# SPARCstation 5 Model 110 Service Manual

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# Preface

This service manual describes how to troubleshoot problems and replace parts in the SPARCstation™ 5 computer system. Technicians, advanced computer system end-users (with experience replacing hardware and troubleshooting), system administrators, or qualified service providers should use this book.

# How This Book Is Organized

This book is divided into seven parts. A table, at the beginning of each part, lists the chapters, sections, and page numbers.

- Part 1, "System Information," provides an overview of the SPARCstation 5 standard features, internal options, and external options.

- Part 2, "Troubleshooting," provides a troubleshooting overview, describes how to run and troubleshoot errors displayed during the Power-On Self-Test (POST), and presents symptoms and corrective actions.

- Part 3, "Preparing for Service," explains safety requirements, symbols used in this book, tools required, and how to shut down, power off, and power on the system.

- Part 4, "Subassembly Removal and Replacement," describes how to open and close the system, attach and remove a wrist strap, and remove and replace subassemblies.

- Part 5, "System Board," provides an overview of the system board, describes how to remove and replace the system board and replaceable parts and components on the system board.

- Part 6, "Illustrated Parts Breakdown," provides illustrations of the major replaceable parts and lists part numbers.

■ Part 7, "Appendixes, Glossary, Index," provides physical, electrical, and environmental specifications, connector pinouts and signal descriptions, information on SCSI targeting, a glossary of technical terms, and an index.

# Typographic Conventions

The following table describes the type changes and symbols used in this book.

**TABLE P-1**    Typographic Conventions

| Typeface or Symbol | Meaning | Example |
|---|---|---|
| AaBbCc123 | The names of commands, files, and directories; on-screen computer output | Edit your .login file.<br>Use ls -a to list all files.<br>system% You have mail. |
| **AaBbCc123** | What you type, contrasted with on-screen computer output | system% **su**<br>Password: |
| *AaBbCc123* | Command-line placeholder: replace with a real name or value | To delete a file, type rm *filename*. |
| *AaBbCc123* | Book titles, new words or terms, or words to be emphasized | Read Chapter 6 in *Owner's Guide*.<br>These are called *class* options.<br>You *must* be root to do this. |

Code samples are included in boxes and may display the following:

| % | UNIX C shell prompt | system% |
|---|---|---|
| $ | UNIX Bourne and Korn shell prompt | $ |
| # | Superuser prompt, all shells | # |

# Related Documentation

The following manuals describe software troubleshooting procedures:

■ *OpenBoot Command Reference*
■ *SunDiag User's Guide*
■ *SunVTS User's Guide*
■ System administration manual for the computer system

- Operating system documentation

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# Product Description

This chapter presents a brief overview of the major components of the SPARCstation 5 system. Please acquaint yourself with the overview before servicing and maintaining the hardware for this product.

- "Standard Features" on page 1
- "Internal Options" on page 4
- "External Options" on page 5

## 1.1 Standard Features

The SPARCstation 5 system accommodates the following storage devices:

- 535-Mbyte single-connector hard disk drive
- 1.05-Gbyte single-connector hard disk drive
- 2.0-Gbyte single-connector hard disk drive
- Diskette drive
- Internal CD-ROM drive

It also accommodates up to 256 Mbytes of memory using dynamic single in-line memory modules (DSIMMs). The system has four audio ports on the back panel and includes an internal speaker. FIGURE 1-1 shows a typical SPARCstation 5 system.
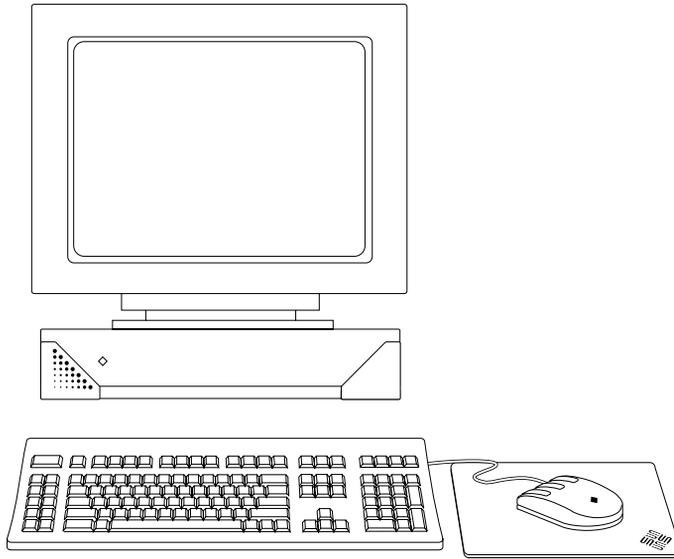
**FIGURE 1-1**    Basic SPARCstation 5 System

## 1.1.1        Subassemblies, Boards, and Components

The SPARCstation 5 system unit accommodates the following subassemblies, boards, and components:

- System board
- DSIMMs (up to 8)
- S24 graphics card
- SBus cards (up to 3)
- Hard disk drives, 3.5-inch, 88.0-mm, single-connector (up to 2)
- CD-ROM drive
- Diskette drive (3.5-inch)
- Power supply (150-watt with 2 fans)

## 1.1.2        Interior View

FIGURE 1-2 shows an interior view of the major subassemblies and the system board for the SPARCstation 5 system.
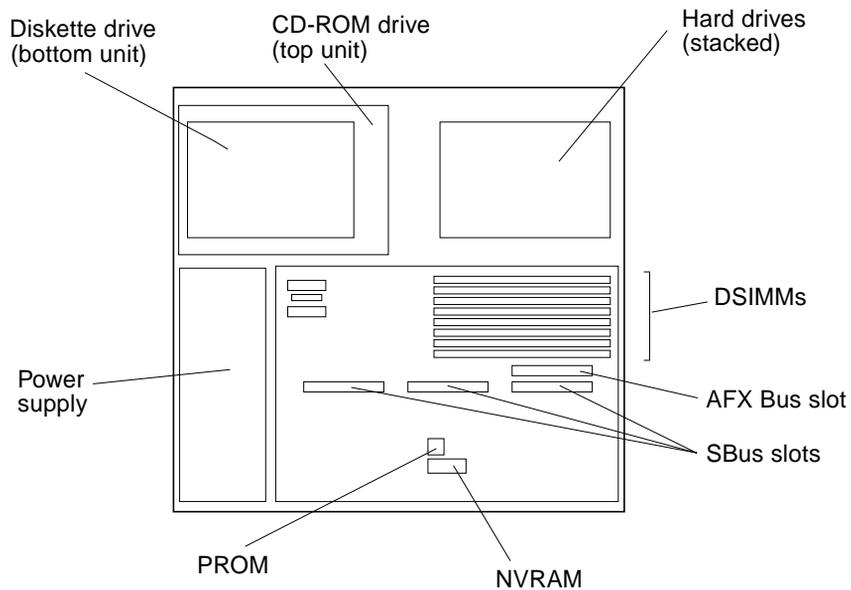
**FIGURE 1-2**  Interior View of SPARCstation 5 System

## 1.1.3    Rear View

FIGURE 1-3 shows the rear view of the system.

Legend

1 – AC On/Standby switch     7 – SCSI     13 – Keyboard
2 – AC power outlet     8 – Parallel     14 – Audio, headphone
3 – Lock block     9 – AUI Ethernet     15 – Audio, line out
4 – SBus     10 – Twisted-pair Ethernet     16 – Audio, line in
5 – SBus or AFX Bus     11 – Serial port B     17 – Audio, microphone
6 – AC power receptacle     12 – Serial port A
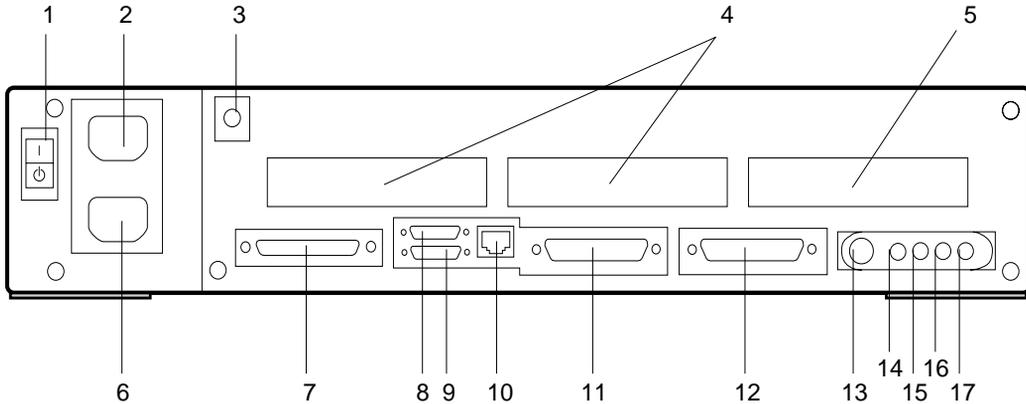


**FIGURE 1-3**    Rear View of SPARCstation 5 System

# 1.2 Internal Options

TABLE 1-1 lists the internal options.

**TABLE 1-1**    Internal Options

| Option | Quantity | Comments |
|---|---|---|
| S24 card | 1 | Provides accelerated 24-bit color graphics on the system AFX Bus. |
| SBus cards | Up to 3 | System board provides up to three SBus slots for additional system functionality. |
| Hard disk drives | 1 or 2 | System supports up to two disk drives of varying capacities. See Chapter 9 for more information. |

**TABLE 1-1**   Internal Options *(Continued)*

| Option | Quantity | Comments |
|---|---|---|
| CD-ROM drive | 1 | Internal CD-ROM drive. |
| Diskette drive | 1 | Internal diskette drive for diskette I/O. |
| DSIMMs | Up to 8 | System supports up to 256 Mbytes of dynamic single in-line memory modules (DSIMMs). |

# 1.3 External Options

TABLE 1-2 lists selected external small computer system interface (SCSI) options.

**TABLE 1-2**   Selected External SCSI Peripheral Options

| Unit | Description |
|---|---|
| Desktop Backup Pack | 150-Mbyte tape drive or DAT tape drive. |
| Desktop Disk Pack | Disk expansion unit with a variety of SCSI disk drive capacities. |
| Desktop SunCD™ Pack | Compact CD-ROM disc drive. |
| Desktop Storage Module | 1.3-Gbyte disk drive or 5.0-Gbyte tape drive. |
| SCSI Expansion Pedestal | Up to seven SCSI disks, compact CD-ROM drive, tape drive, other non-disk units. |
| Multi-Disk Pack | Desktop enclosure containing a disk array of SCSI disk drives. |
| 20-Gbyte 4-mm Desktop Tape Auto-Loader | Desktop enclosure containing a tape drive with multiple magazine cartridges; provides up to 20 Gbytes of tape backup storage. |
| SCSI Expansion Pedestal | Holds up to eight disk drives and two or three removable media in the upper tray. Requires a minimum of two SCSI controllers if all three trays are used. You cannot have more than seven SCSI devices on each SCSI bus. |

# Troubleshooting Overview

This chapter describes the factory-defined boot sequence. It also describes the different types of SPARCstation 5 diagnostic firmware and software tools that are available to you for troubleshooting; the chapter explains how the tools are related and when to use them.

- "Factory-Defined Boot Mode" on page 1
- "After Power Is Switched On" on page 3
- "Diagnostic Tools and When to Use Them" on page 7
- "Power-On Self-Test" on page 8
- "FORTH-Based PROM Diagnostics" on page 8
- "FORTH Monitor" on page 11
- "System Exercisers" on page 11

## 2.1     Factory-Defined Boot Mode

The flowcharts in FIGURE 2-1 and FIGURE 2-2 outline the roles played by various diagnostics during a *factory-defined boot* operation under the control of the OpenBoot™ PROM (OBP) firmware.

