its antistatic package; do not touch or bend the pins. Place it pin-down on a grounded, static-free surface or conductive foam pad.
5. Place the processor so the small dot on the top of one corner matches the pin 1 orientation of the socket. Lower the processor into the socket, being careful not to bend the pins.
6. To lock in the processor, push the socket lever forward and down until the lever snaps into the closed, horizontal position.

Applying Thermal Compound

Before installing the heat sink and clips, apply thermal (heat-conductive) compound to the metal plate on top of the processor. This section explains the following:

- Normal procedure for applying thermal compound
- Special instructions for 200 MHz 1MB cache processors

CAUTION: Be sure to use the proper procedure for applying thermal compound. Improper application can result in damage to the processor.

Normal Procedure for Applying Thermal Compound

For all processors except the 200 MHz 1MB cache processor, use the following procedure to apply thermal compound:

1. Open the thermal compound carrier. This contains a thin metal pad coated with thermal compound. Thermal compound is not a glue; it helps transmit heat but does not hold the heat sink in place.
2. Carefully remove the thin metal pad that is coated with thermal compound from the paper wrapper. Remove as much of the thermal compound with the pad as possible. Apply the metal pad to the metal plate on the processor chip. Do not extend compound onto the ceramic housing of the processor.

Special Instructions for 200 MHz 1MB Cache Processors

Perform the following steps to apply thermal compound to a 200 MHz 1MB cache processor:

1. Apply a ½- to ¾-inch bead of thermal compound directly from the tube to the processor surface. **Do not use a thermal compound-coated metal pad with this processor.**
2. Using a straight-edged tool wider than the processor, smooth the compound across the processor surface. The surface of this processor is concave; use the tool like a trowel to even out the layer of compound. Compound should be thinnest at outer edges and deep enough in the center to make contact with the heat sink.

Installing the Heat Sink and Clips

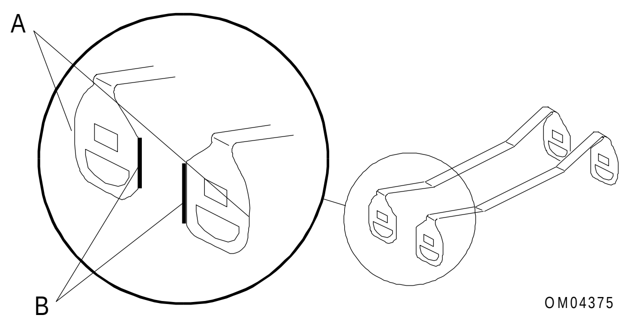
See the “Processor, Heat Sink, and Clip on a Processor Board” figure for a semi-exploded view of the processor heat sink and clips.

CAUTION: Use care when installing retention clips. The heat sink retention clips are installed under tension. Use a heat sink removal tool for the clips to minimize the risk of damage to the processor, to the plastic tabs on the socket, and to circuit traces on the board near the socket. Also be careful not to let the clips scrape against the board, the socket, or other components.

To install the heat sink and retention clips:

1. With the extended lip of the heat sink oriented toward the back of the socket, center the heat sink over the processor and socket and lower it. The edges of the heat sink extend beyond the edges of the processor and socket.
2. Before installing the clips, check the following figure for the correct clip orientation. On the clips, each end piece has a flat side and a rounded side; orient the pair so that the flat sides at each end face each other.

   Orienting Retention Clips

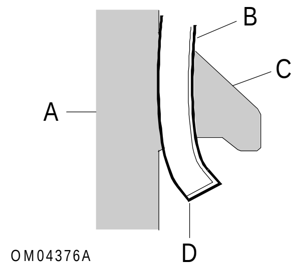
   

A	Rounded sides toward outside edges of heat sink
B	Flat sides toward each other

3. The sockets have three tabs on each side; use the two outer tabs, not the one in the middle. Place the first end of the first clip over the plastic tab on the front end of the socket (opposite the flat end).

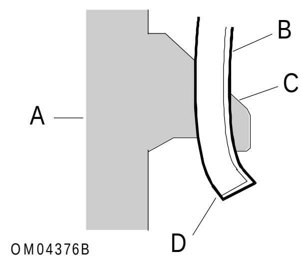
   CAUTION: Make sure first clip end is correctly installed. Make sure the first clip end is correctly installed on the first tab before trying to install the opposite end. The following figures indicate that the clip end must be flush with the socket, not out away from it. If the clip is incorrectly aligned, the socket tab can break. If this happens, there is no way to make sure the heat sink is retained on the processor to dissipate heat energy.

Correct Position of Clip and Tab



A	Socket body
B	Clip
C	Socket tab
D	Clip shown in correct position, flush with socket

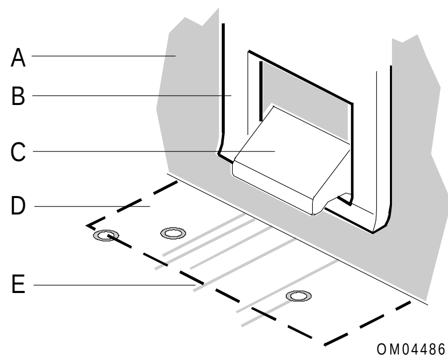
Incorrect Position of Clip and Tab



A	Socket body
B	Clip
C	Socket tab
D	Clip shown in incorrect position, away from socket

4. Lay the clip straight across the heat sink toward the tab on the back end of the socket. See the following figure for sensitive areas.

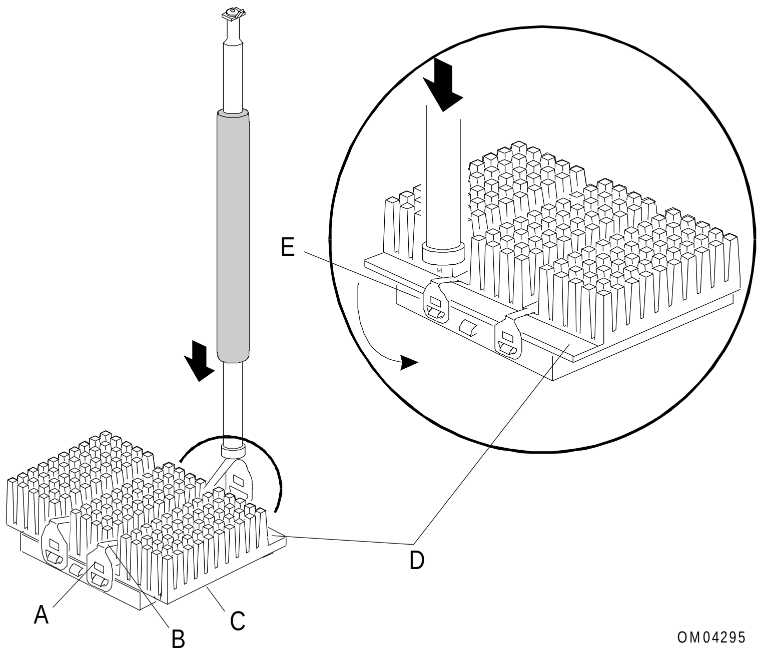
Areas and Features To Be Careful of As You Install Back (Second) End of Clip



A	Socket body
B	Clip end
C	Socket tab
D	Area on board subject to damage by clip
E	Possible circuit traces on board

5. Use the blunt end of a heat sink removal tool to carefully press the clip downward until the slot in the clip snaps over the plastic socket tab. See the following figure.

Installing Retention Clip with Heat Sink Removal Tool



A	First end of clip shown already installed at front of socket
B	Clip aligned across heat sink to tab on back end of socket
C	Socket lever location (under edge of heat sink)
D	Extended lip of heat sink placed toward back of socket
E	Heat sink removal tool held vertically, with blunt end of tool placed on top of back end of clip; press down carefully on clip

CAUTION: To avoid possible board damage, do not use excessive force. Excessive downward force or misalignment may cause the clip to contact the system board and damage circuit traces or components.

Removing a Processor

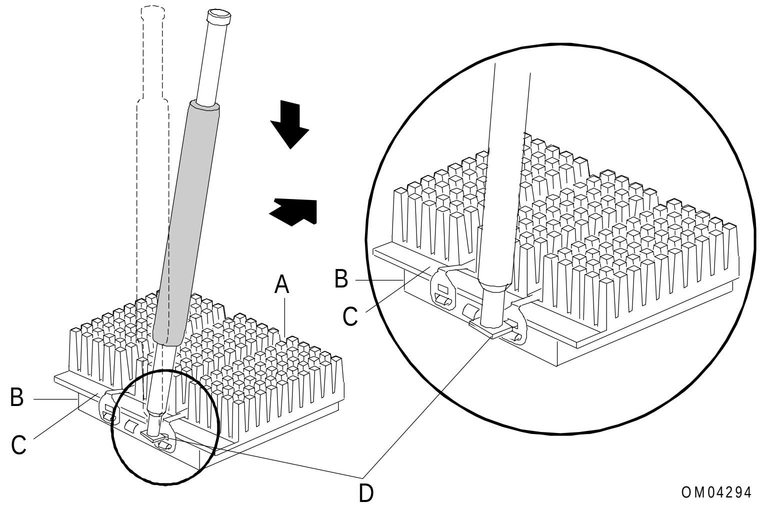
CAUTION: Use care when removing retention clips. The heat sink retention clips are installed under tension. Use a heat sink removal tool for the clips to minimize the risk of damage to the processor, to the plastic tabs on the socket, and to circuit traces on the board near the socket. Also be careful not to let the clips scrape against the board, the socket, or other components.

To remove a processor from a socket:

1. Observe the safety and ESD precautions listed at the beginning of this chapter and this section.
2. Remove the correct processor board from the system, and locate the correct socket according to the configuration model figure. As you work, place boards and processors on a grounded, static-free surface or conductive foam pad.
3. Use a heat sink removal tool to remove the two clips that secure the heat sink and processor. The following figure shows an example of such a tool.

CAUTION: Press DOWN and then OUT slightly. To avoid possible tab damage, you must press down slightly on the heat sink removal tool **before** leveraging the base of the tool out. If you just leverage out, the tab can break. Do not use excessive force. Excessive downward force or misalignment may cause the clip to contact the system board and damage circuit traces or components.

Removing Retention Clip with Heat Sink Removal Tool



A	First end of clip already installed at front of socket
B	Socket lever location (called out here to help orient the correct edge of the heat sink to the back end of the socket)
C	Extended lip of heat sink placed toward back of socket
D	Heat sink removal tool held vertically, small tab on end of tool inserted into slot on end of clip ↓ First apply slight force DOWNWARD → Then at top of tool, apply slight force BACKWARD to leverage base of tool OUTWARD, thus releasing clip from plastic tab on socket

4. When the clip end is clear of the socket tab, lift the clip up carefully and free the other end with your fingers. Move the clip up and away from the processor and heat sink.
5. Repeat for the second clip.
6. Lift heat sink away from the processor. If surface tension holds it in place, slide the heat sink sideways and then lift.
7. Before removing processor from the socket, clean the thermal compound off the metal plate on top of the processor. Use cloth or a low-lint tissue, dry or moistened with a small amount of isopropyl alcohol.
8. Push the socket lever slightly down and out until it pulls up freely, and lift it to the open, vertical position. Grasp opposite sides of the processor and lift it out. Do not touch or bend the pins.
9. Put the processor in a piece of conductive foam and store in an antistatic package. If you install a new processor that is **identical** to the one you removed, you can re-use the heat sink. If upgrading to a different processor, you may need a new heat sink. All processor upgrade kits include heat sinks.

   Installing a different processor may require changes to the configuration jumpers on the processor board. See the “Processor Board Configuration Jumpers” section later in this chapter.
10. If leaving the socket empty, push the lever down until it snaps into the closed, horizontal position.

Removing and Installing a Bus Termination Board

A bus termination board must be installed in each processor board connector that does not contain a processor board. The following table lists the connectors on the R1 and R2 system boards that can contain a bus termination board. To install a processor board in place of a bus termination board, remove the bus termination board.

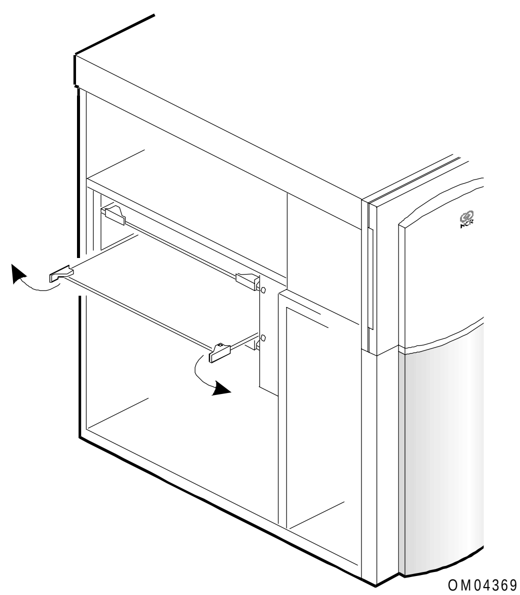
System board	Connectors in which a bus termination board can be installed
R1	Second processor board connector
R2 primary	CPU 2
R2 secondary	CPU 4 Both CPU 3 and CPU 4 (no processor boards installed) **Note:** If the secondary system board contains only one processor board, it must be installed in CPU 3 and a bus termination board must be installed in CPU 4.

Removing a Bus Termination Board

To remove a bus termination board:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the side cover.
3. Remove the board support panel in accordance with the instructions at the beginning of this chapter.
4. Rotate the board's ejector handles outward to a 90-degree angle from the board. This eases the board out of the system board connector. The following figure shows how to remove a bus termination board.

   Bus Termination Board



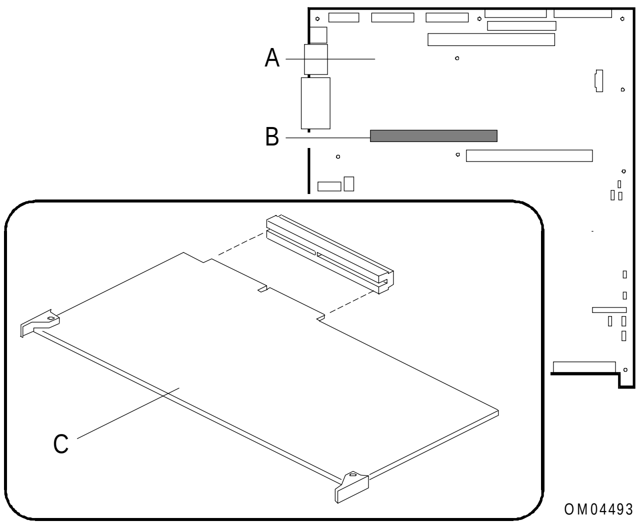
5. Holding the board by the corners where the handles are, carefully pull it out until the edge connectors are free from the system board connector.

6. Be careful not to touch components or gold edge connectors on the board as you remove it from the slot and place it component-side up on an antistatic surface.
7. Store board in an antistatic protective wrapper for future use if you need to install it in this or another system.

Installing a Bus Termination Board

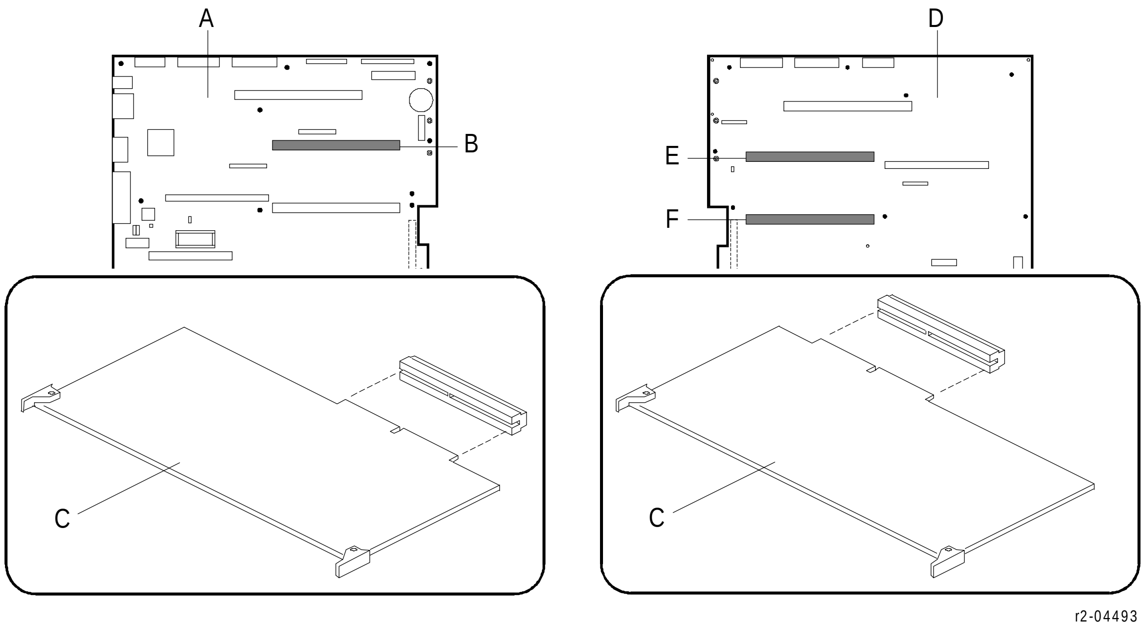
The following figures show how to install a bus termination board on the R1 system board and the R2 system boards.

Installing a Bus Termination Board on the R1 System Board



A	R1 system board
B	Secondary processor board connector on the system board
C	Bus termination board (installed component-side up); details of edge connector keying not shown

Installing a Bus Termination Board on an R2 System Board



A	R2 primary system board
B	CPU 2 on the primary system board
C	Bus termination board (installed component-side down on the R2 primary side, component-side up on the R2 secondary side); details of edge connector keying not shown
D	R2 secondary system board
E	CPU 4 on the secondary system board
F	CPU 3 on the secondary system board

To install a bus termination board:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Be careful not to touch components or gold edge connectors on the board as you remove it from its protective wrapper and place it component-side up on an antistatic surface.
3. On the system board, locate the connector that requires a bus termination board.
4. Hold the bus termination board by the corners with the ejector handles turned outward to a 90-degree angle from the board. The component side should be facing as follows:

If you are installing on an...	Then the bus termination board should be facing...
R1 system board	component-side up
R2 primary system board	component-side down
R2 secondary system board	component-side up

5. Do not press in on the board yet! Ease board into the correct slot guides until it is just touching the connector on the system board.

   CAUTION: Before closing handles, check board connector. Before closing the board handles, confirm visually that the board edge connectors are correctly oriented—not too low or high—at the system board connector.

6. Press board carefully but firmly into the system board connector, and rotate the handles closed (flush with front edge of board) to seat the board.

   CAUTION: Before applying power, perform one more check. After closing the handles, make sure the board is completely seated in the system board connector before applying power. Incomplete insertion can result in damage to the system board and to the board you have installed.

7. Reinstall the board support panel, doing a last alignment check with the scribe marks in the panel.

Processor Board Configuration Jumpers

This section contains information about the following processor board configuration jumpers:

- Dyadic 200 MHz 512K cache processor board
- Dyadic 200 MHz 1 MB cache processor board

CAUTION: Use care when installing/moving jumpers. A jumper is a small plastic-encased conductor that slips over two jumper pins. Newer jumpers have a small tab 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 the wide sides. Gripping the wide sides can damage the contacts inside the jumper, causing intermittent problems with the function controlled by that jumper. Take care to grip with, but not squeeze, the pliers or other tool you use to remove a jumper, or you may bend or break the stake pins on the board.

Dyadic 200 MHz 512K Cache Processor Board

The following table summarizes the configuration jumpers on the dyadic 200 MHz 512K cache processor board.

Processor Board Configuration Jumpers	Pins	Description
J101 and J106, Scan for processor (SCAN) *	**1-2**	Processor not installed in adjacent socket**
	2-3	Processor installed in adjacent socket
J103, Voltage Identification (VID)**	1-2	If jumper is installed, VID is disabled, processor 2. If not installed, VID is enabled, processor 2.
	3-4	If jumper is installed, VID is disabled, processor 1. If not installed, VID is enabled, processor 1.
	5-6	Park - not connected
	7-8	Park - not connected
J105, Processor frequency select (SEL)	**1-2**	SEL0
	3-4	SEL1
	5-6	SEL2
	7-8	Park - not connected
	9-10	Park - not connected
	11-12	Park - not connected

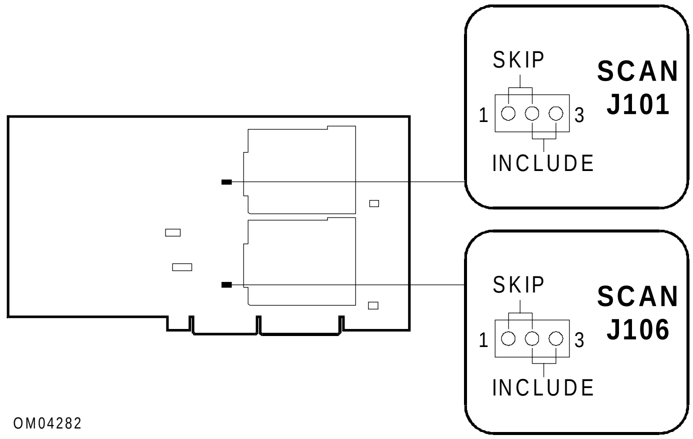
* The pins at J101 and J106 should be jumpered according to what is in the system.

** J103 block may not be present on all versions of the processor board. If not present, then VID is enabled and is not selectable.

SCAN Jumpers J101 and J106

The following figure shows the location of SCAN Jumpers J101 and J106.

SCAN Jumpers J101 and J106



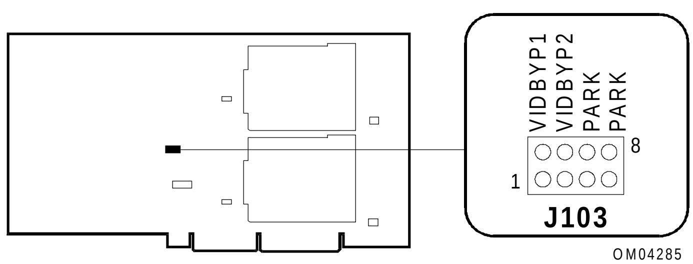
1-2	Processor not installed in adjacent socket (SKIP position), factory default
2-3	Processor installed in adjacent socket (INCLUDE position)

There are two SCAN jumper blocks, one for each processor socket. These are used to determine if a processor is installed in the socket adjacent to a given jumper block. In normal operation, these jumpers have no function. They are useful only during low-level processor bus debugging with an In-Target Probe (ITP).

VID Jumper J103

The following figure shows the location of VID Jumper J103.

VID Jumper J103



1-2	VID bypass 1
3-4	VID bypass 2
5-6	Park, factory default
7-8	Park, factory default

The settings at J103 depend on whether processors are voltage-ID-ready or not. In general, Voltage Identification (VID) is default-enabled; that is, the unused jumpers are placed in the Park locations on pins 5 and 6 and on pins 7 and 8. The J103 block is present only on early versions of the processor board; later versions have VID enabled at all times.

To disable VID for processor 2, move a jumper to pins 1 and 2 (VIDBYP1).

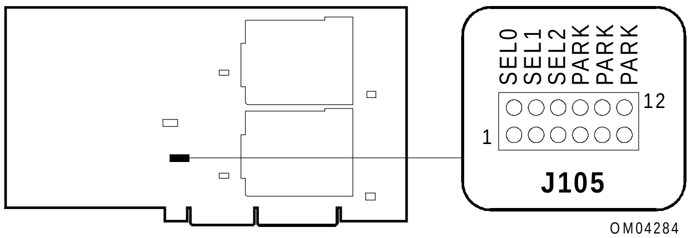
To disable VID for processor 1, move a jumper to pins 3 and 4 (VIDBYP2). (This is the correct description; VIDBYP1 refers to processor 2, and VIDBYP2 to processor 1.)

Note: VID Jumper J103 is not present on all processor board models.

Processor Frequency Select Jumper J105

The following figure shows the location of Processor Frequency Select Jumper J105.

Processor Frequency Select Jumper J105



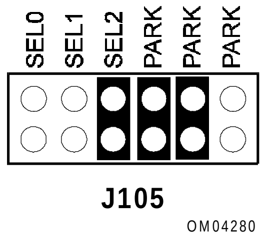
CAUTION: Damage to the processor can occur if you select a jumper setting frequency that is greater than the actual frequency of the processor.

Use this jumper block to select the processor core/bus frequency. The selection must match the frequency of the processor being installed in the system. Be sure that all boards are programmed to the same frequency.

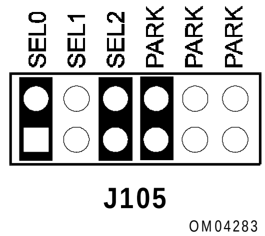
Install jumpers for the desired frequency as shown in the following table. Place any unused jumpers in the Park locations (pins 7-8; 9-10; 11-12).

Frequency	SEL0 Pins 1-2	SEL1 Pins 3-4	SEL2 Pins 5-6
150/60 MHz	No jumper	No jumper	No jumper
180/60 MHz	Jumper	No jumper	No jumper
210/60 MHz	No jumper	Jumper	No jumper
240/60 MHz	Jumper	Jumper	No jumper
166/66 MHz	No jumper	No jumper	Jumper
200/66 MHz	Jumper	No jumper	Jumper
233/66 MHz	No jumper	Jumper	Jumper
266/66 MHz	Jumper	Jumper	Jumper

Example, jumpering for 166/66 MHz



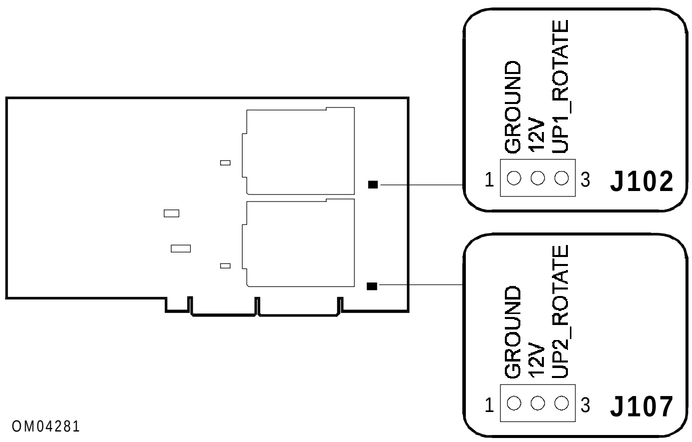
Example, jumpering for 200/66 MHz



Fan Sink Connectors J102 and J107

The following figure shows the location of Fan Sink Connectors J102 and J107.

Fan Sink Connectors, J102 and J107



J102 and J107 are connectors to power optional fan sinks to cool the processors while the board set is being tested outside of the chassis on a test bench. Each fan sink comes with a 3-pin connector wire. The connectors are not used in normal system operation.

Dyadic 200 MHz 1 MB Cache Processor Board

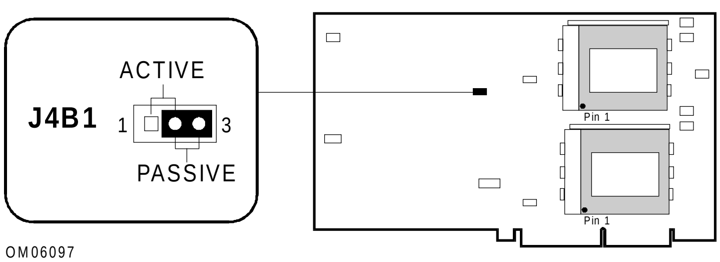
The following table summarizes the configuration jumpers on the dyadic 200 MHz 1 MB cache processor board.

Processor Board Configuration Jumpers	Pins	Description
J6D1 and J6B1, Scan for processor (SCAN) *	**1-2**	Processor not installed in adjacent socket
	2-3	Processor installed in adjacent socket
J4B1, Active/passive	1-2	Active
	2-3	Passive
J1C1, Processor cache	1-4	512 KB cache
	5-8	1 MB cache
J4D1, Processor frequency select (SEL)	**1-2**	SEL0
	3-4	SEL1
	5-6	SEL2
	7-8	Park - not connected
	9-10	Park - not connected
	11-12	Park - not connected

Active/Passive Jumper J4B1

The following figure shows the location of Active/Passive Jumper J4B1.

Active/Passive Jumper J4B1



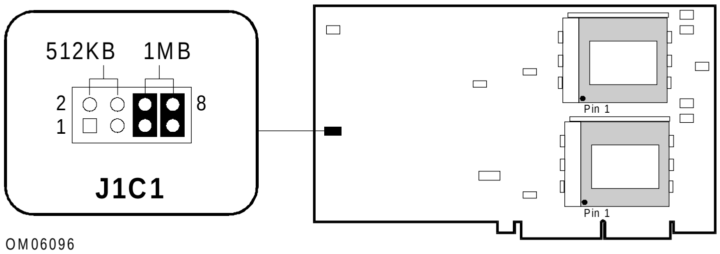
1-2	Active
2-3	Passive

The Active/Passive jumper block is used to select the heat sink cooling option. The jumper should be at the passive setting (pins 2 and 3) to indicate the use of passive heat sinks. Active (dual fan) heat sinks are not used in this server.

Processor Cache Jumper J1C1

The following figure shows the location of Processor Cache Jumper J1C1.

Processor Cache Jumper J1C1



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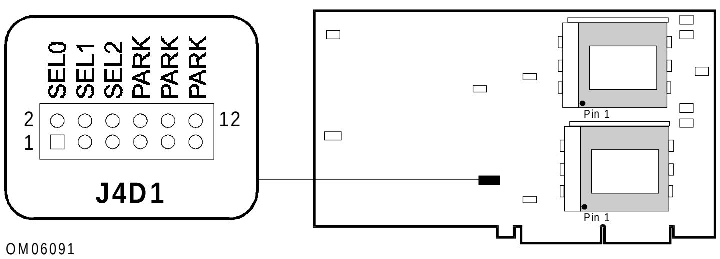
1-4	512 KB cache
5-8	1 MB cache

The Processor Cache jumper block is used to select the processor cache size. The selected cache size must match the cache size of the processors installed on the board.

Processor Frequency Select Jumper J4D1

The following figure shows the location of Processor Frequency Select Jumper J4D1.

Processor Frequency Select Jumper J4D1



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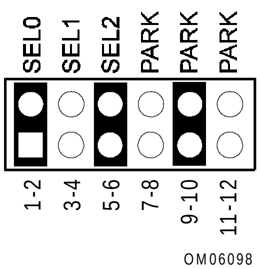
CAUTION: Damage to the processor can occur if you select a jumper setting frequency that is greater than the actual frequency of the processor.

Use this jumper block to select the processor core/bus frequency. The selection must match the frequency of the processor being installed in the system. Be sure that all boards are programmed to the same frequency.

Install jumpers for the desired frequency as shown in the following table. Place any unused jumpers in the PARK locations (pins 7-8; 9-10; 11-12).

Frequency	SEL0 Pins 1-2	SEL1 Pins 3-4	SEL2 Pins 5-6
150/60 MHz	No jumper	No jumper	No jumper
180/60 MHz	Jumper	No jumper	No jumper
210/60 MHz	No jumper	Jumper	No jumper
240/60 MHz	Jumper	Jumper	No jumper
166/66 MHz	No jumper	No jumper	Jumper
200/66 MHz	**Jumper**	**No jumper**	**Jumper**
233/66 MHz	No jumper	Jumper	Jumper
266/66 MHz	Jumper	Jumper	Jumper

Example, jumpering for 200/66 MHz



Chapter 6

Memory

This chapter describes the following:

- Supported memory boards
- Removing and installing memory boards
- Adding and removing SIMMs on the 2 GB memory board
- Adding and removing DIMMs on the 4 GB memory board
- BIOS performance options for memory
- Removing and installing an LST SIMM

Tools and Supplies Needed

You need the following tools and supplies to perform the procedures described in this chapter:

- Phillips #2 screwdriver
- Standard tip screwdriver
- Antistatic package
- Antistatic wrist strap and conductive foam pad (recommended)
- *System Site Log*. This document contains forms for recording information on system equipment and components, hardware service, software products, and preventive maintenance activities. Use these forms as you set up your system for the first time, integrate new parts or software into the system, service or troubleshoot system problems, and perform preventive maintenance.

Updating the Configuration History File

Whenever you install or replace a system component, update the configuration history file on the Diagnostic Partition. To update the configuration history file:

1. Boot to the Diagnostic Partition.
2. Select “Run Utilities and Diagnostics” from the MS-DOS Startup Menu.
3. Select “System Config Utils.”
4. Select “View Version Info.”
5. Select “Edit Config History.”

Warnings and Cautions

The following warnings and cautions apply throughout this chapter. Only qualified service personnel should integrate and configure boards.

Warnings

System power on/off: The DC push-button on/off switch (a convex 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 cord. Do not remove the side covers or internal board support panels unless the AC power cord has been unplugged. If the system has internal battery backup power, you must also turn the local battery disconnect switch on the back of the server to “Off.”

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

Cautions

Electrostatic discharge (ESD) and ESD protection: ESD can damage disk drives, boards, and other parts. This system can withstand normal levels of environmental ESD while you are hot-swapping SCSI hard drives. However, we recommend that you perform all procedures in this chapter only at an ESD 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.

ESD and handling boards: 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. Use a conductive foam pad if available but not the board wrapper. Do not slide a board over any surface.

Ensure complete board insertion: When installing memory boards, before closing the board ejector handles, confirm visually that the board edge connectors are correctly oriented at the system board connector—not too low or too high. Then, after closing the handles, make sure the boards are completely seated in the system board connectors before applying power. Incomplete insertion can result in damage to the system board and the boards being inserted.

Board support panel, proper cooling and airflow: For proper cooling and airflow, always install the board support panel for the processor and memory boards before installing the chassis side and top covers and turning on the system. Operating it without this support panel in place can damage system parts.

Chassis covers, proper cooling and airflow: For proper cooling and airflow, always install the chassis side and top covers before turning on the system. Operating it without these covers in place can damage system parts.

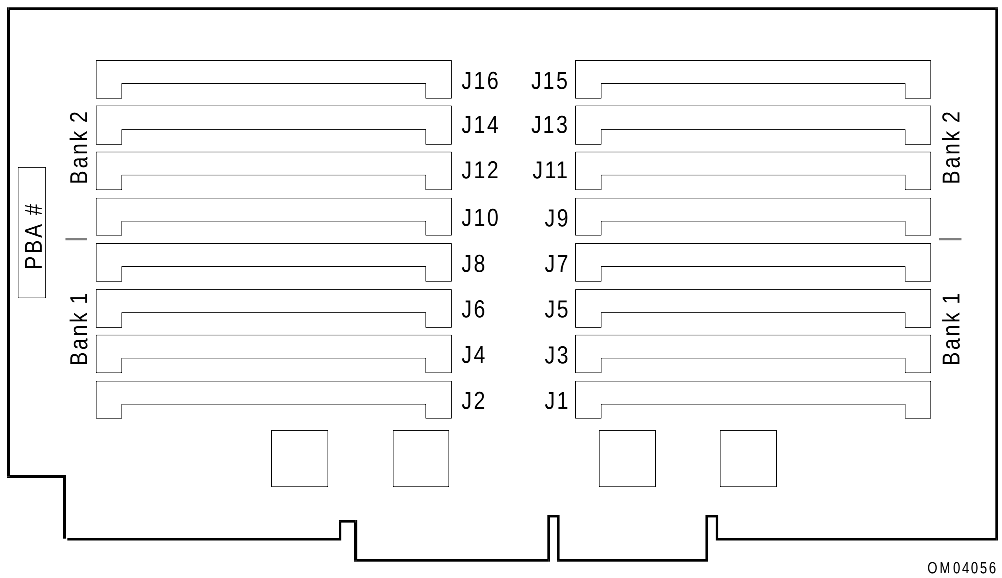
Supported Memory Boards

Two memory boards are supported for the server:

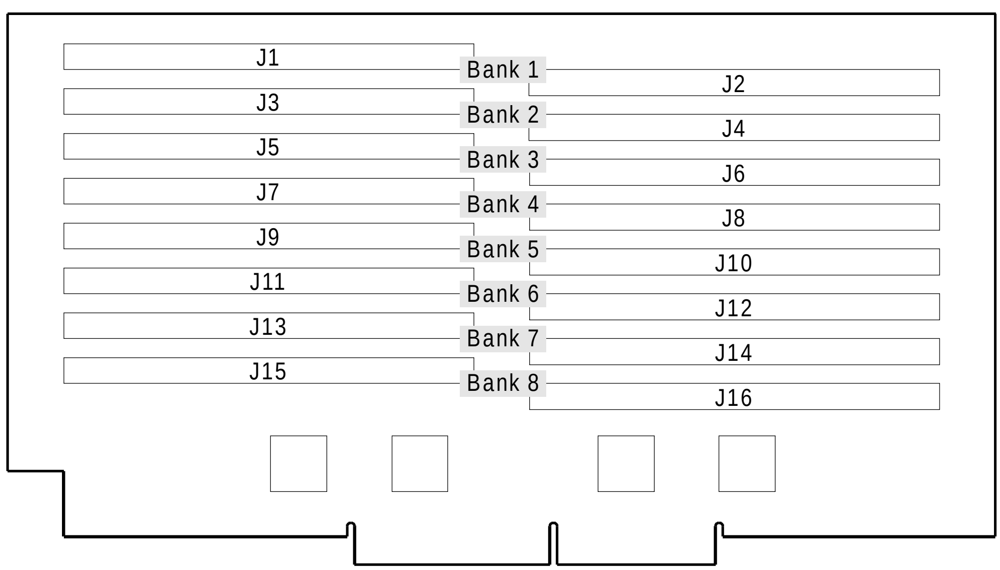
- 2 GB memory board that uses Single In-line Memory Modules (SIMMs)
- 4 GB memory board that uses Dual In-line Memory Modules (DIMMs)

The following figures show the 2 GB and 4 GB memory boards.

2 GB Memory Board



4 GB Memory Board



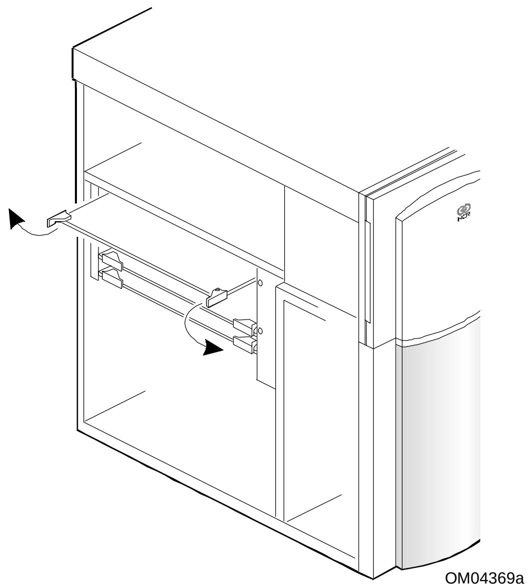
CAUTION: The 2 GB memory board cannot support DIMMs, and the 4 GB memory board cannot support SIMMs.

Removing and Installing Memory Boards

Removing a Memory Board

The instructions for removing and installing the 2 GB and 4 GB memory boards are the same. The following figure shows the location of the memory board on the primary side of the server. You must remove the board support panel to access a memory board.

Removing a Memory Board (Primary Side)



To remove a memory board:

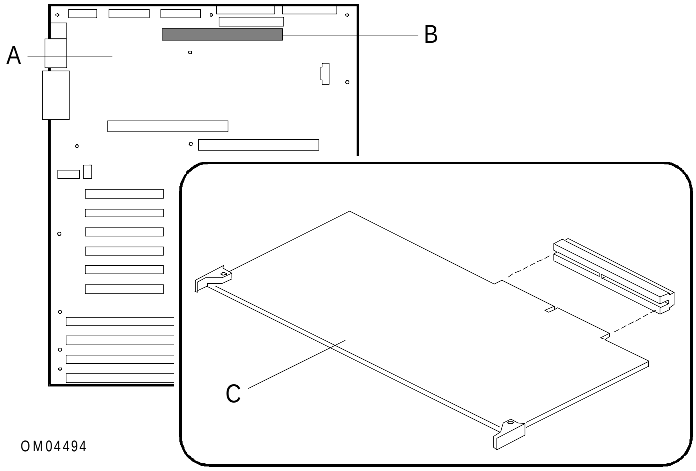
1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the side cover.
3. Remove the board support panel.
4. Rotate the ejector handles outward to a 90-degree angle from the board. This eases the board free from the system board connector.
5. Holding the board by the corners where the handles are located, carefully pull it out until the edge connectors are free from the system board connector.

   Be careful not to touch components or gold edge connectors on the board as you remove it from the slot.
6. Place the board component-side up on an antistatic surface so you can add or remove memory modules. (If necessary, store the board in an antistatic bag until you are ready to modify it.)

Installing a Memory Board

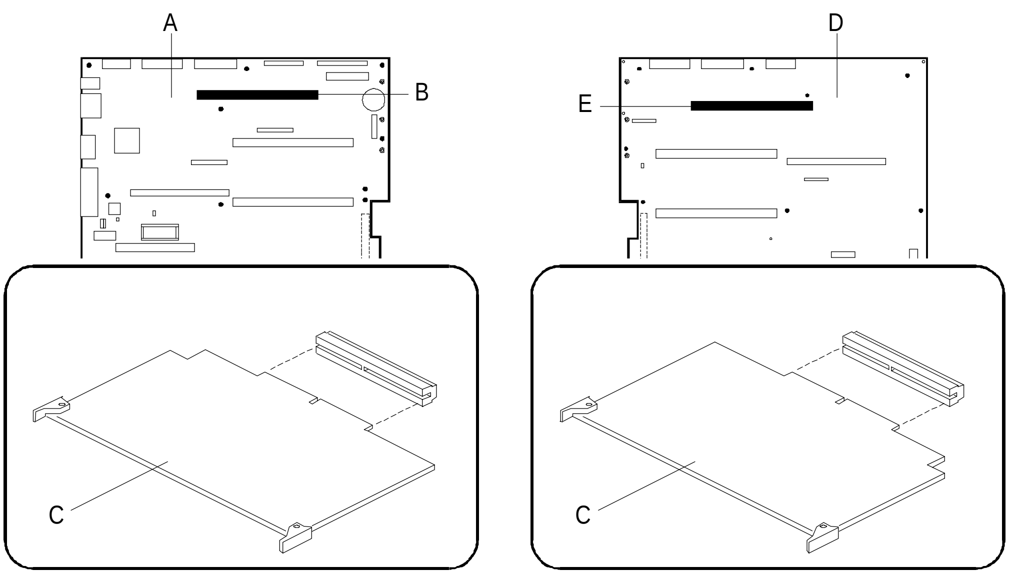
The following figures shows how to install a memory board on the R1 system board and the R2 system boards. Refer to the appropriate figure as you perform the installation procedure.

Installing the Memory Board (R1 System Board)



A	R1 system board
B	Memory board connector
C	Memory board; install with memory modules facing down

Installing a Memory Board (R2 System Boards)



A	R2 primary system board
B	Primary system board memory board connector
C	Memory board; memory modules face down on the primary side and up on the secondary side
D	R2 secondary system board
E	Secondary system board memory board connector

To install a memory board:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Be careful not to touch components or gold edge connectors on the board as you remove it from its protective wrapper. Place board component-side up on an antistatic surface.
3. Locate the memory board connector on the system board.
4. Hold the board by the corners with the ejector handles turned outward to a 90-degree angle from the board. The following table shows how the memory modules should be oriented:

If you are installing a memory board on the...	Then the memory modules should face...
R1 system board	down
R2 primary system board	down
R2 secondary system board	up

5. Do not press in on the board yet! Ease the board into the correct slot guides until it is just touching the connector on the system board.

   CAUTION: Before closing handles, check board connectors. Before closing the board handles, confirm visually that the board edge connectors are correctly oriented—not too low or high—at the system board connector.

6. Press board carefully but firmly into the system board connector, and rotate the handles closed (flush with front edge of board) to seat the board.

   CAUTION: Before applying power, do one more check. After closing the handles, make sure the board is completely seated in the system board connector before applying power. Incomplete insertion can result in damage to the system board and to the board you have installed.

7. Reinstall the board support panel, doing a last alignment check with the scribe marks in the panel.

Adding and Removing SIMMs on the 2 GB Memory Board

This section contains information on the following:

- SIMM upgrade kits
- SIMM sockets
- Allowed SIMM configurations
- SIMM configuration restrictions
- Adding SIMMs to the memory board
- Removing SIMMs from the memory board

2 GB Memory Board SIMM Upgrade Kits

The following table lists memory board SIMM upgrade kits:

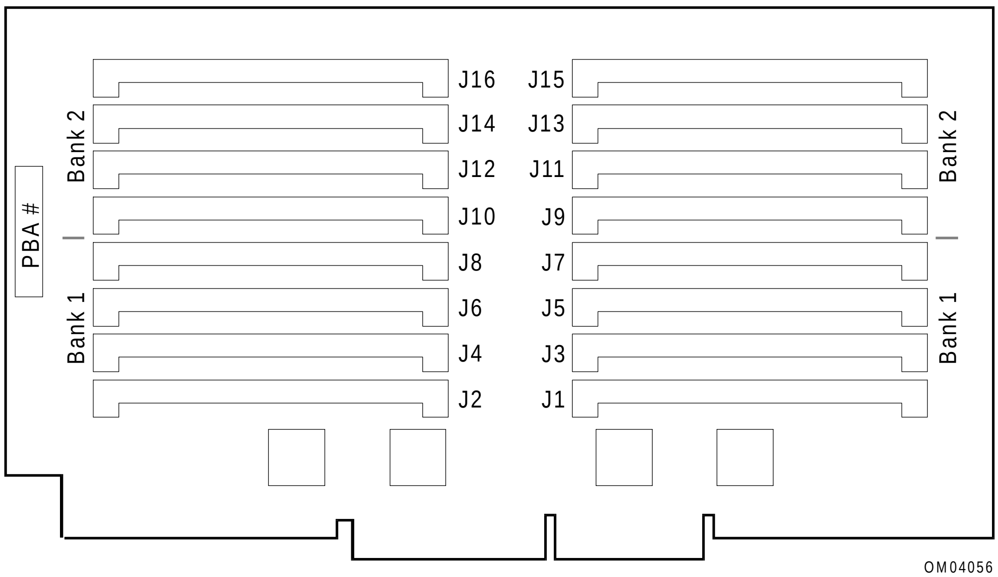
Kit Number	Description
3446-K104	32 MB Kit (two 16 MB SIMMs)
3446-K105	64 MB Kit (two 32 MB SIMMs)
3446-K109	128 MB Kit (two 64 MB SIMMs)
3446-K110	256 MB Kit (two 128 MB SIMMs)

Note: All SIMM upgrade kits include installation instructions.

2 GB Memory Board SIMM Sockets

The memory board has 16 SIMM sockets, arranged in two banks. The system automatically detects installed memory, so you do not need to set jumpers to specify memory size. The following figure shows the SIMM sockets on the memory board.

SIMM Sockets on the 2 GB Memory Board



Approved 2 GB Memory Board SIMM Configurations

This subsection includes the following:

- Approved SIMM configurations for R1 systems
- Approved SIMM configurations for R2 systems

Note the following as you view the tables that show the approved configurations:

- F104 - 32 MB feature kit containing two 16 MB memory SIMMs
- F105 - 64 MB feature kit containing two 32 MB memory SIMMs
- F109 - 128 MB feature kit containing two 64 MB memory SIMMs
- F110 - 256 MB feature kit containing two 128 MB memory SIMMs

Approved SIMM Configurations for R1 systems

The following table shows approved memory board SIMM configurations for R1 systems. The memory subsystem supports up to four memory interleaves (simultaneous accesses to system memory). You can maximize overall system performance by using as many memory interleaves as possible. For example, in a system with four same-size SIMMs, the configuration on row 2 is preferable to the configuration on row 4. See “2 GB Memory Board SIMM Configuration Restrictions” later in this section for restrictions on SIMM configuration.

		Bank 1				Bank 2					
Row ID	Total Memory	Slots J1/J2	Slots J3/J4	Slots J5/J6	Slots J7/J8	Slots J9/J10	Slots J11/J12	Slots J13/J14	Slots J15/16	Inter-leaves	Comments
1	32 MB	F104								1	
2	64 MB	F104	F104							2	
3	128 MB	F104	F104	F104	F104					4	
4	64 MB	F104				F104				1	Row #2 has better performance
5	128 MB	F104	F104			F104	F104			2	Row #3 has better performance
6	256 MB	F104	F104	F104	F104	F104	F104	F104	F104	4	
7	64 MB	F105								1	
8	128 MB	F105	F105							2	
9	256 MB	F105	F105	F105	F105					4	
10	128 MB	F105				F105				1	Row #8 has better performance
11	256 MB	F105	F105			F105	F105			2	Row #9 has better performance
12	512 MB	F105	F105	F105	F105	F105	F105	F105	F105	4	
13	96 MB	F104				F105				1	
14	192 MB	F104	F104			F105	F105			2	
15	384 MB	F104	F104	F104	F104	F105	F105	F105	F105	4	
16	96 MB	F105				F104				1	Same performance as Row #13.
17	192 MB	F105	F105			F104	F104			2	Same performance as Row #14.
18	384 MB	F105	F105	F105	F105	F104	F104	F104	F104	4	Same performance as Row #15.
19	128 MB	F109								1	
20	256 MB	F109	F109							2	
21	512 MB	F109	F109	F109	F109					4	
22	256 MB	F109				F109				1	Row #20 has better performance
23	512 MB	F109	F109			F109	F109			2	Row #21 has better performance
24	1024 MB	F109	F109	F109	F109	F109	F109	F109	F109	4	
25	256 MB	F110								1	
26	512 MB	F110	F110							2	
27	1024 MB	F110	F110	F110	F110					4	
28	512 MB	F110				F110				1	Row #26 for better performance.
29	1024 MB	F110	F110			F110	F110			2	Row #27 for better performance.
30	2048 MB	F110	F110	F110	F110	F110	F110	F110	F110	4	
31	384 MB	F110				F109				1	
32	768 MB	F110	F110			F109	F109			2	
33	1536 MB	F110	F110	F110	F110	F109	F109	F109	F109	4	
34	384 MB	F109				F110				1	Same performance as Row #31.
35	768 MB	F109	F109			F110	F110			2	Same performance as Row #32.
36	1536 MB	F109	F109	F109	F109	F110	F110	F110	F110	4	Same performance as Row #33.

Approved SIMM Configurations for R2 systems

The following table shows approved memory board SIMM configurations for R2 systems.

		Bank 1				Bank 2				
Row ID	**Total Memory**	**Slots J1/J2**	**Slots J3/J4**	**Slots J5/J6**	**Slots J7/J8**	**Slots J9/J10**	**Slots J11/J12**	**Slots J13/J14**	**Slots J15/16**	**Comments**
1	128 MB	F104	F104	F104	F104					
2	256 MB	F104	F104	F104	F104	F104	F104	F104	F104	
3	256 MB	F105	F105	F105	F105					
4	512 MB	F105	F105	F105	F105	F105	F105	F105	F105	
5	384 MB	F104	F104	F104	F104	F105	F105	F105	F105	
6	384 MB	F105	F105	F105	F105	F104	F104	F104	F104	Same performance as Row #5.
7	512 MB	F109	F109	F109	F109					
8	1024 MB	F109	F109	F109	F109	F109	F109	F109	F109	
9	1024 MB	F110	F110	F110	F110					
10	2048 MB	F110	F110	F110	F110	F110	F110	F110	F110	
11	1536 MB	F110	F110	F110	F110	F109	F109	F109	F109	
12	1536 MB	F109	F109	F109	F109	F110	F110	F110	F110	Same performance as Row #11.

2 GB Memory Board SIMM Configuration Restrictions

This section includes the following:

- General restrictions
- Additional restrictions for R1 systems only
- Additional restrictions for R2 systems only

Note: The internal battery support system supports a maximum of 1.5 GB of memory. If the memory configuration is greater than 1.5 GB, an external Uninterruptible Power Source (UPS) is recommended.

General Restrictions

The following general restrictions apply to SIMM configuration on the 2 GB memory board:

- Use only 16 MB, 32 MB, 64 MB, or 128 MB SIMMs.
- SIMMs within a bank must be the same size.
- Use only 36-bit, 72-pin 60 or 70 ns (nanoseconds) fast page mode SIMMs. The 2 GB memory board does not allow mixing of DRAM speeds.
- Use only SIMMs with tin-lead alloy-plated edge connectors. Do not use gold-plated SIMMs. The memory board connectors use tin-lead plated contacts that are not designed to mate reliably with gold-plated SIMMs.

Additional Restrictions for R1 Systems Only

The following additional restrictions apply to SIMM configuration on R1 systems only:

- The first row in the first bank (slots J1 and J2) should be populated first. If BIOS does not detect a memory module in the first row, it assumes that no memory is present.
- The 2 GB memory board allows 1-way, 2-way, and 4-way interleaving. Interleaving must be the same in each populated bank.
- Interleave size cannot be less than 32 MB. BIOS does not protect against invalid memory configurations, however.
- For optimum performance, use a configuration that supports the highest number of interleaves possible.
- For optimum performance, 4-way interleaving is highly recommended for systems with three or four processors.
- The R1 memory controller does not allow you to use 64 MB or 128 MB SIMMs on the same memory board with 16 MB or 32 MB SIMMs.

Additional Restrictions for R2 Systems Only

The following additional restrictions apply to SIMM configuration on R2 systems only:

- SIMMs must be installed 8 at time (an entire bank must be filled).
- Bank 1 (slots J1 through J8) should be fully populated first, then bank 2 (slots J9 through J16).

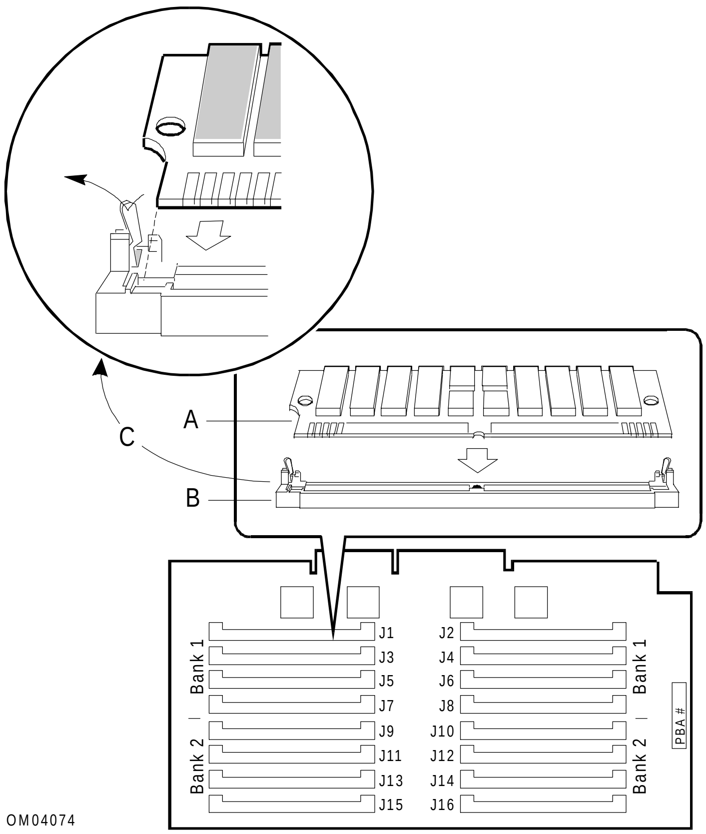
Adding SIMMs to the 2 GB Memory Board

To add SIMMs to the 2 GB memory board:

1. Place board flat with the edge connectors turned away from you, as shown in the following figure. Start with the lowest numbered sockets in bank 1.

   CAUTION: Handle SIMMs carefully. Hold SIMMs only by their edges. Place them on an antistatic surface; do not slide them across any surface. Applying too much pressure on retaining clips can break the clips or damage the socket.

   Installing SIMMs



A	Notch on SIMM to help orient the module to the socket (SIMM held with top angled away from you)
B	Socket on memory board
C	Socket clip details

2. Orient the SIMM by checking the notch on one corner of the module. The module can be inserted in only one way.
3. Hold the SIMM at a 45-degree angle, with the top angled away from you. Press carefully into socket until the SIMM is held by the clips. When properly installed, the SIMM remains at an angle. If there is a gap between the clips and the SIMM, it is not properly installed. In this case, open the clips and remove the SIMM; then try again.

Removing SIMMs from the Memory Board

To remove SIMMs from the memory board:

1. Remove SIMMs starting from the highest numbered sockets (farthest from bank 1).
2. Open retaining clips just enough to lift the top edge of the SIMM away from the clips.
3. Lift SIMM away from socket, and store in an antistatic package.

Adding and Removing DIMMs on the 4 GB Memory Board

This section contains the following:

- DIMM upgrade kits
- DIMM sockets
- Allowed DIMM configurations
- DIMM configuration restrictions
- Adding DIMMs to the memory board
- Removing DIMMs from the memory board

4 GB Memory Board DIMM Upgrade Kits

The following table lists memory board DIMM upgrade kits:

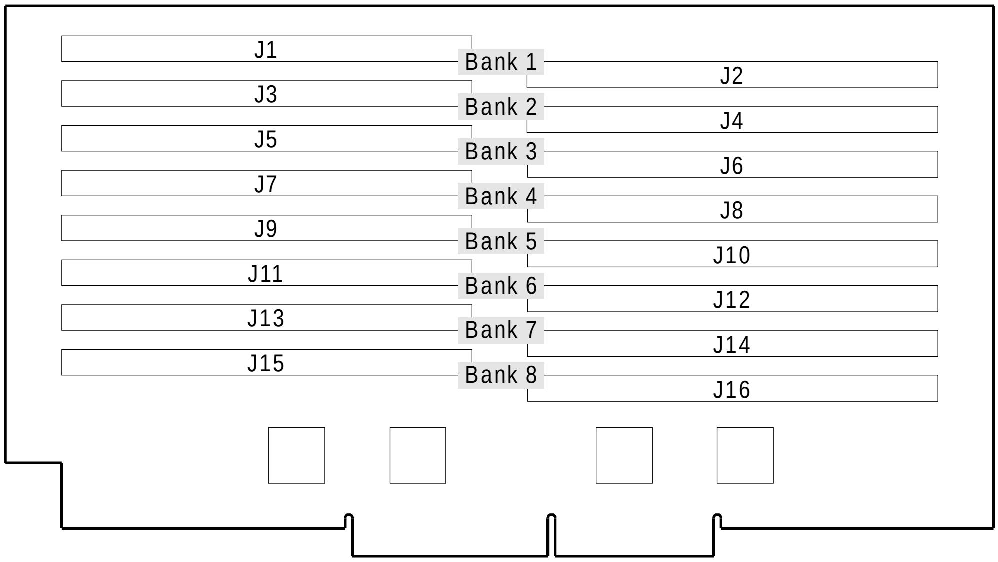
Kit Number	Description
3446-F/K116	**Memory DIMM - 128 MB (4x32 MB)** This feature and kit contains four 32 MB memory DIMMs.
3446-F/K119	**Memory DIMM - 512 MB (4x128 MB)** This feature and kit contains four 128 MB memory DIMMs.
3446-F/K120	**Memory DIMM - 1 GB (4x256 MB)** This feature and kit contains four 256 MB memory DIMMs.

Note: All memory board DIMM upgrade kits include installation instructions.

4 GB Memory Board DIMM Sockets

The 4 GB memory board has 16 DIMM sockets. The system automatically detects system memory that is installed, so you do not need to set jumpers to specify memory size. The following figure shows the DIMM sockets on the 4 GB memory board.

DIMM Sockets on the 4 GB Memory Board



4 GB Memory Board Approved DIMM Configurations

This subsection includes the following:

- Approved DIMM configurations for R1 systems
- Approved DIMM configurations for R2 systems

DIMMs must always be placed in groups of four. Note the following as you view the tables of approved configurations:

- F116 **-** 128 MB feature kit containing four 32 MB memory DIMMs
- F119 **-** 512 MB feature kit containing four 128 MB memory DIMMs
- F120 **-** 1 GB feature kit containing four 256 MB memory DIMMs

Approved DIMM Configurations for R1 systems

The following table shows approved memory board DIMM configurations for R1 systems.

Row ID	Total Memory	Slots J1-J4	Slots J5-J8	Slots J9-J12	Slots J13-J16
1	0.5 GB	F119			
2	1.0 GB	F119	F119		
3	1.0 GB	F119		F119	
4	1.5 GB	F119	F119	F119	
5	2.0 GB	F119	F119	F119	F119
6	1.0 GB	F120			
7	2.0 GB	F120	F120		
8	2.0 GB	F120		F120	
9	3.0 GB	F120	F120	F120	
10	4.0 GB	F120	F120	F120	F120
11	1.5 GB	F119	F120		
12	2.0 GB	F119	F120	F119	
13	2.5 GB	F119	F120	F119	F119
14	2.5 GB	F119	F120	F120	
15	3.5 GB	F119	F120	F120	F120
16	3.0 GB	F119	F120	F119	F120
17	3.0 GB	F119	F120	F120	F119
18	1.5 GB	F120	F119		
19	2.0 GB	F120	F119	F119	
20	2.5 GB	F120	F119	F119	F119
21	2.5 GB	F120	F119	F120	
22	3.5 GB	F120	F119	F120	F120
23	3.0 GB	F120	F119	F119	F120
24	3.0 GB	F120	F119	F120	F119
25	2.0 GB	F119	F119	F120	
26	2.5 GB	F119	F119	F120	F119
27	2.5 GB	F119	F119	F119	F120
28	3.0 GB	F119	F119	F120	F120
29	2.5 GB	F120	F120	F119	
30	3.0 GB	F120	F120	F119	F119
31	3.5 GB	F120	F120	F119	F120
32	3.5 GB	F120	F120	F120	F119

Approved DIMM Configurations for R2 Systems

The following table shows approved memory board DIMM configurations for R2 systems.

Memory Size (MB)	Slots J1-J4 (Banks 1&2)	Slots J5-J8 (Banks 3&4)	Slots J9-J12 (Banks 5&6)	Slots J13-J16 (Banks 7&8)	# of rows used	ABP*
128	F116				1	
256	F116	F116			2	Yes
384	F116	F116	F116		3	
512	F116	F116	F116	F116	4	Yes
512	F119				1	
640	F119	F116			2	
768	F119	F116	F116		3	
896	F119	F116	F116	F116	4	
1024	F119	F119			2	Yes
1024	F120				2	Yes
1152	F119	F119	F116		3	
1152	F120	F116			3	
1280	F119	F119	F116	F116	4	
1280	F120	F116	F116		4	
1408	F120	F116	F116	F116	5	
1536	F119	F119	F119		3	
1536	F120	F119			3	
1664	F119	F119	F119	F116	4	
1664	F120	F119	F116		4	
1792	F120	F119	F116	F116	5	
2048	F119	F119	F119	F119	4	Yes
2048	F120	F120			4	Yes
2048	F120	F119	F119		4	
2176	F120	F120	F116		5	
2304	F120	F120	F116	F116	6	
2560	F120	F120	F119		5	
2560	F120	F119	F119	F119	5	
2688	F120	F120	F119	F116	6	
3072	F120	F120	F120		6	
3072	F120	F120	F119	F119	6	
3200	F120	F120	F120	F116	7	
3584	F120	F120	F120	F119	7	
4096	F120	F120	F120	F120	8	Yes
* ABP - Address Bit Permuting. ABP is a BIOS Setup Utility option that can improve performance. It is available only for the designated DIMM configurations.						

4 GB Memory Board DIMM Configuration Restrictions

The following additional restrictions apply to DIMM configuration:

- The first bank in the first row (J1) should be populated first. If BIOS does not detect a memory module in the first row, it assumes that no memory is present.
- DIMMs must be populated in groups of 4.
- Use only 32 MB, 128 MB or 256 MB DIMMs.
- All DIMMs in a group of 4 must be the same size.
- Use only 72-bit, 168-pin 60 or 70 ns fast page mode DIMMs.
- If you mix DIMM speeds on a memory board, you must install the slowest DIMM in slot J1.
- Use only DIMMs with tin-lead alloy-plated edge connectors. Do not use gold-plated DIMMs. The memory board connectors use tin-lead plated contacts that are not designed to mate reliably with gold-plated DIMMs.

Note: The internal battery support system supports a maximum of 1.5 GB of memory. If the memory configuration is greater than 1.5 GB, an external Uninterruptible Power Source (UPS) is recommended.

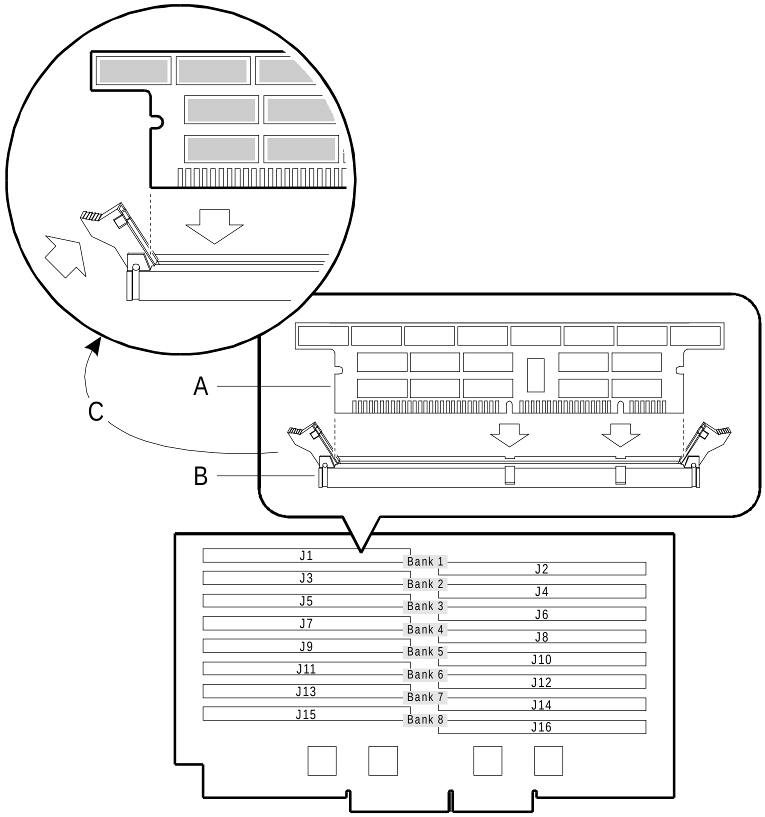
Adding DIMMs to the 4 GB Memory Board

To add DIMMs to the 4 GB memory board:

1. Place board flat with the edge connectors facing you, as shown in the following figure. Start with the lowest numbered sockets.

   CAUTION: Handle DIMMs carefully. Hold DIMMs only by their edges. Place them on an antistatic surface; do not slide them across any surface. Applying too much pressure on retaining clips can break the clips or damage the socket.

Installing DIMMs



A	Notch on DIMM (DIMM held at 90-degree angle relative to memory board)
B	Socket on memory board
C	Socket clip details

2. Orient the DIMM by checking the notches along the module edge. The module can be inserted in only one way.
3. Hold the DIMM at 90 degrees relative to the memory board. Press carefully into socket until the DIMM is held by the clips which swing in from the end. If there is a gap between the clips and the DIMM, it is not properly installed. In this case, open the clips and remove the DIMM; then try again.

Removing DIMMs from the 4 GB Memory Board

To remove DIMMs from the 4 GB memory board:

1. Remove DIMMs starting from the highest numbered sockets.
2. Push ejectors at end of DIMM out and down; this lifts the DIMM from the socket.
3. Lift DIMM away from socket, and store in an antistatic package.

BIOS Performance Options for Memory

There are two BIOS options that can improve memory performance. They are available through the BIOS Setup Utility and are enabled by default.

Note: These options apply to R2 systems only.

The following table lists the memory performance options and the memory configuration requirements for enabling them. You can enable these options in BIOS Setup regardless of whether the memory configuration is valid. If the memory configuration is invalid, BIOS disables these options during the boot process (BIOS does not automatically change the setting of the options in BIOS Setup, however).

BIOS Option	Conditions Required To Enable
Address Permuting	• Server must contain a 4 GB memory board • DIMM configuration must be valid (see the table in the “Approved DIMM Configurations for R2 Systems” section. The **ABP** column of this table denotes configurations for which address permuting is allowed)
Memory Interleaving	• Server must have both primary and secondary system boards • Each system board must have a memory board • Both memory boards must have the same amount of memory

Removing and Installing an LST SIMM (R2 Systems Only)

If a memory board is installed on an R2 system board (either primary or secondary), a Line Status Table (LST) SIMM must be installed on the system board also. LST SIMMs are 64-pin industry-compatible memory modules with an access time of 15 ns or less.

The procedures for removing and installing an LST SIMM are the same for both the primary and secondary side.

Guidelines for Installing LST SIMMs

Note the following guidelines for installing LST SIMMs:

- Since a memory board must be installed on the primary system board, an LST SIMM must also be installed on the primary system board.
- Do not install an LST SIMM on the secondary system board unless a memory board is also installed on the secondary system board.
- If LST SIMMs are installed on both system boards, they must be the same size.

LST SIMM Sizes

The following table shows the recommended LST SIMM size based on the amount of memory installed per system board.

LST SIMM Size	Amount of Memory
256K	≤ 256 MB
1024K	> 256 MB

Note: The 1024K LST SIMM should also be used if the server contains 200MHz 1 MB cache processors.

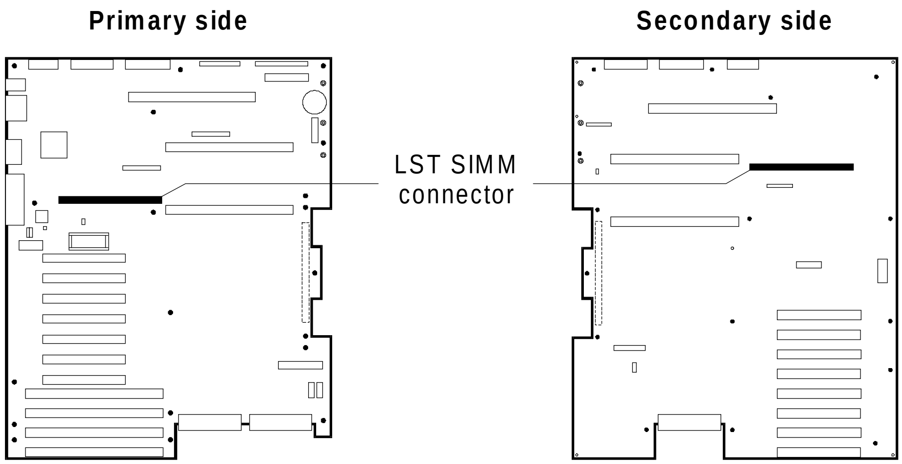
Removing an LST SIMM

Perform the following steps to remove an LST SIMM:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the side cover.
3. Remove the board support panel.
4. Remove both processor boards and place them component-side up in antistatic bags.

5. Locate the LST SIMM on the system board.

   Location of LST SIMM on System Boards



6. Open the retaining clips. Carefully pull the LST SIMM out and up at a 45-degree angle.

Installing an LST SIMM

Perform the following steps to remove an LST SIMM:

1. Observe the safety and ESD precautions at the beginning of this chapter.

   CAUTION: Handle SIMMs carefully. Hold SIMMs only by their edges. Place them on an antistatic surface; do not slide them across any surface. Applying too much pressure on retaining clips can break the clips or damage the socket.

2. Locate the LST SIMM connector on the system board. Refer to the figure “Location of LST SIMM on System Board” in this section.
3. Hold the LST SIMM at a 45-degree angle, with the top angled away from you. Press carefully into the socket until the LST SIMM is held by the retaining clips.
4. Remove each processor board from its antistatic bag and reinstall it. Be careful not to touch the LST SIMM with the processor boards.
5. Replace the board support panel.
6. Replace the side cover.

Chapter 7

R1 (Release 1 4SMP) System Board

This chapter describes the following:

- Removing and installing an R1 system board
- R1 system board configuration
- Removing and installing video memory
- Removing and installing the real-time clock

Definitions

The following abbreviations are used throughout this guide:

R1

The 1-4 way symmetrical multi-processing (SMP) system board

R2

The OctaSCALE system boards

Tools and Supplies Needed

You need the following tools and supplies to perform the procedures described in this chapter:

- Phillips #2 screwdriver
- Standard tip screwdriver
- ¼-inch hexagonal head nut driver
- #8 metric hexagonal-head nut driver
- Needle-nose pliers
- Video RAM removal tool (603-9013457)
- Antistatic wrist strap and conductive foam pad (recommended)
- Antistatic bags
- The *System Site Log*. This document contains forms for recording information on system equipment and components, hardware service, software products, and preventive maintenance activities. Use these forms as you set up your system for the first time, integrate new parts or software into the system, service or troubleshoot system problems, and perform preventive maintenance.

Updating the Configuration History File

Whenever you install or replace a system component, update the configuration history file on the Diagnostic Partition. To update the configuration history file:

1. Boot to the Diagnostic Partition.
2. Select “Run Utilities and Diagnostics” from the MS-DOS Startup Menu.
3. Select “System Config Utils.”
4. Select “View Version Info.”
5. Select “Edit Config History.”

Warnings and Cautions

These warnings and cautions apply throughout this chapter. Only qualified service personnel should integrate and configure boards.

Warnings

System power on/off: The DC push-button on/off switch (a convex 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 cord. Do not remove the side panels or internal cover panels unless the AC power cord has been unplugged. If the system has internal battery backup power, you must also turn the local battery disconnect switch on the chassis back to “Off.”

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

Cautions

Electrostatic discharge (ESD) and ESD protection: ESD can damage disk drives, boards, and other parts. We recommend that you perform all procedures in this chapter only at an ESD 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 the system when handling parts.

ESD and handling boards: 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. Use a conductive foam pad if available but not the board wrapper. Do not slide board over any surface.

Ensure complete board insertion: When installing a processor, memory, or bus termination board, confirm visually that the board edge connectors are correctly oriented at the system board connector—not too low or too high—before closing the board ejector handles. After closing the handles, make sure the boards are completely seated in the system board connectors before applying power. Incomplete insertion can result in damage to the system board and the boards being inserted.

Board support panel, proper cooling and airflow: For proper cooling and airflow always install the board support panel for the processor and memory boards before installing the chassis side and top covers and turning on the system. Operating the system without this support panel in place can damage system parts.

Chassis covers, proper cooling and airflow: For proper cooling and airflow, always install the chassis side and top covers before turning on the system. Operating the system without these covers in place can damage system parts.

Removing and Installing an R1 System Board

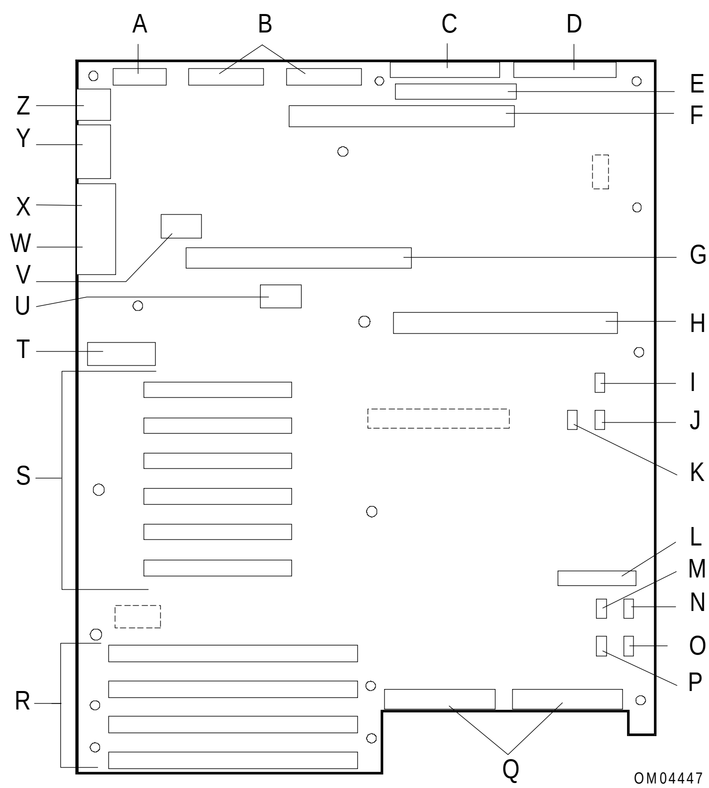
This section contains the following:

- R1 system board connectors
- Removing an R1 system board
- Installing an R1 system board
- Configuring a replacement R1 board

R1 System Board Connectors

The following figure shows the connectors on the R1 system board.

R1 System Board Connectors



A	**CABLE: Power control and status (PS3)**
B	**CABLES:** +5V, +12V, and 3.3V power connectors (PS1 and PS2) (identical)
C	**CABLE:** Diskette drive connector
D	**CABLE:** Front panel connector
E	IDE drive connector (not used)
F	Memory board connector
G	Secondary processor board or termination board connector
H	Primary processor board connector
I	**SHUNT CABLE:** Fan 1 connector (fan not used)
J	**SHUNT CABLE:** Fan 2 connector (fan not used)
K	Hard drive LED 1 connector (not used)
L	Connector for optional Server Management Module (SMM)
M	I^2C connector (not used)
N	**SHUNT CABLE:** Fan 3 connector (fan not used)
O	**SHUNT CABLE:** Fan 4 connector (fan not used)
P	Hard drive LED 2 connector (not used)
Q	**CABLE:** SCSI bus connectors: Channel A to the right, Channel B to the left
R	EISA slots 1 - 4 for add-in boards (slot 1 toward top, 4 toward bottom)
S	PCI slots 1 - 6 for add-in boards (slot 1 toward top, 6 toward bottom: Bus 0 = slots 1 - 3; Bus 1 = slots 4 - 6)
T	Configuration switches and jumpers
U	Real-time clock
V	Video DRAM expansion socket (populated)
W	**EXTERNAL CABLE:** VGA monitor connector
X	**EXTERNAL CABLE:** Parallel port connector
Y	**EXTERNAL CABLES:** Serial port connectors A (COM1) and B (COM2)
Z	**EXTERNAL CABLES:** PS/2®-compatible keyboard and mouse connectors

Note: The “R1 System Board Connectors” figure shows three connectors as dotted-line boxes. They are not used in this system configuration. Their functions at the factory are as follows:

- In-target Probe (ITP) connector, near upper right corner
- Test connector, near middle of board
- 3.3 V PCI power connector, near lower left corner below PCI slots

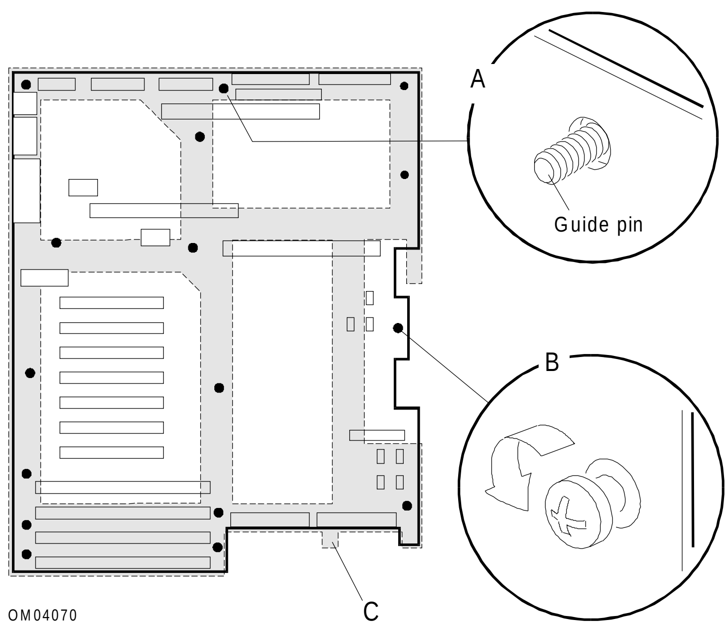
Removing an R1 System Board

Perform the following steps to remove the system board:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the board support panel.
3. Disconnect external devices from the I/O panel at the back of the chassis.
4. Label and disconnect all internal cables connected to add-in boards.
5. Remove all boards present (processor, memory, bus termination, and add-in). Place all boards in antistatic bags.