The following sections describe the relationship between the various diagnostic tools, and the role each tool plays during the SPARCstation 5 factory-defined boot sequence. The descriptions in the following sections assume you are using a graphics monitor to view test results.

FIGURE 2-1 (POST phase) and FIGURE 2-2 (OBP phase) graphically depict the flow of OBP processing control, after power is switched on. Each figure depicts the possible paths for processing control, and the switch settings for the factory-defined boot sequence. By examining the two flowcharts you can see where in the processing sequence other diagnostic tests are available or are encountered.
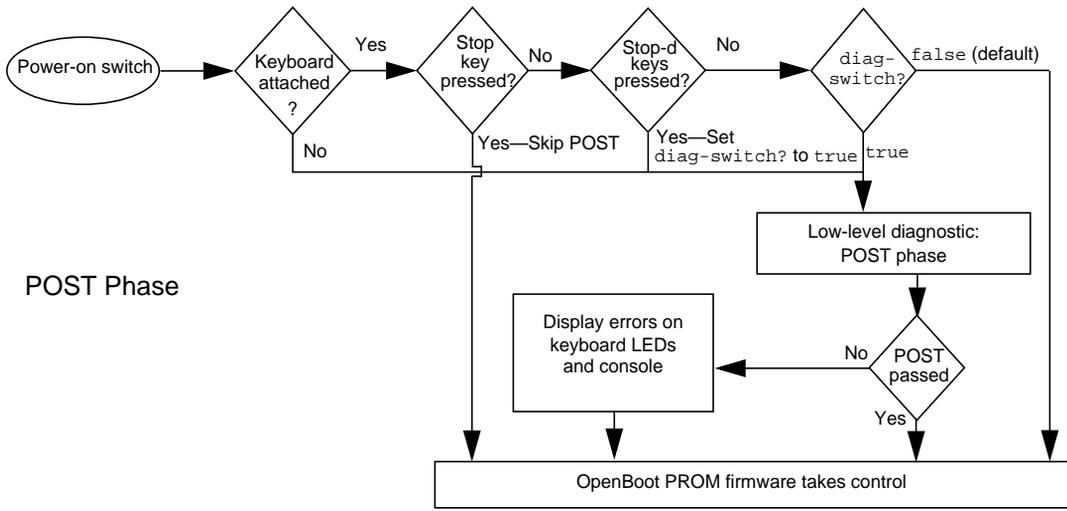
**FIGURE 2-1**   Factory-Defined Boot Sequence—POST Phase Settings and Tests

If you need to run extended FORTH Diagnostics to take advantage of more extensive tests, see Appendix D.
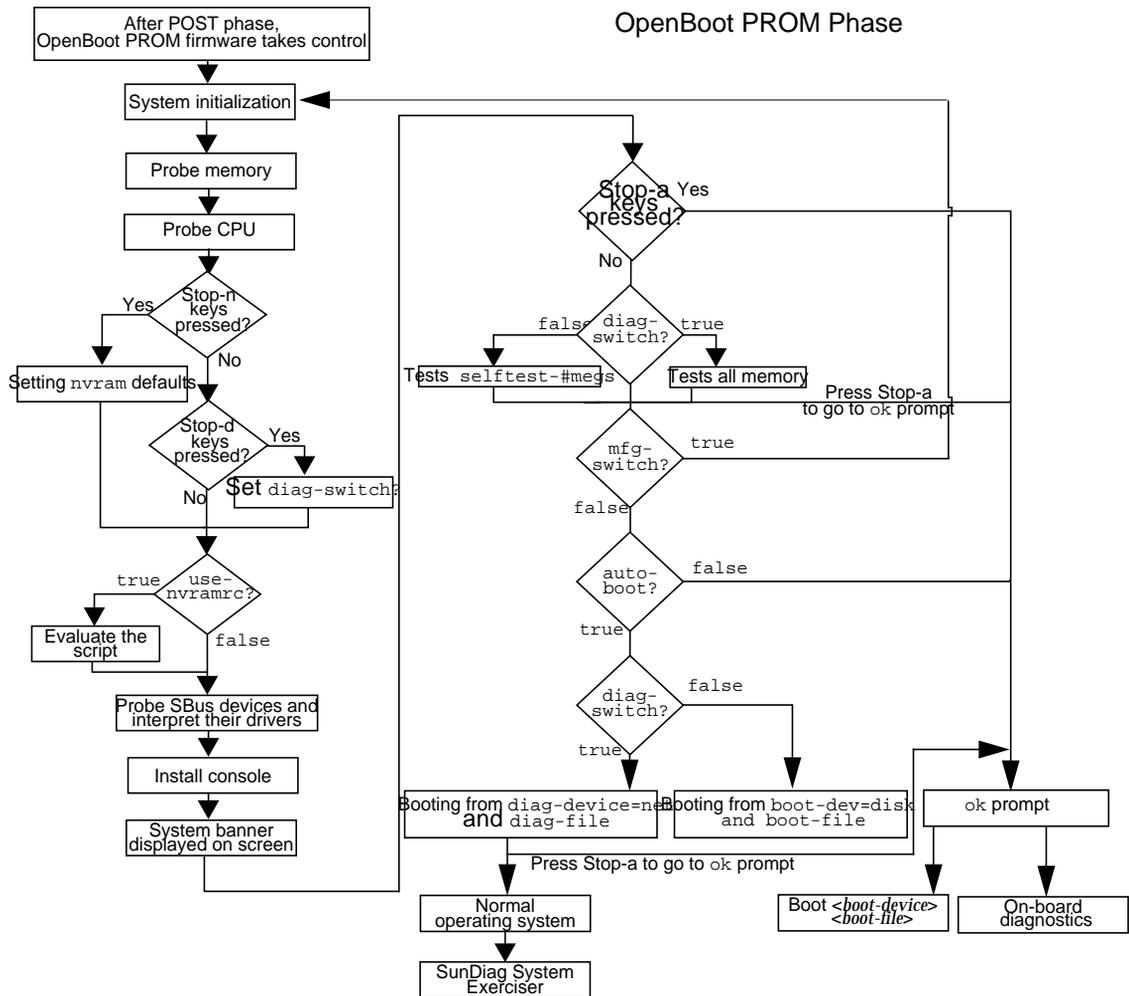
**FIGURE 2-2**   Factory-Defined Boot Sequence—OpenBoot PROM Phase Settings  and Tests

# 2.2     After Power Is Switched On

When you turn on the system power, the low-level POST phase is initiated if any of
the following circumstances apply:

- `diag-switch?` NVRAM parameter is set to `true`.
- Stop-d keys are held down when you turn on the power.
- Keyboard is disconnected, and `diag-switch?` is set to `false`.

The low-level POST code, which is stored in the boot PROM, is designed to test the most basic functions of the system hardware. The status of the POST is conveyed by four LEDs on the Sun™ Type-4, Type-5, and Compact 1 keyboards. The Caps Lock LED blinks to indicate that the tests are in progress. If a failure is detected during low-level POST, one of the other three LEDs will light to indicate the nature of the failure. See Chapter 3 for more information.

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**Note –** You can skip the POST phase by turning on the system while holding down the Stop key.

---

At the successful completion of the low-level POST phase, the OpenBoot PROM firmware takes control and performs the following initialization sequence:

- Initialize system
- Probe memory, then CPU
- Evaluate Script (if use-nvramrc? is set to true)
- Probe SBus devices and interpret their drivers
- Install the console (see FIGURE 2-2)

After initialization, a system banner appears on the screen, and the high-level testing begins. When the high-level tests are finished, the system checks parameters stored in the NVRAM to determine the next step. Depending on the following parameter settings, the system will:

- Boot the operating system from a specified location, if auto-boot? is set to true
- Suppress the boot sequence and enter the FORTH Monitor (ok prompt), if auto-boot? is set to false
- Continually cycle through the OpenBoot PROM sequence, if mfg-switch? is set to true

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**Note –** If you are in the Sunmon compatibility mode (prompt is >) type n to return to the OBP monitor (prompt is ok).

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TABLE 2-1 contains a list of NVRAM parameters and explains their effect on the power-up sequence. For more detailed information about NVRAM parameters, see the *OpenBoot Command Summary.*

**Note –** At any point during the high-level OBP execution, you can abort the OBP sequence and access the FORTH Monitor by pressing the Stop and "a" keys simultaneously.

**TABLE 2-1**    NVRAM Parameters Used During POST and Boot Sequence

| NVRAM Parameter | Description |
| --- | --- |
| selftest-#megs<br>Default = 1 | This parameter determines how many megabytes of memory to test during high-level OBP testing if diag-switch? is concurrently set to false. The minimum is zero; the maximum is the amount actually installed in the system. The default is a 1-megabyte test. |
| diag-switch?<br>Default = false | When set to true, this parameter forces the system to test automatically all available memory. It also enables diagnostic message output to serial port A. If a properly configured terminal or "tip window" is connected, diagnostic progress can be monitored through this port. When auto-boot? is set to true and diag-switch? is set to false, diag-switch? forces the system to boot from the device and file specified in boot-dev and boot-file. |
| auto-boot?<br>Default = true | If auto-boot? is set to true and diag-switch? is set to true, the system boots the operating system from the device and file specified in the diag-device and diag-file NVRAM parameter fields. When set to false, this will suppress the boot sequence. The system halts with the ok prompt. |

At the FORTH Monitor prompt, you can direct the system to boot the operating system from a location that you specify, or you can execute a variety of additional FORTH-based tests. See the *OpenBoot Command Reference* for a complete description of the FORTH Monitor.

If the `auto-boot?` parameter is set to `true` (the default), the system boots a standalone program. To determine which program and device to boot from, the system checks the `diag-switch?` NVRAM parameter. TABLE 2-2 summarizes the effect of the `auto-boot?` and `diag-switch?` parameters.

**TABLE 2-2** Summary of Autoboot and Diagnostic Switch Parameter[1] Settings

| auto-boot? | diag-switch? | Result |
|---|---|---|
| false | false or true | > or ok prompt |
| true | false | Boot operating system from device alias "disk" or "net" for SPARCstation 5 system |
| true | true | Boot operating system from device alias "net" |

1. The boot parameters represented here are default settings. The defaults may be changed by following the procedures listed in the *OpenBoot Command Summary*.

Once the Solaris 2.4 operating system or earlier is running, you can invoke the SunDiag™ System Exerciser if further diagnostic testing is warranted.

Once the Solaris 2.5 operating system or later is running, you can invoke SunVTS for additional diagnostic tests. For further information see the *SunVTS User's Guide*.

To boot user-specified programs you must be at the > prompt or the ok prompt. See Appendix D for a detailed procedure on how to access the > or the ok prompt.

# 2.3    Diagnostic Tools and When to Use Them

TABLE 2-3 provides a summary of the available diagnostic tools and describes when to use each tool.

**TABLE 2-3**    Diagnostic Tools

| Diagnostic Tool | When or Why to Use the Tool |
|---|---|
| Power-On Self-Test (POST) | Executes automatically at power-on when Stop-d keys are pressed or when the `diag-switch?` parameter is set to `true`. The POST code resides in the boot PROM and is driven by the POK signal from the power supply. POST tells you if there is a problem with the system board, the NVRAM, or the DSIMMs. See Section 3.1 "Power-On Self-Test (POST)." |
| FORTH Diagnostics | Tests functions such as the Ethernet and SCSI interfaces, system memory, and the diskette drive controller. You must be at the `ok` prompt (the FORTH Monitor) to run the FORTH Diagnostics. The FORTH Diagnostics reside in the boot PROM. |
| FORTH Monitor | Allows input to the system at the boot PROM level. Supports functions such as changing NVRAM parameters, resetting the system, running diagnostic tests, displaying system information, and redirecting input and output. See the *OpenBoot Command Reference* for more information. |
| SunDiag System Exerciser | Either SunDiag (Solaris 2.4 or earlier) or SunVTS (Solaris 2.5 or later) runs under the operating system, and display real-time use of the system resources and peripherals. The SunDiag exerciser tells you if your system is functioning correctly. If the exerciser fails, run the Power-On Self-Test. If all Power-On Self-Tests pass, then run SunVTS to identify the problem. For further information, depending on your operating system, see either the *SunDiag User's Guide* or the *SunVTS User's Guide*. |
| SunVTS Software (Solaris 2.5 or later *only*) | If your system does not seem to function correctly, yet it still passes the firmware-based diagnostics and boots its operating system (Solaris 2.5 or later *only*), then you can use SunVTS, the Sun Validation and Test Suite, to run individual tests. These tests verify the configuration and functionality of most hardware controllers and devices. You'll need root or superuser access to run SunVTS tests.  For further information, see the *SunVTS User's Guide*. |

## 2.4 Power-On Self-Test

For information about the POST, see Chapter 3.