6. Label and disconnect all cables attached to the system board.
   a. Power connectors: each has a locking tab on the bottom side of the connector. Press upward on the end of the tab to release it as you pull the connector out of the socket on the system board. The left-most connector is harder to access because of the I/O connectors but is removed in the same way.
   b. SCSI connectors at the bottom edge: you can remove the SCSI cables while the board is still installed in the chassis, but it is easier to do so after the board is out of the chassis.
   c. Fan shunt cables: you do not need to remove these three shunts to remove the system board; however, you do need to save them for system board reinstallation.
7. Remove card guides:
   a. The larger metal guide at the front of the cardcage has one screw at the outer edge.
   b. The metal guide inside the back of the cardcage has one screw that you must reach from outside the back of the chassis.
   c. The plastic guide for add-in boards has a press-in release tab.
8. Remove 15 board retaining screws and save them for reinstallation. The following figure shows how to remove the system board. The board is oriented as it would be in the chassis, with the power connectors toward top left.

Removing the System Board



A	Hole for the guide pin used to line up the system board in the chassis
B	15 board retaining screws (shown as black dots)
C	Cardboard spacer

9. Pull the board free from the guide pin. Slide it toward the front of the chassis until the board I/O connectors clear the openings in the back of the chassis.
10. Remove board and place it on an antistatic foam pad or a grounded workstation.

CAUTION: A cardboard spacer is located behind the board (between the system board and the chassis). This spacer is required for proper mechanical spacing in the chassis if an R1 system board is installed. If you are reinstalling an R1 system board, do not discard the spacer. If you are installing an R2 primary system board, you must remove and discard the cardboard spacer before installing the R2 system board.

Installing an R1 System Board

Perform the following steps to install the system board:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Position the board with the I/O connectors toward the chassis back panel. Slide the board toward the back of the system until the I/O connectors protrude through the openings in the back panel.
3. Position the board over the guide pin and seat the board in the chassis. While holding the board in position, insert a screw through one of the mounting holes of the board and into a threaded standoff. Do not tighten yet.
4. Insert the remaining 14 screws through the mounting holes and into the threaded standoffs, shifting the board slightly as needed to fit. Make sure the board is properly seated, and then tighten all screws firmly.
5. Connect all cables to the board, including the three fan shunt cables.
6. Install the metal card guides (and the plastic card guide if it was removed).
7. Install processor boards, memory board, and add-in boards. Install the board support panel.
8. Connect all internal cables for add-in boards installed in the expansion slots, and connect external I/O cables at the back panel.

Configuring a Replacement R1 Board

If you replace the system board with a new board, perform the following steps after you install the new board:

1. Check to be sure that the system BIOS is up to date. To do this:
   a. Boot from the Platform CD-ROM. If an old BIOS is detected, the CD-ROM menu indicates that an update is mandatory.
   b. Press ENTER to continue.
   c. Follow the instructions to complete the update. The system updates the BIOS and reboots when the update is complete.
2. Clear CMOS and NVRAM using the S6A1-1 switch (see “R1 System Board Configuration” later in this chapter for a discussion of this procedure).
3. Boot to the Diagnostic Partition and use the SCU to restore the system configuration. See the *Server Software Guide (4SMP)* for information about the SCU.
4. Clear the BIOS error log.

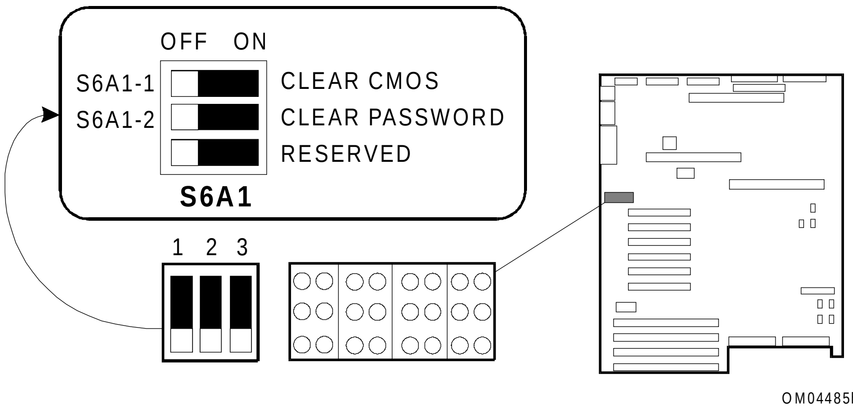
R1 System Board Configuration

The R1 system board has a configuration block that consists of a set of three dip switches and eight jumper blocks. All switch and jumper procedures require that you follow the warnings and cautions at the beginning of this chapter.

Configuration Switches

The following figure shows the R1 system board configuration switches. To change the setting, slide the switch to the desired position.

R1 System Board Configuration Switches



Switch	Position	Function
S6A1-1	On **Off***	Clear CMOS Normal operation
S6A1-2	On **Off***	Clear password Normal operation
S6A1-3	**Off***	Reserved

* Factory default setting appears in boldface.

CMOS Switch S6A1-1

Switch S6A1-1 controls whether settings stored in CMOS nonvolatile memory (NVRAM) are retained during a system reset:

- Switch in OFF position: settings in CMOS and NVRAM are preserved during system reset.
- Switch in ON position: settings in CMOS and NVRAM are reset to factory defaults during system reset.

Clearing CMOS with Switch S6A1-1

To clear CMOS (restore to factory default values):

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Turn off system power, disconnect the AC power cord, and switch the local battery disconnect switch to the “Off” position.
3. Remove the left side cover.
4. Remove the board support panel. You do not need to remove the system board, and you do not need to remove any add-in boards.
5. On the R1 system board, slide switch S6A1-1/CLEAR CMOS to ON.
6. Replace the board support side panel and side cover. Connect the power cord and turn on the system.
7. Wait for the Power-On Self-Test (POST) to complete and the following message to display:

   `NVRAM cleared by jumper`
8. Turn off system power and disconnect the AC power cord.
9. Remove the left side cover and board support panel again.
10. Slide switch S6A1-1 to OFF (the original position). Setting it to OFF preserves the settings during system reset.
11. Replace the board support panel and the left side cover, connect the power cord, switch the local battery disconnect switch to the “On” position, and turn on the system.
12. Run BIOS Setup to verify the correct settings.

Clearing CMOS to Re-enable the Diagnostic Partition

This procedure is necessary only if the following are true:

- The Diagnostic Partition has been disabled through the SCU.
- The Platform CD-ROM and backup diskette are unavailable.

To clear CMOS and re-enable the Diagnostic Partition:

1. Clear CMOS using the procedure detailed in the previous section; this re-enables the Diagnostic Partition.
2. Boot to the Diagnostic Partition and start the SCU in accordance with instructions in the *Server Software Guide (4SMP)*.
3. Restore the system configuration using the procedure detailed in the *Server Software Guide*.
4. When you have restored the system board settings, select “System Board” from the Change Configuration Settings menu.
5. Locate the “Diagnostic Partition” option in the Management Subsystem Group and ensure that it is enabled.
6. Save your configuration and exit from the SCU.

Clearing CMOS Without Removing the Cover Using the clrcmos Routine

You can also clear CMOS without entering the cabinet by running the **clrcmos** routine. To run this routine:

1. Boot from an SCU diskette or BIOS Flash diskette (see the *Server Software Guide*).
2. Exit to the DOS prompt.
3. Type the following at the DOS prompt:

   `clrcmos`

4. Press ENTER.

   When the routine finishes, the DOS prompt displays.

5. Boot the server.

There are no display messages when you run the **clrcmos** routine. The system displays the following message during the next boot:

```
WARNING:
0198: CMOS Checksum Invalid
```

Note: The **clrcmos** routine invalidates CMOS so that the system BIOS reloads it with default values on the next boot. The **clrcmos** routine does not affect the peripheral configuration values stored in NVRAM. Clearing CMOS by using the S6A1-1 switch on the system board clears NVRAM as well as CMOS.

CAUTION: You should run the **clrcmos** routine only if absolutely necessary to recover the system from a situation where booting from a hard disk is impossible.

Password Switch S6A1-2

This switch controls whether a stored password is retained or cleared during a system reset.

- Switch in OFF position: lets you enter and save a password that is preserved during system reset.
- Switch in ON position: clears the password during system reset.

To clear and enter a password:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Turn off system power, disconnect the AC power cord, and switch the local battery disconnect switch to the “Off” position.
3. Remove side and top covers.
4. Remove the board support panel. You do not need to remove the system board, and you do not need to remove any add-in boards.
5. On the R1 system board, slide the S6A1-2 switch to ON (to clear old password).
6. Install side panel. Connect the power cord and turn on the system.
7. Wait for POST to complete. The password is cleared automatically.
8. Turn system off and disconnect the AC power cord.
9. Remove the side panel again.
10. Slide switch to “Off” to resume normal operation (your settings are retained during system reset).

11. Install side panel, connect the power cord, switch the local battery disconnect switch to the "On" position, and turn on the system.
12. Run BIOS Setup or the SCU to specify a new password. When you reboot the system, the new password is retained. Refer to the *Server Software Guide (4SMP)* for information on setting passwords.

Configuration Jumpers

The jumper sets are arranged in pairs; that is, J6A1 has a three-pin block for BIOS Recovery and a three-pin block for Boot Block Protect. These are not numbered separately on the R1 system board, but they are labeled with the function name. Some of the jumper blocks are reserved for future use.

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 the wide sides. Gripping the wide sides can damage the contacts inside the jumper, causing intermittent problems with the function controlled by that jumper. Take care to grip with, but not squeeze, the pliers or other tool you use to remove a jumper, or you may bend or break the stake pins on the board.

The following table summarizes the R1 system board configuration jumpers. The rest of this section briefly describes the function of each jumper and shows the jumper block locations on the R1 system board.

R1 system board configuration jumper (listed by block number on board)	Pins	Description
J6A1, BIOS Recovery	**1-2***	Normal BIOS boot block
	2-3	Recovery BIOS boot block
J6A1, Boot Block Protect	**1-2***	BIOS boot block is write-protected
	2-3	BIOS boot block is programmable
J6A4, BIOS Write	1-2	Disables BIOS update of flash memory
	2-3*	Enables BIOS update of flash memory with special utility
J6A4, Floppy 0	1-2	For 1.44 MB diskette drive size or autodetection. Disables 2.88 MB size detection
	2-3*	For forced 2.88 MB diskette drive size
J6A2, Floppy 1	1-2	For 1.44 MB diskette drive size or autodetection. Disables 2.88 MB size detection
	2-3*	For forced 2.88 MB diskette drive size
J6A2, Video Sleep	1-2	Video Sleep Register resides at 03C3H
	2-3*	Video Sleep Register resides at 46E8H
J6A3, Power Control	1-2	Disables RTC power supply control
	2-3*	Enables power supply control using RTC
* Factory default setting		

Procedure to Change a Jumper Setting

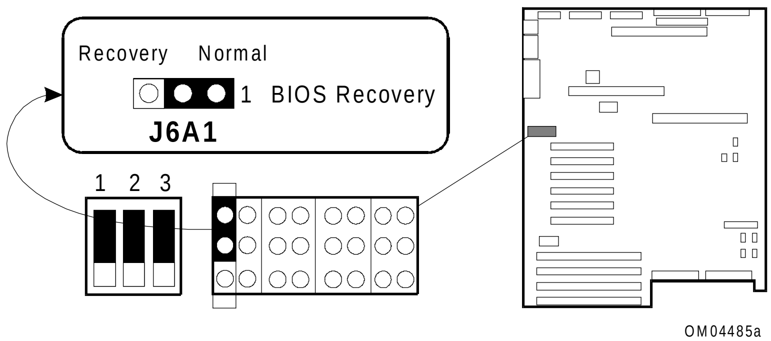
The general procedure for changing a configuration setting is the same for most of the jumper functions:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Turn off system power, disconnect the AC power cord, and switch the local battery disconnect switch to the “Off” position.
3. Remove the side panel.
4. Move jumper to pins specified for the desired setting.
5. Install the side panel, connect the power cord, and switch the local battery disconnect switch to the “On” position.
6. Reboot the system for the change to take effect.

BIOS Recovery Jumper, J6A1

The following figure shows the jumper block location for the BIOS Recovery Jumper, J6A1.

BIOS Recovery Jumper, J6A1



Pins	Description
1-2	Normal BIOS boot block, factory default
2-3	Recovery BIOS boot block

This jumper enables the recovery mode for the BIOS flash memory. This mode is important because the system BIOS can be corrupted—for example, when the update procedure is aborted due to a power outage. The flash memory contains a protected area that cannot be corrupted. Code in this area is used to boot the server from a diskette in drive A when the BIOS has been corrupted.

After booting from the diskette, use the BIOS Flash utility to automatically recover the system BIOS from the BIOS recovery files on the diskette. (For normal operation, it is important to keep the jumper on pins 1 and 2.) When you run the recovery procedure, another jumper, BIOS Write at J6A4, must also be in its default position (pins 2 and 3 jumpered).

BIOS Recovery Procedure

Use the following procedure to recover a corrupted system BIOS:

1. Observe all safety and ESD precautions.
2. If you have a BIOS Flash Utility diskette, the disk is DOS-bootable. If you receive the Flash Memory Update from a bulletin board, it is in a self-extracting archive format file. Executing the file places all necessary format, boot, and Flash Update information onto a diskette.
3. Turn the system off, unplug the power cord, and switch the local battery disconnect switch to “Off.”
4. Open the system. On the system board, move the BIOS Recovery Jumper at J6A1 from pins 1 and 2 to pins 2 and 3. The BIOS Write Jumper at J6A4 must be in its default position (pins 2 and 3).
5. Replace the side cover.
6. Plug in the power cord.
7. Insert the BIOS Flash Utility diskette into the drive and power on the system. After the system boots successfully, the speaker emits a single beep and the recovery process starts – it takes about two to four minutes. When the recovery process completes, the system speaker emits two beeps.

While in the recovery mode, there is no screen display on the monitor, and the keyboard is disabled as the system automatically recovers the BIOS. The recovery status is identified through beep codes. Refer to the next subsection, “BIOS Recovery Mode Beep Codes,” for a description of the beep codes.

8. Turn the system off and unplug the power cord.
9. Open the system. On the system board, move the BIOS Recovery Jumper at J6A1 from pins 2 and 3 back to pins 1 and 2.
10. Manually clear CMOS and NVRAM using Switch S6A1-1 on the system board. See “CMOS Switch S6A1-1” earlier in this chapter for instructions.
11. If you have a password defined, after running the special recovery mode, run the SCU or BIOS Setup Utility to specify this password again. For information on running the SCU and the BIOS Setup Utility, see the *Server Software Guide (4SMP)*.

BIOS Recovery Mode Beep Codes

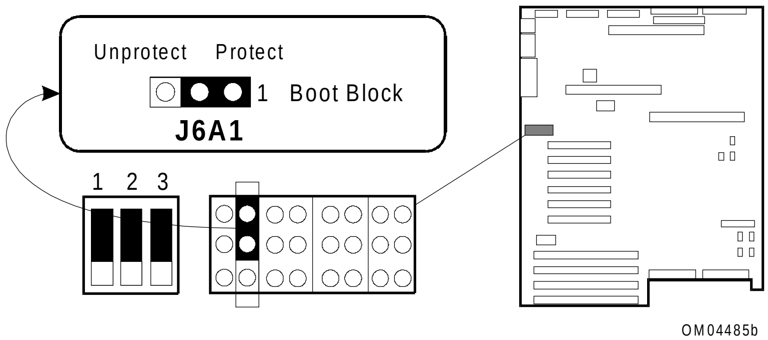
The following table describes the recovery mode beep codes.

Beep Code	Message
1	Signals beginning of recovery process; process takes 2 to 4 minutes.
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	Any or all of the following causes: • The wrong BIOS recovery files are being used. • Configuration jumper allowing BIOS recovery is in the wrong position. • Configuration jumper allowing BIOS write to flash memory is in the wrong position. • The Clear CMOS switch, S6A1-1, is in the wrong position.

Boot Block Jumper, J6A1

The following figure shows the jumper block location for the BIOS Boot Block Jumper, J6A1.

Boot Block Jumper, J6A1



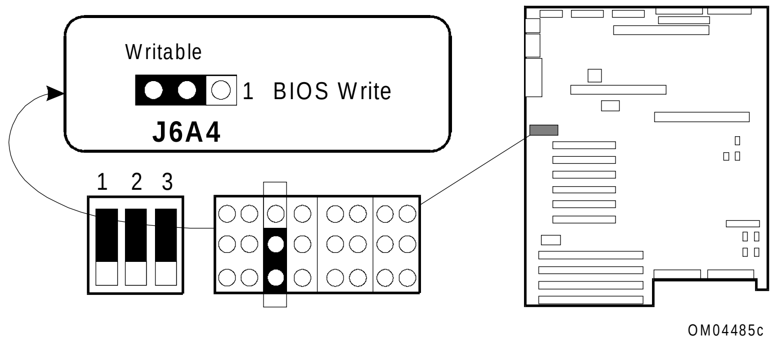
Pins	Description
1-2	BIOS boot block is write-protected, factory default

CAUTION: Leave at factory-default setting, pins 1 and 2. Always leave the Boot Block jumper installed in the factory-default position, on pins 1 and 2, to protect the BIOS boot block from being overwritten. Do not mistake this jumper block for the ones on either side.

BIOS Write Jumper, J6A4

The following figure shows the jumper block location for the BIOS Write Jumper, J6A4.

BIOS Write Jumper, J6A4



Pins	Description
1-2	Disables BIOS update of flash memory (cannot overwrite the BIOS)
2-3	Enables BIOS update of flash memory with special utility, factory default

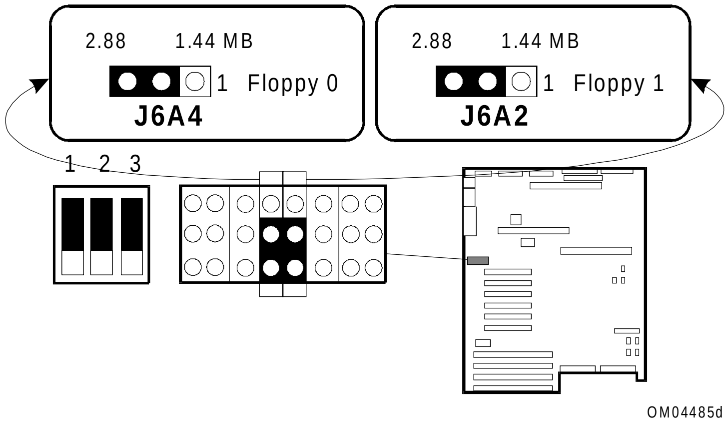
This jumper enables updating the BIOS in flash memory with a special utility. The factory default is to leave this function enabled so that you can update the BIOS without having to open the system and change the jumper.

For a copy of the utility to update the BIOS, contact a customer service representative. For the normal update procedure, see the “Updating Flash Memory” chapter in the *Server Software Guide*.

Floppy 0 Jumper at J6A4; Floppy 1 Jumper at J6A2

The following figure shows the jumper block location for the Floppy 0 Jumper at J6A4 and the Floppy 1 Jumper at J6A2.

Floppy 0 Jumper and Floppy 1 Jumper



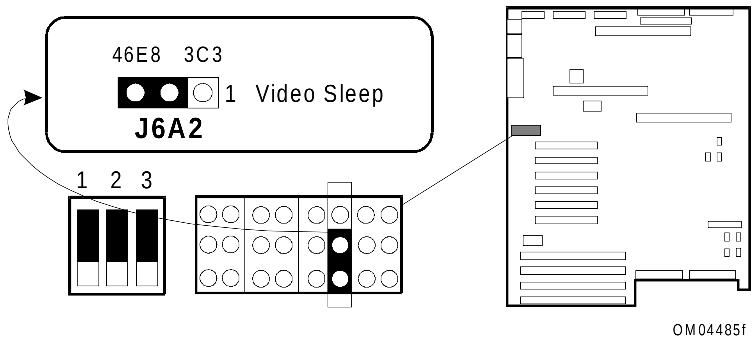
Pins	Description
1-2	For 1.44 MB drive size or autodetection; disables 2.88 MB size detection
2-3	For forced 2.88 MB diskette drive size, factory default

The Floppy 0 and Floppy 1 functions are set at separate jumper blocks, but the descriptions are identical. These jumpers configure the diskette drive port to force 2.88 MB drive size or to support automatic size detection.

Video Sleep Jumper, J6A2

The following figure shows the jumper block location for the Video Sleep Jumper at J6A2.

Video Sleep Jumper, J6A2



Pins	Description
1-2	Video Sleep register resides at 03C3H
2-3	Video Sleep register resides at 46E8H, factory default

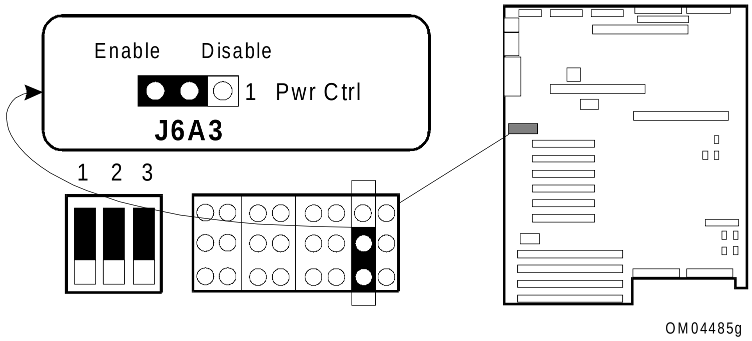
The video address jumper determines which I/O port the onboard Cirrus Logic™ CL-GD5424 super VGA controller uses for its internal AT mode setup port.

If there is no keyboard activity after a specified time-out period (1 to 128 minutes as specified with the Setup Utility), the video sleep register blanks out the monitor screen. When this happens, you must enter a password to reactivate the monitor and the keyboard.

Power Control Jumper, J6A3

The following figure shows the jumper block location for the Power Control Jumper at J6A3.

Power Control Jumper, J6A3



Pins	Description
1-2	Disables RTC power supply control
2-3	Enables power supply control using the RTC, factory default

This jumper (PWR CTRL) enables power supply control using the real-time clock. Power control from the RTC is typically used for Automatic Server Recovery. An alarm is set in the RTC by the BIOS or a utility program to power the system on or off at a predetermined time.

Removing and Installing Video Memory

This section discusses removing and installing video memory in the expansion socket on the R1 system board.

Note: These procedures do not apply to the R2 system board. The video memory on the R2 system board is not removable.

Removing Video Memory

To remove video memory from an R1 system board:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Using the video RAM removal tool, gently pry up each end of the video memory DRAM, and pull it straight out of the socket.
3. Place DRAM in an antistatic package.

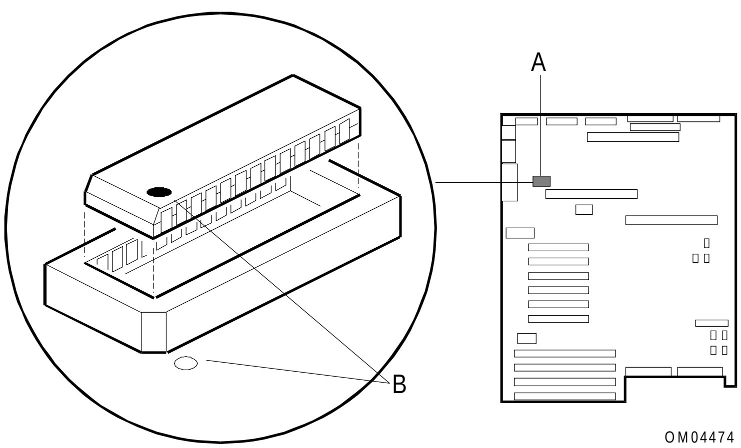
Installing Video Memory

This section assumes that you are installing video memory in the expansion socket to replace defective video memory. The R1 system board comes from the factory with the maximum video DRAM installed.

WARNING: If the system has been running, any installed processors and heat sinks on the processor boards are hot. To avoid the possibility of a burn, be careful when removing or installing system board components that are located near processors.

The following figure shows how to install video memory.

Installing Video DRAM



A	Socket on R1 system board
B	Pin 1 location

To install video memory:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the new DRAM from its protective package. Align the dot on the memory device with the small dot on the system board near one corner of the socket (approximate orientation shown in figure; size of dots exaggerated).
3. Press DRAM down firmly until it is fully seated in the socket.

Removing and Installing the Real-Time Clock

You may need to replace the real-time clock (RTC) on an R1 system board when its internal integral lithium battery reaches the end of its life span. The battery powers the clock for up to 10 years in the absence of power.

Note: The procedures in this section do not apply to the R2 system board. The real-time clock on the R2 system board is not removable.

When the battery starts to weaken, it loses voltage, and the system settings stored in CMOS RAM (for example, the date and time) may be wrong.

The replacement part number for the RTC is 006-2005701.

WARNING: If the system has been running, any installed processors and heat sinks on the processor boards are hot. To avoid the possibility of a burn, be careful when removing or installing system board components that are located near processors.

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

WARNING: Danger of explosion if 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.

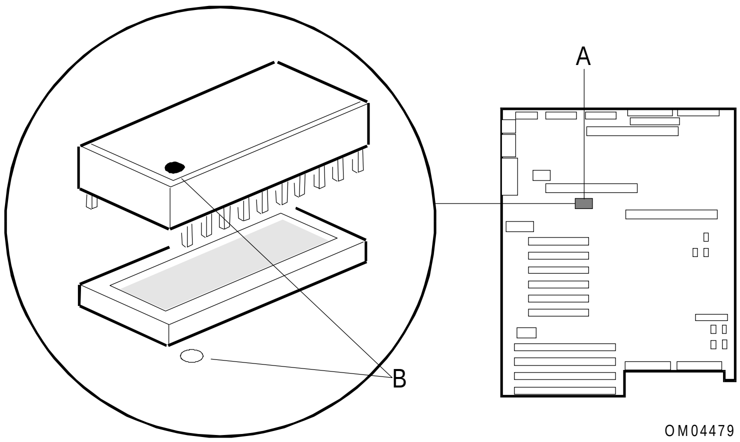
VARNING: Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

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

Removing the Real-Time Clock

The following figure shows how to remove the real-time clock.

Removing the Real-Time Clock



A	Socket on system board
B	Pin 1 location

Perform the following steps to remove the real-time clock:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the real-time clock from its socket with an IC-removal tool.
3. If for any reason you plan to reinstall the same RTC, place it in an antistatic bag to protect it from static electricity.
4. If you are disposing of the RTC, which is powered by a lithium battery, do so according to local ordinance. Do not expose component to excessive heat or fire. Keep all batteries away from children.

Installing the Real-Time Clock

Perform the following steps to install the real-time clock:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the new RTC from its antistatic package, being careful not to touch the pins on the device.
3. Position the RTC so that the small dot on the top at one corner matches the small pin 1 location dot on the system board. Carefully insert the pins on the device into the socket connectors.
4. Be careful not to bend the pins as you press down on the RTC until it is firmly seated in the socket.
5. Clear CMOS and NVRAM using the S6A1-1 switch (see “R1 System Board Configuration” in this chapter for a discussion of this procedure).
6. Boot to the Diagnostic Partition and use the SCU to restore the system configuration. See the *Server Software Guide (4SMP)* for information about the SCU.

Chapter 8

R2 (OctaSCALE) System Boards

This chapter describes the following:

- Removing and installing an R2 primary system board
- Removing and installing an R2 secondary system board
- Removing and installing a primary system board terminator module
- R2 system board configuration
- R2 system board restrictions
- Removing and installing the real-time clock battery

Definitions

The following abbreviations are used throughout this guide:

R1

The 1-4 way symmetrical multi-processing (SMP) system board

R2

The OctaSCALE system boards

Tools and Supplies Needed

You need the following tools and supplies to perform the procedures described in this chapter:

- Phillips #2 screwdriver
- Standard tip screwdriver
- ¼-inch hexagonal head nut driver
- #8 metric hexagonal-head nut driver
- Needle-nose pliers
- Torque wrench
- Antistatic wrist strap and conductive foam pad (recommended)
- Antistatic bags
- The *System Site Log*. This document contains forms for recording information on system equipment and components, hardware service, software products, and preventive maintenance activities. Use these forms as you set up your system for the first time, integrate new parts or software into the system, service or troubleshoot system problems, and perform preventive maintenance.

Updating the Configuration History File

Whenever you install or replace a system component, update the configuration history file on the Diagnostic Partition. To update the configuration history file:

1. Boot to the Diagnostic Partition.
2. Select “Run Utilities and Diagnostics” from the MS-DOS Startup Menu.
3. Select “System Config Utils.”
4. Select “View Version Info.”
5. Select “Edit Config History.”

Warnings and Cautions

These warnings and cautions apply throughout this chapter. Only qualified service personnel should integrate and configure boards.

Warnings

System power on/off: The DC push-button on/off switch (a convex 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 cord. Do not remove the side panels or internal cover panels unless the AC power cord has been unplugged. If the system has internal battery backup power, you must also turn the local battery disconnect switch on the chassis back to “Off.”

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

Cautions

Electrostatic discharge (ESD) and ESD protection: ESD can damage disk drives, boards, and other parts. We recommend that you perform all procedures in this chapter only at an ESD 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 the system when handling parts.

ESD and handling boards: 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. Use a conductive foam pad if available but not the board wrapper. Do not slide board over any surface.

Ensure complete board insertion: When installing a processor, memory, or bus termination board, confirm visually that the board edge connectors are correctly oriented at the system board connector—not too low or too high—before closing the board ejector handles. After closing the handles, make sure all boards are completely seated in the system board connectors before applying power. Incomplete insertion can result in damage to the system board and the boards being inserted.

Board support panel, proper cooling and airflow: For proper cooling and airflow always install the board support panel for the processor and memory boards before installing the chassis side and top covers and turning on the system. Operating the system without this support panel in place can damage system parts.

Chassis covers, proper cooling and airflow: For proper cooling and airflow, always install the chassis side and top covers before turning on the system. Operating the system without these covers in place can damage system parts.

Removing and Installing an R2 Primary System Board

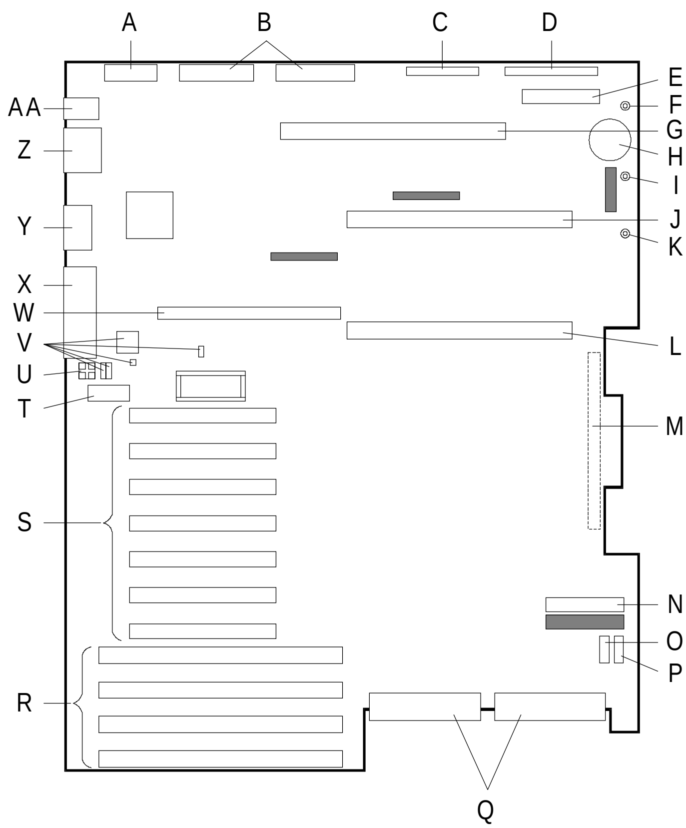
This section contains the following:

- R2 primary system board connectors
- Removing an R2 primary system board
- Installing an R2 primary system board
- Configuring a replacement R2 board

R2 Primary System Board Connectors

The R2 primary system board is located on the left side of the server (as viewed from the front). The following figure shows the connectors on the primary system board.

R2 Primary System Board Connectors



A	**CABLE:** Power control and status (PS3) J36
B	**CABLES:** +5V, +12V, and 3.3V power connectors (PS1 and PS2) (identical) J21 and J26
C	**CABLE:** Diskette drive connector J14
D	**CABLE:** Front panel connector J9
E	**CABLE:** Server Management Board (SMB) connector J6
F	**CABLE:** +12V power plane interconnect connector
G	Memory board connector
H	Real-time clock battery
I	**CABLE:** +5.1V power plane interconnect connector
J	CPU 2 processor board or termination board connector
K	**CABLE:** +3.3V power plane interconnect connector
L	CPU 1 processor board connector
M	Intermodule connector (located on back side of board)
N	Connector for optional Server Monitor Module (SMM) J7
O	**CABLE:** Fan fail connector (inner chassis fans) J3
P	I^2C connector (not used)
Q	**CABLE:** SCSI bus connectors: Channel A (J5) to the right, Channel B (J13) to the left
R	EISA slots 1-4 for add-in boards (slot 1 toward top, 4 at bottom)
S	PCI slots 1-7 for add-in boards (slot 1 toward top, 7 toward bottom: Bus 0 = slots 1-3 and 7; Bus 1 = slots 4-6)
T	3.3 V PCI power connector
U	Processor activity LEDs (DS1-DS4)
V	Configuration switches and jumpers
W	LST SIMM connector
X	**EXTERNAL CABLE:** Parallel port connector
Y	**EXTERNAL CABLE:** VGA monitor connector
Z	**EXTERNAL CABLES:** Serial port connectors A (COM1) and B (COM2)
AA	**EXTERNAL CABLES:** PS/2-compatible keyboard and mouse connectors

Note: The “R2 Primary System Board Connectors” figure shows three connectors as gray boxes. These are not used in this system configuration. Their functions at the factory are as follows:

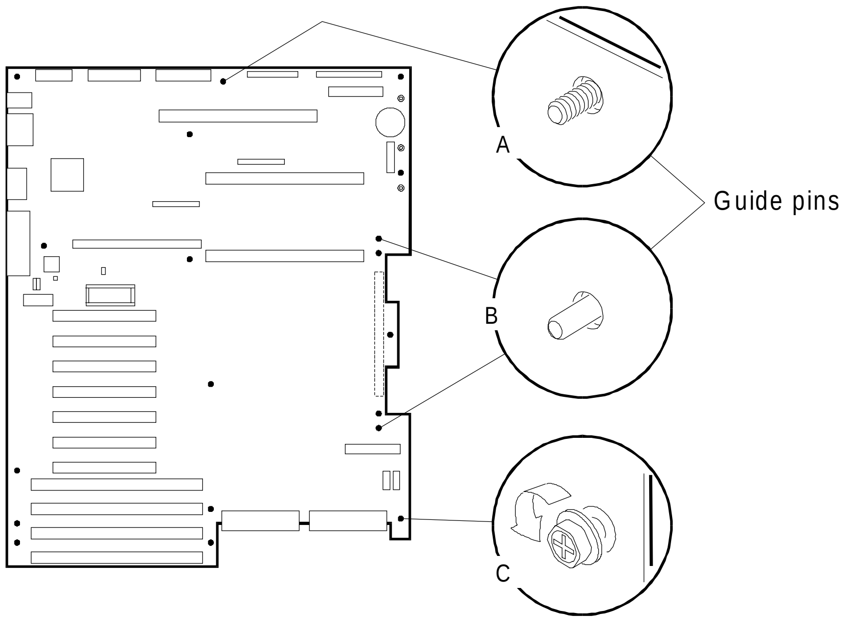
- In-target Probe (ITP) connector, near upper right corner
- Test connectors, near middle of board
- JTAG test connector, near lower right corner

Removing an R2 Primary System Board

To remove an R2 primary system board:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the board support panel.
3. Disconnect external devices from the I/O panel (keyboard, mouse, and so on) at the back of the chassis.
4. Label and disconnect all internal cables connected to PCI or EISA add-in boards.
5. Remove all boards present (processor, memory, bus termination, and add-in). Place all boards in antistatic bags in accordance with the cautions at the beginning of this chapter.
6. Label and disconnect all cables attached to the primary system board.
    a. Power connectors: Each has a locking tab on the bottom side of the connector. Press upward on the end of the tab to release it as you pull the connector out of the socket on the system board. The left-most connector is harder to access because of the I/O connectors but is removed in the same way.
    b. SCSI connectors at the bottom edge: It is possible to remove the SCSI cables while the board is still installed in the chassis, but it is easier to do so after the board is out of the chassis.
    c. Power plane interconnect cables: These three cables are attached to threaded posts in the upper right corner of the primary system board. Remove the nuts that are used to attach the cables and save them.
7. Remove card guides that are present:
    a. The larger metal guide at the front of the cardcage has one screw at the outer edge.
    b. The metal guide inside the back of the cardcage has one screw that you must reach from outside the back of the chassis.
    c. The plastic guide for add-in boards has a press-in release tab.
8. Remove the plastic intermodule connector cover from the ejector assembly.
9. Remove the board retaining screws and save them for reinstallation. The following figure shows how to remove the screws from the primary system board. The board is oriented as it would be in the chassis, with the power connectors toward top left.

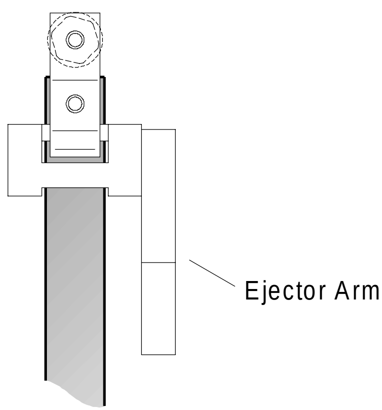
Removing Screws from the R2 Primary System Board



A	Hole for the top guide pin (used to line up the system board in the chassis)
B	Holes for ejector assembly guide pins
C	17 board retaining screws (shown as black dots)

10. Lift the plastic ejector arm up. This disconnects the primary system board intermodule connector from the secondary system board intermodule connector.

Ejector Arm (Primary Side)



11. Pull the right side of the board toward you, then pull the board free from the guide pins. Slide it toward the front of the chassis until the board I/O connectors clear the openings in the back of the chassis.
12. Remove the board and place it on an antistatic foam pad or a grounded workstation.

Installing an R2 Primary System Board

To install an R2 primary system board:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Make sure the ejector arm is in the down position.
3. Are you installing a new primary system board?

   If yes: Perform the following procedure before going to step 4:

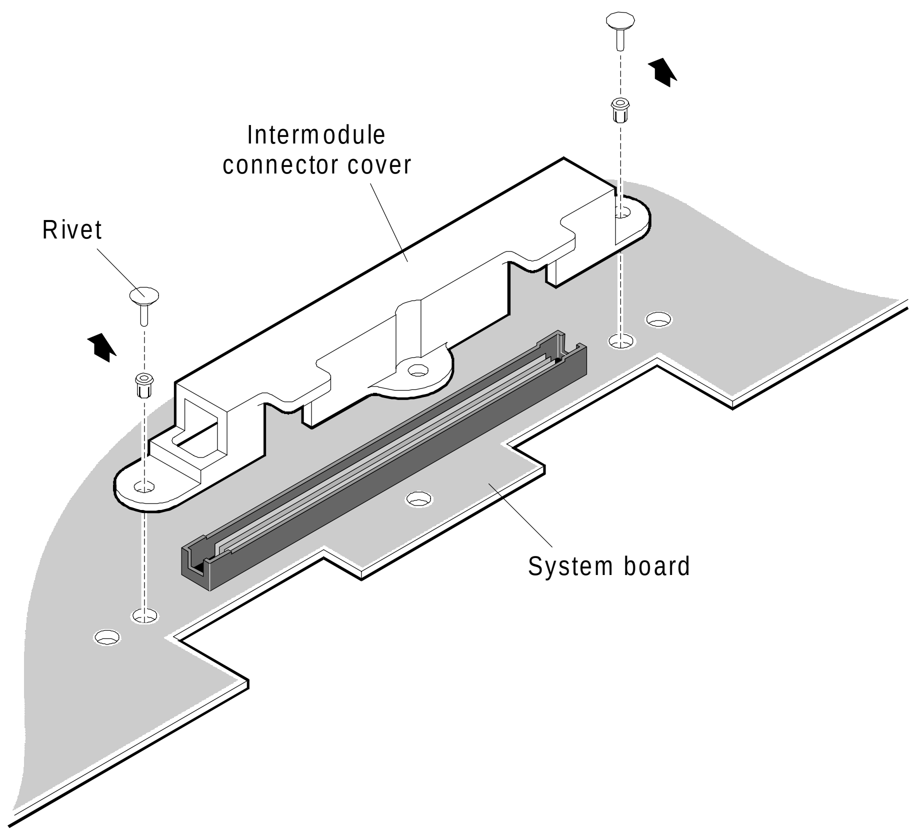
   a. Remove the board from the antistatic bag.

   b. Remove the rivets that hold the plastic cover over the intermodule connector.

   c. Save the intermodule connector cover.