## 2.5 FORTH-Based PROM Diagnostics

For information about how to run the FORTH Diagnostics, see Appendix D. TABLE 2-4 lists specific on-board diagnostic tests for SPARCstation 5 systems.

**TABLE 2-4** Selected FORTH Diagnostic Tests

| Type of Test | Description | Preparation | When to Use |
|---|---|---|---|
| test screen | Tests the system video graphics hardware and monitor. | The diag-switch? NVRAM parameter must be set to true. | See description. |
| test floppy | Tests the floppy drive response to commands. | Insert a formatted diskette into the drive. | See description. |
| test scsi | Tests the SCSI interface logic on the system board. | The diag-switch? NVRAM parameter must be set to true. | See description. |
| test net-aui | Performs an internal and an external loopback test on the AUI (Thick) Ethernet interface. | A cable must be connected to the system AUI Ethernet port and to an Ethernet tap or the test will fail the external loopback phase. | See description. |
| test net-tpe | Performs an internal and an external loopback test on the twisted-pair Ethernet (TPE) interface. | A cable must be connected to the system TPE port and to a TPE hub or the test will fail the external loopback phase. If the tpe-link-test? parameter is false (disabled), the external loopback test will appear to pass even if a cable is not connected. | See description. |
| test net | Performs an internal and an external loopback test on the auto-selected system Ethernet interface. | A cable must be attached to the system and to an Ethernet tap or hub or the external loopback test will fail. | See description. |

**TABLE 2-4**    Selected FORTH Diagnostic Tests *(Continued)*

| Type of Test | Description | Preparation | When to Use |
|---|---|---|---|
| test disk<br>test disk0<br>test disk1<br>test disk2<br>test disk3 | Tests internal or external SCSI disks that have a self-diagnostic program contained in the drive controller (disk0 = SCSI address 0, disk1 = SCSI address 1, disk2 = SCSI address 2, disk and disk3 = SCSI address 3). | The drive must be spinning before this test is executed or the test will fail. Enter a boot <*disk alias*> command to cause the drive to spin up. | Disk drive does not function properly. |
| test cdrom | Performs a self-test diagnostic on the CD-ROM drive. | The CD-ROM must be set to SCSI target 6 and have a CD inserted in the drive or the test will fail. | See description. |
| test tape<br>test tape0<br>test tape1 | Tests the SCSI tape drive by executing the drive self-test program. tape and tape 0 are the first tape drive. tape 1 is the second tape drive. | Connect the tape drive to the system and then turn on the power. | See description. |
| test ttya<br>test ttyb | Outputs an alphanumeric test pattern on the system serial ports (ttya = serial port A, ttyb = serial port B). | Attach a terminal to the serial port to observe the output. | Tests serial ports. |
| test keyboard | Executes the keyboard self-test. The four LEDs on the keyboard should flash on once, and the message Keyboard Present is displayed. | Keyboard must be connected. | See description. |
| test-memory | Tests all of the system main memory if the diag-switch? is true. If diag-switch? is set to false, it tests the memory according to the number specified in selftest-#megs. | None. | See description. |
| test-all | Tests all devices in the system (such as SBus cards) that have a built-in test program. Hard disks, tapes, and CD-ROMs are not tested. | Set the diag-switch? NVRAM parameter to true. | When a device driven by an SBus card is not functioning properly. |
| watch-clock | Displays seconds from the system's Time-of-Day chip. | None. | See description. |
| watch-net | Monitors broadcast Ethernet packets on the Ethernet cable(s) connected to the system. | Connect the system to the network via the desired Ethernet port. | See description. |

**TABLE 2-4** Selected FORTH Diagnostic Tests *(Continued)*

| Type of Test | Description | Preparation | When to Use |
|---|---|---|---|
| watch-aui | Monitors broadcast Ethernet packets (10BASE5—Thicknet) on the Ethernet cable(s) connected to the system. | Connect the system to the network via the desired Ethernet port. | See description. |
| watch-tpe | Monitors broadcast Ethernet packets (10BASET—Twisted Pair Ethernet) on the Ethernet cable(s) connected to the system. | Connect the system to the network via the desired Ethernet port. | See description. |
| watch-net-all | Monitors broadcast Ethernet packets on all Ethernet interfaces installed in the system, one at a time. | Connect the system to the network via the desired Ethernet port. | When an SBus card network controller card is installed. |
| probe-scsi | Returns to the display the SCSI devices (internal and external) and their SCSI targets connected to the built-in SCSI port. | Connect external SCSI devices to the system and turn on their power. | To determine if a SCSI peripheral is talking to the system. To determine the SCSI targets (addresses) of a SCSI device. To determine if more than one SCSI peripheral is assigned the same SCSI address. To determine if the built-in SCSI controller is defective. |
| probe-scsi-all | Returns to the display the SCSI devices and their SCSI targets connected to all SCSI ports (both the built-in SCSI port and any additional SCSI host adapter cards). | Connect external SCSI devices to the system and turn on their power. | See probe-scsi. To determine if a SCSI host adapter controller is defective. |
| power-off | Powers off the system. | You must have a Sun Type-5 keyboard in order to use this command. | To power off the system with a Sun Type-5 keyboard. |

# 2.6 FORTH Monitor

The FORTH Monitor is a basic diagnostic utility and system interface. If there is any problem with your operating system, the FORTH Monitor automatically starts, as indicated by the appearance of the `ok` prompt (the Monitor also starts if `auto-boot?` is set to `false`).

You can also choose to access the FORTH Monitor by halting the system. For information on how to access the FORTH Monitor, see Appendix D. For extensive information about tests you can run from the FORTH Monitor, see *OpenBoot Command Reference*.

# 2.7 System Exercisers

Use the SunDiag System Exerciser (Solaris 2.4 and earlier) or SunVTS (Solaris 2.5 and later) to determine real-time use of system resources and peripheral equipment such as Desktop Storage Modules and External Storage Modules. The System Exerciser verifies that the system is functioning properly. For information about how to use the System Exerciser, see the *SunDiag User's Guide*; for information about SunVTS see the *SunVTS User's Guide*.

If SunDiag passes, the system is operating properly. If SunDiag fails, the error messages should indicate the part of the system that has failed. If the error messages are not descriptive enough, you may need to run POST.

# Power-On Self-Test (POST)

This chapter describes the Power-On Self-Test (POST) for Normal, Full, and Abbreviated modes, available with your SPARCstation 5 system.

The Power-On Self-Test (POST) diagnostics reside in the OpenBoot PROM located on the system board. There are two POST modes: Normal and Diagnostic.

## 3.1      Power-On Self-Test (POST)

The Power-On Self-Test (POST) runs when you turn on the system unit power switch and any of the following conditions apply:

- `diag-switch?` NVRAM parameter is set to `true`.
- Stop-d keys are held down when you turn on the power.
- Keyboard is disconnected, and `diag-switch?` is set to `false`.

The POST comprises a sequence of tests designed to evaluate the major hardware components of the main logic board in the short time before the OpenBoot PROM firmware takes control. The POST does not perform extensive testing on any component of the main logic board. Only major failures can be detected by the POST.

Four different LEDs on the keyboards are used to indicate the progress and results of the POST. These LEDs are on the Caps Lock, Compose, Scroll Lock, and Num Lock keys, as shown in FIGURE 3-1, FIGURE 3-2, and FIGURE 3-3. To indicate the beginning of the POSTs, the four LEDs briefly light all at once. The monitor screen remains blank, and the Caps Lock LED blinks for the duration of the POST.
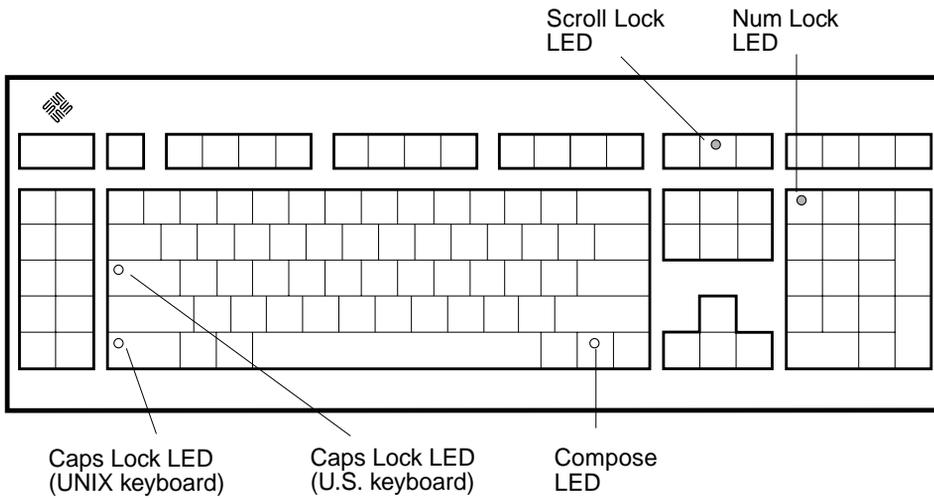