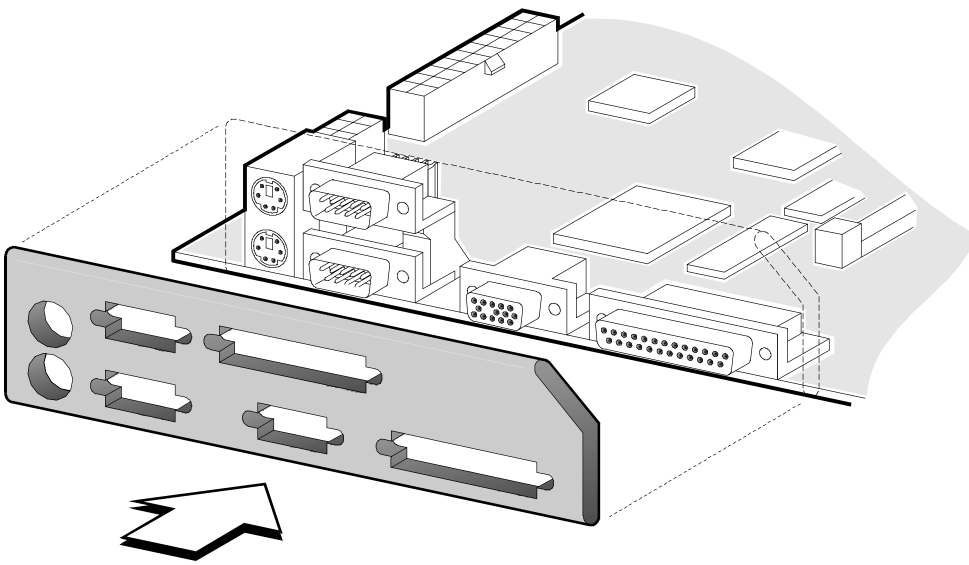
   If no: Continue to the next step.

   Removing the Rivets and Intermodule Connector Cover



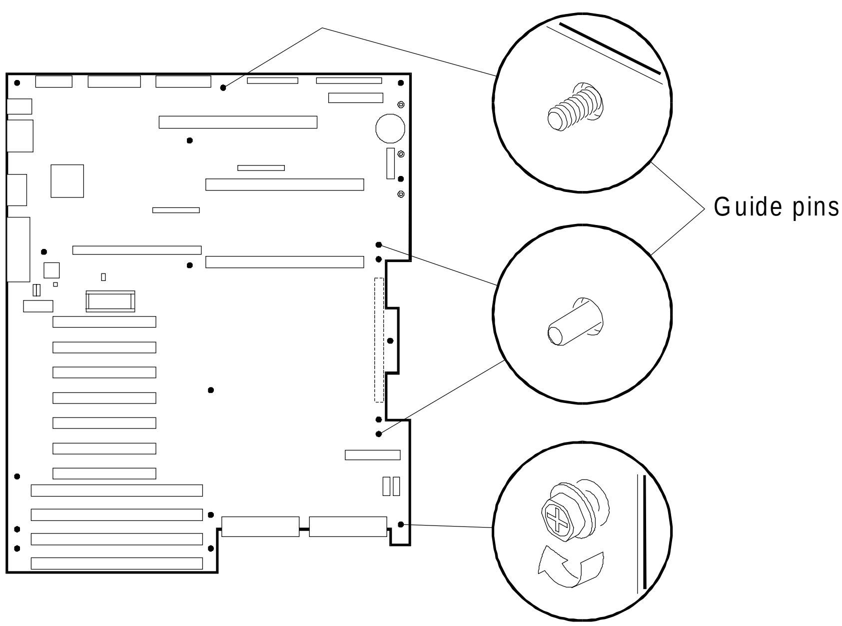
4. Place the system board I/O port EMC gasket over the I/O connectors on the system board.

Placing the System Board EMC Gasket over the I/O Port Connectors



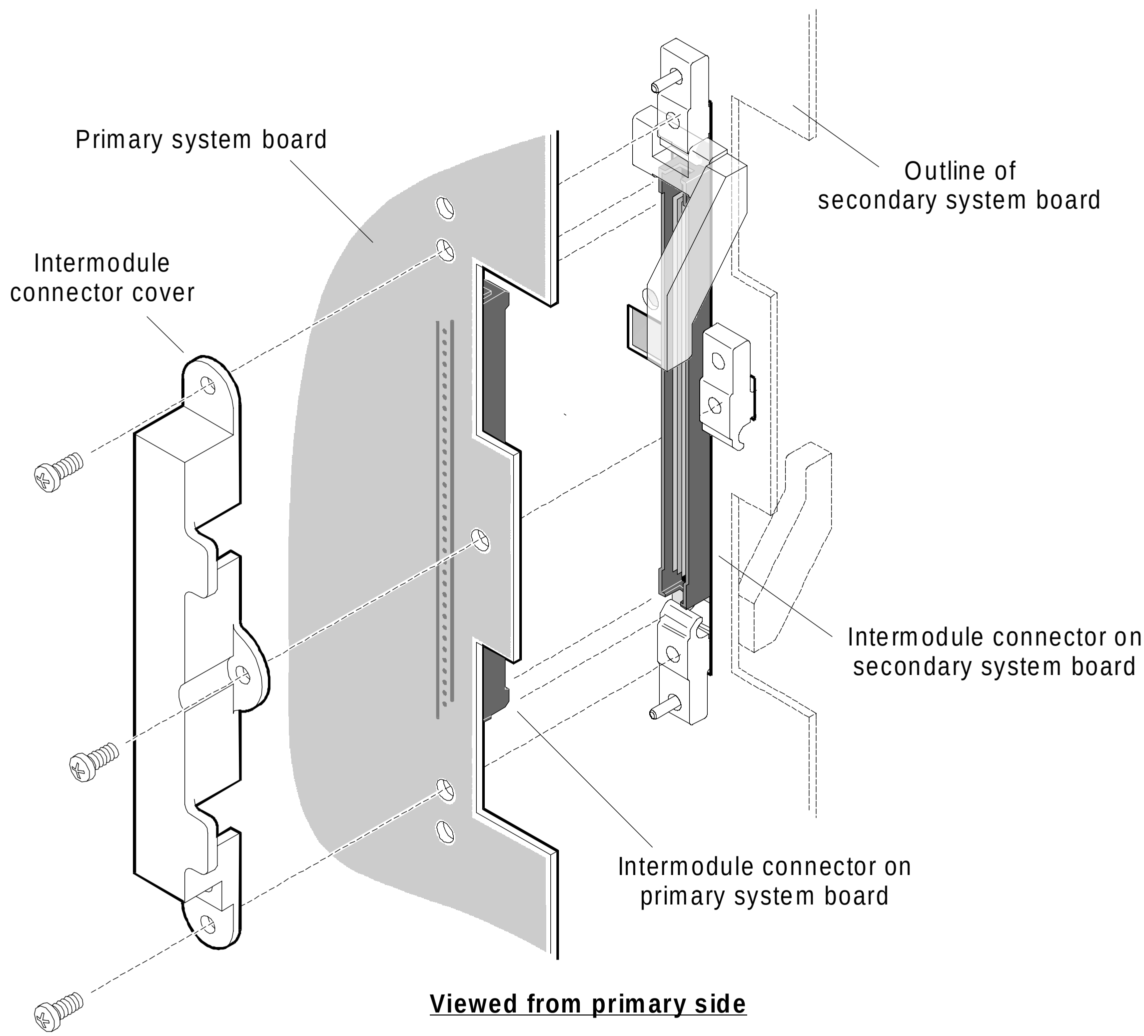
5. Position the board with the I/O connectors toward the chassis back panel. Slide the board toward the back of the system until the I/O connectors protrude through the openings in the back panel.
6. Position the board over the guide pin at the top of the metal plate and the two guide pins protruding from the ejector supports.

Positioning the Primary System Board



7. Align the primary system board intermodule connector with the secondary system board intermodule connector. Seat the board in the chassis and connect the intermodule connectors.
8. While holding the board in position, insert a screw through one of the mounting holes on the board and into a threaded standoff. Do not tighten yet.
9. Insert 13 more screws through the mounting holes and into the threaded standoffs, shifting the board slightly as needed to fit. Do not insert the 3 screws in the ejector assembly area yet.
10. Make sure the board is properly seated, and then tighten all screws firmly.
11. Place the plastic intermodule connector cover over the ejector assembly and insert the remaining 3 screws. Make sure that the tab on the cover fits over the ejector arm.

Installing the Intermodule Connector Cover



12. Connect the power plane interconnect cables to the threaded posts in the upper right corner of the primary system board. The cables are color-keyed as follows:
    - Yellow - top post
    - Red - middle post
    - Gray - bottom post

    CAUTION: Tighten each nut to 12 inch-pounds (approximately ½ turn after you finger-tighten it to slightly snug). Nuts are tightened properly when cables cannot be moved with reasonable hand pressure. Do not over-tighten or you might damage the system board.
13. Connect all other cables to the board.
14. Install the metal card guides and the plastic card guide.
15. Install any of the following used in the configuration:
    - Processor boards
    - Bus termination board
    - Memory board
    - Add-in boards
16. Install the board support panel.
17. Connect all internal cables for add-in boards installed in the expansion slots.
18. Connect external I/O cables at the back panel.

Configuring a Replacement R2 Board

If you replace the primary system board with a new board, perform the following steps after you install the new board:

1. Check to be sure that the system BIOS is up-to-date as follows:
    a. Boot from the Platform CD-ROM. If an old BIOS is detected, the CD-ROM menu indicates that an update is mandatory. Refer to the *Server Software Guide (OctaSCALE)* for information on boot procedures.
    b. Press ENTER to continue.
    c. Follow the instructions to complete the update. The system updates the BIOS and reboots when the update is complete.
2. Clear CMOS NVRAM using the SW1-1 switch (see the “R2 System Board Configuration” section for a discussion of this procedure).
3. Boot to the Diagnostic Partition and use the Configuration Utility to restore the system configuration. See the *Server Software Guide (OctaSCALE)* for information about the Configuration Utility.
4. Clear the BIOS error log.

Removing and Installing an R2 Secondary System Board

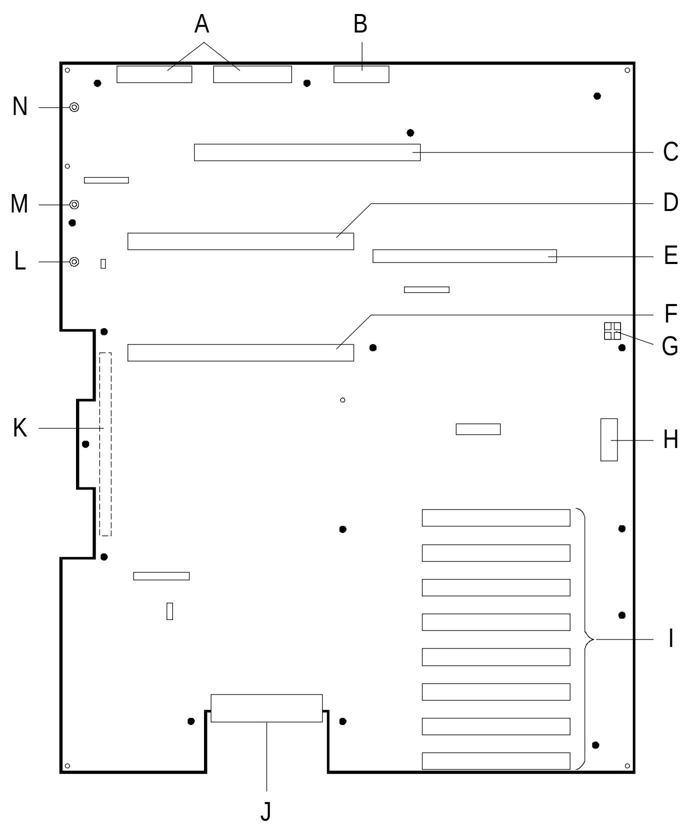
This section contains the following:

- R2 secondary system board connectors
- Removing an R2 secondary system board
- Installing an R2 secondary system board

R2 Secondary System Board Connectors

The secondary system board is located on the right side of the server (as viewed from the front). The following figure shows the connectors on the secondary system board.

R2 Secondary System Board Connectors



A	**CABLES:** +5V, +12V, and 3.3V power connectors (PS1 and PS2) (identical) J20 and J21
B	**CABLE:** Power control and status (PS3) J12
C	Memory board connector
D	CPU 4 processor board or termination board connector
E	LST SIMM connector
F	CPU 3 processor board connector
G	Processor activity LEDs (DS1-DS4)
H	3.3 V PCI power connector
I	PCI slots for add-in boards (numbered from top to bottom: 12, 13, 14, 15, 8, 9, 10, 11; Bus 2 = slots 8-11; Bus 3 = slots 12-15)
J	**CABLE:** SCSI bus connector Channel C
K	Intermodule connector (located on back side of board)
L	**CABLE:** +3.3V power plane interconnect connector
M	**CABLE:** +5.1V power plane interconnect connector
N	**CABLE:** +12V power plane interconnect connector

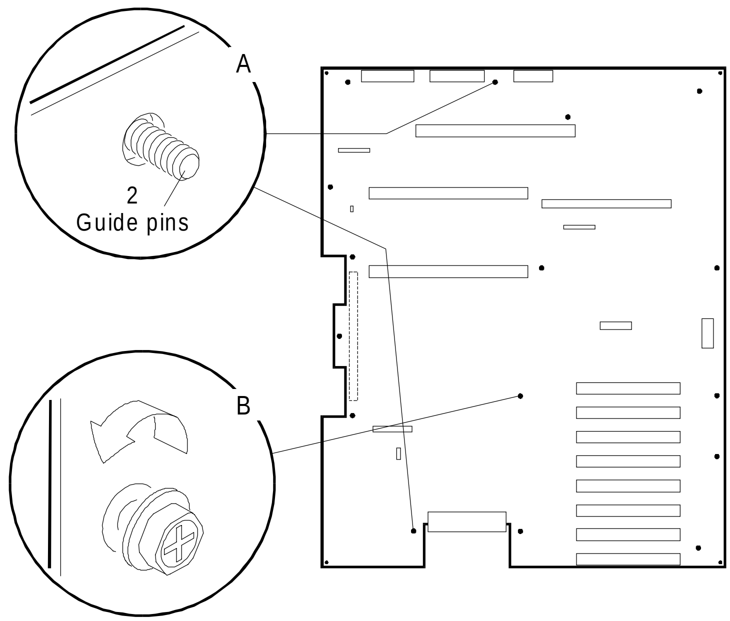
Removing an R2 Secondary System Board

To remove an R2 secondary system board:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the board support panel.
3. Label and disconnect all internal cables connected to PCI add-in boards.
4. Remove all boards present (processor, memory, bus termination, and add-in). Place all boards in antistatic bags in accordance with the cautions at the beginning of this chapter.
5. Label and disconnect all cables attached to the secondary system board.
    a. Power connectors: Each has a locking tab on the bottom side of the connector. Press upward on the end of the tab to release it as you pull the connector out of the socket on the system board.
    b. SCSI connector at the bottom edge: It is possible to remove the SCSI cable while the board is still installed in the chassis, but it is easier to do so after the board is out of the chassis.
    c. Power plane interconnect cables: These three cables are attached to threaded posts in the upper left corner of the secondary system board. Remove the nuts that are used to attach the cables and save them.
6. Remove card guides that are present:
    a. The larger metal guide at the front of the cardcage has one screw at the outer edge.
    b. The metal guide inside the back of the cardcage has one screw that you must reach from outside the back of the chassis.
    c. The plastic guide for add-in boards has a press-in release tab.
7. Remove the plastic intermodule connector cover from the ejector assembly.

8. Remove the remaining 11 board retaining screws and save them for reinstallation. The following figure shows how to remove the screws from the secondary system board. The board is oriented as it would be in the chassis, with the power connectors toward top left.

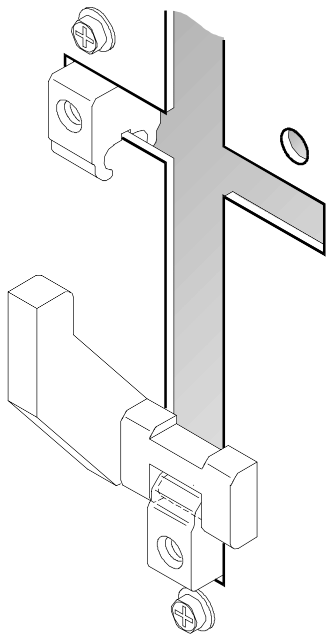
Removing Screws from the Secondary System Board



A	Holes for top and bottom guide pins used to line up the system board in the chassis
B	Board retaining screws (shown as black dots)

9. Pull the plastic ejector arm down. This disconnects the secondary system board intermodule connector from the primary system board intermodule connector.

   Ejector Arm (Secondary Side)



10. Pull the board free from the guide pins.
11. Remove the board and place it on an antistatic foam pad or a grounded workstation.

Installing an R2 Secondary System Board

To install an R2 secondary system board:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Make sure the ejector arm is in the up position.
3. Are you installing a new secondary system board?

   If yes: Perform the following procedure before going to step 4:

   a. Remove the board from the antistatic bag.

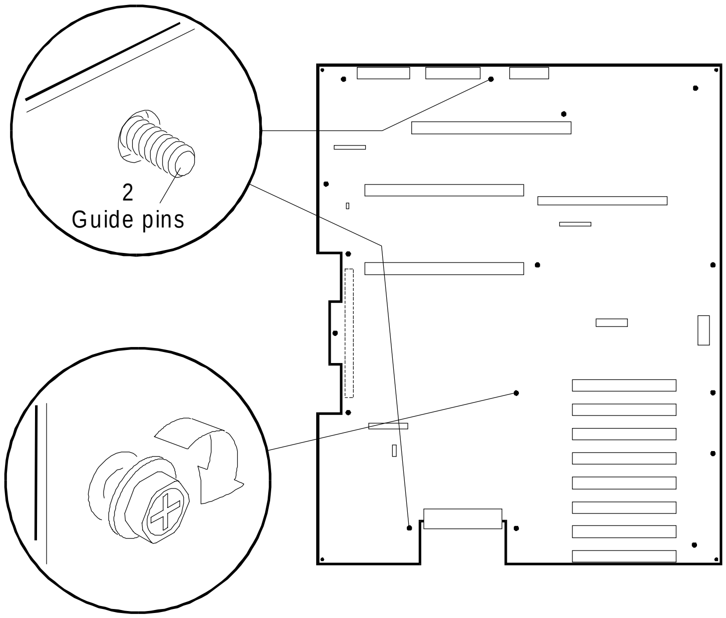
   b. Remove the rivets that hold the plastic cover over the intermodule connector.

   c. Save the intermodule connector cover.

   If no: Continue to the next step.

4. Position the board over the guide pins at the top and bottom of the metal plate that separates the two sides of the server.

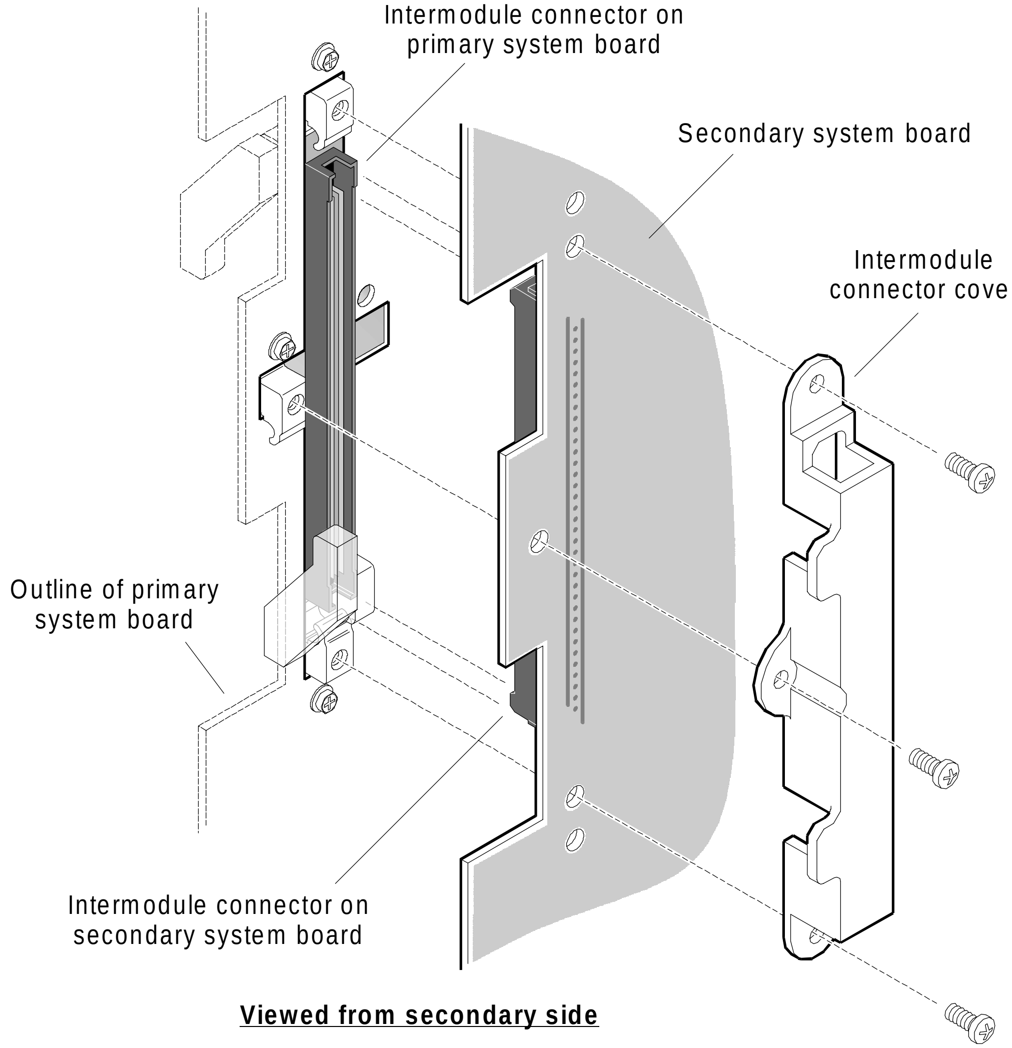
Positioning and Installing the Secondary System Board



5. Align the secondary system board intermodule connector with the primary system board intermodule connector. Seat the board in the chassis and connect the intermodule connectors.
6. While holding the board in position, insert a screw through one of the mounting holes on the board and into a threaded standoff. Do not tighten yet.
7. Insert screws through the mounting holes and into the threaded standoffs, shifting the board slightly as needed to fit. Do not insert the screws in the ejector assembly area yet.
8. Make sure the board is properly seated, and then tighten all screws firmly.

9. Place the plastic intermodule connector cover over the ejector assembly and insert the remaining screws. Make sure that the tab on the cover fits over the ejector arm.

Installing the Intermodule Connector Cover

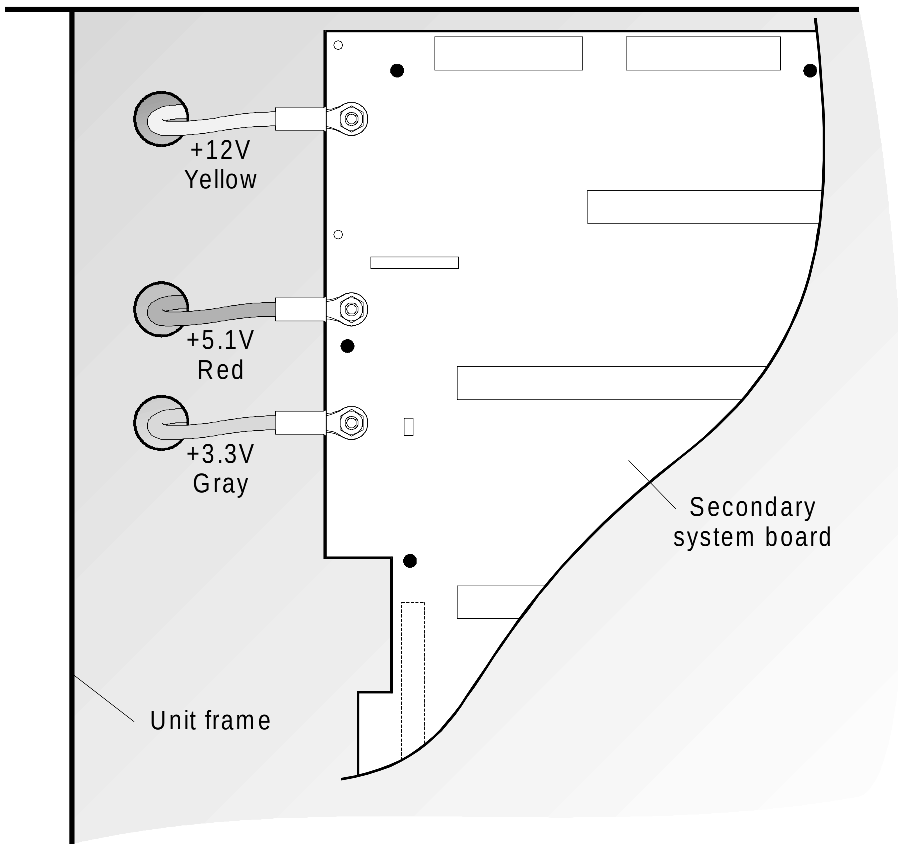


10. Connect the power plane interconnect cables to the threaded posts in the upper left corner of the secondary system board. The cables are color-keyed as follows:

    - Yellow - top post
    - Red - middle post
    - Gray - bottom post

    CAUTION: Tighten each nut to 12 inch-pounds (approximately ½ turn after you finger-tighten it to slightly snug). Nuts are tightened properly when cables cannot be moved with reasonable hand pressure. Do not over-tighten or you might damage the system board.

    Connecting the Power Plane Interconnect Cables to the Secondary System Board



11. Connect all other cables to the board.
12. Install the metal card guides and the plastic card guide.
13. Install any of the following used in the configuration:

    - Processor boards
    - Bus termination board
    - Memory board
    - Add-in boards

14. Install the board support panel.
15. Connect all internal cables for add-in boards installed in the expansion slots.

Removing and Installing a Primary System Board Terminator Module

The primary system board terminator module terminates an R2 primary system board if a secondary system board is not installed.

Removing a Primary System Board Terminator Module

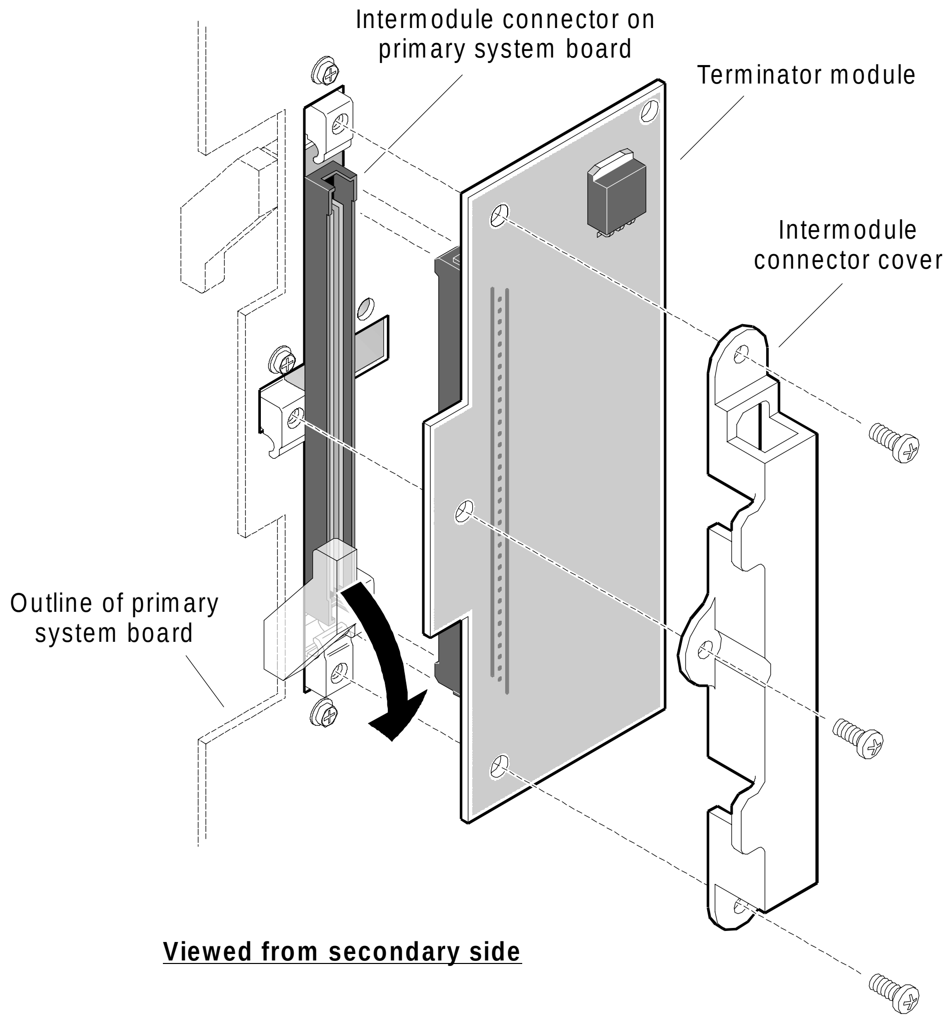
If you are upgrading from an R2 single system board configuration to an R2 dual system board configuration, you must remove the primary system board terminator module before installing the secondary system board.

Perform the following steps to remove a primary system board terminator module.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Attach the EUI wriststrap to the padlock loop on the secondary side of the server (the right side, if you are viewing the server from the front).
3. Remove the screws that secure the intermodule connector cover and the terminator module to the ejector supports.
4. Remove and save the intermodule connector cover.

5. Pull the ejector arm down to disconnect the terminator module from the primary system board. Place the terminator module in an antistatic bag.

Removing the Primary System Board Terminator Module



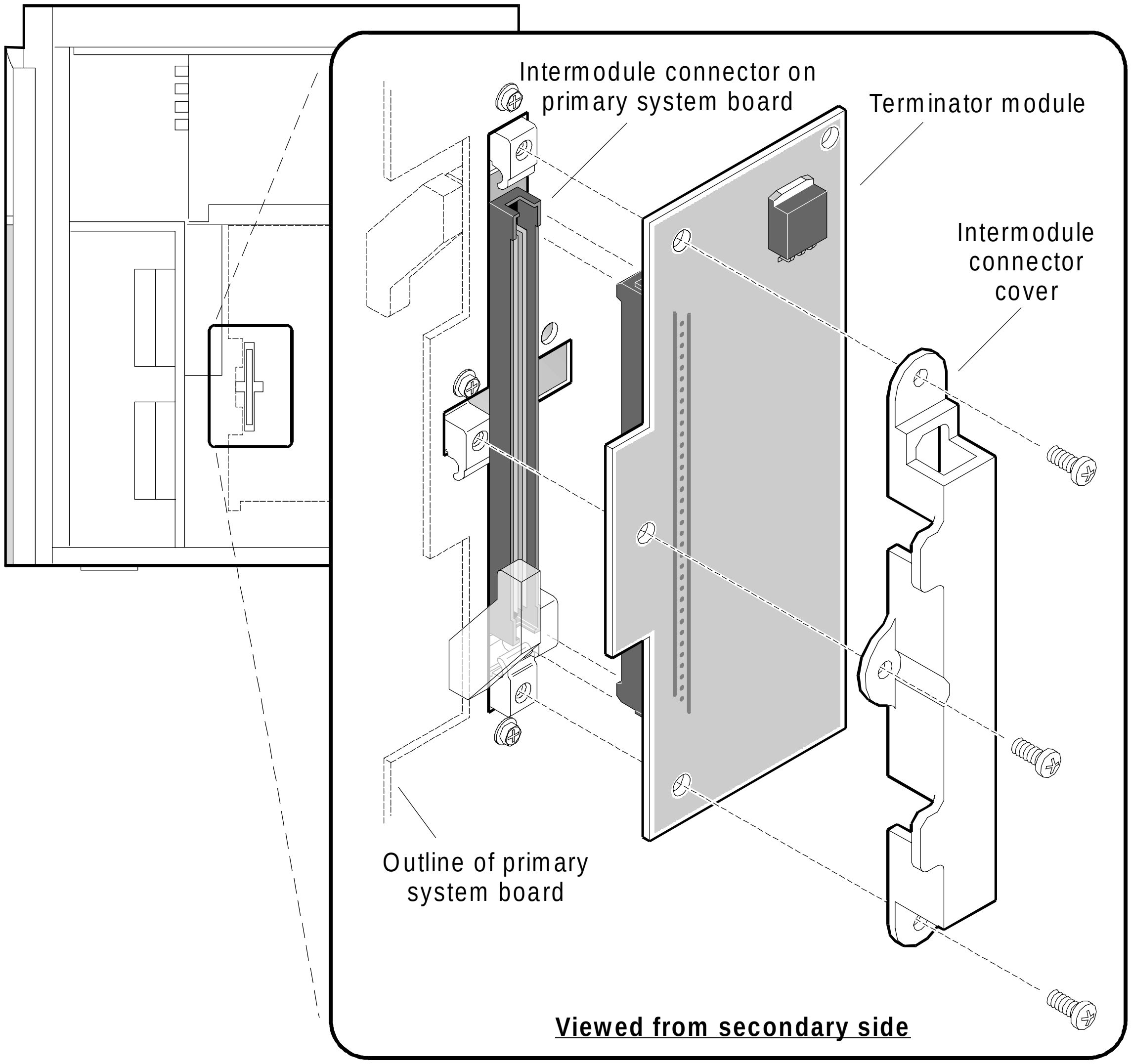
6. Return the ejector arm to the “up” position.

Installing a Primary System Board Terminator Module

Perform the following steps to install a primary system board terminator module.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Attach the EUI wriststrap to the padlock loop on the secondary side of the server (the right side, if you are viewing the server from the front).
3. Remove the primary system board terminator module from its antistatic bag.
4. From the secondary side of the server, insert the connector on the back of the terminator module into the intermodule connector slot in the sheet metal.
5. Press the terminator module connector into the primary system board intermodule connector.
6. Place the intermodule connector cover over the ejector assembly and screw it in place.

Installing the Primary System Board Terminator Module



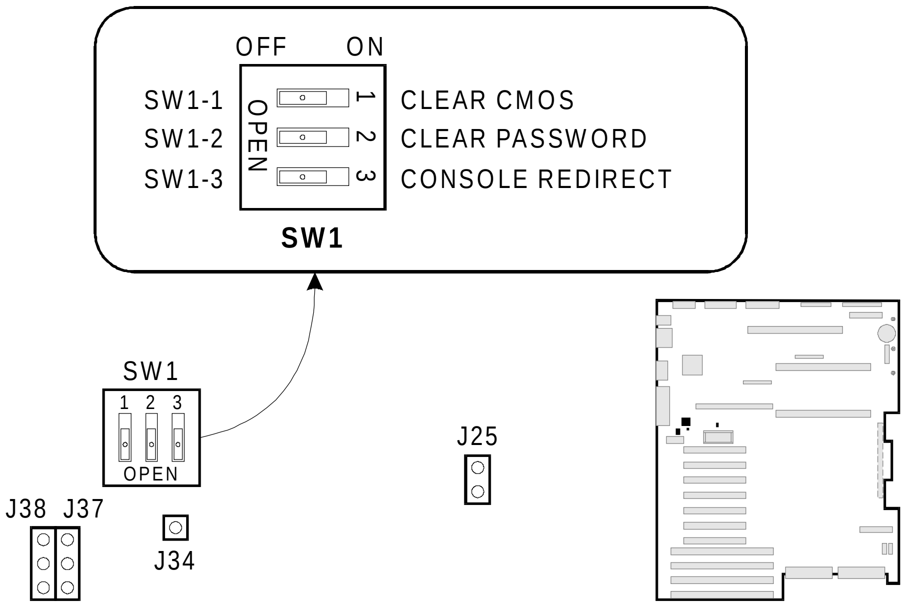
R2 System Board Configuration

The R2 primary system board has a configuration block that consists of a set of three dip switches and four jumper blocks. All switch and jumper procedures require that you follow the warnings and cautions at the beginning of this chapter.

Configuration Switches

The following figure shows the R2 system board configuration switches in their factory settings. To change the setting, slide the switch to the desired position.

R2 Primary System Board Configuration Switches



Switch	Position	Function
SW1-1	On **Off***	Clear CMOS Normal operation
SW1-2	On **Off***	Clear password Normal operation
SW1-3	On **Off***	Console redirect Local console

* Factory default setting appears in boldface.

CMOS Switch SW1-1

Switch SW1-1 controls whether settings stored in CMOS nonvolatile memory (NVRAM) are retained during a system reset:

- Switch in OFF position: settings in CMOS NVRAM are preserved during system reset.
- Switch in ON position: settings in CMOS NVRAM are reset to factory defaults during system reset.

Clearing CMOS with Switch SW1-1

To clear CMOS (restore to factory default values):

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Turn off system power, disconnect the AC power cord, and switch the local battery disconnect switch to the “Off” position.
3. Remove the primary (left) side cover.
4. Remove the board support panel. You do not need to remove the primary system board, and you do not need to remove any add-in boards.
5. On the R2 primary system board, slide the SW1-1/CLEAR CMOS switch to ON.
6. Replace the board support side panel and side cover. Connect the power cord and turn on the system.
7. Wait for the following message to display:

   `Cleared CMOS due to DIP switch on baseboard`
8. Turn off system power and disconnect the AC power cord.
9. Remove the left side cover and board support panel again.
10. Slide switch SW1-1 to OFF (the original position). Setting the switch to OFF preserves the settings during system reset.
11. Replace the board support panel and the left side cover, connect the power cord, switch the local battery disconnect switch to the “On” position, and turn on the system.
12. Run BIOS Setup to verify the correct settings.

Clearing CMOS Without Removing the Cover Using the clrcmos Routine

You can also clear CMOS without entering the cabinet by running the **clrcmos** routine. To run this routine:

1. Boot from a Configuration Utility diskette or BIOS Flash diskette. See the *Server Software Guide (OctaSCALE)* for information.
2. Exit to the DOS prompt.
3. Type the following at the DOS prompt:

   `clrcmos`
4. Press ENTER.

   When the routine finishes, the DOS prompt displays.
5. Boot the server.

There are no display messages when you run the **clrcmos** routine. After you run the routine, the system displays the following message during the next boot:

```
WARNING:
0198: Cleared CMOS due to bad checksum
```

Note: The **clrcmos** routine invalidates CMOS so that the system BIOS reloads it with default values on the next reboot. The **clrcmos** routine does not affect the peripheral configuration values stored in NVRAM. Clearing CMOS by using the SW1-1 switch on the primary system board reloads default values **and** clears peripheral configuration values.

CAUTION: You should run the **clrcmos** routine only if absolutely necessary to recover the system from a situation where booting from a hard disk is impossible.

Password Switch SW1-2

This switch controls whether a stored password is retained or cleared during a system reset.

- Switch in OFF position: lets you enter and save a password that is preserved during system reset.
- Switch in ON position: clears the password during system reset.

To clear and enter a password:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Turn off system power, disconnect the AC power cord, and switch the local battery disconnect switch to the “Off” position.
3. Remove the primary (left) side cover.
4. Remove the board support panel. You do not need to remove the primary system board, and you do not need to remove any add-in boards.
5. On the primary system board, slide the SW1-2 switch to ON (to clear the old password).
6. Replace the board support panel and the left side cover. Connect the power cord and turn on the system.
7. Wait for POST to complete. The password is cleared automatically.
8. Turn system off and disconnect the AC power cord.
9. Remove the left side cover and the board support panel again.
10. Slide the SW1-2 switch to “Off” to resume normal operation (password is retained during system reset).
11. Replace the board support panel and the left side cover, connect the power cord, switch the local battery disconnect switch to the “On” position, and turn on the system.
12. Run BIOS Setup or the Configuration Utility to specify a new password. When you reboot the system, the new password is retained. Refer to the *Server Software Guide (OctaSCALE)* for information on setting passwords.