**FIGURE 3-1**    Arrangement of Sun Type-5 Keyboard Diagnostic LEDs
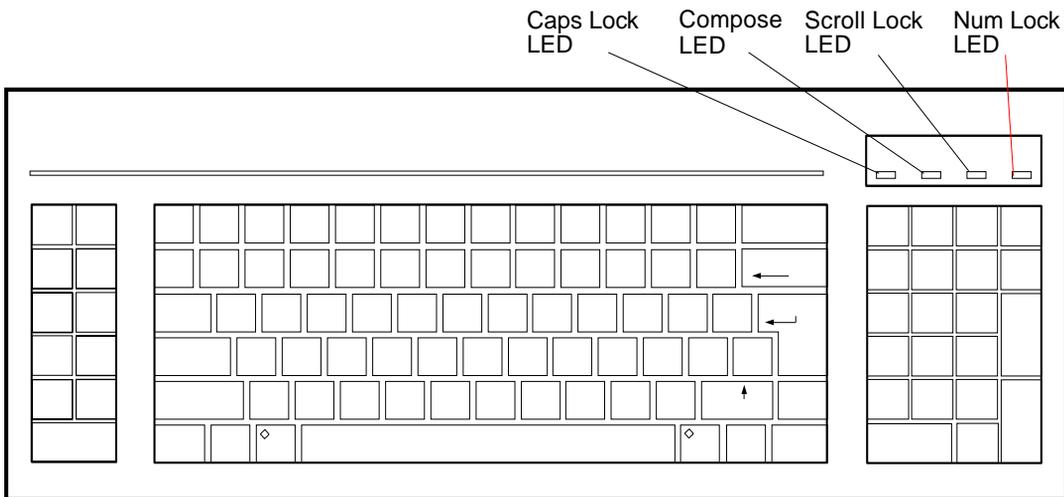


**FIGURE 3-2**    Sun Type-4 Keyboard

Scroll Lock LED

Caps Lock LED (UNIX keyboard)  Caps Lock LED (U.S. keyboard)  Compose LED  Num Lock LED
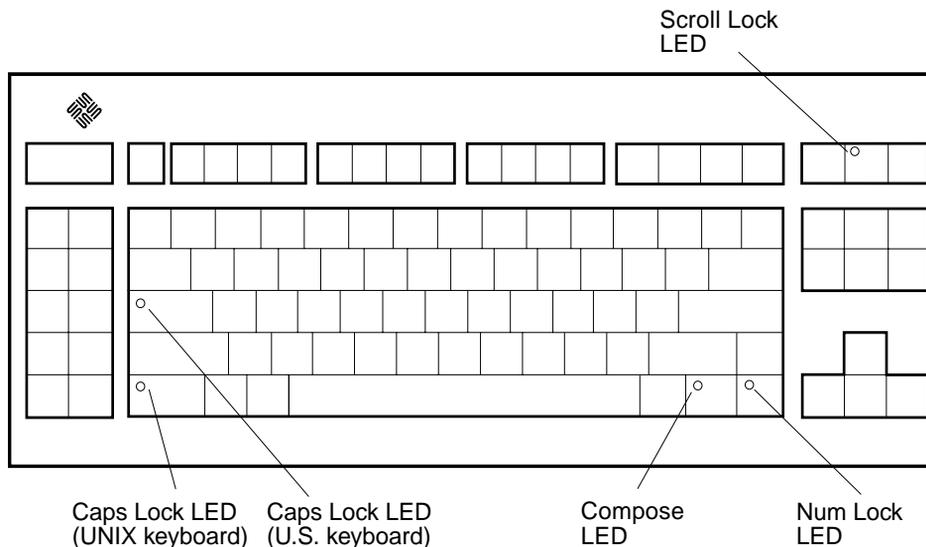
**FIGURE 3-3**  Sun Compact 1 Keyboard

If the system fails any POST, one of the LEDs will light to indicate the nature of the problem. The LED may be lit continuously, or for just a few seconds. TABLE 3-1 provides the meaning of each diagnostic LED.

**TABLE 3-1**  Interpreting the Keyboard Diagnostic LEDs

| Diagnostic LED | Failed Part |
| --- | --- |
| Num Lock LED is lit. | Main logic board |
| Scroll Lock LED is lit. | NVRAM |
| Compose LED is lit | DSIMMs (see Section 4.4 "Determining Faulty DSIMM Locations") |

**Note –** The Caps Lock LED is *not* used as a failure indicator; it blinks on and off to indicate that the POSTs are running. The keyboard LED diagnostics feature described here applies only to a SPARCstation 5 system with a Sun Type-4, Type-5, or Compact 1 keyboard connected to its keyboard port. The LED diagnostics do not apply if a different Sun-supported keyboard is connected to the keyboard port, or if a terminal and its keyboard are used as a main console instead of a monitor and a Type-4, Type-5, or Compact 1 keyboard.

If the system passes all the POSTs, all four LEDs light again and then go off. Next, the OBP firmware performs its initialization sequence and the system banner appears on the screen. A generic SPARCstation banner is shown as an example. From this point on, the keyboard LEDs assume their normal functions (that is, you should no longer interpret the LEDs as diagnostic error indicators).

*SPARCstation XXX, Keyboard Present*
*ROM Rev. X.XY, XX MB memory installed, Serial #XXX*
*Ethernet address X:X:YY:Z:A:BB, Host ID:  XXXXXXXX.*
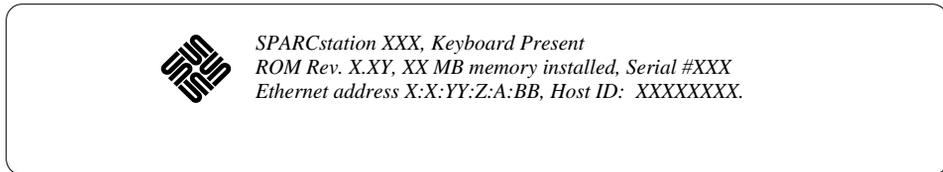
**FIGURE 3-4**   SPARCstation System Banner

Following the system's successful initialization, the operating system is booted automatically—unless the NVRAM configuration options specify otherwise.

You can retrieve more detailed POST failure information by connecting a terminal to the `ttya` serial port. If you connect a terminal, you must set the NVRAM parameter `diag-switch?` to `true`. For more information about the NVRAM parameters, see TABLE 2-1 on page 2-5. Test failure messages are displayed on the system monitor or console, whether or not the system is in Diagnostic Mode. However, it may be easier to understand the failure message output when it is accompanied by more detailed POST progress messages available via the `ttya` serial port.

## 3.2  Normal Mode

Under Normal Mode, when the system is turned on, control is sent to the OpenBoot PROM. Depending on the options set in the OpenBoot PROM, for example if `auto-boot?` is enabled (set to `true`), the operating system will load. Diagnostic testing is *not* run.

## 3.3  Full Diagnostic Mode

Full Diagnostic Mode tests the major hardware system board components and, if the POST is successful, control is transferred to the OBP firmware that probes the installed SBus modules. Full Diagnostic Mode runs if *one* of these conditions is met:

■  You press and hold the Stop-d keys while you turn on the power.

- You set the `diag-switch?` NVRAM parameter to `true` in the OpenBoot PROM.
- You disconnect the keyboard and you set the `diag-switch?` NVRAM parameter to `true` in the OpenBoot PROM.

---

**Note –** POST does not perform extensive testing on any system board component. POST detects only major failures.

---

To view error messages returned by POST, connect a terminal to serial port A or use a `tip` connection to another workstation.

If you do not connect a terminal to serial port A or use a `tip` connection, the screen will be blank during the POST diagnostics. In this case, use the keyboard LEDs to display error conditions. See Section 3.7 "Status Lights (LEDs) and Indicators."

# 3.4 Abbreviated Diagnostic Mode

A silent Power-On Self-Test (POST) is run if you disconnect the keyboard and you set the `diag-switch?` NVRAM parameter to `false` in the OpenBoot PROM. This Power-On Self-Test is silent (no progressive test messages are printed out). If an error or errors occur during the abbreviated Power-On Self-Test, all error messages are displayed on the TTY or `tip` window.

## 3.4.1 Setting Up a `tip` Connection to Another System

You can use the serial port on your SPARCstation 5 system to connect to another Sun workstation (either the same type of SPARC™ system or a different type of Sun workstation or server system). This connection lets you use a shell window on the Sun workstation as a terminal to the SPARCstation 5 being tested.

The `tip` method is recommended, because it lets you use SunOS™ windowing and operating system features to help you work with the boot PROM.

To make a `tip` connection, follow these steps:

1. **Connect the system's serial port (`ttya`) to another Sun workstation `ttya` serial port using a serial connection cable. This connection is made with a 3-wire null modem cable. Connect wires 3-2, 2-3, and 7-7.**

2. **At the other Sun workstation, add the following lines to the file** /etc/remote**:**

```
hardwire:\
     :dv=/dev/ttya:br#9600:el=^C^S^Q^U^D:ie=%$:oe=^D:
```

3. **In a Shell Tool window on the Sun workstation, type** tip hardwire**. (Some commands will not work properly in a Command Tool window.)**

   The system will reply connected.

```
hostname% tip hardwire
connected
```

   The Shell Tool window is now a tip window directed to the Sun workstation serial port.

4. **When you are finished running POST and want to disconnect the** tip **window, either type** ~. **(tilde period) in the** tip **window, or type** kill -9 **and the process ID number of the** tip **hardwire process.**

```
hostname% ~.
or
hostname% kill -9 PID# of tip hardwire process
```

# 3.5    Tests the POST Runs

Following is a sample listing of the Full Diagnostic Mode tests completed by POST.

**TABLE 3-2**    Full Diagnostic Mode Tests

| |
| --- |
| MMU Context Table Reg Test |
| MMU Context Register Test |
| MMU TLB Replace Ctrl Reg Tst |
| MMU Sync Fault Stat Reg Test |
| MMU Sync Fault Addr Reg Test |
| MMU TLB RAM NTA Pattern Test |
| MMU TLB CAM NTA Pattern Test |

**TABLE 3-2**  Full Diagnostic Mode Tests *(Continued)*

```
MMU TLB LCAM NTA Pattern Test

IOMMU SBUS Config Regs Test

IOMMU Control Reg Test

IOMMU Base Address Reg Test

IOMMU TLB Flush Entry Test

IOMMU TLB Flush All Test

SBus Read Time-out Test

EBus Read Time-out Test

D-Cache RAM NTA Test

D-Cache TAG NTA Test

I-Cache RAM NTA Test

I-Cache TAG NTA Test

Memory Address Pattern Test

FPU Register File Test

FPU Misaligned Reg Pair Test

FPU Single-precision Tests

FPU Double-precision Tests

FPU SP Invalid CEXC Test

FPU SP Overflow CEXC Test

FPU SP Divide-by-0 CEXC Test

FPU SP Inexact CEXC Test

FPU SP Trap Priority > Test

FPU SP Trap Priority < Test

FPU DP Invalid CEXC Test

FPU DP Overflow CEXC Test

FPU DP Divide-by-0 CEXC Test

FPU DP Inexact CEXC Test

FPU DP Trap Priority > Test

FPU DP Trap Priority < Test

PROC0 Interrupt Regs Tests
```

**TABLE 3-2**   Full Diagnostic Mode Tests *(Continued)*

```
Soft Interrupts OFF Test

Soft Interrupts ON Test

PROC0 User Timer Test

PROC0 Counter/Timer Test

DMA2 E_CSR Register Test

LANCE Address Port Tests

LANCE Data Port Tests

DMA2 D_CSR Register Test

DMA2 D_ADDR Register Test

DMA2 D_BCNT Register Test

DMA2 D_NADDR Register Test

ESP Registers Tests

DMA2 P_CSR Register Test

DMA2 P_ADDR Register Test

DMA2 P_BCNT Register Test

PPORT Registers Tests

NVRAM Access Test

TOD Registers Test
```

# 3.6   POST Error Messages

The POST error messages returned to the terminal are self-explanatory. For example, if no DSIMM is installed in the system, the POST will tell you that no DSIMM is installed and will indicate the slot number of the DSIMM slot. Use the error messages returned by POST to troubleshoot the system.

# 3.7    Status Lights (LEDs) and Indicators

The LED at the front of the chassis lights when the system is operating normally. FIGURE 3-5 shows the location of the system LED. Chapter 4 ", shows flow diagrams of actions to take when the system LED is not lit.



System Front
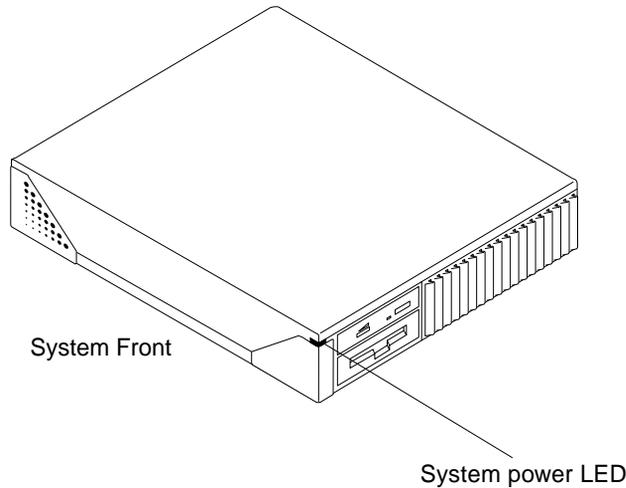
System power LED

**FIGURE 3-5**    Location of System Power LED

Section 3.1 "Power-On Self-Test (POST), describes the keyboard LED sequences displayed at power up when POST fails. If a failure occurs in POST, the keyboard displays a specific LED pattern. See FIGURE 3-1 through FIGURE 3-3 and TABLE 3-1. During normal system operation, the LEDs should not be interpreted as diagnostic error indicators.

Following the system initialization, the operating system boots automatically, unless the NVRAM configuration options specify not to do so.

---

**Note –** The Caps Lock key LED on some U.S. keyboards, located just above the left-hand Shift key, is not used as a POST failure indicator, but blinks on and off while POST is running.

---

If the Caps Lock key fails to flash on and off after you have pressed and held the Stop-d keys when you power on the system, POST failed. See Section 4.2.2 "System Board Test," for troubleshooting information.

CHAPTER **4**

# Troubleshooting Procedures

This chapter describes how to troubleshoot SPARCstation 5 system problems. Each problem is described, and a set of procedures is provided as a solution to the problem.

■ "No Video Output on the System Monitor" on page 2
■ "Power-On Does Not Succeed" on page 2
■ "Disk Drive Errors" on page 6
■ "Determining Faulty DSIMM Locations" on page 7

TABLE 4-1 describes commonly encountered problems, and tips for solving them.

**TABLE 4-1**    Troubleshooting Tips

| Problem | Action |
| --- | --- |
| LED on front of system is not lit. | Verify that the power switch is turned on and that the power cord is connected. If both the power switch and the power cord are connected, shut down the system and verify that the LED cable is connected. If the LED cable is connected, the power supply may be defective. Replace the power supply. See Chapter 8. |
| Disk drive fails to boot or does not respond. | Shut down the system. The SCSI controller may be defective. See Section 4.3.1 "Verifying the Built-In SCSI Controller." Verify that each SCSI device is assigned a unique SCSI target address. See Appendix C for important additional information. |
| Operating system does not recognize disk drive at boot up. | Shut down the system. Verify that each SCSI device is assigned a unique SCSI target address. See Appendix C for important additional information. |
| No video output on monitor. | Verify that the power cord is connected. Use a volt-ohmmeter (VOM) to check voltages. See Section 4.1 "No Video Output on the System Monitor." |
| Slow disk drive response. | If many SCSI devices are connected to the same SCSI bus and if some of these devices are "fast SCSI" devices, you can install an FSBE/S SBus card to the "fast SCSI" devices to speed up performance. |

**TABLE 4-1**    Troubleshooting Tips

| Problem | Action |
| --- | --- |
| Read, write, or parity error reported by the operating system or applications. | Replace the disk drive indicated by the failure message. Solaris 1.x operating systems identify the disk drive installed in the lower bay (SCSI target ID 3) as `sd0` and the disk drive installed in the upper bay (SCSI target ID 1) as `sd1`. With Solaris 2.x operating systems, the two drives are identified as `c0t3d0` and `c0t1d0`, respectively. |
| Power on does not succeed. LEDs on keyboard do not light and there is no tone from the keyboard when you turn on the system power. | The power supply may be defective. See Section 4.2.1 "Power Supply Test." |
| Power on does not succeed. The system fails to initialize but the LEDs on the keyboard light and there is a tone from the keyboard. | The system board may be defective. See Section 4.2.2 "System Board Test." |

# 4.1    No Video Output on the System Monitor

1. **Check that the power cord is connected to the monitor and to the wall outlet.**

2. **Verify that the wall outlet is supplying AC power to the monitor.**

   Use a volt-ohmmeter (VOM).

3. **Verify that the video cable connection is secure between the monitor and the system video output port.**

   Use a VOM to perform the continuity test on the video cable.

   If the power cord and video cable connection are good and there is still no video output, reseat the video card for the monitor.

4. **If the monitor power supply is internally fused, check the fuse.**

   The fuse could be blown.

# 4.2    Power-On Does Not Succeed

1. **Turn off the system power switch.**

2. **Check that the system power cord is properly connected to the system rear panel power receptacle and to the wall outlet.**

3. **Verify with a VOM that the wall outlet is supplying AC power to the system.**

4. **Turn the rear panel system power switch on and observe the keyboard.**

   The LEDs on the keyboard should briefly light. You should hear a tone from the keyboard. If you have a Sun Type-5 keyboard, there is a Standby power key which you may also press to see if the system can be powered on or not. Only try the Standby power key if the rear switch fails to turn on the system.

   If you hear no tone or see no lights on the keyboard, the system's power supply may be defective. See Section 4.2.1 "Power Supply Test."

   If you hear a tone and see lights on the keyboard, but the system still fails to initialize, see Section 4.2.2 "System Board Test."

# 4.2.1    Power Supply Test

1. **Use a VOM (volt-ohmmeter) to check the power supply output voltages.**

   Place the VOM negative probe on one of the logic ground pins in the connector, and test the +12V, –12V, and +5V power pins individually with the positive probe (pins 1 through 8). See FIGURE 4-1 and TABLE 4-2.

---

**Note –** The power supply must remain connected to the system board during this test. This allows the power supply to regulate the voltages.

---

2. **Replace the power supply assembly if any of the voltages are not present.**

   See Section 8.1 "Power Supply."
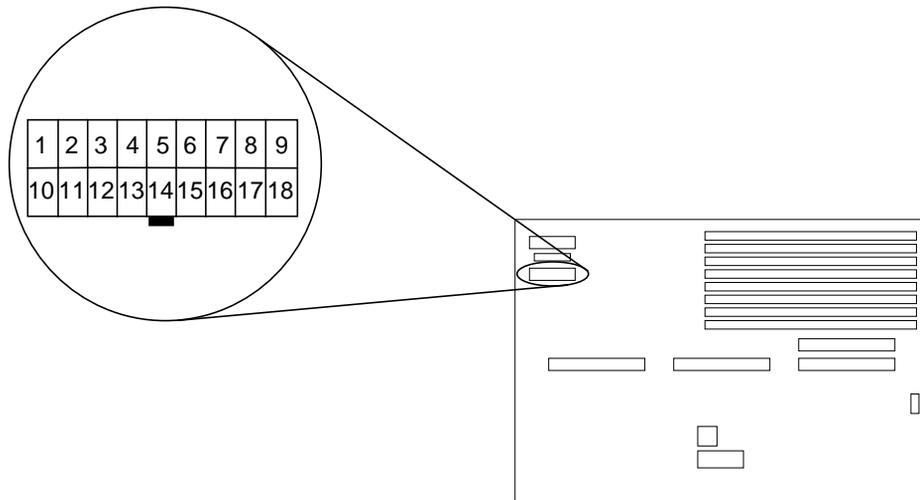
**FIGURE 4-1**   Power Supply Connector

TABLE 4-2 shows the pin assignments on the power supply connector.

**TABLE 4-2**   Power Supply Connector Pin Assignments

| Pin | Color | Description[1] | Pin | Color | Description |
|---|---|---|---|---|---|
| 1 | Blue | +12V | 10 | Black | Ground |
| 2 | Brown | −12V | 11 | Black | Ground |
| 3 | Red | +5V | 12 | Black | Ground |
| 4 | Red | +5V | 13 | Black | Ground |
| 5 | Red | +5V | 14 | Black | Ground |
| 6 | Red | +5V | 15 | Black | Ground |
| 7 | Red | +5V | 16 | Green | AC Outlet |
| 8 | Red | +5V | 17 | Purple | Fan |
| 9 | Grey | Power off | 18 | Yellow | Power on |

1. All volts are direct current.

## 4.2.2  System Board Test

1. **Connect a terminal to serial port A or use a** `tip` **connection to another workstation to receive additional POST failure information.**

   To set up a `tip` connection to another workstation, see Section 3.4.1 "Setting Up a tip Connection to Another System."

2. **Press and hold the Stop-d keys. While holding the keys down, turn the system power switch on. Watch the keyboard LEDs.**

   a. **The Caps Lock key on the keyboard should flash on and off, indicating that the system is running the Power-On Self-Test (POST).**

      If the Caps Lock key fails to flash on and off after you have pressed and held the Stop-d keys, POST failed.

   b. **To further troubleshoot the system board, see Section 4.2.2.1 "Caps Lock Key Fails to Flash On and Off During POST."**

3. **Observe the keyboard LEDs.**

   If a failure occurs during POST, an LED may light up. See TABLE 3-1 on page 3-3 to interpret the keyboard diagnostic LEDs.

4. **Replace the defective part indicated.**

## 4.2.2.1  Caps Lock Key Fails to Flash On and Off During POST

1. **Remove optional SBus cards and DSIMMs.**

   Leave one DSIMM in Slot 0 (J0300).

2. **Run POST again before replacing the system board.**

   Remove all other parts to eliminate the possibility that those parts could be causing the POST failure.

# 4.3 Disk Drive Errors

TABLE 4-3 presents disk drive error conditions and corrective actions.

**TABLE 4-3**    Troubleshooting Disk Drive Errors

| Symptom | Corrective Action |
|---|---|
| Read, write, or parity error reported by the operating system or applications. | Replace the disk drive indicated by the failure message. Solaris 1.x operating systems identify the disk drive installed in the lower bay (SCSI target ID 3) as `sd0` and the disk drive installed in the upper bay (SCSI target ID 1) as `sd1`. With Solaris 2.x operating systems, the two drives are identified as `c0t3d0` and `c0t1d0`, respectively. |
| Drive fails to boot or does not respond to commands. | SCSI controller may be defective. See Section 4.3.1 "Verifying the Built-In SCSI Controller." Verify that each SCSI device is assigned a unique SCSI target address. See Appendix C for important additional information. |
| Slow disk drive response. | If many SCSI devices are connected to the same SCSI bus and if some of these devices, such as the 1.05-Gbyte disk drive, are "fast SCSI" devices, you may want to install an FSBE/S SCSI host adapter card to the "fast SCSI" devices and put these "fast SCSI" devices on a separate SCSI bus to speed up disk drive response. |

# 4.3.1 Verifying the Built-In SCSI Controller

To check whether the built-in SCSI controller is defective, test the drive response to the `probe-scsi` command. To test additional SCSI host adapters added to the system, use the `probe-scsi-all` command. Refer to Section D.1.6 "module-info.

● **At the** ok **prompt, type** probe-scsi

See the following example.

```
ok probe-scsi
Target 1
  Unit 0  Disk CONNER CP30548   SUN0535AEBX93081QTT
Target 3
  Unit 0  Disk SEAGATE ST3610N   SUN0535881200054301
```

a. **If the disk drive responds and a message is displayed, the system SCSI controller has successfully probed the devices.**

This indicates that the system board is working correctly.

**b. If a disk doesn't respond:**

   **i. Make sure that every SCSI disk and other SCSI device on the SCSI bus has a different SCSI target ID (see Appendix C).**

---

**Note –** Internal SCSI hard drives are automatically assigned target 3 (lower bay) and target 1 (upper bay).

---

   **ii. Verify that all SCSI cables and the SCSI terminator are connected securely.**

   **iii. Check the SCSI cables to make sure there are no bent pins.**

   **iv. If you still have not found the problem, replace the unresponsive drive.**

   **v. If the problem still occurs after replacing the drive, replace the system board.**

   **vi. If the problem persists, replace the internal disk drive cable assembly.**

# 4.4 Determining Faulty DSIMM Locations

The SunDiag System Exerciser, SunVTS , and POST diagnostics can report memory errors encountered during program execution. For general information about diagnostics, see Chapter 2, "Troubleshooting Overview." Memory error messages on the video monitor usually indicate a physical memory address where the error was detected.

Depending on the diagnostic program you are running, a DSIMM location number ("J" number) or a memory address may be displayed.

If the error message displays the location number, see FIGURE 4-2 for DSIMM location numbers. If the error message displays a physical memory address, consult TABLE 4-4 to see which memory slot contains the physical address.

For example, if an error is detected at physical memory address 12fe958, examining TABLE 4-4 shows that the error occurred in the DSIMM in slot 0.