Console Redirect Switch SW1-3

This switch controls whether system messages are displayed on the local console or redirected to a remote console.

- Switch in OFF position: system messages are displayed on the local console.
- Switch in ON position: system messages are redirected to a remote console through COM1 (serial port A).

The factory setting for this switch is in the OFF position. You can still enable console redirection through BIOS if the switch is in the OFF position. Setting the switch to ON ensures that console redirection is always enabled, even after a system failure.

Note: If you set this switch to ON, BIOS automatically configures COM1 for console redirection the next time you boot the server.

R2 Primary System Board Configuration Jumpers

The jumper blocks are numbered separately on the primary system board and labeled with the function name.

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 the wide sides. Gripping the wide sides can damage the contacts inside the jumper, causing intermittent problems with the function controlled by that jumper. Take care to grip with, but not squeeze, the pliers or other tool you use to remove a jumper, or you may bend or break the stake pins on the board.

The following table lists the R2 primary system board configuration jumpers. The rest of this section describes the function of the Flash Recovery jumper.

R2 primary system board configuration jumper (listed by block number on board)	Pins	Description
J38		Reserved
J37, Flash Recovery	**1-2***	Normal BIOS boot block
	2-3	Recovery BIOS boot block
J34		Reserved
J25		Reserved
* Factory default setting		

CAUTION: Do not remove jumpers from the reserved blocks or move them to different locations. In addition to those listed in the table, there are other jumper blocks on the R2 primary system board. Do not remove jumpers from these blocks or move them to different locations.

Procedure to Change a Jumper Setting

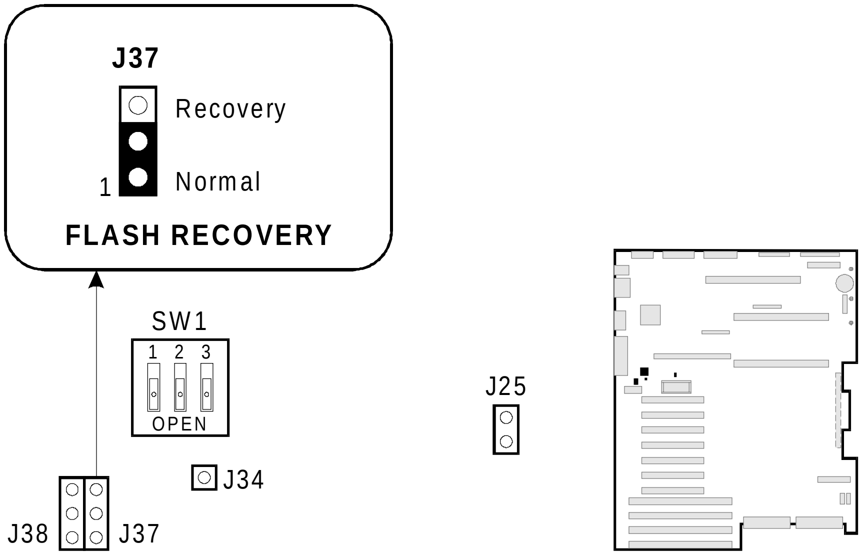
The general procedure for changing a configuration setting is the same for most of the jumper functions:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Turn off system power, disconnect the AC power cord, and switch the local battery disconnect switch to the “Off” position.
3. Remove the side panel.
4. Move jumper to pins specified for the desired setting.
5. Install the side panel, connect the power cord, and switch the local battery disconnect switch to the “On” position.
6. Reboot the system for the change to take effect.

Flash Recovery Jumper, J37

The following figure shows the jumper block location for the Flash Recovery Jumper, J37.

Flash Recovery Jumper, J37



Pins	Description
1-2	Normal BIOS boot block, factory default
2-3	Recovery BIOS boot block

This jumper enables the recovery mode for the BIOS flash memory. This mode is important because the system BIOS can be corrupted—for example, when the update procedure is aborted due to a power outage. The flash memory contains a protected area that cannot be corrupted. Code in this area is used to boot the computer from a diskette in drive A when the BIOS has been corrupted.

After booting from the diskette, use the BIOS Flash utility to recover the system BIOS automatically from the BIOS recovery files on the diskette. (For normal operation, it is important to keep the jumper on pins 1 and 2.)

BIOS Recovery Procedure

Use the following procedure to recover a corrupted system BIOS:

1. Observe all safety and ESD precautions.
2. If you have a BIOS Flash Utility diskette, the disk is DOS-bootable. If you receive the Flash Memory Update from a bulletin board, it is in a self-extracting archive format file. Executing the file places all necessary format, boot, and Flash Update information onto a diskette.
3. Turn the system off, unplug the power cord, and switch the local battery disconnect switch to “Off.”
4. Open the system. On the primary system board, move the Flash Recovery Jumper at J37 from pins 1 and 2 to pins 2 and 3.
5. Replace the side cover.
6. Plug in the power cord.

7. Insert the BIOS Flash Utility diskette into the drive and power on the system. After the system boots successfully, the speaker emits a single beep and the recovery process starts – it takes about two to four minutes. When the recovery process completes, the system speaker emits two beeps.

   While the system is in recovery mode, there is no screen display on the monitor, and the keyboard is disabled as the system automatically recovers the BIOS. The recovery status is identified through beep codes. Refer to the next subsection, “BIOS Recovery Mode Beep Codes,” for a description of the beep codes.

8. Turn the system off, unplug the power cord, and switch the local battery disconnect switch to “Off.”
9. Open the system. On the primary system board, move the Flash Recovery Jumper at J37 from pins 2 and 3 back to pins 1 and 2.
10. Manually clear CMOS and NVRAM using Switch SW1-1 on the primary system board. See “CMOS Switch SW1-1” earlier in this chapter for instructions.
11. If you have a password defined, after running the special recovery mode, run the Configuration Utility or BIOS Setup Utility to specify this password again. For information on running the Configuration Utility and the BIOS Setup Utility, see the *Server Software Guide (OctaSCALE)*.

BIOS Recovery Mode Beep Codes

The following table describes the recovery mode beep codes.

Beep Code	Message
1	Signals beginning of recovery process; process takes 2 to 4 minutes.
2	Successful completion, no errors.
Continuous series of low beeps	Any or all of the following causes: • The wrong BIOS recovery files are being used. • Configuration jumper allowing BIOS recovery is in the wrong position.

R2 System Board Restrictions

This section lists restrictions that apply to the:

- R2 primary system board
- Both R2 system boards

R2 Primary System Board Restrictions

The following restrictions apply to the R2 primary system board:

- The maximum number of PCI and EISA adapters you can install on the primary system board is 10, in either of the following configurations:
  - 6 PCI and 4 EISA
  - 7 PCI and 3 EISA
- If you install a video controller adapter in one of the PCI bus 0 or EISA slots, the onboard VGA controller is disabled. You must attach the monitor to the add-in video controller.
- If a Server Management Board (SMB) is installed, the COM1 serial port is unavailable.
- The intermodule connector must be plugged into a secondary system board or a primary system board terminator module.

Restrictions for Both R2 System Boards

The following restrictions apply to both R2 system boards:

- Either a processor board or a bus termination board must be installed in each processor board connector (CPU 1 and CPU 2 on the primary system board, CPU 3 and CPU 4 on the secondary system board).
- All processors on all processor boards must be the same speed and cache size.
- If a memory board is installed on the system board, an LST SIMM must also be installed.

Removing and Installing the Real-Time Clock Battery

WARNING: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

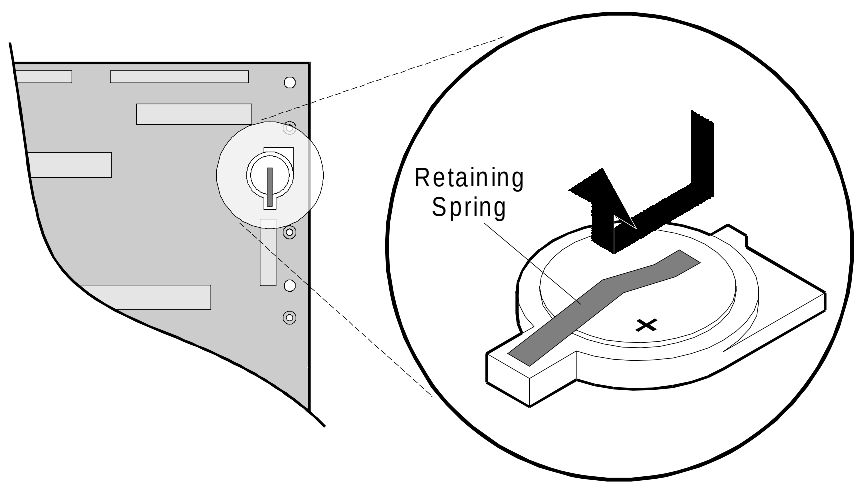
ATTENTION: Il y a danger d'explosion s'il y a remplacement incorrect de la batterie. Remplacer uniquement avec une batterie du même type ou d'un type équivalent recommandé par le constructeur. Mettre au rebut les batteries usagées conformément aux instructions du fabricant.

Removing the Real-Time Clock Battery

The real-time clock battery is located on the R2 primary system board. Perform the following steps to remove the real-time clock battery:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Carefully lift the retaining spring and remove the real-time clock battery from its socket.

   Removing the Real-Time Clock Battery



3. If you are disposing of the real-time clock battery, do so according to local ordinance. Do not expose component to excessive heat or fire. Keep all batteries away from children.

Installing the Real-Time Clock Battery

Perform the following steps to install the real-time clock battery:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Remove the new real-time clock battery from its antistatic package.
3. Position the real-time clock battery so that the plus sign (+) is facing up.
4. Carefully insert the battery into the socket under the retaining spring. Be careful not to break the retaining spring as you slip the real-time clock battery under it.
5. Clear CMOS and NVRAM using the SW1-1 switch (see “R2 System Board Configuration” in this chapter for a discussion of this procedure).
6. Boot to the Diagnostic Partition and use the Configuration Utility to restore the system configuration. See the *Server Software Guide (OctaSCALE)* for information about the Configuration Utility.

Chapter 9

Installing and Removing Add-In Boards

This chapter describes the following:

- Add-in board slots
- Considerations
- Installing and removing add-in PCI or EISA boards
- Installing and removing the Server Monitor Module
- Installing and removing the Server Management Board

Tools and Supplies Needed

You need the following tools and supplies to perform the procedures described in this chapter:

- Phillips #1 and #2 screwdrivers
- Standard tip screwdriver
- Torque wrench
- Antistatic protective wrapper
- Antistatic wrist strap and conductive foam pad (recommended)
- The *System Site Log* contains forms for recording information on system equipment and components, hardware service, software products, and preventive maintenance activities. Use these forms as you set up your system for the first time, integrate new parts or software into the system, service or troubleshoot system problems, and perform preventive maintenance.

Updating the Configuration History File

Whenever you install or replace a system component, update the configuration history file on the Diagnostic Partition. To update the configuration history file:

1. Boot to the Diagnostic Partition.
2. Select “Run Utilities and Diagnostics” from the MS-DOS Startup Menu.
3. Select “System Config Utils.”
4. Select “View Version Info.”
5. Select “Edit Config History.”

Warnings and Cautions

The following warnings and cautions apply throughout this chapter. Only a technically qualified person should install and remove add-in boards.

No procedures in this chapter can be done with the power on. For any procedure inside the system, turn off system power and disconnect the AC power cord.

Warnings

System power on/off: The DC push-button on/off switch (a convex 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 cord. Do not remove the side panels or internal cover panels unless the AC power cord has been unplugged. If the system has internal battery backup power, you must also turn the local battery disconnect switch on the back of the server to “Off.”

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

Cautions

Electrostatic discharge (ESD) and ESD protection: ESD can damage disk drives, boards, and other parts. We recommend that you perform all procedures in this chapter only at an ESD 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 the system when handling parts.

ESD, handling boards and modules: 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. Use a conductive foam pad if available but not the board wrapper. Do not slide a board over any surface.

Insert boards in the proper connectors: Do not insert a PCI adapter into an EISA connector. If you do so and then apply power, damage can result to the system board and the adapter that was inserted incorrectly.

Ensure complete board insertion: When installing add-in boards, be sure that the boards are completely seated in the system board connectors before applying power. Incomplete insertion can result in damage to the system board and the boards being inserted.

Board support panel, proper cooling and airflow: For proper cooling and airflow, always install the board support panel for the processor and memory boards before installing the chassis side and top covers and turning on the system. Operating the system without this support panel in place can damage system parts.

Chassis covers, proper cooling and airflow: For proper cooling and airflow, always install the chassis side and top covers before turning on the system. Operating the system without these covers in place can damage system parts.

Accessory/option adapter boards: Accessory/option adapter board outputs may exceed National Electric Code (NEC) Class 2 or limited power source limits and must be installed with the appropriate interconnecting cabling in accordance with the NEC.

Add-In Board Slots

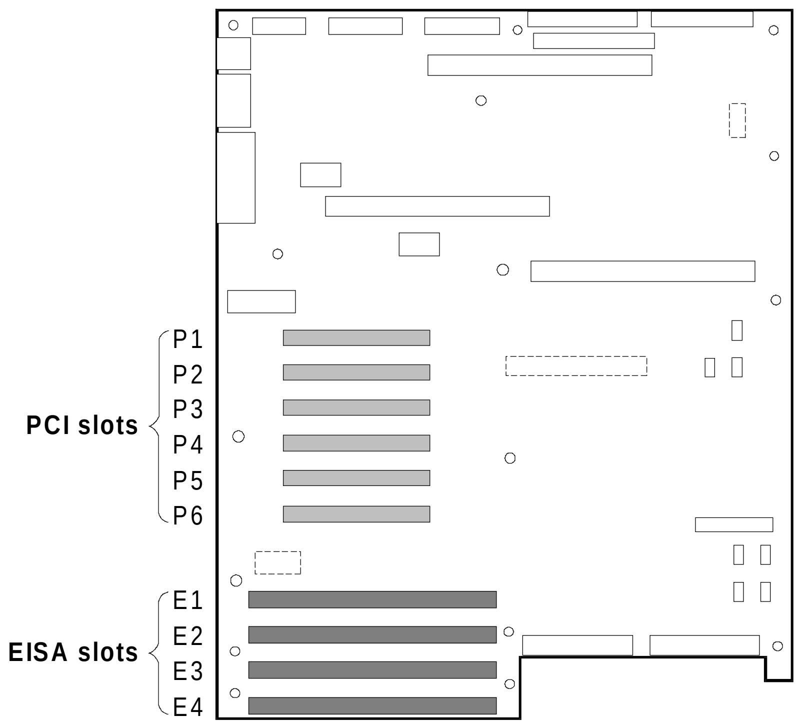
This section shows the PCI and EISA bus slots on the following:

- R1 system board
- R2 primary system board
- R2 secondary system board

R1 System Board Slots

An R1 system board has 6 PCI bus slots and 4 EISA bus slots. The following figure shows these slots:

Location of PCI and EISA Slots on R1 System Board



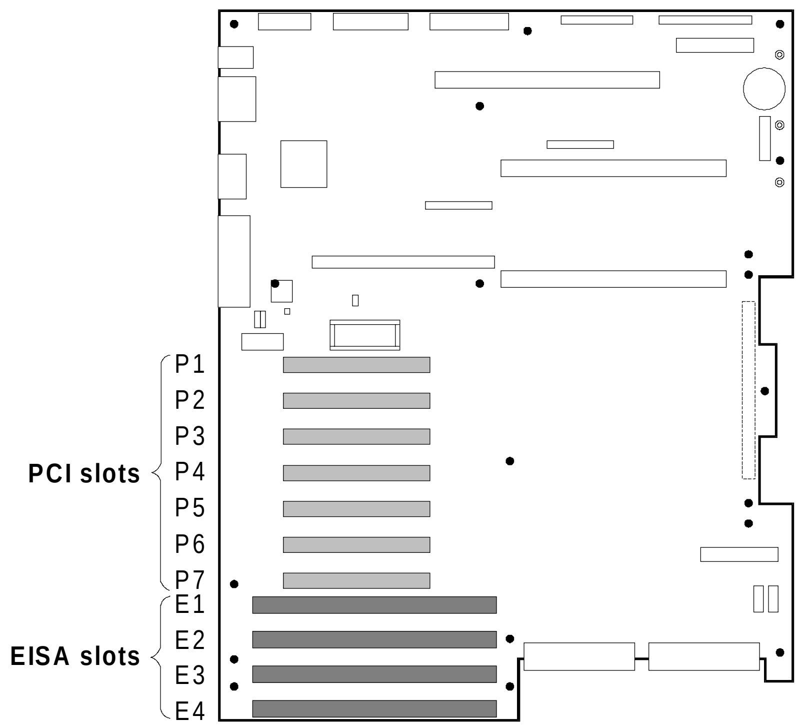
R2 Primary System Board Slots

An R2 primary system board has 7 PCI bus slots and 4 EISA bus slots.

Note: The bottom PCI slot (P7) and the top EISA slot (E1) share a logical slot. If P7 contains an adapter, then E1 must be empty. If E1 contains an adapter, then P7 must be empty. Therefore, the maximum number of add-in boards on the primary side is 10 (7 PCI and 3 EISA or 6 PCI and 4 EISA).

The following figure shows the add-in slots on the R2 primary system board.

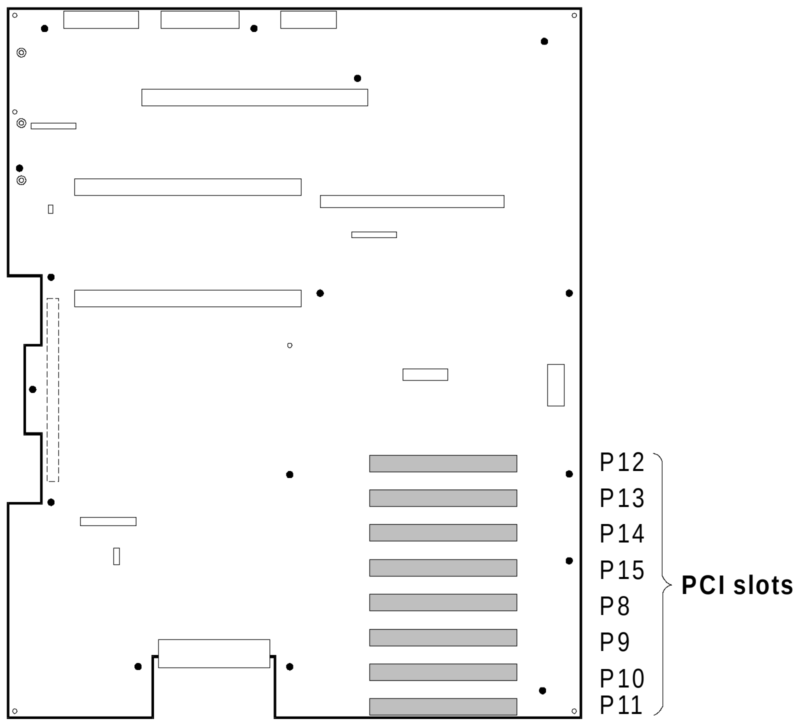
Location of PCI and EISA Slots on R2 Primary System Board



R2 Secondary System Board Slots

An R2 secondary system board has 8 PCI bus slots. The following figure shows these slots:

Location of PCI Slots on R2 Secondary System Board



Considerations

This section contains the following:

- Guidelines for populating EISA slots
- Guidelines for populating PCI slots
- Maximum number of boards

Guidelines for Populating EISA Slots

Follow these guidelines for populating the EISA adapter slots:

- Populate the EISA slots in bottom to top order, as follows:

  E4
  E3
  E2
  E1

- If the server contains a Server Monitor Module (SMM), it must be installed in slot E3.
- Slot E1 is unavailable if there is a PCI adapter in slot P7. This does not apply to R1 system boards, which do not contain slot P7.
- Do not install an Avanstar TTY EISA or Olicom® Token Ring EISA adapter on an R2 system. Use the PCI versions of these adapters instead.
- The Digi Sync570 ISA adapter is incompatible with the Digi Sync570 WAN 2 and 4 Port PCI adapters. Do not install these adapters in the same system.

Guidelines for Populating PCI Slots

Follow these general guidelines for populating the PCI adapter slots:

- Although not required, it is recommended that you populate the PCI slots from top to bottom on alternating busses. See “R2 PCI Busses and Device Numbers” in Chapter 10 for a table that lists the PCI slots and busses. The following table lists the population order for both single and dual system board configurations:

Single System Board Order	Dual System Board Order
P1	P1
P4	P4
P2	P8
P5	P12
P3	P2
P6	P5
P7	P9
	P13
	P3
	P6
	P10
	P14
	P7
	P11
	P15

- If you use an add-in SCSI adapter board as the controller for the boot device, install it on the primary side.
- **The SCSI BIOS should only be enabled for the SCSI device (either onboard or add-in) that is used for booting. The SCSI BIOS should be disabled for onboard SCSI channels and add-in adapter boards that are not used for booting.**
- A PQS adapter should not be installed in the P1 slot on the R2 primary system board.
- The following restrictions apply to Mylex adapters:
  - Due to cabling restrictions, Mylex SCSI adapters must be installed either on PCI bus 1 (slots P4, P5, and P6) or PCI bus 2 (slots P8, P9, P10, and P11).
  - The first Mylex adapter must be installed in slot P4.
  - If the boot device is attached to a Mylex adapter, it must be attached to the Mylex adapter in slot P4 and the adapter BIOS must be enabled.
  - The cache memory SIMM must be installed on the Mylex adapter.
- Slot P7 is unavailable if there is an EISA adapter in slot E1. This does not apply to R1 system boards, which do not contain slot P7.
- Similar types of add-in boards (for example, SCSI adapters) can share IRQs. Dissimilar types of add-in boards (for example, SCSI and LAN adapters) should not share IRQs.
- The server supports Ultra SCSI devices. However, you cannot mix Ultra SCSI and non-Ultra SCSI devices on the same SCSI bus.
- If at all possible, it is recommended that you not move SCSI adapters to different physical slots after the system has been in normal operation. Moving adapters affects the PCI scan order and the operating system device name assignment.

Notes:

- Performance considerations should be balanced against reconfiguration considerations that might result if additional add-in boards are installed in the future.
- The onboard VGA controller and the EISA bridge are attached to PCI bus 0. In a system with high VGA or EISA activity, PCI adapters might perform better on other busses.
- To provide redundant access to a high-availability redundant disk array, you can connect it to redundant SCSI controllers on different busses.

Maximum Number of Boards

The following table lists the maximum number allowed for different types of add-in boards. Except where noted, these guidelines apply to R2 systems.

Add-in Board Type	Maximum Number
ATM	Maximum number of ATM boards of all types is 4.
Single channel SCSI	4 Adaptec 2940UW adapters or 3 Adaptec 2944W adapters
PCI Dual SCSI (PDS) and PCI Quad SCSI (PQS)	• On an R1 system or an R2 single system board configuration, the combined number of PCI Dual SCSI (PDS) and PCI Quad SCSI (PQS) adapters should not exceed 4. • On an R2 dual system board configuration, the combined number of PDS and PQS adapters should not exceed 8.
RAID	4
Ethernet™	4
Token Ring	4
FDDI	Maximum number of FDDI boards of all types is 8.
ISDN	4

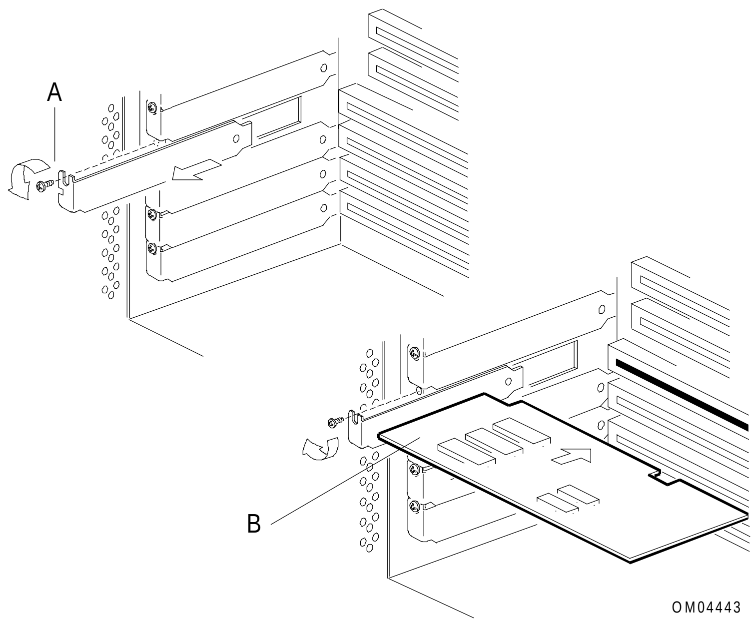
Installing and Removing Add-in PCI or EISA Boards

Installing an Add-in PCI or EISA Board

Use any EISA add-in board or any add-in board that is compatible with an IBM® PC AT® or PC XT® system (except for an 8-bit drop card that fits only in an 8-bit PC XT connector). The following figure shows how to install an add-in board.

CAUTION: Do not insert a PCI adapter into an EISA connector. If you do so and then apply power, damage can result to the system board and the adapter that was inserted incorrectly.

Installing an Add-in Board



A	Expansion slot cover and screw
B	Add-in board, same screw

To install an add-in board:

Note: This is a general procedure. The installation may vary with the board type. Refer to applicable documentation for the board you are installing before performing the procedure.

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove and save the expansion slot screw and cover.
3. Remove add-in board from its protective wrapper. Be careful not to touch the components or gold edge connectors. Place board component-side up on an antistatic surface.
4. Set jumpers or switches as described by the board manufacturer.
5. Hold board by its top edge or upper corners. Firmly press it into an expansion slot on the system board. The tapered foot of the board retaining bracket must fit into the mating slot in the expansion slot frame.

6. Align the rounded notch in the retaining bracket with the threaded hole in the frame. The bracket fits the space that was occupied by the slot cover.
7. Use the screw removed earlier. Insert it into the threaded hole, and push the rounded notch against the screw. Tighten it firmly (6.0 inch-pounds) to prevent the bracket from interfering with adjacent brackets. Attach cables if necessary.
8. If you install or move an EISA or ISA board, run the Configuration Utility to reconfigure the system (see the *Server Software Guide* for information about the Configuration Utility). If you install or move a PCI board, run the Configuration Utility to verify that there are no resource conflicts.

   See the appropriate operating system installation guide (*Installing MP-RAS* or *Installing Windows NT Server*) to determine the required or preferred resource assignments.
9. Install software according to the operating system and application software manuals. Review the README files on the software installation diskettes; they contain important information.

Removing an Add-in PCI or EISA Board

To remove an add-in board:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Disconnect any cables attached to the board you are removing.
3. Remove and save the screw from the board retaining bracket.
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 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.

   CAUTION: Slot covers must be installed on all vacant expansion slots. This maintains the electromagnetic emission characteristics of the system and ensures proper cooling of system components.
7. Use the screw removed earlier. Insert it into the threaded hole, and push the rounded notch against the screw. Tighten it firmly (6.0 inch-pounds) to prevent the bracket from interfering with adjacent brackets.
8. If you remove an EISA add-in board, run the Configuration Utility to reconfigure the system (see the *Server Software Guide* for information about the Configuration Utility). If you remove a PCI board, run the Configuration Utility to verify that there are no resource conflicts. See the appropriate operating system installation guide (*Installing MP-RAS* or *Installing Windows NT Server*) to determine the required or preferred resource assignments.

Installing and Removing the Server Monitor Module

The Server Monitor Module (SMM) is an ISA board that provides enhanced server management capabilities for the server. The SMM has its own processor, memory, and battery power.

This section contains the following topics:

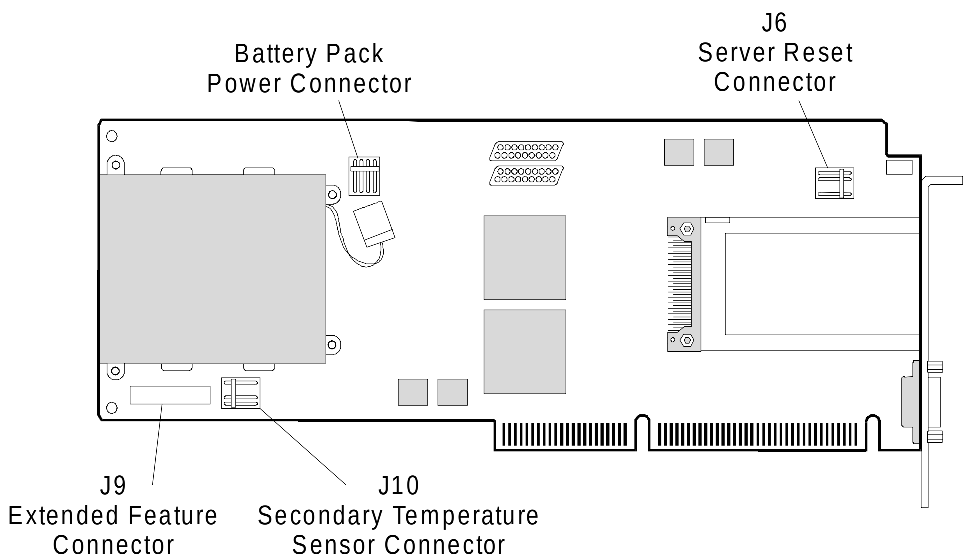
- Connector locations
- Cables for the module
- Configuring the module
- Installing the module
- Removing the module
- PCMCIA modem

WARNING: In addition to using normal ESD precautions when handling the Server Monitor Module, you should remove all jewelry from your fingers and wrists. The SMM components are receiving power while the battery is connected. Rings or other conductors can cause a short circuit, damaging or destroying the board and creating a risk for personal harm.

Connector Locations

The following figure shows connector locations for the Server Monitor Module.

Server Monitor Module Connector Locations



Cables

Four cables come with the Server Monitor Module:

- J10 - remote temperature sensor
- J6 - reset cable
- J9 - extended feature (ribbon) cable
- Battery pack power connector

All cables are keyed except for the planar end of the reset cable.

J10 - Remote Temperature Sensor

The secondary temperature sensor cable is not installed at the factory. You can install it to monitor the temperature of a remote location in the server.

A possible location for the sensor is attached to the underside of the horizontal shelf, beneath the power supply. The sensor may be placed approximately 1 inch into the system board/adapter enclosure and 4-5 inches to the left of the vertical partition (between the system board/adapter enclosure and the hot dock bays).

The sensor cable should be tie-fastened along the vertical partition.

The temperature at which to alarm is dependent on the hardware in the server and the operating environment. You should run the server for at least two hours, using a characteristic workload in a typical setting. You should then take a temperature reading. To the measured value, add 5°C and a value representing possible variations in the ambient (room) temperature. Use this calculated value to set the Server Monitor Module’s alarm temperature.

For example, assume that the following are true:

- After two hours of operation, the server’s internal temperature is measured at 27°C
- The ambient temperature can vary approximately 10°C, higher or lower

In this example, you would set the alarm temperature to 42°C (27 + 5 + 10).

Internal temperatures should not exceed 50°C.

J6 - Reset Cable

This cable is not used in the server. Hard resets are supported via the feature cable, connected to J9.

J9 - Extended Feature (Ribbon) Cable

This cable attaches to the feature connector on the system board. The following functions are enabled through this connector:

- Power on/off
- Reset
- 3.3 volts

Battery Pack Power Connector

The Server Monitor Module is shipped with the battery disconnected. Charge the SMM battery for three hours before using.

Configuring the Server Monitor Module

Before installing the SMM hardware, use the Configuration Utility to define and account for the required system resources.

To configure the module:

1. Boot to the Diagnostic Partition. Refer to the *Server Software Guide* for additional information.
2. Select “Run Utilities and Diagnostics” from the MS-DOS Startup Menu and press ENTER.
3. Select “System Config Utils” from the Main Menu and press ENTER.
4. Select “Execute SCU” from the SCU Menu and press ENTER.
5. Press any key to escape from the SCU banner screen.
6. Select “Step 2: Add and Remove Boards” from the SCU Main Menu and press ENTER.
7. Select INSERT from the Step 2 menu.
8. Select the following and press ENTER:

   `!INT0016.CFG Intel Server Monitor Module`
9. When the Slot Selection window displays, choose the EISA/ISA slot in which the SMM resides and press ENTER.
10. From the SCU Main Menu, select “Step 3: Change Configuration Settings” and press ENTER.
11. Select “Intel Server Monitor Module” and press ENTER.
12. Configure the adapter by selecting an interrupt level, memory base address, and DMA channel that does not conflict with other adapters in the system.

    The default settings for the system resources are:

    - I/O Port - 110H - 113H
    - Memory Address - C8000
    - IRQ (Interrupt Request) - 5
    - DMA (Direct Memory Access) - 3

CAUTION: For R1 systems only, make sure that the base memory address for the SMM is not shadowed by the system. This setting (Shadowing ISA/EISA ROM) can be changed in the SCU system board configuration. If the shadowing ROM option is not disabled, the SMM is not recognized by software. This can cause potential conflicts with other adapters in the system.

For R2 systems, BIOS handles shadowing automatically. There are no potential conflicts between the SMM and other adapters.

Installing the Server Monitor Module

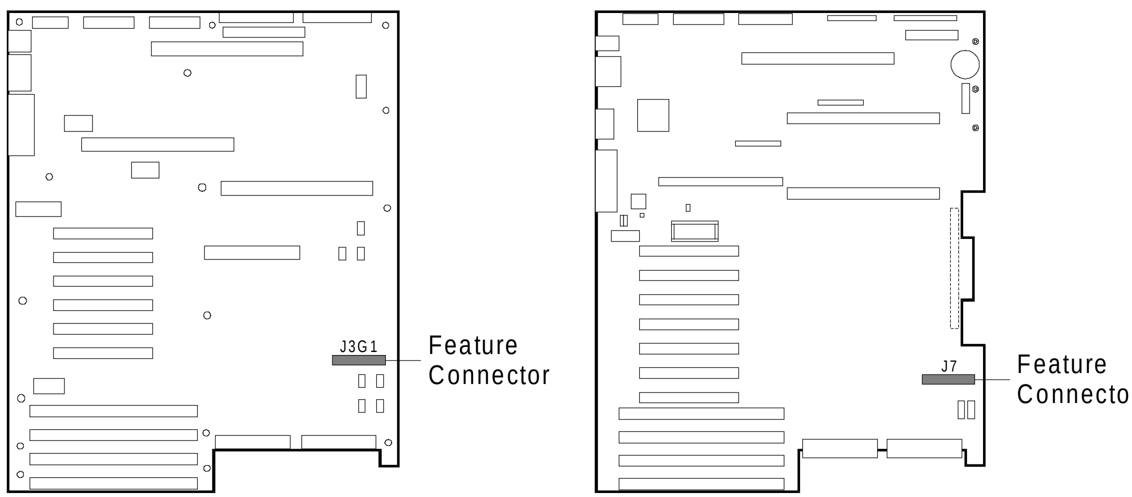
To install the Server Monitor Module:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Remove the expansion slot screw and cover from EISA slot E3 and save them.
3. **Before** plugging in the SMM, connect the flat ribbon cable to the feature connector on the primary system board. The location of the feature connector is shown in the “Feature Connector on the System Board” figure.

   Both ends of the cable should be keyed and only one end (P2) should fit on the feature connector.

If the server has…	Then…
An R1 system board	If a Server Management Board (SMB) is present in the server, the feature connector is used to enable the SMB's remote power-on/power-off function. You must disconnect this cable wire to attach the SMM ribbon cable. The SMB retains all functionality except remote power-on/power-off.
An R2 primary system board	There are feature connectors for both the SMB and the SMM. Both the SMB and SMM can be used to perform remote power-on/power-off, although not simultaneously.

Feature Connector on the System Board



R1 System Board R2 System Board (primary)

4. Connect the other end of the flat ribbon cable (P1) to connector J9 on the Server Monitor Module.
5. Plug the SMM in EISA slot E3.
6. Use the screw removed earlier. Insert it into the threaded hole, and push the rounded notch against the screw. Tighten it firmly (6.0 inch-pounds) to prevent the bracket from interfering with adjacent brackets. Attach other cables if necessary.

You are now ready to install the operating system software to use the Server Monitor Module. Refer to the operating system software documentation for additional information.

Removing the Server Monitor Module

To remove the Server Monitor Module:

1. Observe the safety and ESD precautions listed at the beginning of this chapter.
2. Disconnect all cables attached to the board except the feature connector cable (J9).
3. Remove and save the screw from the board retaining bracket.
4. Holding the board by its top edge or upper corners, carefully pull it out. Do not scrape the board against other components.
5. Disconnect the feature connector cable (J9).
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.
8. Use the screw removed earlier. Insert it into the threaded hole, and push the rounded notch against screw. Tighten it firmly (6.0 inch-pounds) to prevent the bracket from interfering with adjacent brackets.

CAUTION: Disconnect the battery pack power connector upon removing the board from the system. Do **not** use a conductive object such as a screwdriver to separate this connector. This can cause a short circuit, damaging or destroying the board.

PCMCIA Modem

The SMM contains a slot for a PCMCIA modem.

Unlike most PCMCIA devices, the Server Monitor Module does not support the hot-plugging of PCMCIA adapters. After installing or removing a PCMCIA modem in the Server Monitor Module, you must reset the card. Consult the software documentation for information on resetting the Server Monitor Module.

The PCMCIA modem requires that automatic cellular detection be turned “Off” in order to function properly in the Server Monitor Module. To turn off automatic cellular detection, put **C1** in the modem initialization string from the Server Monitor Module. Refer to the server management software documentation for additional information.

Installing and Removing the Server Management Board

For complete information about the Server Management Board (SMB), see the *Server Management Product Manual*.

The Server Management Board (SMB) performs functions similar to the Server Monitor Module (SMM) discussed in the previous section. The server may run with both boards for full-featured monitoring functions.

Note: In an R1 system, if both the SMM and SMB are present, the SMB retains all functionality except for remote power-on/power-off of the server. In an R2 system with both the SMM and SMB, either board can be used for remote power-on/power-off.

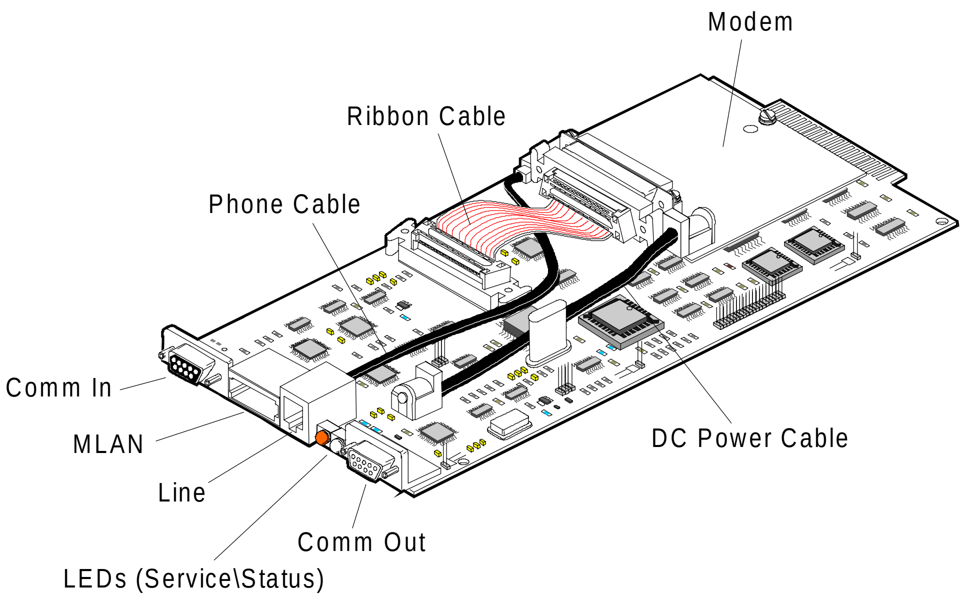
The SMB has an optional internal modem. If present, the internal modem must be removed from the SMB to enable SMB connection to an external modem.

The SMB is hot-pluggable; however, be careful to verify that the modem is not in use before removing the board.