After you have identified the defective DSIMM, follow the instructions in Section 11.3.1 "Removing a DSIMM, for removing the defective DSIMM. To replace the DSIMM, follow the directions in Section 11.3.2 "Replacing a DSIMM.

|  | SIMM slot J0403 | Slot 7 |
|  | SIMM slot J0402 | Slot 6 |
|  | SIMM slot J0401 | Slot 5 |
|  | SIMM slot J0400 | Slot 4 |
|  | SIMM slot J0303 | Slot 3 |
|  | SIMM slot J0302 | Slot 2 |
|  | SIMM slot J0301 | Slot 1 |
|  | SIMM slot J0300 | Slot 0 |
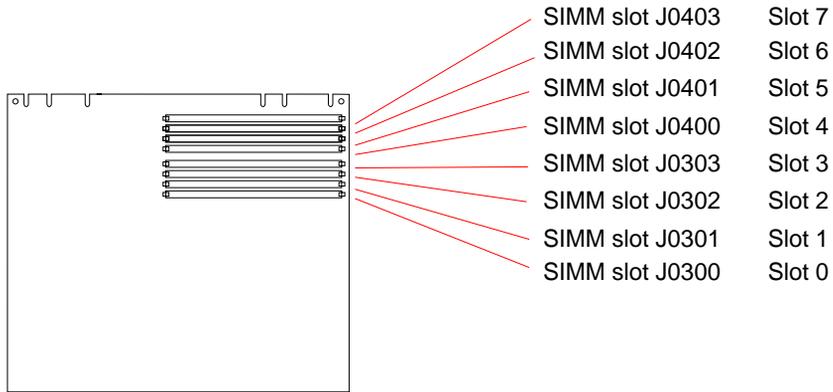
**FIGURE 4-2**   DSIMM Slot Locations

**TABLE 4-4**   Physical Memory Address Ranges for Slots[1] 0 Through 7

| Slot | SIMM # | Physical Memory Address Ranges |
|------|--------|-------------------------------|
| 0 | J0300 | 0000 0000 through 01FF FFFF |
| 1 | J0301 | 0200 0000 through 03FF FFFF |
| 2 | J0302 | 0400 0000 through 05FF FFFF |
| 3 | J0303 | 0600 0000 through 07FF FFFF |
| 4 | J0400 | 0800 0000 through 09FF FFFF |
| 5 | J0401 | 0A00 0000 through 0BFF FFFF |
| 6 | J0402 | 0C00 0000 through 0DFF FFFF |
| 7 | J0403 | 0E00 0000 through 0FFF FFFF |

1. Each memory slot can contain one DSIMM up to 32 megabytes in size. Slot 0 must have a DSIMM present.

CHAPTER **5**

# Safety and Tools Requirements

This chapter describes standards, safety procedures, and precautions you should follow whenever you need to replace or remove assemblies or subassemblies from your system.

- "Safety Requirements" on page 1
- "Symbols" on page 2
- "System Precautions" on page 3
- "Tools Required" on page 3
- "Electrostatic Discharge (ESD) Precautions" on page 4

## 5.1    Safety Requirements

For your protection, observe the following safety requirements:

- Follow all cautions, warnings, and instructions marked on the equipment.

- Ensure that the voltage and frequency rating of the power outlet matches the electrical rating labels on the system.

- Use properly grounded power outlets.

To protect both yourself and the equipment, observe the safety precautions listed in TABLE 5-1.

**TABLE 5-1**     Safety Precautions

| Item | Problem | Precaution |
|---|---|---|
| AC power cord | Electric shock | Unplug the AC cord from the AC wall socket before working on the power supply. |
| | Grounding | Leave the AC power cord plugged into the AC wall outlet when replacing drives, DSIMMs, chips, or the system board. Leaving the AC power cord plugged into the wall outlet provides a grounding path for the wrist strap, which must be attached. |
| Wrist strap | Electrostatic Discharge (ESD) | Wear a wrist strap when handling printed circuit boards, drives, or other components such as DSIMMs. |
| ESD mat | ESD | An approved antistatic mat provides protection from static damage when used with a wrist strap. The mat also cushions and protects small parts that are attached to printed circuit boards. Chapter 12 ", lists the part number of the mat. |
| Printed circuit boards | ESD | Handle a printed circuit board by the edges only. Store a board in an antistatic bag. |
| Cover | System damage and overheating | Replace the cover after performing service on the system. |
| SBus slot filler panels | System damage and overheating | Install filler panels in all unused SBus openings. Openings on the back of the system board reduce the cooling capability of the system. |
| TurboSPARC chip heat sink | Heat, burns | Do not touch the TurboSPARC chip. The heat sink can be hot enough to cause personal injury. |

# 5.2    Symbols

The following symbols mean:

**Caution –** This equipment contains lethal voltages. Accidental contact can result in serious injury or death.

**Caution –** Physical danger due to a non-electrical hazard or danger of irreversible damage to data or to the operating system.

**Caution –** Improper handling by unqualified personnel can cause serious damage to this equipment. Unqualified personnel who tamper with this equipment may be held liable for any resulting damage to the equipment.

**Caution –** Hot surface. Avoid contact. Surfaces are hot and may cause personal injury if touched.

## 5.3 System Precautions

Individuals who service this equipment must observe all safety precautions and ensure compliance with skill level requirements, certification, and all applicable local and national laws.

Procedures contained in this document must be performed by trained maintenance providers. Only people who have been trained at the Sun MicrosystemsTM training facilities (or at Sun Microsystems affiliates) and have been certified as required by local and national laws are considered qualified.

**Caution –** Before you begin, carefully read each of the procedures in this manual. If you have not performed similar operations on comparable equipment, *do not attempt* to perform these procedures.

## 5.4 Tools Required

To remove and replace customer replaceable units (CRUs), you will need the following tools and materials:

- Small Phillips-head screwdriver
- Small flat-blade screwdriver
- Wrist strap
- Antistatic surface
- Volt-ohmmeter (VOM) for checking voltages and continuity
- Needlenose pliers
- Conductive foam to store chips
- Container for screws

## 5.5 Electrostatic Discharge (ESD) Precautions

**Caution –** The system chassis power must be turned off, and the AC power cord must remain plugged in to ensure a proper ground.

To minimize electrostatic discharge, observe the following precautions:

- Hold the system board, SBus cards, DSIMMs, or system components only by the edges.
- When removing a board, card, or module from an antistatic bag, lay it on an antistatic surface such as a Sun ESD mat, an antistatic bag, or a disposable antistatic mat.
- Do not place the boards, cards, or modules on an unprotected surface. Use a cushioned antistatic mat or antistatic bag. Connectors and components have very thin pins that bend easily.
- Do not use an oscilloscope or VOM (volt-ohmmeter) probe on the components. The soldered pins are easily damaged or shorted by the probe point.
- Transport boards, cards, or modules in an antistatic bag.
- Always wear an antistatic wrist strap connected to a metal surface on the chassis when working on system components and parts.

# Power On and Off

This chapter explains the procedures that you need to perform before removing a customer-replaceable unit (CRU).

■ "Powering Off the System" on page 1
■ "Powering On the System" on page 4

# 6.1 Powering Off the System

Before you begin any removal or replacement procedure, you must halt the system in an orderly manner. The procedure to use depends upon whether your system is working normally or not, as described in the next sections.

**Caution –** When the operating system or any other standalone program has already booted, do not use the Stop-a keys to halt the system. Using the Stop-a keys to abort program execution can damage data files.

## 6.1.1 When the System Is Working Normally

To halt your system when it is working normally:

**1. Save all your work.**

Consult your software documentation for instructions on ending a work session and saving your files. If you do not save your work, you could lose it when you switch off the power.

2. **Return to the operating system environment.**

If you are in a windowing environment, exit from it and wait for the system prompt to appear. See the documentation supplied with your windowing system.

3. **Halt the operating system.**

See the documentation supplied with your operating system for instructions on how to halt it.

a. **For Solaris 2.x (SunOS 5.x) systems, type:**

```
% su
Password: superuser password
# /usr/sbin/shutdown -y -g60 -i0
```

b. **For Solaris 1.x (SunOS 4.x) systems, type:**

```
% su
Password: superuser password
# /usr/etc/shutdown -h +1
```

The operating system warns other users of your system of the impending shutdown, and then halts itself after a one-minute delay. If you wish to provide a longer delay, see the man page for shutdown(1).

The system responds with system halt messages followed by an ok prompt. When the ok prompt appears, you can safely turn off the power in the proper sequence.

c. **When the ok prompt appears, turn off the power to the system components in this order:**

1. External drive units (if you have any)

2. System unit

3. Monitor

## 6.1.2 When the System Does Not Respond Normally

To halt a system that is hung, or frozen, and unresponsive to commands:

1. **If your system is on a network, wait a few minutes before proceeding.**

Your system's slow response may be due to network problems or delays. Check with the person in charge of your network. If the response is not due to the network, go to the next step.

2. **Press Stop-a (or Break).**

   If you use a Wyse WY-50, VT-100 or compatible terminal as the console with your SPARCstation 5 system unit, press Break instead of Stop-a.

   ---

   **Note –** If the system does not respond to the mouse and keyboard, pressing Stop-a will not be effective. You may have to turn the power off, wait at least 10 seconds, and turn the power on again. Then try pressing Stop-a once more.

   ---

3. **When the** ok **prompt appears, boot the operating system.**

   Enter boot at the ok prompt.

4. **When you see the** login **prompt, log in to the system with your user name and password.**

5. **Halt the operating system.**

   See the documentation supplied with your operating system for instructions on how to halt it.

   a. **For Solaris 2.x (SunOS 5.x) systems, type:**

   ```
   % su
   Password: superuser password
   # /usr/sbin/shutdown -y -g60 -i0
   ```

   b. **For Solaris 1.x (SunOS 4.x) systems, type:**

   ```
   % su
   Password: superuser password
   # /usr/etc/shutdown -h +1
   ```

   The operating system warns other users connected to your system from the network of the impending shutdown, and then halts itself after a one-minute delay. If you wish to provide a longer delay, see the man page for shutdown(1).

   The system responds with system halt messages followed by the ok prompt. When the ok prompt appears, you can safely turn off the power in the proper sequence.

   c. **When the** ok **prompt appears, turn off the power to the system components in this order:**

   1. External drive units (if you have any)

   2. System unit

## 6.2 Powering On the System

**Caution –** Before turning on power to your system, be sure to close the system unit. It is not safe to operate your SPARCstation while the system unit is open. SPARCstation systems are equipped with a three-wire grounded power cord. To reduce the risk of electrical shock, always plug the power cord into a properly grounded power outlet.

**Caution –** Always allow 10 seconds between turning off the power and turning it back on again. This pause prevents possible damage to power supply components in your system unit.

To turn on power to the SPARCstation 5 system:

1. **If your system uses external drive units, turn on the power to these units first, starting with the unit that is furthest electrically from the system unit.**

2. **Turn on the power to the monitor.**

3. **Turn on the power to the system unit.**

# Internal Access

This chapter describes how to access the subassemblies inside the system unit, and how to close the system unit after you have finished the service procedures.

- "Removing the Cover" on page 1
- "Attaching the Wrist Strap" on page 3
- "Replacing the Cover" on page 4

## 7.1   Removing the Cover

**Caution –** The AC power cord should remain attached between the system unit and an AC wall outlet. This connection provides the ground path necessary to protect internal system components from harmful static discharges. Inside the system unit, be sure that the power supply wiring harness is connected to the main logic board to complete the ground.

**Caution –** The surface of the TurboSPARC chip may be hot and could cause personal injury if touched. Avoid contacting this component.

**Caution –** Before opening the system unit, make sure that the system power is in the Standby mode. The LED on the front of the system unit should not be lit, and the fans should not be running. When the system power switch is in the Standby position, and the AC power cord remains connected to a power outlet, hazardous AC voltage is still present in the power supply primary. Do not attempt to service the power supply under these conditions. Disconnect the AC power cord prior to handling the power supply. When servicing any other system component, the AC power cord should remain connected; it poses no safety hazard.

1. **Press the Standby side of the system power switch.**

2. **Loosen the captive Phillips screw in the upper-right corner of the rear panel (see** FIGURE 7-1**).**

3. **Loosen and remove the Phillips screw that secures the lock block to the cover. Remove the lock block and put it aside (see** FIGURE 7-1**).**
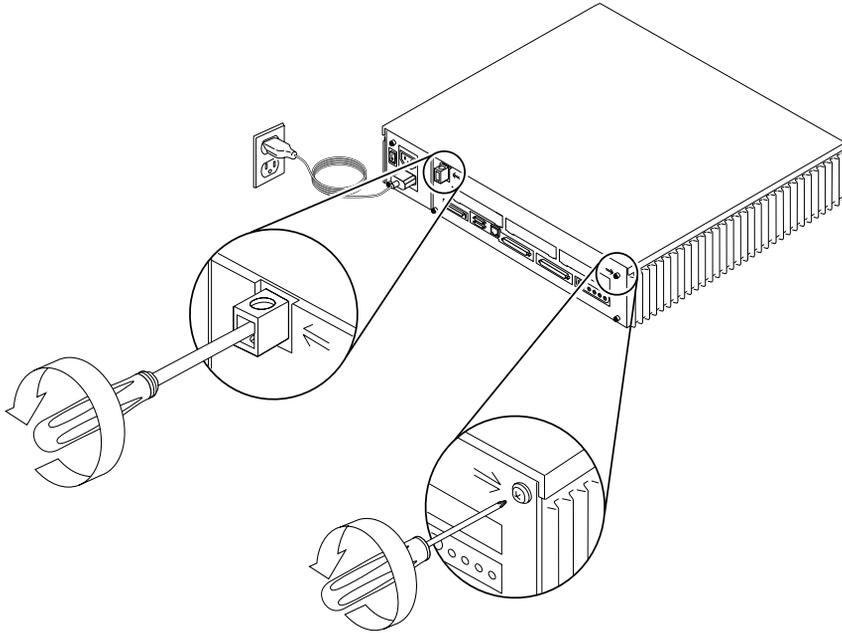


**FIGURE 7-1**   Removing the Rear Panel Cover Screws

4. **Lift the cover free of the chassis as shown in** FIGURE 7-2**.**
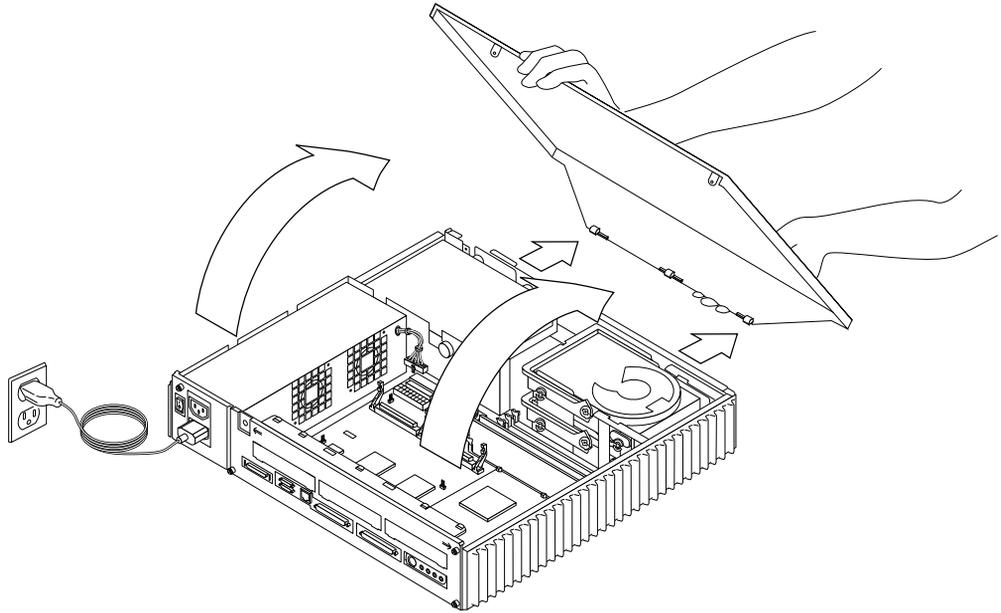
**FIGURE 7-2**   Removing the Cover

**5. Attach a wrist strap to your wrist and to the metal casing of the power supply.**

See Section 7.2 "Attaching the Wrist Strap."

**Caution –** When you are finished servicing parts inside the system unit, be sure to close the system unit before turning on the power. It is not safe to operate the system unit while it is open.

# 7.2   Attaching the Wrist Strap

**1. Unwrap the first two folds of the wrist strap and wrap the adhesive side securely around your wrist.**

See FIGURE 7-3.
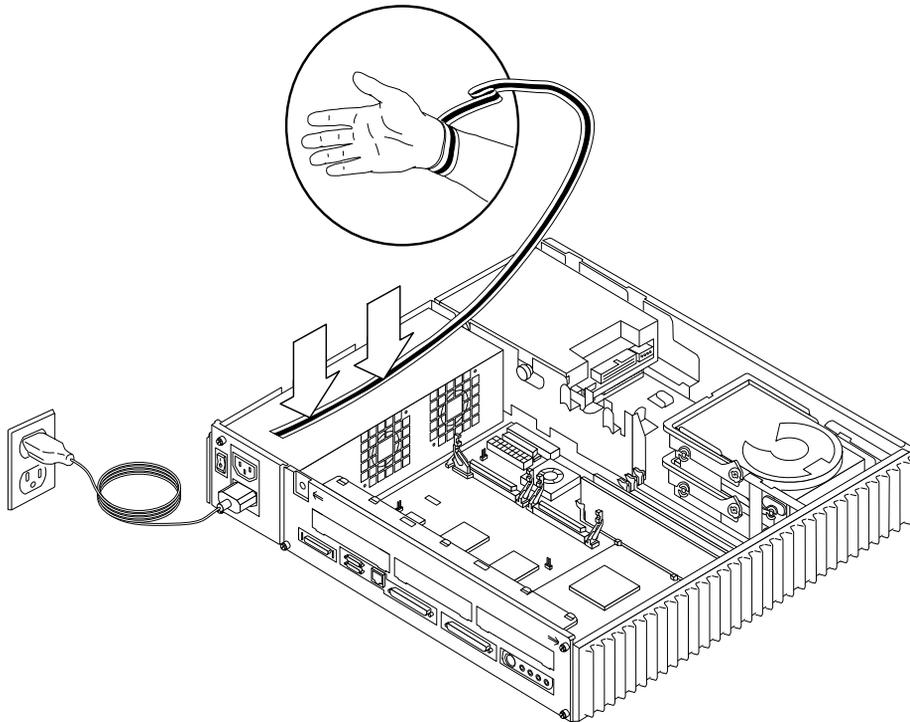
**FIGURE 7-3** Grounding the Wrist Strap to the Power Supply

2. **Peel the liner from the copper foil at the opposite end of the wrist strap and attach that end to the top of the power supply.**

   See FIGURE 7-3. Make sure that the strap makes good contact with the metal casing of the power supply; avoid the labels on top of the supply.

# 7.3     Replacing the Cover

1. **Remove the wrist strap from your wrist and then from the power supply.**

2. **Align the cover hinge tabs with the tab slots on the bottom front of the system chassis. Carefully lower the cover, making sure that the hinge hooks remain inside their respective slots.**

Guide cover hinge hooks into corresponding slots in front of system chassis.
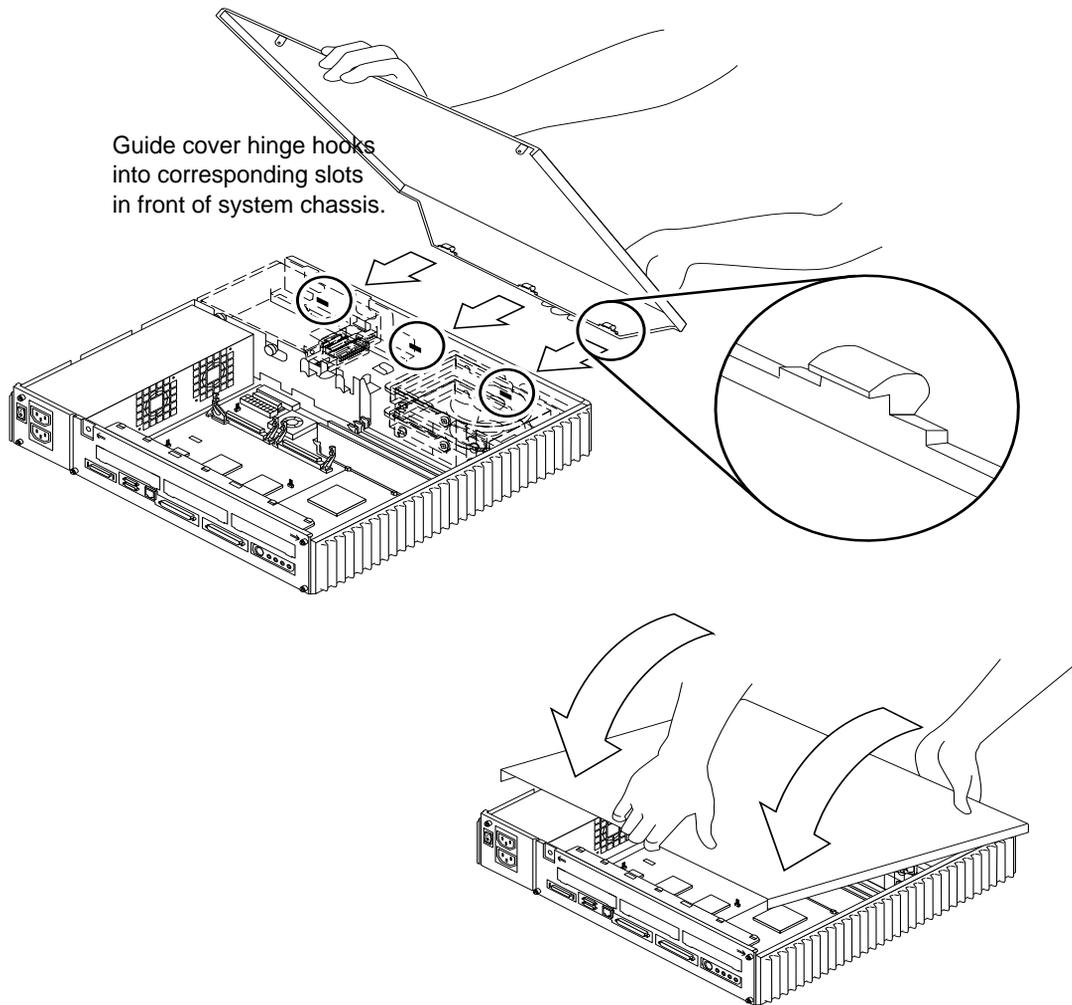
**FIGURE 7-4**   Replacing the Cover

3. **Replace the lock block on the rear panel. Tighten the Phillips screw that secures the lock block to the cover.**

   See FIGURE 7-5.

4. **Tighten the captive Phillips screw in the upper-right corner of the rear panel.**

   See FIGURE 7-5.