Server Management Board Components

The following figure defines connections and components of the Server Management Board:

Server Management Board

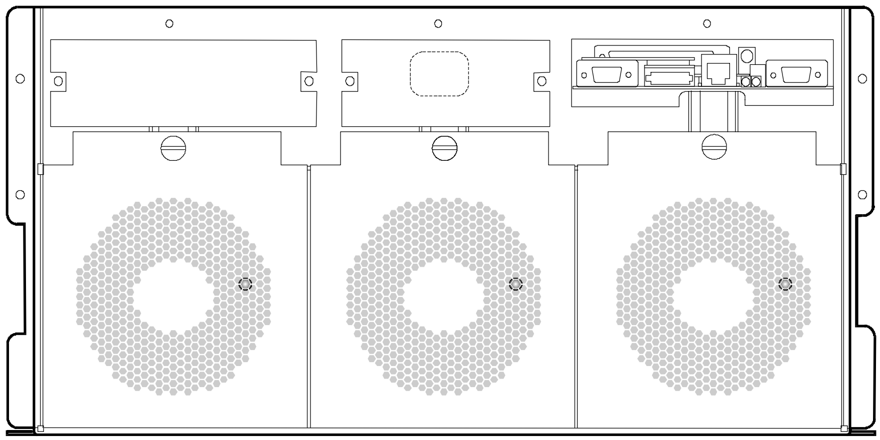


Comm In	Connects to COM1 port on chassis, if using internal or external modem line on SMB. DB9 connector.
MLAN	Management LAN cable connection
Line	Phone line connection when using SMB internal modem
LEDs	Left: reserved for future use Right: green status light indicating the board is properly inserted and connected
Comm Out	Connects SMB to an external modem. Disables SMB's internal modem. DB9 connector.
Phone Cable	Connection for internal modem, if used
Ribbon Cable	Connection for internal modem, if used
DC Power Cable	Connection for internal modem, if used
Modem	Internal modem for remote management (optional item). Must be removed to enable SMB connection to external modem through Comm Out.

Server Management Board Location

The following figure shows the rear view of the deskside power rack showing the placement of the Server Management Board in the upper right corner.

Server Management Board Location (Rear View of Deskside Power Rack)



Removing the Server Management Board

To remove the Server Management Board, proceed as follows.

CAUTION: Before removing the Server Management Board, make sure that the modem is not in use.

1. Remove any cables that are connected to the following connectors:
   - Comm In (DB9)
   - Line (Internal Modem)
   - Comm Out (DB9) (External Modem)
2. Unscrew the jack screw located at the bottom center of the Server Management Board. Use a manual slotted screwdriver; do not use a power tool.
3. Using the jack screw as a handle, remove the old Server Management Board from the cabinet.

Installing the Server Management Board

The procedure for installing the Server Management Board is slightly different for R1 and R2 systems. In an R2 system, the SMB communicates with the system board by means of a cable from the power distribution backplane. This cable is not used in R1 systems.

The following subsections detail SMB installation procedures for both R1 and R2 systems.

Installing the SMB on an R1 System

To install a Server Management Board on an R1 system, perform the following steps:

1. Slide the Server Management Board into the slot on the back of the power rack, as shown in the “Server Management Board Location” figure.

   CAUTION: Do not try to force the board all the way into the slot. The board engages fully when you tighten the jack screw.

2. Tighten the jack screw (maximum of 6.0 inch-pounds) to hold the Server Management Board in place. Do not over-tighten the jack screw.
3. Attach the cables to the following external connectors as appropriate:
   - If using an SMB internal modem, connect the Comm In (9DB) cable to the COM1 port. Connect the Line (Internal Modem) cable to a phone line.
   - If using an external modem, connect the Comm In (9DB) cable to the COM1 port. Connect the Comm Out (DB9) (External Modem) cable to an external modem.
4. Wait for the right LED (status) on the board to turn green.

   If the light does not turn green within 30 seconds, check that the SMB is properly inserted and connected. Holding the board by its top edge or upper corners, carefully pull it out. Do not scrape the board against other components.
5. Perform a Server Management Board Firmware Flash to install the firmware on the Server Management Board. See the *Server Management Product Manual* for the procedure.

Installing the SMB on an R2 System

To install a Server Management Board on an R2 system, perform the following steps:

1. Slide the Server Management Board into the slot on the back of the power rack, as shown in the "Server Management Board Location" figure.

   CAUTION: Do not try to force the board all the way into the slot. The board engages fully when you tighten the jack screw.
2. Tighten the jack screw (maximum of 6.0 inch-pounds) to hold the Server Management Board in place. Do not over-tighten the jack screw.
3. Attach the cables to the following external connectors as appropriate:
   - If using an SMB internal modem, connect the Comm In (9DB) cable to the COM1 port. Connect the Line (Internal Modem) cable to a phone line.
   - If using an external modem, connect the Comm In (9DB) cable to the COM1 port. Connect the Comm Out (DB9) (External Modem) cable to an external modem.
4. Wait for the right LED (status) on the board to turn green.

   If the light does not turn green within 30 seconds, check that the SMB is properly inserted and connected. Holding the board by its top edge or upper corners, carefully pull it out. Do not scrape the board against other components.

5. Route the SMB cable through the slot at the top of the front bulkhead on the primary side. Connect the SMB cable as follows:
    - One end to J36 on the upper left side of the power distribution backplane
    - The other end to J6 on the R2 primary system board
6. Perform a Server Management Board Firmware Flash to install the firmware on the Server Management Board. See the *Server Management Product Manual* for the procedure.

    Note: The Server Management Board Firmware Flash must be performed from a Windows NT client machine running LANDesk Server Manager software.

LEDs

The Server Management Board has two light-emitting diodes (LEDs) which are visible on the back of the power subsystem.

When the Server Management Board is correctly placed and connected, the LED on the right (Status) will be green. If it does not turn green within 30 seconds, verify that the Server Management Board is properly inserted and connected.

The left LED (Service) is reserved for future use.

Replacing the Internal Modem

On occasion, it may be necessary to replace the internal modem. Before installing a new modem, contact your service provider to ensure the modem has been certified to operate correctly with the Server Management Board.

Removing the Modem

To remove the internal modem, proceed as follows:

1. Remove the Server Management Board following the procedures earlier in this chapter.
2. Disconnect the following cables:
    - Ribbon cable connecting the modem to the Server Management Board
    - Phone cable
    - DC power cable
3. Using the Phillips head screwdriver, unscrew the two screws holding the modem on the Server Management Board.
4. Remove the modem.

Installing the Modem

To install a new internal modem, proceed as follows.

CAUTION: Before installing a new modem, contact your manufacturer’s representative to ensure the modem has been certified to operate correctly with the Server Management Board.

1. Slip the back of the modem into the Server Management Board standoff.
2. Place the modem on the Server Management Board so that the two screw holes are aligned.
3. Insert and tighten the two screws.
4. Connect the following cables:
   - Ribbon cable connecting the modem to the Server Management Board
   - Phone cable
   - DC power cable
5. Perform a Server Management Board Reset before using the modem.

Using an External Modem

You can connect an external modem rather than an internal modem; however, the presence of an internal modem disables the Comm Out port, making an external modem inoperative.

You must first remove the Server Management Board’s internal modem, if present, to enable connection to a external modem.

To connect an external modem, proceed as follows:

1. Connect the external modem, including the phone line, following the instructions in the modem user guide.
2. Connect the modem cable to the Comm Out line on the Server Management Board.
3. Connect the Server Management Board Comm In line to the chassis COM1 port.
4. Perform a Server Management Board reset before using the modem.

Chapter 10

Connector Pinouts and System Mapping

This chapter provides descriptions of the following:

- R1 system memory map
- R2 system memory map
- R1 system I/O map
- R2 system I/O map
- EISA slot IDs
- R1 PCI busses and device numbers
- R2 PCI busses and device numbers
- Direct memory access channels
- ISA interrupts
- R1 PCI interrupts
- R2 primary system board PCI interrupts
- R2 secondary system board PCI interrupts
- Diskette drive capacities supported by BIOS
- R1 system board connectors
- R1 system board connector pinouts
- R2 system board connectors
- R2 system board connector pinouts
- Front panel control board connectors
- SCSI drive backplane connectors
- Power distribution backplane connectors

Terms and Abbreviations

The following terms and abbreviations are used in the pinout tables in this chapter:

- Signal active low: In all tables in this section, a pound sign (#) following a signal name indicates that the signal is active in the low state.
- NC = Not connected. This also displays in its spelled-out form.
- GND = Ground

R1 System Memory Map

The following table shows the system memory map for R1 system board configurations:

Address Range (hex)	Amount	Function
0000_0000H–0007_FFFFH	512 KB	Base system memory (fixed)
000A_0000H–000B_FFFFH	128 KB	ISA video buffer
000C_0000H–000E_FFFFH	160 KB	Video BIOS, AIC-7880 SCSI BIOS, other option ROMs. All these can be shadowed
000E_8000H–000F_FFFFH	96 KB	System BIOS and data areas (fixed)
0010_0000H–00EF_FFFFH	14 MB	System memory or unused
00F0_0000H–00FF_FFFFH	1 MB	System memory or EISA memory
0100_0000H–FEBF_FFFFH	4060 MB	System memory or add-in cards or unused
FEC0_0000H–FEC0_0FFFH	4 KB	I/O APIC #1
FEC0_1000H–FEC0_1FFFH	4 KB	I/O APIC #2
FEC0_2000H–FEC0_7FFFH	24 KB	Unused
FEC0_8000H–FEC0_8FFFH	4 KB	Local APIC
FEC0_9000H–FFF7_FFFFH	4939 KB	Add-in card or unused
FFF8_0000H–FFFF_FFFFH	512 KB	System BIOS (fixed)

R2 System Memory Map

The following table shows the system memory map for R2 system board configurations:

Address Range (hex)	Amount	Function
0000_0000H–0007_FFFFH	512 KB	Base system memory (fixed)
0008_0000H–0009_FFFFH	128 KB	Base system memory (PS/2 keyboard code for mouse)
000A_0000H–000B_FFFFH	128 KB	Video data RAM area
000C_0000H–000C_7FFFH	32 KB	Offboard video area (optional area for add-in cards)
000C_8000H–000C_FFFFH	32 KB	Adapter BIOS extensions
000D_0000H–000D_FFFFH	64 KB	Adapter BIOS extensions
000E_0000H–000E_7FFFH	32 KB	Optional adapter BIOS extension (optional video BIOS, optional AIC-7880 SCSI BIOS)
000E_8000H–000F_FFFFH	96 KB	System BIOS code (enabled by default at power-on reset)
0010_0000H–FEBF_FFFFH	3023 MB	Extended system memory (optional PCI/EISA/ISA adapter)
FEC0_0000H–FEC0_0FFFH	4 KB	I/O APIC #1
FEC0_1000H–FEC0_1FFFH	4 KB	I/O APIC #2
FEC0_2000H–FEC0_2FFFH	4 KB	I/O APIC #3
FEC0_4000H–FEC0_FFFFH	48 KB	Optional EISA memory space
FEC1_0000H–FECF_FFFFH	960 KB	Optional EISA memory space
FED0_0000H–FEDF_FFFFH	1 MB	Optional EISA memory space
FEE0_0000H–FEEF_FFFFH	1 MB	Local APIC
FEF0_0000H–FFF7_FFFFH	16.5 MB	Reserved
FFF8_0000H–FFFF_FFFFH	512 KB	BIOS ROM
1000_0000H–FFFF_FFFFH	4 GB	Extended memory above 4 GB

R1 System I/O Map

The following table shows the R1 system I/O map:

I/O Address(es)	Resource
0000–001F	DMA controller 1
0020–0021	Interrupt controller 1
0022–0023	EISA bridge configuration space access ports
0040–005F	Programmable timer
0060–0064	Keyboard controller
0061	NMI status and control register
0070	NMI mask (bit 7) and RTC address (bits 6:0)
0071	Real-time Clock (RTC)
0080–0081	PCEB BIOS timer
0080–008F	DMA low page register
0092	System control port A (PC-AT control port)
00A0–00BF	Interrupt controller 2
00C0–00DF	DMA controller 2
00F0	Clear NPX error
00F8–00FF	x87 numeric coprocessor
0102	Video display controller
0170–0177	Secondary fixed disk controller (IDE)
01F0–01F7	Primary fixed disk controller (IDE)
0278–027F	Parallel port 2 (relocatable)
02E8–02EF	Serial port 4 (relocatable)
02F8–02FF	Serial port 2 (relocatable)
0370–0377	Secondary diskette drive
0378–037F	Parallel port 1 (relocatable)
03B4–03BA	Monochrome display port
03BC–03BF	Parallel port 3
03C0–03CF	Enhanced graphics adapter
03D4–03DA	Color graphics controller
03E8–03EF	Serial port (relocatable)
03F0–03F7	Diskette drive controller
03F8–03FF	Serial port 1 (relocatable)
0400–043F	DMA controller 1, extended mode registers
0461	Extended NMI / reset control
0462	Software NMI
0464	Last EISA bus master granted
0480–048F	DMA high page register

I/O Address(es)	Resource
04C0–04CF	DMA Controller 2, high base register
04D0–04D1	Interrupt controllers 1 and 2 control register
04D4–04D7	DMA controller 2, extended mode register
04D8–04DF	Reserved
04E0–04FF	DMA channel stop registers
0C80–0C83	EISA system identifier registers
0C84	Board revision register
OCA0	I^2C controller
0CF8	PCI CONFIG_ADDRESS register
0CFC	PCI CONFIG_DATA register
n000–n0FF	EISA slot n I/O space (n = 1 to 4)
x100–x3FF	ISA I/O slot alias address
n400–n4FF	EISA slot n I/O space (n = 1 to 4)
x500–x7FF	ISA I/O slot alias address
n800–n8FF	EISA slot n I/O space (n = 1 to 4)
x900–xBFF	ISA I/O slot alias address
nC00–nCFF	EISA slot n I/O space (n = 1 to 4)
xD00–xFFF	ISA I/O slot alias address

R2 System I/O Map

The following table shows the R2 system I/O map:

I/O Address(es)	Resource
0000–001F	DMA controller 1
0020–0021	Interrupt controller 1
0022–0023	ESC configuration access
0024–0025	Reserved - AIP configuration access
0026–0027	XPC/XPD/INCA configuration access
0028–003F	Reserved
0040–004F	ESC programmable timers 1 and 2
0050–005F	Reserved
0060, 0064	Keyboard controller
0061	NMI status and controller register
0062–006F	Reserved
0070	NMI mask (bit 7) and RTC address (bits 6:0)
0071	Real-time Clock (RTC)
0072–007F	Reserved (0078 is default BIOS timer address in PCEB)
0080–008F	DMA low page register
0090–0091	Reserved
0092	A20GATE/RST (ESC)
0093	Reserved
0094	Video display controller
0095–009F	Reserved
00A0–00A1	Interrupt controller 2 (ESC)
00A2–00B1	Reserved
00B2–00B3	APM control ports
00B4–00BF	Reserved
00C0–00DF	DMA controller 2
00E0–00EF	Reserved
00F0	Reset numeric coprocessor (IRQ 13)
00F1–00F7	Reserved
00F8–00FF	Numeric coprocessor
0100–0101	Reserved
0102	Video display controller
0103–010F	Reserved
0110–0117	Server Monitor Module (SMM) configuration
0118–016F	ISA adapter available
0170–0177	Reserved

I/O Address(es)	Resource
0178–01EF	ISA adapter available
01F0–01F7	Reserved
0200–0207	Reserved
0208–021F	ISA adapter available
0220–022F	Serial port 1
0238–023F	Serial port 1
0240–0277	ISA adapter available
0278–027F	Parallel port 3
0280–02E7	ISA adapter available
02E8–02EF	Serial port 4
02F8–02FF	Serial port 2 (relocatable)
0300–0337	ISA adapter available
0338–033F	Serial port 3
0340–036F	ISA adapter available
0370–0375	Secondary diskette drive
0376	Reserved
0377	Diskette drive
0378–037F	Parallel port 2
0380–0397	ISA adapter available
0398–0399	AIP config access
03A0–03AF	ISA adapter available
03B4–03BB	Monochrome display port
03BC–03BF	Parallel port 1 (relocatable)
03C0–03CF	Enhanced graphics controller
03D4–03DB	Color graphics controller
03E8–03EF	Serial port 3
03F0–03F5	Diskette drive controller (relocatable)
03F6–03F7	Diskette/IDE (relocatable)
03F8–03FF	Serial port 1 (relocatable)
0400–040F	DMA controller 1, extended mode registers
0410–043F	DMA scatter/gather control registers (relocatable)
0440–0460	Reserved
0461	Extended NMI/reset control
0462	Software NMI
0464–0465	Last EISA bus master granted
0466–047F	Reserved
0480–048F	DMA high page register
0490–04BF	Reserved

I/O Address(es)	Resource
04C0–04CF	DMA Controller 2, high base register
04D0–04D1	Interrupt controllers 1 and 2 control register
04D2–04DF	DMA controller 2, extended mode register
04E0–04FF	DMA channel stop registers
0500–07FF	ISA I/O slot alias address
0678, 0778, 07BC	AIP parallel port (ECP registers)
0800–08FF	Reserved
0900–0BFF	ISA I/O slot alias address
0C00	System configuration register
0C80–0C83	EISA system identifier registers
0C84	Board revision register
0C85–0C86	BIOS function control
0CA0–0CA1	Primary I^2C controller
0CA2–0CA3	Port I/O snoop register
0CA4–0CA5	Secondary I^2C controller
0CA6–0CAF	Reserved
0CB0–0CB3	INCA LCD command port
0CB4–0CB7	INCA LCD data port
0CB8–0CF7	Reserved
0CF8	PCI configuration address register
0CF9	Reset/deturbo to compatibility OPB
0CFA–0CFB	Reserved (PCI configuration)
0CFC–0CFF	PCI configuration data register
0D00–0FFF	ISA I/O slot alias address
n000–n0FF	EISA slot n I/O space (n = 1 to 4)
n100–n3FF	ISA I/O slot alias address
n400–n4FF	EISA slot n I/O space (n = 1 to 4)
n500–n7FF	ISA I/O slot alias address
n800–n8FF	EISA slot n I/O space (n = 1 to 4)
n900–nBFF	ISA I/O slot alias address
nC00–nCFF	EISA slot n I/O space (n = 1 to 4)
nD00–nFFF	ISA I/O slot alias address
46E8	Video display controller

EISA Slot IDs

The following table shows the slot IDs for EISA boards.

EISA slot (hex)	Device
0	Primary system board
1-4	EISA expansion boards

R1 PCI Busses and Device Numbers

The following table shows the R1 PCI busses and device numbers.

Note: PCI slots are scanned in the order they are listed in the table.

Bus Number	Physical Slot ID	Device Number (Hexadecimal)	INCA IRQs
0	P1	0B	0, 5, 6, 7
0	P2	0C	1, 7, 5, 6
0	P3	0D	2, 6, 7, 5
1	P4	0A	3, 5, 6, 7
1	SCSI-A	0B	12
1	SCSI-B	0C	13
1	P5	0D	4, 7, 5, 6
1	P6	0E	15, 6, 7, 5

R2 PCI Busses and Device Numbers

The following table shows the R2 PCI busses and device numbers. Busses 0 and 1 are on the primary system board. Busses 2 and 3 are on the secondary system board.

Bus numbering assumes that no bridge adapters have been added to the server. If you install a bridge adapter, the PCI scan assigns it the next bus number and increments the bus numbers for subsequent busses by 1. For example, if you install a bridge adapter in a PCI slot on bus 0, the following occur:

- The bridge adapter is assigned PCI bus 1
- Bus number does not change for other slots on bus 0 that do not contain bridge adapters
- Peer bus 1 becomes bus 2, peer bus 2 becomes bus 3, and so on

Note: PCI slots are scanned in the order they are listed in the table, with the exception of the INCA devices, which are not scanned.

Bus Number	Physical Slot ID	Device Number (Hexadecimal)	INCA IRQs
0	P1	0B	0, 5, 6, 7
0	P2	0C	1, 7, 5, 6
0	P3	0D	2, 6, 7, 5
0	P7	0F	ESC PIRQ 2, 5, 6, 7
1	P4	0A	3, 5, 6, 7
1	SCSI-A	0B	12
1	SCSI-B	0C	13
1	P5	0D	4, 7, 5, 6
1	P6	0E	15, 6, 7, 5
1	INCA	0F	N/A
2	P8	0A	0, 5, 6, 7
2	SCSI C	0B	12
2	P9	0C	1, 7, 5, 6
2	P10	0D	2, 6, 7, 5
2	P11	0E	10, 5, 6, 7
3	P12	0A	3, 5, 6, 7
3	P13	0C	4, 7, 5, 6
3	P14	0D	15, 6, 7, 5
3	P15	0E	9, 5, 6, 7
3	INCA	0F	N/A

Direct Memory Access Channels

The following table shows the Direct Memory Access channels and the devices that use them:

Channel	Device
0	(add-in board)
1	(add-in board)
2	Diskette drive
3	IDE hard disk drive (R1 systems only; used by add-in board on R2 systems)
4	Reserved
5	(add-in board)
6	(add-in board)
7	(add-in board)

ISA Interrupts

The following table lists ISA IRQs (interrupt requests) and the devices that use them:

IRQ	Device
NMI	Parity error
0	Interval timer
1	Keyboard buffer full
2	Reserved, cascade interrupt from slave PIC
3	Onboard serial port B (COM2) or add-in board
4	Onboard serial port A (COM1) or add-in board
5	Parallel port LPT2 or add-in board
6	Onboard diskette controller, if enabled
7	Parallel port LPT1 or add-in board
8	Real-time clock (RTC)
9	(add-in board)
10	(add-in board)
11	(add-in board)
12	Onboard PS/2 mouse port or add-in board
13	Math coprocessor error
14	IDE hard drive controller, if enabled (R1 system board only; open for R2 system board)
15	(add-in board)

R1 PCI Interrupts

An Interrupt Control ASIC (INCA) is used to map PCI interrupts into standard ISA interrupts, APIC-based interrupts, or System Management Interrupts (SMI).

The following table lists PCI Interrupt Request signals and the INCA PCI Interrupt Request inputs to which they are routed. The INTB, INTC, and INTD interrupt lines from all PCI slots are shared.

INCA PCI Interrupt Input	Device
0	PCI-0 slot 1 INTA
1	PCI-0 slot 2 INTA
2	PCI-0 slot 3 INTA
3	PCI-1 slot 1 INTA
4	PCI-1 slot 2 INTA
5	PCI-0 slot 1 INTB PCI-0 slot 2 INTC PCI-0 slot 3 INTD PCI-1 slot 1 INTB PCI-1 slot 2 INTC PCI-1 slot 3 INTD
6	PCI-0 slot 1 INTC PCI-0 slot 2 INTD PCI-0 slot 3 INTB PCI-1 slot 1 INTC PCI-1 slot 2 INTD PCI-1 slot 3 INTB
7	PCI-0 slot 1 INTD PCI-0 slot 2 INTB PCI-0 slot 3 INTC PCI-1 slot 1 INTD PCI-1 slot 2 INTB PCI-1 slot 3 INTC
12	SCSI channel A INTA
13	SCSI channel B INTA
15	PCI-1 slot 3 INTA

R2 Primary System Board PCI Interrupts

The following table lists INCA PCI Interrupt Request signals for the R2 primary system board.

INCA PCI Interrupt Input	Device
0	PCI-0 slot 1 INTA
1	PCI-0 slot 2 INTA
2	PCI-0 slot 3 INTA
3	PCI-1 slot 1 INTA
4	PCI-1 slot 2 INTA
5	Shared PCI-0 slot 1 INTB PCI-0 slot 2 INTC PCI-0 slot 3 INTD PCI-0 slot 4 INTB PCI-1 slot 1 INTB PCI-1 slot 2 INTC PCI-1 slot 3 INTD
6	Shared PCI-0 slot 1 INTC PCI-0 slot 2 INTD PCI-0 slot 3 INTB PCI-0 slot 4 INTC PCI-1 slot 1 INTC PCI-1 slot 2 INTD PCI-1 slot 3 INTB
7	Shared PCI-0 slot 1 INTD PCI-0 slot 2 INTB PCI-0 slot 3 INTC PCI-0 slot 4 INTD PCI-1 slot 1 INTD PCI-1 slot 2 INTB PCI-1 slot 3 INTC
8	Primary I^2C controller
12	SCSI channel A INTA
13	SCSI channel B INTA
14	Primary memory module single-bit error
15	PCI-1 slot 3 INTA

R2 Secondary System Board PCI Interrupts

The following table lists INCA PCI Interrupt Request signals for the R2 secondary system board.

INCA PCI Interrupt Input	Device
0	PCI-2 slot 1 INTA
1	PCI-2 slot 2 INTA
2	PCI-2 slot 3 INTA
3	PCI-3 slot 1 INTA
4	PCI-3 slot 2 INTA
5	Shared PCI-2 slot 1 INTB PCI-2 slot 2 INTC PCI-2 slot 3 INTD PCI-2 slot 4 INTB PCI-3 slot 1 INTB PCI-3 slot 2 INTC PCI-3 slot 3 INTD PCI-3 slot 4 INTB
6	Shared PCI-2 slot 1 INTC PCI-2 slot 2 INTD PCI-2 slot 3 INTB PCI-2 slot 4 INTC PCI-3 slot 1 INTC PCI-3 slot 2 INTD PCI-3 slot 3 INTB PCI-3 slot 4 INTC
7	Shared PCI-2 slot 1 INTD PCI-2 slot 2 INTB PCI-2 slot 3 INTC PCI-2 slot 4 INTD PCI-3 slot 1 INTD PCI-3 slot 2 INTB PCI-3 slot 3 INTC PCI-3 slot 4 INTD
9	PCI-3 slot 4 INTA
10	PCI-2 slot 4 INTA
12	SCSI channel C INTA
14	Secondary memory module single-bit error
15	PCI-3 slot 3 INTA

Diskette Drive Capacities Supported by BIOS

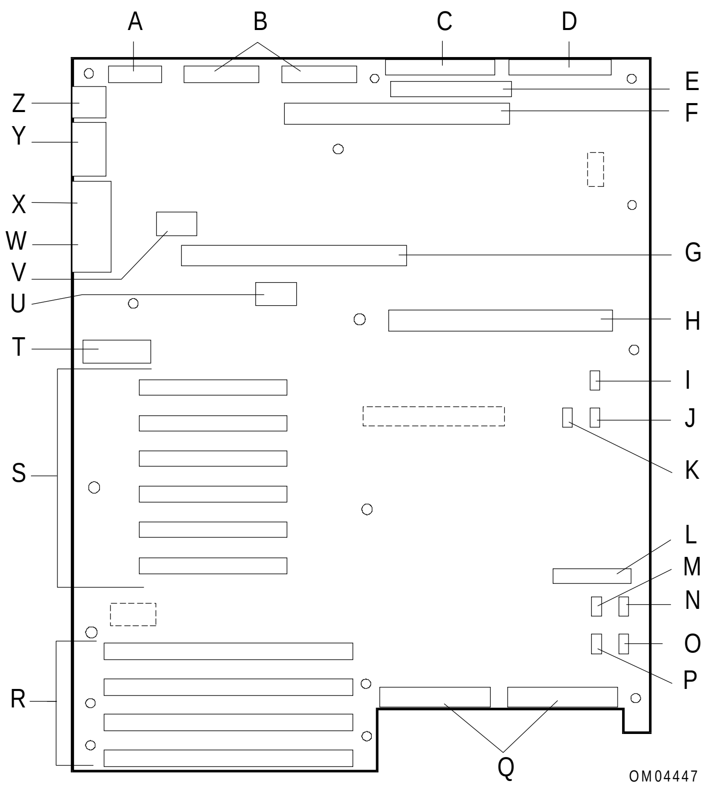
The following table shows the standard diskette drive capacities supported by the server BIOS:

Size, inches	Capacity
5.25	360 KB
5.25	600 KB
5.25	1.2 MB
3.5	720 KB
3.5	1.44 MB
3.5	2.88 MB

R1 System Board Connectors

The following figure shows connector locations on the R1 system board.

R1 System Board Connectors



A	**CABLE: Power control and status (PS3)**
B	**CABLES:** +5V, +12V, and 3.3V power connectors (PS1 and PS2) (identical)
C	**CABLE:** Diskette drive connector
D	**CABLE:** Front panel connector
E	IDE drive connector (not used)
F	Memory board connector
G	Secondary processor board or termination board connector
H	Primary processor board connector
I	**SHUNT CABLE:** Fan 1 connector (fan not used)
J	**SHUNT CABLE:** Fan 2 connector (fan not used)
K	Hard drive LED 1 connector (not used)
L	Connector for optional Server Management Module (SMM)
M	I^2C connector (not used)
N	**SHUNT CABLE:** Fan 3 connector (fan not used)
O	**SHUNT CABLE:** Fan 4 connector (fan not used)
P	Hard drive LED 2 connector (not used)
Q	**CABLE:** SCSI bus connectors: Channel A to the right, Channel B to the left
R	EISA slots 1 - 4 for add-in boards (slot 1 toward top, 4 toward bottom)
S	PCI slots 1 - 6 for add-in boards (slot 1 toward top, 6 toward bottom: Bus 0 = slots 1 - 3; Bus 1 = slots 4 - 6)
T	Configuration switches and jumpers
U	Real-time clock
V	Video DRAM expansion socket (populated)
W	**EXTERNAL CABLE:** VGA monitor connector
X	**EXTERNAL CABLE:** Parallel port connector
Y	**EXTERNAL CABLES:** Serial port connectors A (COM1) and B (COM2)
Z	**EXTERNAL CABLES:** PS/2-compatible keyboard and mouse connectors

R1 System Board Connector Pinouts

This section provides pin information for connectors on the R1 system board for which system integrators need interface information. The system board set connector pinouts (processor boards, bus termination boards, memory boards) are not provided.

Power Connectors PS1 and PS2

The following table shows the pinouts for power connectors PS1 and PS2 on the R1 system board:

Pin	Signal	Pin	Signal
1	+5.1 VDC	11	+12 VDC
2	GND	12	GND
3	+5.1 VDC	13	+12 VDC
4	GND	14	GND
5	+5.1 VDC	15	+3.3 VDC
6	GND	16	GND
7	+5.1 VDC	17	+3.3 VDC
8	GND	18	GND
9	+5.1 VDC	19	+3.3 VDC
10	GND	20	GND

Power Control and Status Connector PS3 (R1 System Board)

The following table shows the pinouts for power control and status connector PS3 on the R1 system board:

Pin	Signal	Pin	Signal
1	-12 VDC	8	+5 V standby
2	-5 VDC	9	GND
3	PON	10	PGOOD
4	I2C-SDA	11	GND
5	I2C-SCL	12	I2C_PRES
6	+5 V Sense+	13	+3.3 V Sense+
7	+12 V Sense+	14	GND Sense-

Diskette Drive Connector (R1 System Board)

The following table shows the pinouts for the diskette drive connector on the R1 system board:

Pin	Signal	Pin	Signal
1	GND	2	Density select
3	GND	4	Motor enable 3
5	Key (pin missing)	6	Extended density in
7	GND	8	Index
9	GND	10	Motor A on
11	GND	12	Drive B select
13	GND	14	Drive A select
15	GND	16	Motor B on
17	GND	18	Head direction
19	GND	20	Step
21	GND	22	Write data
23	GND	24	Write enable
25	GND	26	Track 0
27	GND	28	Write protect
29	Extended density out	30	Read data
31	GND	32	Head select side 1
33	GND	34	Disk change

Front Panel Connector

The following table shows the pinouts for the front panel connector on the R1system board:

Pin	Signal Name	Function
1	SPKRDAT	Drives standard PC-AT speaker
2	VCC5	5 V power supply
3	5VSTANDBY	5 V power supply standby
4	PS_ON	Power supply on/off switch connection
5	FP_RESET #	Active-low front panel reset switch connection
6	GND	Ground
7	FP_NMI #	Connects to FP_NMI driver
8	GND	Ground
9	HD_LED_VCC	IDE activity indicator LED return (not used)
10	HD1_IDE_ACT#	IDE activity indicator (not used)
11	HD2_ACT#	SCSI activity indicator LED (not used)
12	HD_LED_VCC	SCSI activity indicator LED return (not used)
13	KEYLOCK#	Keyboard lock signal (not used)
14	GND	Ground
15	SECURE	Secure mode indicator
16	VCC5	LCD display controller power
17	KEY	Not connected
18	VCC5	5 V power supply
19	I2C-SDA	I^2C interface data signal
20	CHASIS_SWT_RET	Chassis intrusion detection switch return
21	LCD_SD	Serial I/O data to LCD controller
22	H_PWROFF#	Host power control (from Server Management board)
23	LCD_SCLK	Clock for LCD serial I/O
24	I2C_SCL	I^2C interface clock signal
25	LCD_PCLK	LCD controller processor clock
26	GND	Ground
27	EN	LCD enable
28	GND	Ground
29	RW	LCD read/write strobe
30	VCC3	3.3 V power supply
31	RS	LCD reset
32	PWR#	RTC power control indication
33	LCD_GND	LCD display ground connection

Pin	Signal Name	Function
34	GND	Ground
35	FAN_FAIL#	Indicates failure of at least one cooling fan
36	GND	Ground
37	I2C_PRES	I^2C control signal (not used)
38	Reserved	Reserved
39	Vcc	Vcc
40	Reserved	Reserved

IDE Drive Connector (R1 System Board Only)

The following table shows the pinouts for the IDE drive connector on the R1 system board. This connector is not used on the R2 system board.

Pin	Signal	Pin	Signal
1	IDERST#	2	GND
3	ID7 (data bit 7)	4	ID8 (data bit 8)
5	ID6 (data bit 6)	6	ID9 (data bit 9)
7	ID5 (data bit 5)	8	ID10 (data bit 10)
9	ID4 (data bit 4)	10	ID11 (data bit 11)
11	ID3 (data bit 3)	12	ID12 (data bit 12)
13	ID2 (data bit 2)	14	ID13 (data bit 13)
15	ID1 (data bit 1)	16	ID14 (data bit 14)
17	ID0 (data bit 0)	18	ID15 (data bit 15)
19	GND	20	Keyed (pin missing)
21	IDEDRQ (DMA request 3)	22	GND
23	IDEIOW# (I/O write)	24	GND
25	IDEIOR# (I/O read)	26	GND
27	CHRDY (I/O channel ready)	28	SPSYNC (address latch enable)
29	IDEDAK# (DMA acknowledge 3)	30	GND
31	IDEIRQ14 (interrupt request 14)	32	IDEIO16 # (I/O channel size 16)
33	IDESA1 (address bit 1)	34	PDIAG #
35	IDESA0 (address bit 0)	36	IDESA2 (address bit 2)
37	IDECS0# (host chip select 0)	38	IDECS1# (host chip select 1)
39	IDEHDACT#/DRVPRES# disk activity/drive present)	40	GND

12V Fan Connector (R1 System Board Only)

The following table shows the pinouts for the 12V fan connector on the R1 system board:

Pin	Function
1	GND
2	+12V
3	Fan fail sensor (high = fan failure)

Server Management Connector (R1 System Board)

The following table shows the pinouts for the server management connector on the R1 system board:

Pin	Signal	Description
1	SMI#	System management interrupt
2	I2C_SCL	I^2C clock
3	GND	Ground
4	TMS0	TMS signal for JTAG 1149.1 port 0
5	H_PWROFF#	Power supply on/off (active low)
6	I2C_SDA	I^2C data signal
7	LPOK	Host line power okay
8	KEYLK#	Keyboard lock
9	NMI	Nonmaskable interrupt
10	3.3 V	3.3 V power
11	RESET#	Reset system board
12	GND	Ground
13	GND	Ground
14	TCK0	TCK signal for JTAG 1149.1 port 0
15	SECURE	Host in secure mode
16	GND	Ground
17	INTRUD#	Chassis is open
18	TDI0	TDI0 signal for JTAG 1149.1 port 0
19	TDO0	TD0 signal for JTAG 1149.1 port 0
20	GND	Ground
21	Reserved	No connection
22	Reserved	No connection
23	POWERGD	Power to system is within specification
24	Reserved	No connection
25	Reserved	No connection, pin missing
26	Reserved	No connection

SCSI Channels A and B Connectors

See the table in the “68-pin Wide Input Connector (J15)” section later in this chapter.

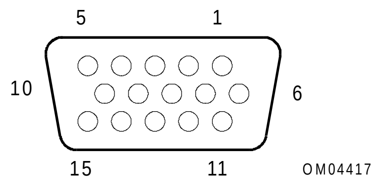
PCI Connectors

The system board PCI connectors adhere to the requirements in PCI Specification 2.0.

VGA Video Port Connector

The following figure shows the VGA video port connector on the R1 system board. The accompanying table shows the pinouts for this connector.

VGA Video Port Connector

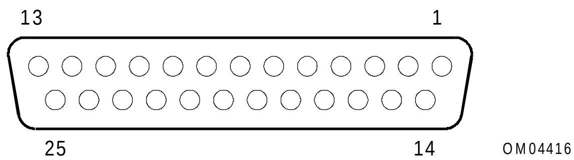


Pin	Signal	Pin	Signal
1	Red	9	Not connected
2	Green	10	GND
3	Blue	11	Not connected
4	Not connected	12	Not connected
5	GND	13	HSYNC (horizontal sync)
6	GND	14	VSYNC (vertical sync)
7	GND	15	Not connected
8	GND		

Parallel Port Connector

The following figure shows the parallel port connector on the R1 system board. The accompanying table shows the pinouts for this connector.

Parallel Port Connector

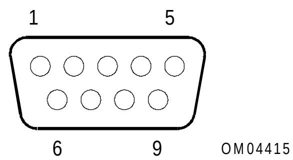


Pin	Signal	Pin	Signal
1	STROBE #	10	ACK# (acknowledge)
2	Data bit 0	11	BUSY
3	Data bit 1	12	PE (paper end)
4	Data bit 2	13	SLCT (select)
5	Data bit 3	14	AUFDXT# (auto feed)
6	Data bit 4	15	ERROR #
7	Data bit 5	16	INIT# (initialize printer)
8	Data bit 6	17	SLCTIN# (select input)
9	Data bit 7	18–25	GND

Serial Port Connectors A (COM1), B (COM2)

The following figure shows a serial port connector on the R1 system board. The accompanying table shows the pinouts for this connector.

Serial Port Connector

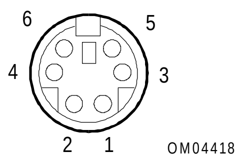


Pin	Signal
1	DCD (data carrier detect)
2	RXD (receive data)
3	TXD (transmit data)
4	DTR (data terminal ready)
5	GND
6	DSR (data set ready)
7	RTS (request to send)
8	CTS (clear to send)
9	RIA (ring indicator)

Keyboard and Mouse Connectors

The following figure shows an example of the keyboard and mouse connectors on the R1 system board. These identical PS/2-compatible connectors share a common housing. The accompanying table shows the pinouts for these connectors.

Keyboard and Mouse Connector



Pin	Keyboard signal	Pin	Mouse signal
1	KEYDAT (keyboard data)	1	MSEDAT (mouse data)
2	Not connected	2	Not connected
3	GND	3	GND
4	FUSED_VCC (+5 V)	4	FUSED_VCC (+5 V)
5	KEYCLK (keyboard clock)	5	MSECLK (mouse clock)
6	Not connected	6	Not connected

R2 System Board Connectors

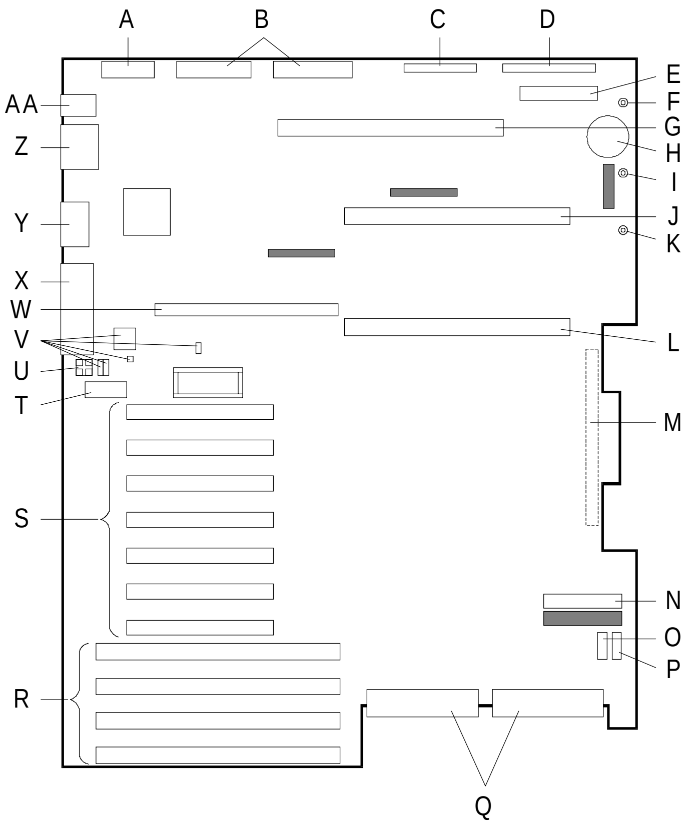
This section illustrates and defines the connectors on the following:

- R2 primary system board
- R2 secondary system board

R2 Primary System Board Connectors

The following figure shows connector locations on the R2 primary system board.

R2 Primary System Board Cable Connectors

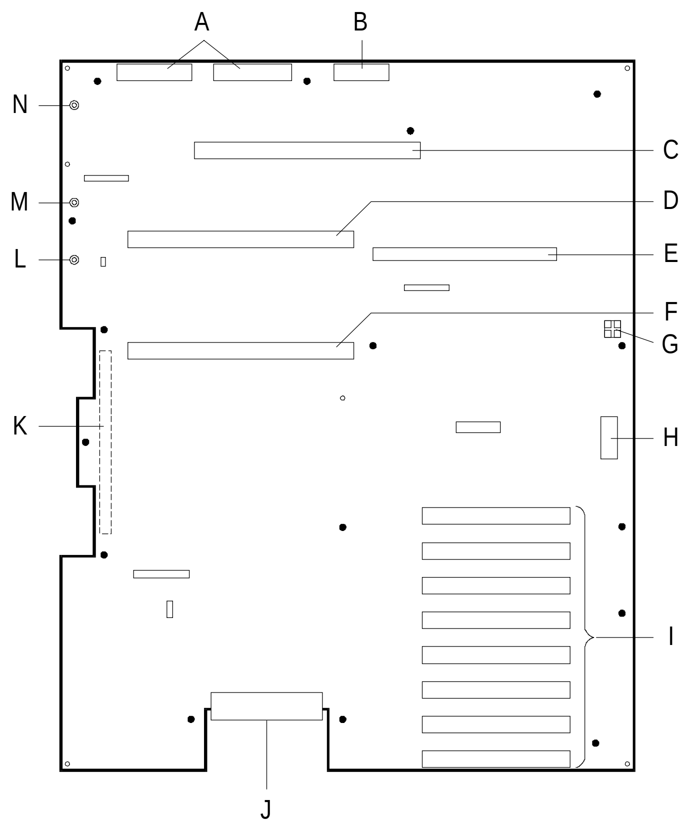


A	**CABLE:** Power control and status (PS3) J36
B	**CABLES:** +5V, +12V, and 3.3V power connectors (PS1 and PS2) (identical) J21 and J26
C	**CABLE:** Diskette drive connector J14
D	**CABLE:** Front panel connector J9
E	**CABLE:** Server Management Board (SMB) connector J6
F	**CABLE:** +12V power plane interconnect connector
G	Memory board connector
H	Real-time clock battery
I	**CABLE:** +5.1V power plane interconnect connector
J	CPU 2 processor board or termination board connector
K	**CABLE:** +3.3V power plane interconnect connector
L	CPU 1 processor board connector
M	Intermodule connector (located on back side of board)
N	Connector for optional Server Monitor Module (SMM) J7
O	**CABLE:** Fan fail connector (inner chassis fans) J3
P	I^2C connector (not used)
Q	**CABLE:** SCSI bus connectors: Channel A (J5) to the right, Channel B (J13) to the left
R	EISA slots 1-4 for add-in boards (slot 1 toward top, 4 at bottom)
S	PCI slots 1-7 for add-in boards (slot 1 toward top, 7 toward bottom: Bus 0 = slots 1-3 and 7; Bus 1 = slots 4-6)
T	3.3 V PCI power connector
U	Processor activity LEDs (DS1-DS4)
V	Configuration switches and jumpers
W	LST SIMM connector
X	**EXTERNAL CABLE:** Parallel port connector
Y	**EXTERNAL CABLE:** VGA monitor connector
Z	**EXTERNAL CABLES:** Serial port connectors A (COM1) and B (COM2)
AA	**EXTERNAL CABLES:** PS/2-compatible keyboard and mouse connectors

R2 Secondary System Board Connectors

The following figure shows connector locations on the R2 secondary system board.

R2 Secondary System Board Cable Connectors



A	**CABLES:** +5V, +12V, and 3.3V power connectors (PS1 and PS2) (identical) J20 and J21
B	**CABLE:** Power control and status (PS3) J12
C	Memory board connector
D	CPU 4 processor board or termination board connector
E	LST SIMM connector
F	CPU 3 processor board connector
G	Processor activity LEDs (DS1-DS4)
H	3.3 V PCI power connector
I	PCI slots for add-in boards (numbered from top to bottom: 12, 13, 14, 15, 8, 9, 10, 11; Bus 2 = slots 8-11; Bus 3 = slots 12-15)
J	**CABLE:** SCSI bus connector Channel C
K	Intermodule connector (located on back side of board)
L	**CABLE:** +3.3V power plane interconnect connector
M	**CABLE:** +5.1V power plane interconnect connector
N	**CABLE:** +12V power plane interconnect connector

R2 System Board Connector Pinouts

This section provides pin information for connectors on the R2 system boards. The system board set connector pinouts (processor boards, bus termination boards, memory boards) are not provided.

Power Connectors PS1 and PS2

The following table shows the pinouts for power connectors PS1 and PS2. These connectors are present on both the R2 primary and secondary system boards:

Pin	Signal	Pin	Signal
1	+5.1 VDC	11	+12 VDC
2	GND	12	GND
3	+5.1 VDC	13	+12 VDC
4	GND	14	GND
5	+5.1 VDC	15	+3.3 VDC
6	GND	16	GND
7	+5.1 VDC	17	+3.3 VDC
8	GND	18	GND
9	+5.1 VDC	19	+3.3 VDC
10	GND	20	GND

Power Control and Status Connector PS3 (R2 Primary System Board)

The following table shows the pinouts for power control and status connector PS3 on the R2 primary system board:

Pin	Signal	Pin	Signal
1	-12 VDC	8	+5 V standby
2	-5 VDC	9	GND
3	PS-ON	10	PGOOD
4	I2C-SDA	11	GND
5	I2C-SCL	12	I2C_PRES
6	+5 V Sense+	13	+3.3 V Sense+
7	+12V Sense+	14	GND Sense-

Power Control and Status Connector PS3 (R2 Secondary System Board)

The following table shows the pinouts for power control and status connector PS3 on the R2 secondary system board:

Pin	Signal	Pin	Signal
1	-12 VDC	9	+5V_STANDBY
2	-5 VDC	10	GND
3	2BDRPRES_L (ground)	11	PWRGOOD
4	+5 VDC	12	GND
5	+5 VDC	13	GND
6	+3.3 VDC	14	GND
7	+3.3 VDC	15	GND
8	GND	16	GND

Diskette Drive Connector (R2 Primary System Board)

The following table shows the diskette drive connector pinouts on the R2 primary system board:

Pin	Signal	Pin	Signal
1	GND	2	Density select
3	GND	4	Reserved
5	GND	6	Reserved
7	GND	8	Index
9	GND	10	Motor Enable A
11	GND	12	Drive Sel B
13	GND	14	Drive Sel A
15	GND	16	Motor Enable B
17	GND	18	Head direction
19	GND	20	Step
21	GND	22	Write data
23	GND	24	Write enable
25	GND	26	Track 0
27	GND	28	Write protect
29	GND	30	Read data
31	GND	32	Head select side 1
33	GND	34	Disk change

Front Panel Connector

The following table shows the pinouts for the front panel connector on the R2 primary system board:

Pin	Signal Name	Function
1	SPKR_DAT	Drives standard PC-AT speaker
2	5V	5 V power supply
3	5VSTANDBY	5 V power supply standby
4	PS_ON	Power supply on/off switch connection
5	FP_RESET #	Active-low front panel reset switch connection
6	GND	Ground
7	FP_NMI #	Connects to FP_NMI driver
8	GND	Ground
9	HD1_LED	+5 V
10	HD1_RTN	Not connected
11	HD2_RTN#	Not connected
12	HD2_LED	+5 V
13	KBD_LOCK#	Keyboard lock signal
14	GND	Ground
15	SECURE	Secure mode indicator
16	5V	LCD display controller power
17	KEY	Not connected
18	5V	5 V power supply
19	I2C-SDA	I^2C interface data signal
20	CHASIS_SWT_RET	Chassis intrusion detection switch return
21	LCD_SD	Serial I/O data to LCD controller
22	H_PWROFF#	Host power control (from Server Management board)
23	LCD_SCLK	Clock for LCD serial I/O
24	I2C_SCL	I^2C interface clock signal
25	LCD_PCLK	LCD controller processor clock
26	GND	Ground
27	LCD_EN	LCD enable
28	GND	Ground
29	LCD_RW	LCD read/write strobe
30	3.3V	3.3 V power supply
31	LCD_RS	LCD reset
32	REQ_PWR#	RTC power control indication
33	LCD_VDD	LCD display ground connection

Pin	Signal Name	Function
34	GND	Ground
35	FAN_FAIL#	Indicates failure of at least one cooling fan
36	GND	Ground
37	I2C_PRES	I^2C control signal (not used)
38	Reserved	Reserved
39	5V	Vcc
40	Reserved	Reserved

Fan Fail Connector (R2 Primary System Board)

The following table shows the pinouts for the fan fail connector on the R2 primary system board:

Pin	Function
1	GND
2	no connect
3	FAN_SENSE (high = fan failure)

Server Monitor Module (SMM) Connector

The following table shows the pinouts for the Server Monitor Module (SMM) connector on the R2 primary and secondary system boards:

Pin	Signal	Description
1	SMI#	System management interrupt*
2	I2CCLK	I^2C clock (8MHz)
3	GND	Ground
4	TMS	JTAG TMS signal for OPBs, AMC-DC and AMC-DP on this system board
5	PWROFF#	Power supply off (active low)*
6	I2CDATA	I^2C data signal
7	LPOK	Host line power okay*
8	KEYUNLK#	Keyboard unlock*
9	NMI	Nonmaskable interrupt
10	3.3 V	3.3 V power
11	RESET#	Reset unit
12	GND	Ground
13	GND	Ground
14	TCK	JTAG TCK for OPBs, AMC-DC and AMC-DP on this system board
15	SECURE	Host in secure mode*
16	GND	Ground

Pin	Signal	Description
17	INTRUD#	Chassis open indicator*
18	TDI	JTAG TDI for OPBs, AMC-DC and AMC-DP on this system board
19	TDO	JTAG TDO for OPBs, AMC-DC and AMC-DP on this system board
20	GND	Ground
21	Reserved	No connection
22	Reserved	No connection
23	PWR_GD	Power to system is within specification
24	I2CPRSNT	I^2C bus present*
25	Key	Key pin
26	Reserved	No connection
* Connected on primary system board only		

Server Management Board (SMB) Connector (R2 Primary System Board)

The following table shows the pinouts for the Server Management Board (SMB) connector on the R2 primary system board.

Pin	Signal	Pin	Signal
1	5VSTANDBY	2	NC
3	H_PWR_L	4	GND
5	I2C-SCL (secondary system board)	6	GND
7	I2C_SDA (secondary system board)	8	GND
9	RI	10	GND
11	RTS	12	CTS
13	SMB_PRES_L	14	DSR
15	TX	16	DTR
17	DCD	18	RX
19	GND	20	5VSTANDBY

LST SIMM Connector

The following table shows the pinouts for the LST SIMM connector. This connector is present on both the R2 primary and secondary system boards.

Pin	Signal	Pin	Signal
1	GND	2	GND
3	LST_PD(2)	4	VCC
5	GND	6	LST_PD(0)
7	LST_PD(1)	8	LST_DATA(0)
9	LST_DATA(8)	10	LST_DATA(1)
11	LST_DATA(9)	12	LST_DATA(2)
13	LST_DATA(10)	14	LST_DATA(3)
15	LST_DATA(11)	16	LST_DATA(4)
17	LST_DATA(12)	18	LST_DATA(5)
19	LST_DATA(13)	20	LST_DATA(6)
21	LST_DATA(14)	22	LST_DATA(7)
23	LST_DATA(15)	24	LST_DATA(16)
25	VCC	26	LST_DATA(17)
27	LST_BKSEL_L(1)	28	LST_DATA(18)
29	LST_BKSEL_L(0)	30	LST_DATA(19)
31	VCC	32	LST_DATA(20)
33	LST_WE_L	34	LST_DATA(21)
35	GND	36	LST_DATA(22)
37	GND	38	LST_DATA(23)
39	LST_OE_L	40	VCC
41	LST_ADDR(5)	42	LST_ADDR(23)
43	LST_ADDR(6)	44	LST_ADDR(22)
45	LST_ADDR(7)	46	LST_ADDR(21)
47	LST_ADDR(8)	48	LST_ADDR(20)
49	LST_ADDR(9)	50	LST_ADDR(19)
51	LST_ADDR(10)	52	LST_ADDR(18)
53	LST_ADDR(11)	54	LST_ADDR(17)
55	LST_ADDR(12)	56	LST_ADDR(16)
57	LST_ADDR(13)	58	LST_ADDR(15)
59	LST_ADDR(14)	60	N$277140
61	GND	62	GND
63	GND	64	GND

SCSI Channels A, B, and C Connectors

See the table in the “68-pin Wide Input Connector (J15)” section later in this chapter. SCSI channels A and B are located on the R2 primary system board. SCSI channel C is located on the R2 secondary system board.

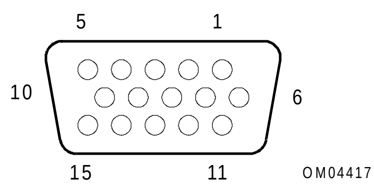
PCI Connectors

The system board PCI connectors adhere to the requirements in PCI Specification 2.0.

VGA Video Port Connector

The following figure shows the VGA video port connector on the primary system board. The accompanying table shows the pinouts for this connector.

VGA Video Port Connector

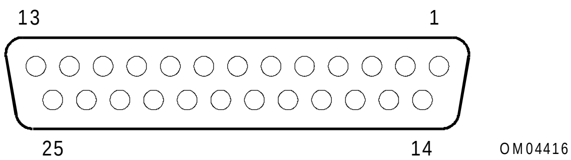


Pin	Signal	Pin	Signal
1	Red	9	Not connected
2	Green	10	GND
3	Blue	11	Not connected
4	Not connected	12	Not connected
5	GND (NC)	13	HSYNC (horizontal sync)
6	GND (red return)	14	VSYNC (vertical sync)
7	GND (green return)	15	Not connected
8	GND (blue return)		

Parallel Port Connector

The following figure shows the parallel port connector on the primary system board. The accompanying table shows the pinouts for this connector.

Parallel Port Connector

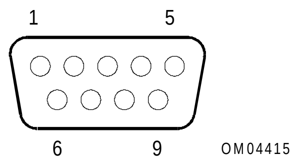


Pin	Signal	Pin	Signal
1	STROBE #	10	ACK# (acknowledge)
2	Data bit 0	11	BUSY
3	Data bit 1	12	PE (paper end)
4	Data bit 2	13	SLCT (select)
5	Data bit 3	14	AUFDXT# (auto feed)
6	Data bit 4	15	ERROR #
7	Data bit 5	16	INIT# (initialize printer)
8	Data bit 6	17	SLCTIN# (select input)
9	Data bit 7	18–25	GND

Serial Port Connectors A (COM1), B (COM2)

The following figure shows a serial port connector on the primary system board. The accompanying table shows the pinouts for this connector.

Serial Port Connector

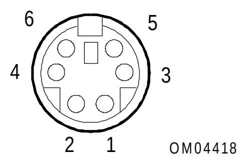


Pin	Signal
1	DCD (data carrier detect)
2	RX (receive data)
3	TX (transmit data)
4	DTR (data terminal ready)
5	GND (signal ground)
6	DSR (data set ready)
7	RTS (request to send)
8	CTS (clear to send)
9	RI (ring indicator)

Keyboard and Mouse Connectors

The following figure shows an example of the keyboard and mouse connectors on the primary system board. These identical PS/2-compatible connectors share a common housing. The mouse connector is stacked over the keyboard connector. The accompanying table shows the pinouts for these connectors.

Keyboard and Mouse Connector

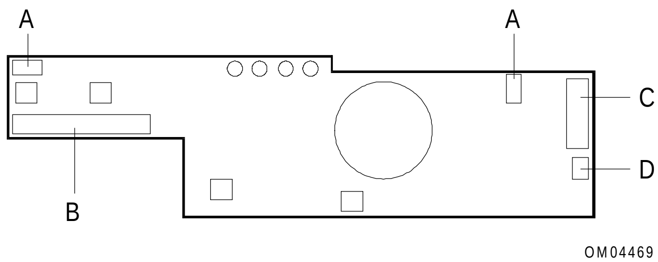


Pin	Keyboard signal	Pin	Mouse signal
1	KEYDAT (keyboard data)	1	MSEDAT (mouse data)
2	Not connected	2	Not connected
3	GND	3	GND
4	FUSED_VCC (+5 V)	4	FUSED_VCC (+5 V)
5	KEYCLK (keyboard clock)	5	MSECLK (mouse clock)
6	Not connected	6	Not connected

Front Panel Control Board Connectors

The following figure shows the front panel control board connectors.

Front Panel Control Board Connectors



A	Intrusion switch connectors (J1 in upper left corner; J6 in upper right)
B	Signal interface to system board; 40-pin straight-head connector (J3)
C	Signal interface to LCD; 14-pin straight-head connector (J2)
D	Backlight power to LCD; 3-pin straight-head connector latching-style connector (J7)

Intrusion Switch Connectors (J1, J6)

The following table shows the pinouts for the intrusion switch connectors on the front panel control board:

Pin	Description
1	Ground
2	Chassis Switch
3	Ground

Signal Interface, Front Panel to System Board (J3)

See “Front Panel Connector” in the appropriate “System Board Connector Pinouts” section earlier in this chapter.

LCD Signal Interface, J2

The following table shows the pinouts for the LCD signal interface connector on the front panel control board:

Pin	Signal	Description
1	DB6	Data bit 6
2	DB7	Data bit 7
3	DB4	Data bit 4
4	DB5	Data bit 5
5	DB2	Data bit 2
6	DB3	Data bit 3
7	DB0	Data bit 0
8	DB1	Data bit 1
9	RW	Control LCD read/write
10	EN	Enable LCD
11	LCC	LCD contrast control signal
12	RS	Select LCD register
13	GND	Ground
14	LCD-VDD	Power line to LCD

LCD Backlight Power, J3

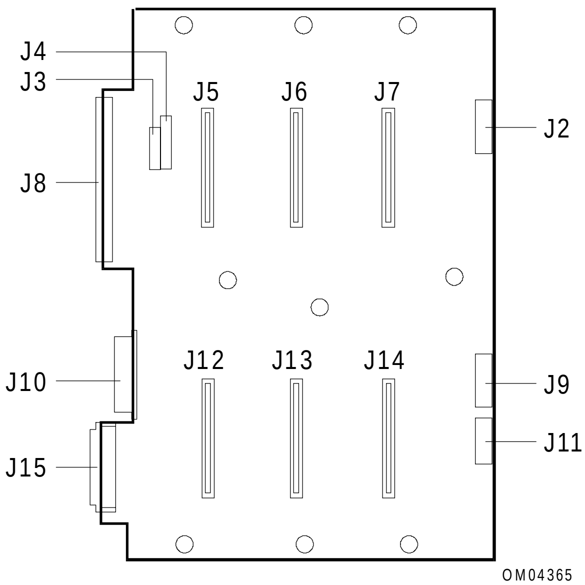
The following table shows the pinouts for the LCD backlight power connector on the front panel control board:

Pin	Description
1	Ground
2	Backlight power
3	Ground

SCSI Drive Backplane Connectors

The following figure shows connector locations on the SCSI drive backplane.

SCSI Backplane Connectors



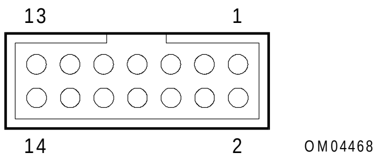
J3, J4	Drive ID and configuration jumper blocks	
J8	Narrow SCSI cable, output (not used)	
J10	Power and ground from power distribution backplane	
J15	Wide SCSI cable, input from SCSI channel A, SCSI channel C, or SCSI adapter (PCI or EISA)	
J2	LED connector cable for drives 1, 2, 3	
J9	LED connector cable for drives 4, 5, 6	
J11	I^2C bus connector	
J5	SCA drive connector	Drive 1, ID 0 (default)
J6	SCA drive connector	Drive 2, ID 1 (default)
J7	SCA drive connector	Drive 3, ID 2 (default)
J12	SCA drive connector	Drive 4, ID 3 (default)
J13	SCA drive connector	Drive 5, ID 4 (default)
J14	SCA drive connector	Drive 6, ID 5 (default)

LED Connectors (J2, J9)

The hot-swap backplane has two 14-pin cable connectors (J2, J9) for the SCSI drive LEDs. Each cable connects to the LEDs for one row of three drives.

The following figure shows an LED connector on the SCSI drive backplane. The accompanying table shows the pinouts for this connector.

LED Connector

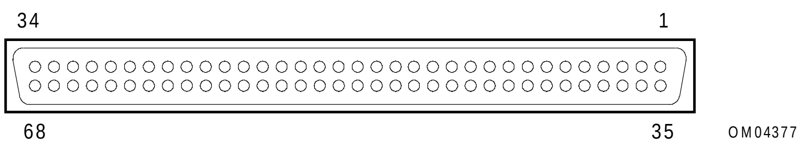


Pin	J2 Signal	J9 Signal
1	+5 V	+5 V
2	+5 V	+5 V
3	Not connected	Not connected
4	DRV0PWR#	DRV3PWR#
5	DRV0ACT#	DRV3ACT#
6	DRV0FLT#	DRV3FLT#
7	DRV1PWR#	DRV4PWR#
8	DRV1ACT#	DRV4ACT#
9	DRV1FLT#	DRV3FLT#
10	DRV2PWR#	DRV5PWR#
11	DRV2ACT#	DRV5ACT#
12	DRV2FLT#	DRV5FLT#
13	Not connected	Not connected
14	Not connected	Not connected

68-pin Wide Input Connector (J15)

The following figure shows a 68-pin wide input connector (J15) on the SCSI drive backplane. The accompanying table shows the pinouts for this connector.

68-pin Wide Input Connector



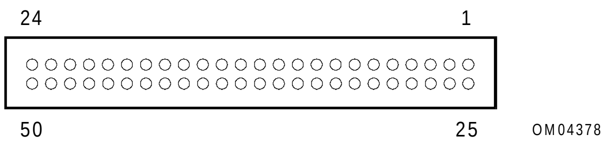
Signal Name	Connector Contact	SCSI Bus Conductor	SCSI Bus Conductor	Connector Contact	Signal Name
GND	1	1	2	35	DB(12) #
GND	2	3	4	36	DB(13) #
GND	3	5	6	37	DB(14) #
GND	4	7	8	38	DB(15) #
GND	5	9	10	39	DB(P1) #
GND	6	11	12	40	DB(0) #
GND	7	13	14	41	DB(1) #
GND	8	15	16	42	DB(2) #
GND	9	17	18	43	DB(3) #
GND	10	19	20	44	DB(4) #
GND	11	21	22	45	DB(5) #
GND	12	23	24	46	DB(6) #
GND	13	25	26	47	DB(7) #
GND	14	27	28	48	DB(P) #
GND	15	29	30	49	GND
GND	16	31	32	50	GND
TERMPWR	17	33	34	51	TERMPWR
TERMPWR	18	35	36	52	TERMPWR
Reserved	19	37	38	53	Reserved
GND	20	39	40	54	GND
GND	21	41	42	55	ATN #
GND	22	43	44	56	GND
GND	23	45	46	57	BSY #
GND	24	47	48	58	ACK #
GND	25	49	50	59	RST #
GND	26	51	52	60	MSG #
GND	27	53	54	61	SEL #
GND	28	55	56	62	CD #
GND	29	57	58	63	REQ #
GND	30	59	60	64	I/O #
GND	31	61	62	65	DB(8) #
GND	32	63	64	66	DB(9) #
GND	33	65	66	67	DB(10) #
GND	34	67	68	68	DB(11) #

50-pin Narrow Output Connector (J8)

The following figure shows the 50-pin narrow output connector (J8) on the SCSI drive backplane. The accompanying table shows the pinouts for this connector.

Note: SCSI device connections to the narrow SCSI connector on the backplane are not supported.

50-pin Narrow Output Connector



Signal Name	Connector Contact	SCSI Bus Conductor	SCSI Bus Conductor	Connector Contact	Signal Name
GND	1	1	2	2	DB(0) #
GND	3	3	4	4	DB(1) #
GND	5	5	6	6	DB(2) #
GND	7	7	8	8	DB(3) #
GND	9	9	10	10	DB(4) #
GND	11	11	12	12	DB(5) #
GND	13	13	14	14	DB(6) #
GND	15	15	16	16	DB(7) #
GND	17	17	18	18	DB(P) #
GND	19	19	20	20	GND
GND (cable present)	21	21	22	22	GND
Reserved	23	23	24	24	Reserved
Open	25	25	26	26	TERMPWR
Reserved	27	27	28	28	Reserved
GND	29	29	30	30	GND
GND	31	31	32	32	ATN #
GND	33	33	34	34	GND
GND	35	35	36	36	BSY #
GND	37	37	38	38	ACK #
GND	39	39	40	40	RST #
GND	41	41	42	42	MSG #
GND	43	43	44	44	SEL #
GND	45	45	46	46	C/D #
GND	47	47	48	48	REQ #
GND	49	49	50	50	I/O #

SCA Drive Connectors (J5-J7, J12-J14)

The following table shows the pinouts for the SCA drive connectors (J5-J7, J12-J14) on the SCSI drive backplane:

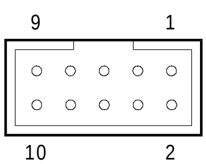
Connector Contact	Signal Name	Signal Name	Connector Contact
1	12 V charge	GND	41
2	12 V	GND	42
3	12 V	GND	43
4	12 V	Mated 1	44
5	Reserved	Reserved	45
6	Reserved	GND	46
7	DB(11) #	GND	47
8	DB(10) #	GND	48
9	DB(9) #	GND	49
10	DB(8) #	GND	50
11	I/O #	GND	51
12	REQ #	GND	52
13	C/D #	GND	53
14	SEL #	GND	54
15	MSG #	GND	55
16	RST #	GND	56
17	ACK #	GND	57
18	BSY #	GND	58
19	ATN #	GND	59
20	DB(P) #	GND	60
21	DB(7) #	GND	61
22	DB(6) #	GND	62
23	DB(5) #	GND	63
24	DB(4) #	GND	64
25	DB(3) #	GND	65
26	DB(2) #	GND	66
27	DB(1) #	GND	67
28	DB(0) #	GND	68
29	DB(P1) #	GND	69
30	DB(15) #	GND	70
31	DB(14) #	GND	71
32	DB(13) #	GND	72

Connector Contact	Signal Name	Signal Name	Connector Contact
33	DB(12) #	GND	73
34	5 V	Mated 2	74
35	5 V	GND	75
36	5 V charge	GND	76
37	Spindle sync	Active LED out	77
38	MTRON	DLYD_START	78
39	SCSI ID (0)	SCSI ID (1)	79
40	SCSI ID (2)	SCSI ID (3)	80

I²C Connector

The hot-swap backplane has a 10-pin cable connector which is used to interface to the system I^2C bus. The following figure shows the I^2C bus connector. The accompanying table shows the pinouts for this connector.

I^2C Connector

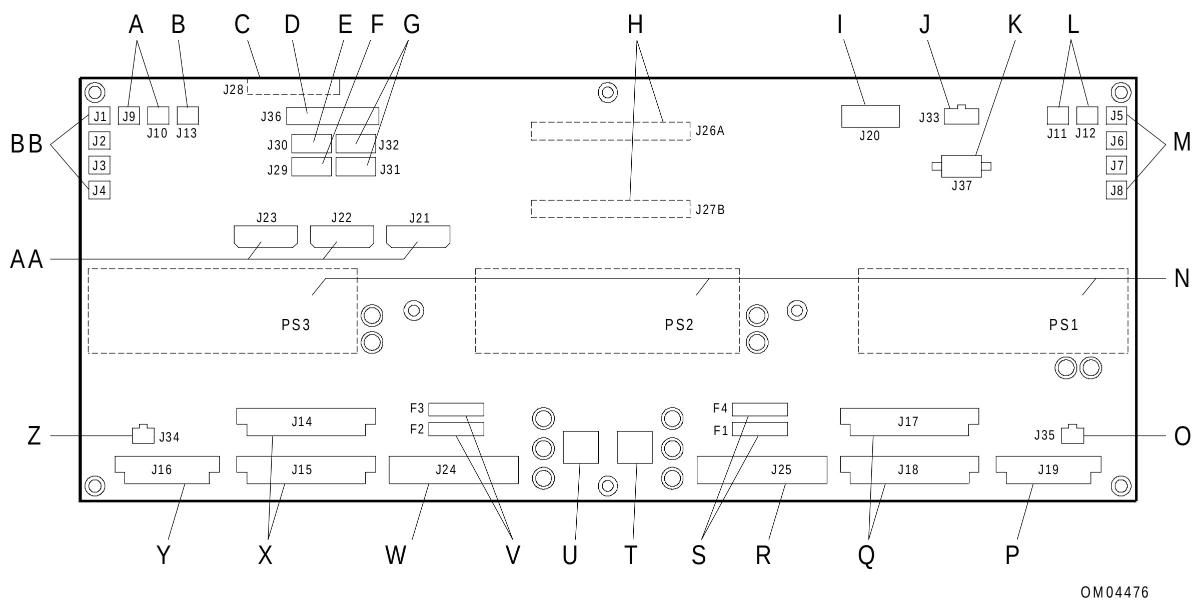


Pin	Signal
1	GND
2	GND
3	GND
4	+5 V standby
5	+5 V
6	+5 V
7	not connected
8	12C_SCL
9	12C_SDA
10	not connected

Power Distribution Backplane Connectors

The following figure shows the power distribution backplane connectors (viewed from the front of the server).

Power Distribution Backplane Connectors



A	J9 and J10, power/signal connectors for fans 9 and 10, respectively (not used)
B	J13, system fan failure (used on R2 systems only)
C	J28, Server Management Board connector
D	J36, RS-232 connector (for Server Management Board cable to system board)
E	J29, H_PWR# connector (allows Server Management Board to control system on/off)
F	J30, primary I^2C connector
G	J31 and J32, secondary I^2C connectors
H	J26A and J27B, I^2C board connectors
I	J20, SCSI I^2C connector
J	J33, intrusion A and B signals
K	J37, battery charger positive and negative input
L	J11 and J12, power/signal connectors for fans 11 and 12, respectively (not used)
M	J5, J6, J7, J8, power/signal connectors for secondary fans 5, 6, 7, and 8, respectively
N	PS1, PS2, PS3, hot plug power supply connectors
O	J35, intrusion/interlock switch B
P	J19, power control signal to secondary system board
Q	J17 and J18, power to secondary system board
R	J25, power to lower SCSI hard disk backplane
S	F1 and F4, F1 - fuse for +5 V to lower SCSI backplane, F4 - fuse for +12 V to lower SCSI backplane
T	Positive 48 V battery input
U	Negative 48 V battery input
V	F2 and F3, F2 -fuse for +5 V to upper SCSI backplane, F3 - fuse for +12 V to upper SCSI backplane
W	J24, power to upper SCSI hard drive backplane

X	J14 and J15, power to primary system board
Y	J16, power control signal to primary system board
Z	J34, intrusion/interlock switch A
AA	J21, J22, and J23, power to system peripherals
BB	J1, J2, J3, and J4, power/signal connectors for primary fans 1, 2, 3, and 4, respectively

Chapter 11

Troubleshooting

This chapter provides some suggestions for troubleshooting problems with the server. It contains the following information:

- Resetting the system
- System power-on and reset checklist
- After the system has been running correctly
- Verifying proper operation of key system lights
- Sample problems and suggested corrective actions
- R1 POST codes
- R2 POST codes

Tools and Supplies Needed

The *System Site Log* contains forms for recording information on system equipment and components, hardware service, software products, and preventive maintenance activities. Use these forms as you set up the system for the first time, integrate new parts or software into the system, service or troubleshoot system problems, and perform preventive maintenance.

Resetting the System

The following subsections discuss key combinations and buttons that you can use to reset your system.

CTRL+ALT+DEL

For Windows NT servers only, you can reload the operating system by pressing the CTRL+ALT+DEL keys simultaneously. This process is called a “soft boot” reset.

Note: The soft boot process does not automatically reset a system running Windows NT Server. The soft boot process offers you the opportunity to perform a shutdown or to log off from the system, as well as several other options.

Reset Button

Pushing the reset button located above the small front bezel door clears system memory and restarts POST.

CAUTION: If possible, perform an orderly shutdown of the operating system before resetting the system.

Power On/Off

Turning the power off and on by pushing the DC push-button switch twice on the front panel has the same effect as pushing the reset button, except that power is halted to all peripherals. This process is called a “cold boot” reset.

CAUTION: If possible, perform an orderly shutdown of the operating system before turning the power off and on.

System Power-On and Reset Checklist

When problems occur during a power-on or system reset, check the following:

- Is AC power available at the wall outlet?
- Is the system power cord properly connected to the system and plugged into a NEMA 5-15R outlet for 100-120 VAC or a NEMA 6-15R outlet for 200-240 VAC?
- Did you press the DC power on/off push-button switch on the front panel to turn the server on (power-on light should be lit)?
- If the server contains R2 system boards, is the intermodule connector for the primary system board fully seated in the intermodule connector for the secondary system board?

  Note: If the intermodule connector covers are not installed on both R2 system boards, the screws in the intermodule connector area can prevent the connectors from being fully seated.
- Are all cables correctly connected and secured?
- Are the memory boards fully seated in their slots on the system boards?
- Do all processor board slots contain either a processor board or a bus termination board? Are all boards fully seated in the processor board slots?
- If the server contains R2 system boards, is an LST SIMM installed on each system board that contains a memory board?
- Are all the EISA/ISA/PCI add-in boards fully seated in their slots on the system boards?
- Are all switch and jumper settings on the system board correct? For information, see the appropriate section:
  - “R1 System Board Configuration” in Chapter 7
  - “R2 System Board Configuration” in Chapter 8
- Are all jumper settings on the processor boards correct? For information, see the “Processor Board Configuration Jumpers” section in Chapter 5.
- Are all jumper and switch settings on add-in boards and peripheral devices correct? To check these settings, refer to the manufacturer’s documentation that comes with them. If applicable, ensure that there are no conflicts—for example, two add-in boards sharing the same interrupt.

  In the case of ISA boards, it is necessary to add the boards manually, using the Configuration Utility to avoid resource conflicts with installed EISA and PCI boards. Refer to the *Server Software Guide* for more information about adding ISA boards to the system.
- Are all add-in boards and peripheral devices installed correctly? Refer to the “Installing and Removing Add-in PCI and EISA Boards” section in Chapter 9 for installation instructions.
- Are all memory modules on the ECC memory boards installed correctly? The following message indicates an invalid memory configuration (or a defective memory module that is causing an invalid memory configuration):

  ```
  Error: All four interleaves on memory board x must be populated
  System halted…Please check memory configuration
  ```

Refer to the following sections in Chapter 6 for memory module installation instructions:

– “Adding and Removing SIMMs on the 2 GB Memory Board”
– “Adding and Removing DIMMs on the 4 GB Memory Board”

- If the system has a hard disk drive, is it properly formatted or defined? Refer to the documentation for your operating system.
- Is the SCSI hot-docking backplane configured and terminated correctly? For information, refer to “Setting SCSI Backplane Configuration Jumpers” in Chapter 3.
- Are all device drivers properly installed? For information about installing drivers, see your operating system documentation.
- Are the configuration settings made with the Configuration Utility correct? For information about running the Configuration Utility, see the *Server Software Guide*. Some Configuration Utility settings are set to certain values based on the operating environment being installed. Refer to the appropriate operating environment installation document (*Installing Windows NT Server* or *Installing MP-RAS*) to determine the correct settings.
- Is the operating system properly loaded? Refer to the operating system documentation.

After the System Has Been Running Correctly

Problems that occur after the system hardware and software have been running correctly often indicate equipment failure. Check the following:

- If you are running the software from a hard disk drive, try running it from the original installation media, if possible.
- 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. (Symptoms of voltage spikes include a flickering video display, unexpected system reboots, and the system not responding to user commands.)

Note: If the user is receiving random errors in data files, voltage spikes on the power line may be corrupting the files. The Server Monitor Module and operating system should detect voltage spikes and log them (or shut the server down if fatal). If you encounter any of the symptoms that might indicate voltage spikes on the power line, you might want to install a surge suppressor between the power outlet and the server power cord.

Verifying Proper Operation of Key System Lights

As POST determines the system configuration, it tests for the presence of each mass storage device installed in the system. As each device is checked, its activity light should turn on briefly.

Check the following to verify proper operation of key system lights:

- Is the power light lit? If not, refer to the “Power Light Does Not Light” section in this chapter.
- Does the diskette drive activity light turn on briefly? If not, refer to the “Diskette Drive Activity Light Does Not Light” section in this chapter.
- If a second diskette drive is installed, does its activity light turn on briefly? If not, refer to the “Diskette Drive Activity Light Does Not Light” section in this chapter.
- If there is a hard disk drive or SCSI devices installed in the system, does the hard disk drive activity light turn on briefly? If not, refer to the “Hard Disk Drive Activity Light Does Not Light” section in this chapter.

Sample Problems and Suggested Corrective Actions

This section provides possible solutions for the following specific problems:

- Power light does not light
- System cooling fans do not rotate
- No characters appear on screen
- Characters are distorted or incorrect
- No beep codes
- Diskette drive activity light does not light
- Hard disk drive activity light does not light
- Cannot boot from hard drive
- Hard disks do not start up during boot
- Cannot boot from CD-ROM
- System takes a long time to boot
- BIOS corrupted during system BIOS upgrade
- System does not recognize Mylex adapter
- Problems with application software

Try the solutions in the order given.

Power Light Does Not Light

Check the following:

- Is the system operating normally? If so, the power LED is probably defective.
- Are there other problems with the system? If so, check the items listed under "System Cooling Fans Do Not Rotate."

System Cooling Fans Do Not Rotate

If the system cooling fans are not operating properly, damage to the system components occurs.

Note: In addition to the chassis cooling fans, each power supply contains a fan as one of its integral parts. There are no serviceable components in a power supply. Because hazardous voltages may be present within a power supply at any time, do not open a power supply for any reason.

Check the following:

- Is the fan fail LED (third from the left) lit?
- Have any of the fan motors stopped?
- Is AC power available at the wall outlet?
- Is the system power cord properly connected to the system and the wall outlet?
- Did you press the power on/off push-button switch?
- Is the power-on light lit?
- Is the fan fail cable properly connected to the primary system board and power distribution backplane (R2 systems only)?
- Is the cable from the front panel control board connected to the primary system board?

- Are the power supply cables properly connected to the primary system board?
- If only the R2 primary system board is installed, is the primary system board terminator module installed and fully seated?
- If an R2 secondary system board is installed, are the intermodule connectors connected properly?
- If an R2 secondary system board is installed, are the power supply cables properly connected to it?
- 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 correct and AC power is available at the wall outlet, the power supply has probably failed.

No Characters Appear on Screen

Check the following:

- Is the keyboard working?
- Is the video monitor plugged in and turned on?
- 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 there is an add-on video controller board, verify that the video controller board is fully seated in the system board connector. After verifying that the video controller is fully seated, reboot the system.
  - If there are still no characters on the screen after you have rebooted the system, remove the add-on video card and determine whether the onboard video adapter is functional. If using the onboard video adapter resolves the problem, the problem lies with the add-on card.
- Does the speaker emit a beep pattern during POST? POST emits a beep pattern to indicate a possible problem with the video configuration or VGA ROM module:

Type of system	**Beep pattern**
R1	One long beep and four short beeps or a long-short-long-short beep pattern
R2	One long beep and two short beeps or one long followed by a series of short beeps

  If you do not receive a beep pattern and characters do not appear, the video display monitor or video controller may have failed. If possible, try connecting a video display which you know works correctly to the server.

- Are the keyboard LEDs flashing? If so, the system may be in secure mode with the “Video Blanking” option enabled. Enter the password at the console keyboard to unlock the keyboard and restore video.

Cannot Use Keyboard or Mouse

If the BIOS Setup option “Secure Mode Boot” is enabled, the system boots in secure mode and you must enter a password to unlock the keyboard. If the server is running Windows NT, two situations can occur where it might become impossible to use the keyboard or mouse:

BIOS Setup Options	Situation That Causes a Problem
Secure Mode Boot is enabled and Password on Boot is disabled.	If you boot the server and do not unlock the keyboard before Windows NT detects devices at the blue screen, then the keyboard and mouse are not detected. When Windows NT loads, you cannot access the system through the keyboard or mouse.
Secure Mode Timer is set to too short an interval (1 to 5 minutes).	If you boot the server and keyboard lockout occurs before Windows NT detects devices at the blue screen, then the keyboard and mouse are not detected. When Windows NT loads, you cannot access the system through the keyboard or mouse.

If one of these situations occurs, you must reset the server to recover use of the keyboard and mouse.

Note: If the “Front Panel” option is also enabled, the front panel power on/off function is locked until you enter a password. If the front panel is locked and you cannot access the keyboard, you might have to do one of the following to reset the server:

- Reset the server from a remote location
- Disconnect and reconnect the power cord

Characters Are Distorted or Incorrect

Check the following:

- Are the brightness and contrast controls properly adjusted on the video monitor? Refer to the video monitor documentation from the manufacturer.
- Are the video monitor signal cable and the power cable properly installed?

If the problem persists, the video monitor may be faulty or the monitor may be the incorrect type.

No Beep Codes

Check the following:

- Is the speaker enabled? Use the Configuration Utility to make sure that “Speaker Options” in the Management Subsystem group is set to “Enabled.” For information about running the Configuration Utility, see the *Server Software Guide*.
- Is the signal cable connected to the front panel?

If the system operates normally, but there was no beep, the speaker may be defective.

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?
  - If you are using the onboard diskette controller, use the Configuration Utility to make sure that “On-Board Floppy Controller” is set to “Enabled.”
  - If you are using an add-in diskette controller, make sure that “On-Board Floppy Controller” is set to “Disabled.”
  - Be sure the server has been configured with “Secure Boot Mode” disabled. Otherwise, it is not possible to boot from the diskette drive.

For information about running the Configuration Utility, see the *Server Software Guide*.

If the problem persists, there may be a problem with the diskette drive, system board, or drive signal cable.

Hard Disk Drive Activity Light Does Not Light

If the system contains one or more hard disk drives, check the following:

- Are the power and signal cables to the hard disk drive properly installed?
- If the system contains a SCSI host adapter other than the onboard Adaptec 7880 controllers, is the host adapter fully seated in the system board connector?
- Are all relevant switches and jumpers on the hard disk drive and controller board set correctly?
- Are all relevant jumpers on the SCSI drive backplane set correctly?
- Is the hard disk drive properly configured?
- If the system contains a SCSI host adapter, is the hard disk activity LED cable connector plugged into the controller board?

If you receive error messages, refer to the POST codes sections later in this chapter for information about the messages.

If you do not receive error messages, run the SCSI*Select* Utility and make sure that the hard disk drive is configured with the correct parameters. For information about running the SCSI*Select* Utility, see the “Configuring Adapters” chapter in the *Server Software Guide*.

If the problem persists, there may be a problem with the hard disk drive, the add-in controller board, system board, drive signal cable, or LED connector.

Cannot Boot From Hard Drive

The following options must be enabled for you to boot from a hard drive attached to an onboard Adaptec controller.

Option	How to Enable or Disable
SCSI ROM BIOS Scan	**Configuration Utility:** SCSI ROM BIOS Options Group, then select applicable SCSI device > Enabled **BIOS Setup**: Advanced > PCI Configuration, then select applicable PCI device > Option ROM Scan > Enabled
Host Adapter BIOS	SCSI*Select* Utility > Set to "Enabled" for the SCSI controller that controls the boot drive (set this option to "Disabled" for all SCSI controllers except the one that controls the boot drive)
Send Start Unit Command	SCSI*Select* Utility > Set to "Yes"
Initiate Wide Negotiation	SCSI*Select* Utility > Set to "Yes"

These options are enabled by default. If you disable them for any reason, you must re-enable them before you can boot from the hard drive.

In addition, the following options affect the order in which devices are booted:

Type of system	Options
R1	• "Boot Options" in BIOS Setup's Main menu • "Boot Options" in Configuration Utility's Boot Subsystem Group
R2	"Boot Sequence" in BIOS Setup's Main menu

Refer to the *Server Software Guide* for information on configuring your server.

Hard Disks Do Not Start Up During Boot

If internal hard disks are connected to the onboard Adaptec controllers, the following SCSI*Select* Utility options must be set to “Yes” for the disks to start up during boot:

- “Send Start Unit Command”
- “Initiate Wide Negotiation”

These options are set to “Yes” by default. If one or both of these options are set to “No,” you can use the SCSI*Select* Utility to do either of the following:

- Selectively set these options to “Yes” for each SCSI device ID.
- Set all options for each onboard controller to default values.

  Note: Before returning all SCSI*Select* options to default values, make sure this is the appropriate course of action.

For information about running the SCSI*Select* Utility, see the “Configuring Adapters” chapter in the *Server Software Guide*.

Cannot Boot From CD-ROM

The following options must be enabled for you to boot from the Platform CD-ROM.

Option	How to Enable or Disable
SCSI ROM BIOS Scan	The Configuration Utility or BIOS Setup Utility
Host Adapter BIOS (for the adapter to which the CD-ROM device is connected)	SCSI*Select* Utility
BIOS Support for Bootable CD-ROM	SCSI*Select* Utility
BIOS Support for Int13 Extension	SCSI*Select* Utility

These options are enabled by default. If you disable them for any reason, you must re-enable them before you can boot from the Platform CD-ROM.

System Takes a Long Time To Boot

If the system takes a long time to boot, one of the following might be the cause:

- Configuration Utility memory test options might be enabled. Unless you need to test memory during a boot, make sure the following options are disabled:
  - “Memory Test on Warm Boots”
  - “Memory Test on Cold Boots”
- BIOS might be enabled for add-in SCSI adapters when not necessary. Make sure that the BIOS is enabled for the boot device SCSI controller and disabled for all other SCSI adapters. If the server displays the following message during boot, check to see whether the BIOS is enabled for SCSI adapters other than the boot device controller:

  ```
  Expansion ROM not initialized
  ```

BIOS Corrupted During System BIOS Upgrade

If the BIOS is corrupted during a flash memory upgrade procedure (for example, due to a power failure or an inability to read the BIOS diskette which results in a fatal BIOS upgrade error), you might not be able to boot the server. If this happens, you must perform a BIOS flash recovery procedure. Refer to the appropriate system board chapter of this manual for details.

System Does Not Recognize Mylex Adapter

If the system contains a Mylex adapter, the cache memory SIMM must be installed on the adapter. If the cache memory SIMM is not installed, the system does not recognize the adapter and does not display a message indicating its presence during the POST process.

Problems with Application Software

If you have problems with application software:

- Verify that the software is properly configured for the system. Refer to the software installation and operation documentation for instructions on installing and using the software.
- Try a different copy of the software to see if the problem is with the copy of the software you are using.
- Make sure all cables are installed correctly.
- If other software runs correctly on the system, contact the software vendor to determine the reason for the software failure.

R1 POST Codes

This section includes the following R1 POST codes:

- On-screen error codes and messages
- Terminal error beep codes
- Standard port-80 codes
- Recovery port-80 codes

On-Screen Error Codes and Messages

The BIOS indicates errors as follows:

- By writing an error code to the PS/2-standard logging area in the Extended BIOS Data Area
- By displaying a POST error code and message on the screen

The following table shows the POST error codes and messages.

Number	Error Message
0002	Primary Boot Device Not Found
0010	Cache Memory Failure, Do Not Enable Cache
0015	Primary Output Device Not Found
0016	Primary Input Device Not Found
0041	EISA ID Mismatch for Slot
0042	ISA Configuration Contains Invalid Info
0043	EISA Invalid Configuration for Slot
0044	EISA Config NOT ASSURED!
0045	EISA Expansion Board Not Ready in Slot
0047	EISA CMOS Configuration Not Set
0048	EISA CMOS Checksum Failure
0049	EISA NVRAM Invalid
0050	PNP Memory Conflict
0051	PNP 32-bit Memory Conflict
0052	PNP IRQ Conflict
0053	PNP DMA Conflict
0054	PNP Error Log Is Full
0055	Bad PNP Serial ID Checksum
0056	Bad PNP Resource Data Checksum
0060	Keyboard Is Locked ... Please Unlock It
0070	CMOS Time & Date Not Set
0080	Option ROM has bad checksum
0081	Custom Binary Checksum Failure

Number	Error Message
0083	Shadow of PCI ROM Failed
0084	Shadow of EISA ROM Failed
0085	Shadow of ISA ROM Failed
0131	Floppy Drive A:
0132	Floppy Drive B:
0135	Floppy Disk Controller Failure
0140	Shadow of System BIOS Failed
0170	Disabled CPU Slot #
0171	CPU Failure - Slot 1, CPU # 1
0172	CPU Failure - Slot 1, CPU # 2
0173	CPU Failure - Slot 2, CPU # 1
0174	CPU Failure - Slot 2, CPU # 2
0175	CPU modules are incompatible or one is not present **Note:** If a processor board is removed, it must be replaced with a terminator board or another processor board. If a processor board slot on the system board is empty, the server either does not boot or does not operate correctly. Both connectors on the system board must be populated in order to provide proper electrical termination of the system bus.
0176	Previous CPU Failure - Slot 1, CPU # 1
0177	Previous CPU Failure - Slot 1, CPU # 2
0178	Previous CPU Failure - Slot 2, CPU # 1
0179	Previous CPU Failure - Slot 2, CPU # 2
0180	Attempting to boot with failed CPU
0181	BSP Switched, System May Be In Uniprocessor Mode
0191	CMOS Battery Failed
0195	CMOS System Options Not Set
0198	CMOS Checksum Invalid
0289	System Memory Size Mismatch
0295	Address Line Short Detected
0297	Memory Size Decreased
0299	ECC Error Correction failure
0301	ECC Single bit correction failed, Correction Disabled
0302	ECC Double bit Error
0303	ECC SIMMs Incompatible
0304	Invalid Configuration For Memory Sizes Between Banks
0310	ECC Address failure, Partition #
0313	ECC Memory Size Decreased, Bank #

Number	Error Message
0370	Keyboard Controller Error
0373	Keyboard Stuck Key Detected
0375	Keyboard and Mouse Swapped
0380	ECC SIMM failure, Board in slot 1 SIMM #
0392	ECC SIMM failure, Board in slot 2 SIMM #
0430	Timer Channel 2 Failure
0440	Gate-A20 Failure
0441	Unexpected Interrupt in Protected Mode
0445	Master Interrupt Controller Error
0446	Slave Interrupt Controller Error
0450	Master DMA Controller Error
0451	Slave DMA Controller Error
0452	DMA Controller Error
0460	Fail-safe Timer NMI Failure
0461	Software Port NMI Failure
0465	Bus Timeout NMI in Slot
0467	Expansion Board NMI in Slot
0501	PCI System Error
0510	PCI Parity Error
0511	PCI System Error
0710	System Board Device Resource Conflict
0711	Static Device Resource Conflict
0780	PCI Segment 1 Memory Request Exceeds 998 MB
0781	PCI Segment 1 I/O Request Exceeds 12K
0782	PCI I/O Request Exceeds Amount Available
0783	PCI Memory Request Exceeds Amount Available
0784	Illegal Bus For Memory Request Below 1 MB
0785	Memory Request Below 1 MB Exceeds 1 MB
0800	PCI I/O Port Conflict
0801	PCI Memory Conflict
0802	PCI IRQ Conflict
0803	PCI Error Log is Full
0804	PCI ROM Not Found, May Be OK For This Card
0805	Insufficient Memory To Shadow PCI ROM
0806	Memory Allocation Failure For Second PCI Request

Number	Error Message
0809	Shadow of PCI ROM failed
0810	Floppy Disk Controller Resource Conflict
0811	Primary IDE Controller Resource Conflict
0812	Secondary IDE Controller Resource Conflict
0815	Parallel Port Resource Conflict
0816	Serial Port 1 Resource Conflict
0817	Serial Port 2 Resource Conflict
0820	Expansion Board Disabled in Slot
0900	NVRAM Checksum Error, NVRAM Cleared
0903	NVRAM Data Invalid, NVRAM Cleared
0905	NVRAM Cleared By Jumper
0906	Password Cleared By Jumper
0982	I/O Expansion Board NMI in Slot
0984	Expansion Board Disabled in Slot
0985	Fail-safe Timer NMI
0986	System Reset caused by Watchdog Timer
0987	Bus Timeout NMI in Slot

Terminal Error Beep Codes

At power-on, before the video adapter has been initialized, BIOS indicates failures by using audible beep codes. A beep code consists of a series of individual beeps, each equal in length. The following table describes the error condition associated with each code and the corresponding POST checkpoint code as seen by a “port-80h” card.

Beep Count	Port 80 Codes	Error Condition
1	71h	Refresh failure
2	72h	Parity cannot be reset
3	73h	First 4 MB memory failure
4	74h	Timer not operational
5	75h	Processor failure
6	76h	Keyboard controller gate A20 is off (v_mode)
7	77h	Exception interrupt error
8	78h	Display memory R/W error
9	79h	ROM checksum error
10	7Ah	Shutdown register R/W error

Standard Port-80 Codes and Countdown Codes

At power-on, after the video adapter has been initialized, the R1 BIOS indicates the current testing phase by sending a 2-digit hex code to I/O location 80h. If a port-80h EISA adapter is installed, it displays this 2-digit code on a pair of hex display LEDs. The current countdown code also displays on the LCD panel after this panel is initialized.

The following table shows the standard port-80 and countdown codes.

Port 80 Code	Countdown Code	Reason
D0h		Early Multi Processor Initialization, telling processor to enter Real/Big mode
D1h		Power On Initialization
D2h		Disable NMI
D3h		Reset video controller
D4h		Enter real mode
D5h		Checksum the 8 KB loader BIOS
D6h		Loader BIOS checksum good
D7h	900	Check if Keyboard Controller (KBC) buffers are free
D8h		Issue BAT (basic assurance test) command to KBC
D9h		Read BAT results
DAh		Check if Keyboard Controller passed BAT
DBh	820	Keyboard initialization passed
DDh		Disable keyboard and auxiliary devices
DFh		Disable both DMA controllers
E0h	780	Preliminary initialization of PICs
E1h		Enter real big mode and initialize chipset, size memory
E2h		Initialize timer 2 for speaker
E3h	760	Initialize timer channel 0 for system timer
E4h		Clear any pending parity errors
E6h	740	Test RAM from 0-640 KB
E7h		Test and initialize 2 MB memory
E8h		RAM failure, remap memory partitions and test again
E9h		RAM test complete, passed. Clear parity errors
EAh	730	Set up stack at 30:100, enable cache and shadow BIOS
EBh		Initialize code dispatcher
ECh		Make F000h DRAM R/W enabled
EDh		Dispatch POST
23h	700	Initializations before setting up vector table
24h		Setup interrupt vector table

Port 80 Code	Countdown Code	Reason
0Dh		Check CMOS clear jumper
0Eh	690	Check validity of CMOS
0Fh		Force CMOS defaults if required
10h		CMOS initialization complete
25h		Nothing
28h		Set monochrome mode
29h		Set color display
2ah		Clear parity status if any, initialize warm reset flag
2bh		Video auto-configuration and initialization
F0h		EISA Slot Initialization
F1h		Enable extended NMI sources
F2h		Test extended NMI sources
2ch	580	Conventional video option ROM search
2dh		Scan user flash
2eh	570	Initialize monochrome display if no other video present
2fh	560	Test buffer memory for monochrome
30h		Check vertical and horizontal retrace
31h		Test for color display memory if no external video BIOS found
32h		Check vertical retrace
34h		Sign on message
36h		Initialize Messaging Services and clear screen
37h	500	Custom sign on display
80h	370	Keyboard/mouse port check
81h		Keyboard controller initialization and testing
83h		Check if keyboard is locked
F5h	330	Initialize mouse
39h		Keyboard, mouse and other signons
3bh		Prepare for memory test
43h	290	Decide memory size from chipset
4Fh		Disable cache, test memory and display memory size on screen
52h		Initialize for the other processors in MP system, reset DMA controller
61h	250	DMA register tests
62h		DMA test OK
65h		Initialize 8237 DMA controller
66h		Clear DMA write request register and mask set/reset register

Port 80 Code	Countdown Code	Reason
67h	220	8259 Interrupt controller test
F4h		Enable extended NMI sources
8Ch	140	Enable console redirection, initialize remaining Plug-N-Play devices (i.e. other than video), initialize IPL, initialize IDE controller
8Fh	130	Floppy Initialization
92h		Set printer, RS-232 time out
96h		Optional ROM scan and initialize above C800h
97h	080	Scan User flash and conventional option ROM scan
98h		Scan User flash area
9Ah		Clear soft reset flag, complete MP Table
9Dh	070	Timer data area initialization
A0h		Printer setup
A1h		RS_232 setup
A2h		Check for stuck key
ABh		Before NPX test and initialization
ACh	060	NPX test and initialization
ADh		Update coprocessor information in CMOS and recalculate checksum
AEh		Set typematic rate
AFh	050	Keyboard read ID command
B0h		Wait for READ ID response
A3h		Display POST errors
A6h		Before Setup
A7h	030	Call Setup if required, prompt for password if enabled
B1h		Enable Cache for boot
B3h		Setup display mode set
B4H		Jump to pre-OS code
BBh	020	Initialize SMI code, prepare for boot
00h	000	Prompt to boot Diagnostic Partition or execute normal operating system boot

Recovery Port-80 Codes and Countdown Codes

During BIOS recovery, the diskette in drive A is booted, and a BIOS image is automatically installed.

The following table shows the R1 recovery port-80 and countdown codes.

Port 80 Code	Countdown Code	Reason
02h		Disable internal cache
08h		Disable DMA controller #1, #2, disable interrupt controller #1, #2, and reset video display
13h		Initialize all chipset registers (Enable LCD display here)
15h	900	Initialize system timer
1Bh	800	Real mode base 64 KB test
20h	700	16 KB base RAM test
23h	650	Setup interrupt vectors
40h	600	Test memory in virtual mode
65h	500	Initialize 8237 DMA controller
67h	400	8259 interrupt controller test
80h	300	Unmask diskette, keyboard and timer interrupts
88h	200	Floppy unit initialization
A0h	100	Cache enable
00h	000	Boot OS

R2 POST Codes

This section includes the following R2 POST codes:

- On-screen error codes and messages
- Terminal error beep codes
- Standard port-80 codes
- Recovery port-80 codes

On-Screen Error Codes and Messages

The BIOS indicates errors by displaying a POST error code and message on the screen. You can also read these codes in the BIOS Event Log. The following table shows the POST error codes and messages:

Error Code	Error Code Description
Disk Errors are 2x0	
200	Disk Failed
Keyboard Errors are 2x1	
201	User Has Stuck Keyboard
211	Keyboard Failure
221	Keyboard Controller Failure
231	Keyboard is Locked
Video Errors are 2x2	
202	Video Error
Memory Errors are 2x3	
203	Base Memory Failure
213	Shadowing of Memory Failed
223	Extended Memory Failure
POS/Timeout Errors are 2x4	
204	POS/Timeout Errors
CMOS Errors are 2x5	
205	CMOS Battery Weak or Dead
215	CMOS Checksum Bad
Timer Errors are 2x6	
206	Timer Error
Real Time Clock Errors are 2x7	
207	RTC Error
Configuration Errors are 2x8	
208	Configuration Errors
218	Configuration of Memory Failed
NVRAM Errors are 2x9	
209	NVRAM Error
COP Errors are 2xa	
20a	Co-Processor Errors

Error Code	**Error Code Description**
Diskette Errors are 2xb	
20b	Diskette Drive A Error
21b	Diskette Drive B Error
22b	Incorrect Drive A Type – Run Setup
23b	Incorrect Drive B Type – Run Setup
Load Errors are 2xc	
20c	Load Errors
Cache Errors are 2xd	
20d	System Cache Failure – Cache Disabled
I/O Errors are 2xe	
20e	I/O Address Failure
21e	COM Ports Failure
22e	Line Printer Port Failure
23e	I/O Address Conflicts
24e	Unsupported I/O Address
25e	IRQ Errors
26e	IDE Failure
27e	FDD Failure
Other Errors are 2xf	
20f	CPU ID Error
21f	BIST Failure
22f	Boot Strap Processor Error
23f	Application Processor Error
24f	EISA CMOS Not Writeable
25f	DMA Test Failed
26f	Software NMI Failed
27f	Fail-Safe Timer NMI Failed

Terminal Error Beep Codes

During system power-on, the server uses beep codes to inform you of errors that occur before the video adapter has been initialized. A terminal error is one which prevents the POST process from continuing. POST error codes are logged in nonvolatile flash memory and displayed on the console monitor and in the Event Log. If POST can display a message on the video display screen, it causes the speaker to beep twice as the message displays.

The table below describes the error condition associated with each beep code.

Beep Count	Error Condition
1	Refresh failure
2	Parity cannot be reset
3	First 4 MB memory failure
4	Timer not operational
5	Processor failure
6	Keyboard controller gate A20 is off (v_mode)
7	Exception interrupt error
8	Display memory R/W error
9	ROM checksum error
10	Shutdown register R/W error

Standard Port-80 Codes

During POST, the R2 BIOS indicates the current testing phase by sending a two-digit hex code to I/O location 80h. If a port-80h EISA adapter is installed, it displays this two-digit code on a pair of hex displays.

The following table shows the standard port-80 codes for R2 systems.

Post Code	Description	Action Needed
002h	Verify BSP is in real mode	Check bootstrap processor
003h	Disable NMIs	Check primary system board
004h	Get BSP type	Check bootstrap processor
006h	Preinitialize DMA, VGA, RTC	Check primary system board
008h	Preinitialize chipset	Check system boards
009h	Set POST flag	Check primary system board
00Ah	Initialize BSP; load microcode update	Check bootstrap processor
00Bh	Enable BSP cache	Check bootstrap processor
00Ch	Set default memory cache types	Check bootstrap processor
00Eh	Reserved	Check system boards

Post Code	Description	Action Needed
00Fh	Reserved	Check system boards
010h	Reserved	Check system boards
011h	Initialize chipset registers	Check system boards
014h	Configure keyboard controller	Check primary system board
016h	Verify ROM checksum	Check primary system board
017h	Disable BSP cache for autosizing memory	Check bootstrap processor
018h	Initialize timer/counters	Check primary system board
01Ah	Initialize DMA controller	Check primary system board
01Ch	Initialize interrupt controller	Check primary system board
020h	Test DRAM refresh rate	Check primary system board
022h	Check keyboard controller status	Check primary system board
024h	Enable 4GB address space	Check bootstrap processor
026h	Disabled 1MB wraparound	Check primary system board
028h	Autosize memory	Check SIMM/DIMM seating
029h	Initialize POST memory manager	Check bootstrap processor
02Ah	Clear lower 4 MB	Check SIMM/DIMM seating
02Ch	Test address lines	Check SIMM/DIMM seating
02Eh	Test lower 4 MB	Check SIMM/DIMM seating
02Fh	Prepare caches for shadowing	Check bootstrap processor
032h	Measure internal CPU clock	Check bootstrap processor
033h	Initialize POST dispatch manager	Check bootstrap processor
034h	Verify CMOS checksum	Check primary system board
038h	Shadow system BIOS	Check SIMM/DIMM seating
03Ah	Determine size of BSP cache	Check bootstrap processor
03Ch	Disable unused chipset device IDs	Check system boards
03Dh	Install registers from CMOS	Check system boards
042h	Install interrupt vectors	Check primary system board
045h	Initialize miscellaneous devices	Check primary system board
046h	Check validity of ROM	Check primary system board
048h	Check VGA	Check primary system board
049h	Scan and initialize PCI busses	Check seating of PCI adapters
04Ah	Initialize VGA	Check primary system board
04Bh	Reserved	Check primary system board
04Ch	Shadow VGA BIOS	Check SIMM/DIMM seating
04Eh	Display copyright	Check primary system board

Post Code	Description	Action Needed
050h	Display BSP information	Check primary system board
051h	Initialize EISA bus	Check seating of ISA/EISA adapters
052h	Test keyboard and auxiliary devices	Check primary system board
054h	Reserved	Check primary system board
058h	Check for unexpected interrupts	Check primary system board
059h	Enable POST display services	Check primary system board
05Ah	Display F2 prompt	Check primary system board
05Bh	Disable BSP cache	Check bootstrap processor
05Ch	Test lower 640 KB	Check SIMM/DIMM seating
060h	Test extended memory	Check SIMM/DIMM seating
062h	Test upper address lines	Check SIMM/DIMM seating
066h	Configure memory cache types	Check bootstrap processor
067h	Initialize CPUs and install microcode patches	Check system processors
068h	Modify memory cache types	Check bootstrap processor
069h	Reserved	Check primary system board
06Ah	Display cache size	Check primary system board
06Ch	Reserved	Check primary system board
06Eh	Reserved	Check primary system board
070h	Display error messages	Check primary system board
072h	Check configuration status	Check primary system board
074h	Check RTC battery	Check primary system board
076h	Report keyboard failures	Check primary system board
07Ch	Install hardware interrupt vectors	Check primary system board
07Eh	Reserved	Check primary system board
080h	Reserved	Check primary system board
081h	Initialize final devices	Check primary system board
082h	Reserved	Check primary system board
083h	Reserved	Check primary system board
084h	Reserved	Check primary system board
085h	Initialize PC-compatible PnP devices	Check primary system board
086h	Reserved	Check primary system board
087h	Initialize system board devices	Check primary system board
088h	Initialize BIOS data structures	Check primary system board
089h	Enable NMIs	Check primary system board
08Ah	Initalize extended BIOS data area	Check primary system board

Post Code	Description	Action Needed
08Bh	Configure mouse	Check primary system board
08Ch	Test floppy drive	Check primary system board
08Eh	Reserved	Check primary system board
08Fh	Reserved	Check primary system board
090h	Reserved	Check primary system board
091h	Reserved	Check primary system board
093h	Initialize all CPUs	Check system processors
095h	Reserved	Check primary system board
096h	Restore DOS memory limits	Check bootstrap processor
097h	Update MPS table	Check primary system board
098h	Execute expansion ROMs	Check add-in adapters
09Ch	Initialize system management mode	Check system processors
09Dh	Initialize security features	Check primary system board
09Eh	Enable hardware interrupts	Check primary system board
09Fh	Reserved	Check primary system board
0A0h	Verify RTC setting and clock ticks	Check primary system board
0A2h	Test keyboard password	Check primary system board
0A4h	Reserved	Check primary system board
0A8h	Erase F2 prompt	Check primary system board
0AAh	Check for F2 key	Check primary system board
0ACh	Enter setup	Check primary system board
0AEh	Clear POST flag	Check primary system board
0B0h	Wait for F1, F2, or D	Check primary system board
0B2h	Report POST complete	Check primary system board
0B5h	Reserved	Check primary system board
0B6h	Check password	Check primary system board
0B9h	Restore display manager	Check primary system board
0BAh	Reserved	Check primary system board
0BCh	Clear parity checkers	Check primary system board
0BDh	Reserved	Check primary system board
0BEh	Clear screen	Check primary system board
0BFh	Reserved	Check primary system board
0C0h	Boot operating system	Check boot device
0C1h	Initialize POST error manager	Check primary system board
0C2h	Log POST errors	Check system processors

Post Code	Description	Action Needed
0C3h	Display POST errors	Check primary system board
0C4h	Clear POST errors	Check primary system board
0C1h	Reserved	Check primary system board
0C2h	Reserved	Check primary system board
0C3h	Reserved	Check primary system board
0C4h	Enable hot keys	Check primary system board
0C5h	Disable hot keys	Check primary system board
0C6h	Reserved	Check primary system board
0C7h	Reserved	Check primary system board
0C8h	Test A20	Check primary system board
0C9h	Reserved	Check primary system board
0CAh	Reserved	Check primary system board
0CBh	Reserved	Check primary system board
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0CEh	Examine I^2C ports	Check I^2C devices
0CFh	Clear I^2C ports	Check I^2C devices
0D0h	Check fans and power supplies	Check I^2C devices
0D3h	Clear DRAM	Check system boards
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0D6h	Enable error reporting	Check system boards
0D7h	Update memory timings	Check SIMM/DIMM types
0D8h	Enable nodal interleaving	Check system boards
0D9h	Enable address bit permuting	Check system boards
0DAh	Reserved	Check primary system board
0DBh	Report CMOS messages	Check primary system board
0DCh	Resize DRAM due to errors	Check primary system board
0DDh	Log DRAM resize events	Check primary system board
0DEh	Preconfigure LST SIMMs	Check primary system board
0DFh	Verify memory configuration	Check primary system board
0E0h	Enable boot watchdog timer	Check primary system board
0E1h	Check watchdog status	Check I^2C devices
0E2h	Disable boot watchdog timer	Check primary system board
0E3h	Map VGA sleep register	Check primary system board
0E4h	Unmap VGA sleep register	Check primary system board

Recovery Port-80 Codes

During BIOS recovery, the diskette in drive A: is booted, and a BIOS image is automatically installed.

The following table shows the port-80 codes generated during a BIOS recovery on an R2 system.

Post Code	Description	User Action
E0	Chipset initialization	Replace primary system board
E1	Bridge initialization	Replace primary system board
E2	CPU initialization	Replace primary system board
E3	System timer initialization	Replace primary system board
E4	System IO initialization	Replace primary system board
E5	Check force recovery	Replace primary system board
E6	Check BIOS checksum	Replace primary system board
E7	Go to BIOS	Replace primary system board
E8	Multiprocessor initialization	Replace primary system board
E9	Set huge segment	Replace primary system board
EA	OEM specific Initialization	Replace primary system board
EB	Initialize PIC and DMA	Replace primary system board
EC	Initialize memory type	Replace primary system board
ED	Initialize memory size	Replace primary system board
EE	Shadow boot block	Replace primary system board
EF	System memory test	Replace primary system board
F0	Initialize interrupt vectors	Replace primary system board
F1	Initialize RTC	Replace primary system board
F2	Initialize video	Replace primary system board
F3	Initialize beeper	Replace primary system board
F4	Initialize boot	Replace primary system board
F5	Clear huge segment	Replace primary system board
F6	Boot to mini DOS	Replace primary system board
F7	Boot to full DOS	Replace primary system board

Appendix A

Power Supply Configuration

You can obtain a Windows Excel spreadsheet to help calculate system power requirements. After you enter details of the system configuration, the spreadsheet performs the actual calculations. You can download the spreadsheet from the following website (if you have authorization):

http://www.columbiasc.ncr.com/techinfo/

The spreadsheet enables you to calculate the following system power requirements:

- Maximum and minimum loading requirements

  Determines if a power supply's maximum loading limit has been exceeded or if the minimum loading requirement has been met.

- Maximum system configuration and maximum power supply wattage

  Determines if the maximum system configuration or power supply wattage has been exceeded.

- Redundancy

  Determines if the system's configuration has 1+1, 2+1 or no redundancy.

Definitions

You should be familiar with the following definitions:

power supply redundancy

The system has enough power supplies to continue operating normally if one power supply fails.

1+1 redundancy

The system configuration requires one power supply for normal operation and two power supplies for redundancy.

2+1 redundancy

The system configuration requires two power supplies for normal operation and three power supplies for redundancy.

Glossary

A

add-in boards

PCI, EISA, or ISA adapters which can be added to the basic system. Add-in boards can be installed in slots (connectors) provided on the system board(s).

antistatic bag

Special bag used to store boards while they are not in the server. Antistatic bags are recommended to prevent damage from ESD.

antistatic wrist strap

Strap used to provide ESD protection while you are working on the server. One end of the strap slips over your wrist; attach the clip end of the strap to an unpainted metal surface on the server chassis.

B

baseboard

See *system board*; *primary system board*; *secondary system board*.

Basic Input/Output System (BIOS)

Firmware which initializes and configures system hardware for use by the operating system.

battery disconnect switch

Switch used to disconnect battery power before you work on the server. The battery disconnect switch is located in the middle of the chassis back below the middle power supply.

battery support system

Optional feature that temporarily supplies power if AC power is removed from the server.

beep code

Code consisting of an audible series of beeps; used during POST to indicate errors that occur before the video controller is initialized.

BIOS recovery

See *flash recovery*.

board support panel

Metal panel that supports the processor and memory boards and helps to ensure proper cooling and airflow inside the server.

bus termination board

Board used to terminate a processor board slot if no processor board is installed. A bus termination board must be installed in each processor board slot that does not contain a processor board.

C

card guide

Metal or plastic guides installed on either side of the cardcage to assist you in installing the processor boards, memory board, and add-in boards. Also referred to as a *card retainer*.

CMOS

Storage space used to store the system board configuration; physically located on the real-time clock.

Configuration Utility

Utility used to display or modify the current system configuration.

connector

The part of a cable or device which allows you to connect it to another cable or device. Male connectors have pins; female connectors are receptacles in which you plug the pins of a male connector.

CPU board

See *processor board*.

D

Diagnostic Partition

DOS partition on the server’s boot disk that contains the system BIOS and configuration and diagnostic utilities. The Diagnostic Partition is installed at the factory and should not be removed.

DIMMs

Dual inline memory modules. Required for the DIMM memory board.

drive carrier

Plastic or aluminum piece which must be attached to a SCSI drive. The drive is mounted in the carrier, and the carrier is inserted in the drive bay.

E

EISA

Extended Industry Standard Architecture, a 32-bit bus architecture for servers. The primary system board contains 4 slots for add-in EISA adapters. EISA slots can also accept 8-bit or 16-bit ISA adapters.

ejector arm

Plastic arm located near the intermodule connector on either side of an R2 system. When you are removing an R2 system board, pull the ejector arm to disengage the intermodule connectors on the primary and secondary system boards. **Note: Make sure that you remove all screws from the system board before you pull the ejector arm.**

ejector handles

Plastic levers on a memory board or processor board; used to disengage the board from the system board connector.

Electrostatic Discharge (ESD)

Static electricity which poses a potential threat to computer components. To avoid damage to components, review and comply with the ESD warnings at the beginning of each chapter of this manual.

Event Log

Log containing system component failures and other system events. You can use the Diagnostic Partition menus to view the Event Log.

F

filler panel

Rectangular metal piece used to cover external slots that are not used for add-in adapter ports. Can also be used to cover unused slots for the power supplies, battery charger module, SMB, and removable media drives. Also referred to as a *slot cover*.

flash update

Procedure used to update the system BIOS.

flash recovery

Procedure used to recover the system BIOS if it is corrupted while being updated.

front bezel

Part that serves as a face for the front of the server. Includes the front doors to the removable media and SCSI drive bays.

front panel control board

Board that controls front panel functions (power on/off, status indicator LEDs, and so on).

G

guide pins

Screws that help you to align a system board when installing it.

H

heat sink

Part which is installed on top of a processor to dissipate heat.

heat-sink compound

See *thermal compound*.

hot-swapping

Swapping a faulty component for a new component while the system power is on. The components you can hot-swap are the SCSI drives, power supplies, and battery charger module.

I

Inter-Integrated Circuit (I^2C) bus

Bus used in server monitoring and management.

intermodule connector

Connector used to connect the primary and secondary system boards in an R2 system. The intermodule connector is a 266-pin receptacle on the primary system board and a plug-in type connector on the secondary system board.

ISA

Industry Standard Architecture, an 8- or 16-bit bus architecture for servers. The EISA slots on the primary system board can also accept ISA adapters.

J

jumper

A small plastic-encased conductor that slips over two jumper pins. A jumper can enable or disable a given function depending on the pins that it connects. Also referred to as a *shunt*.

L

Line Status Table (LST) SIMM

64-pin memory module which maintains a line status table for the memory controller in an R2 system. If a memory board is installed on an R2 system board, an LST SIMM must also be installed on the system board.

Liquid Crystal Display (LCD)

Front panel feature which can display two 16-character lines of system information.

M

memory board

Board containing sockets for the installation of memory modules. The memory board plugs directly into a connector on the system board.

motherboard

See *system board*; *primary system board*; *secondary system board*.

N

Non-Volatile Random Access Memory (NVRAM)

Storage space used to store system configuration information; physically located in a battery-backed static RAM chip.

O

onboard SCSI controllers

Adaptec AIC-7880 SCSI controllers which are embedded on the system board. The primary system board has two onboard SCSI controllers (SCSI A and SCSI B). The R2 secondary system board has one onboard SCSI controller (SCSI C).

P

PCI

Peripheral Component Interconnect, a 32-bit local bus architecture for servers which supports a 64-bit extension. The R1 system board contains 6 slots for add-in PCI adapters. The R2 primary system board contains 7 slots for add-in PCI adapters; the R2 secondary system board contains 8 slots for add-in PCI adapters.

pinout

Description of the function of a specific pin on a component.

Platform CD-ROM

Compact disk which contains the system BIOS and the same configuration and diagnostic utilities as the Diagnostic Partition. You can use the Platform CD-ROM to reinstall the Diagnostic Partition if necessary.

port-80 codes

Codes sent by the system BIOS to I/O location 80h during POST to indicate the execution phase. If a port-80h EISA adapter is installed, it displays the port-80 codes on a pair of hex displays. Port-80 codes are also referred to as *POST codes*.

power distribution backplane

Component which distributes power from the power supplies to other system components. The power distribution backplane also provides connections for I^2C status and control functions.

Power-On Self-Test (POST)

A series of diagnostic tests that the server runs on basic components each time it is booted.

power plane interconnect cables

Cables which connect the R2 primary and secondary system board power planes. This connection assists in regulating voltage to the two boards.

primary system board

In an R2 system, the system board on the left side of the server (as viewed from the front). The primary system board contains the CMOS and NVRAM used to store the system configuration. It also contains external connectors (mouse, serial ports, and so on) not found on the secondary system board.

processor board

Board containing sockets for the installation of processors. A processor board plugs directly into a connector on the system board.

R

real-time clock (RTC)

System board chip used to store the system date and time and system configuration information. The RTC on the R1 system board can be removed and replaced. The RTC on the R2 primary system board is embedded and cannot be removed; however, the RTC battery can be removed and replaced.

removable media drives

CD-ROM, tape, or other drives which can be installed in the four 5.25-inch half-height bays at the upper left front of the server.

R1

The 1-4 way SMP (symmetrical multi-processing) system board.

R2

The OctaSCALE system board set.

S

SCSI drive backplane

Board which contains connectors for 6 SCSI drives. The server can contain two internal SCSI drive backplanes: the upper (primary) SCSI drive backplane and an optional lower (secondary) SCSI drive backplane.

SCSI drive bay

Opening in the front of the server through which a SCSI drive is inserted and connected to the SCSI drive backplane.

SCSI drive ID

Identifier assigned to a SCSI drive which is connected to a SCSI drive backplane. SCSI drive IDs are strapped to specific connectors by means of jumpers on the SCSI drive backplane.

SCSI drive status LED board

Board which provides three status LEDs for each of three SCSI drives. The system has four SCSI drive status LED boards.

secondary system board

In an R2 system, the system board on the right side of the server (as viewed from the front). The secondary system board is connected to the primary system board by means of the intermodule connector.

Server Management Board (SMB)

Circuit board used to monitor and control the server. Monitoring can be in-band when the server and network are operating properly, or out-of-band over a telephone line.

Server Monitor Module (SMM)

Optional ISA adapter board that provides server monitoring and control functions. The SMM contains its own processor, memory, and battery power.

Single Connector Attach (SCA)

Industry standard connector required for all SCSI drives in the server.

SIMMs

Single inline memory modules. Required for the SIMM memory board.

stepping

Revision level for a processor.

switch

System board configuration feature with OFF and ON settings.

system board

Main circuit board of the server. Other circuit boards (processor, memory, and adapter) plug into the system board. R1 systems have a single system board. R2 systems have two system boards (primary and secondary). The system board is also referred to as the *system baseboard* or *motherboard*.

thermal compound

Compound applied between a processor and its heat sink to assist in dissipating heat.

Vital Product Data (VPD)

Information about the server which is stored in an EEPROM embedded on the front panel control board.

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W

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