**Caution –** Do not use a power driver to tighten captive screws. Do not overtighten captive screws.
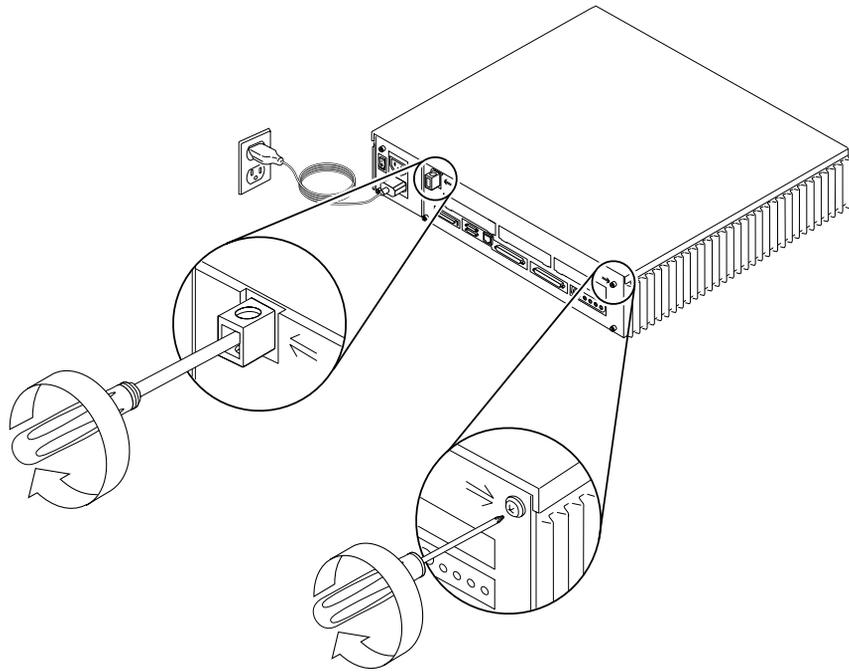
**FIGURE 7-5** Securing the System Unit Cover

# Major Subassemblies

This chapter describes how to remove and replace the system unit's major
subassemblies.

- "Power Supply" on page 1
- "Speaker/LED Assembly" on page 5
- "Internal Speaker" on page 8
- "SCSI Backplane" on page 12

## 8.1 Power Supply

**Caution –** When the system power switch is in the Standby position, and the AC
power cord remains connected to a power outlet, hazardous AC voltage is still
present in the power supply primary. Do not attempt to service the power supply
under these conditions. Disconnect the AC power cord prior to handling the power
supply. When servicing any other system component, the AC power cord should
remain connected; it poses no safety hazard.

### 8.1.1 Removing the Power Supply

**Caution –** To avoid personal injury or damage to the system board or components,
press the Standby side of the AC power switch before disconnecting the external
power cord from the rear panel.  The SPARCstation 5 power supply "remembers"
the state it was in when the power cord was detached, and it will automatically
return to that state when the power cord is reconnected.

1. **Shut down and power off the system.**

   See Section 6.1 "Powering Off the System."

2. **Disconnect the external power cord from the rear panel of the system unit and from the wall outlet.**

3. **Remove the cover.**

   See Section 7.1 "Removing the Cover."

4. **Attach a wrist strap and secure it to the upper flat edge of the rear panel.**

   See FIGURE 8-1.

---

**Note –** The wrist strap is usually grounded to the power supply. When removing or replacing the power supply, attach the wrist strap to the upper flat edge of the rear panel to ground the system.

---

5. **On the rear panel, loosen the captive screw(s) securing the power supply to the chassis.**

   See FIGURE 8-1. Some models have two captive screws, others have one.
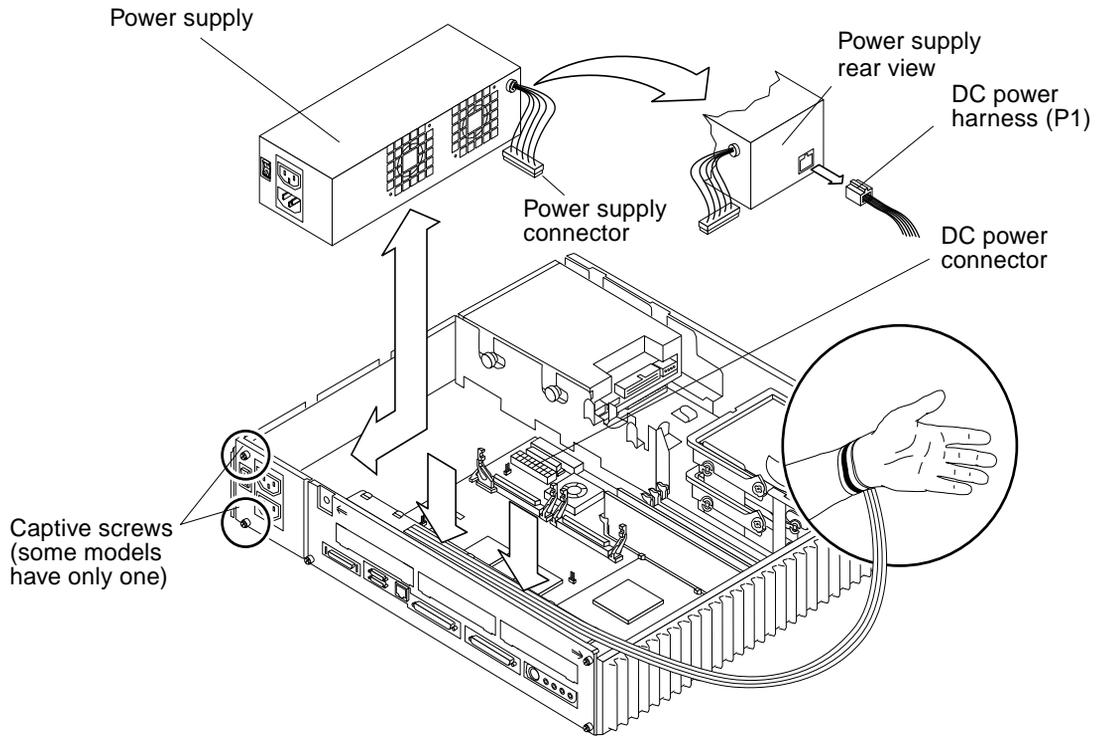
**FIGURE 8-1** Removing the Power Supply

**6. Disconnect the power supply connector from the system board.**

See FIGURE 8-1.

**7. Slide the power supply toward the chassis front to free it from the chassis mounts.**

See FIGURE 8-1.

**8. Lift the power supply out of the chassis and disconnect the DC power harness (labeled P1) from the keyed connector on the rear of the power supply.**

See FIGURE 8-2.

## 8.1.2 Replacing the Power Supply

**1. Attach a wrist strap and secure it to the rear panel.**

See FIGURE 8-1.

**Note –** The wrist strap is usually grounded to the power supply. However, when removing or replacing the power supply, attach the wrist strap to the upper flat edge of the backpanel to ground the system.

2. **Hold the power supply in one hand. Connect the DC power harness (labeled P1) to the rear of the power supply.**
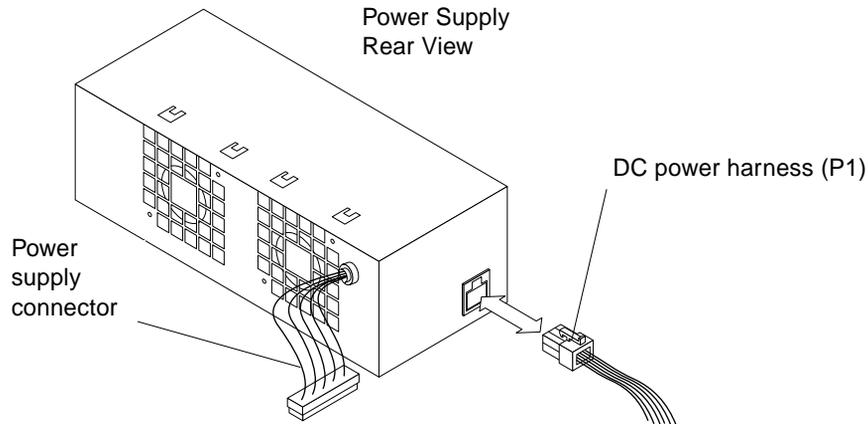
   See FIGURE 8-2.



   **FIGURE 8-2**   Connecting the DC Power Harness to the Power Supply

3. **Lower the power supply into the chassis at an angle, so that the DC power harness fits under the peripherals bracket.**

   Feed the DC power harness under the shelf in the peripherals bracket, and around the plastic card guide.

4. **Slide the power supply toward the rear of the chassis until it locks in the chassis mounts.**

5. **Tighten the captive screw(s) to secure the power supply to the rear of the chassis.**

   See FIGURE 8-1.

   **Caution –** Do not use a power driver to tighten a captive screw. Do not overtighten a captive screw.

6. **Plug in the power supply connector to the system board connector.**

   See FIGURE 8-1.

7. **Remove the wrist strap from your wrist and then from the upper edge of the rear panel.**

8. **Replace the cover.**

   See Section 7.3 "Replacing the Cover."

9. **Plug in the power cord to the system unit and the wall outlet.**

10. **Power on the system.**

    See Section 6.2 "Powering On the System."

# 8.2 Speaker/LED Assembly

The system power LED is located at one end of the speaker/LED cable.
To replace the power LED or the speaker cable, you must remove the speaker/LED assembly.

## 8.2.1 Removing the Speaker/LED Assembly

1. **Shut down and power off the system.**

   See Section 6.1 "Powering Off the System."

2. **Remove the cover and attach a wrist strap.**

   See Chapter 7.

3. **Remove the CD-ROM drive (if present).**

   See Section 9.2.1 "Removing the CD-ROM Drive."

4. **Disconnect the speaker/LED cable from the speaker fast-on connectors.**

   See FIGURE 8-7 on page 8-11.

5. **The LED is located at the shrink-wrapped end of the speaker/LED cable. Using the tip of a small, flat-blade screwdriver, work the cable and LED free from the plastic tabs that hold them in place.**

   See FIGURE 8-3.

6. **Disconnect the speaker/LED connector from the system board.**
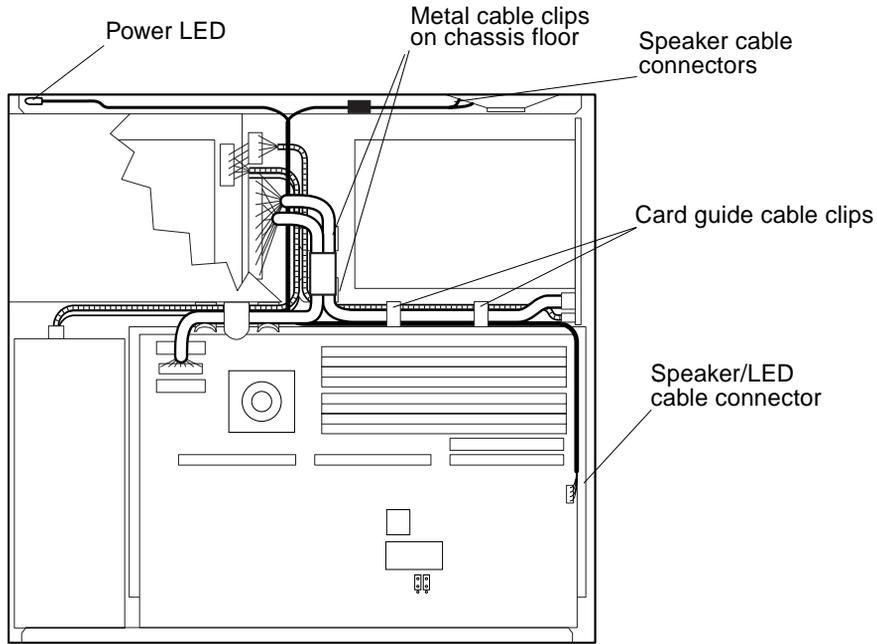
   See FIGURE 8-3.

**FIGURE 8-3**    Speaker/Power LED Cable Connections

**7. Carefully free the speaker/LED harness from the card guide cable clips, and lift the harness out of the system chassis.**

## 8.2.2    Replacing the Speaker/LED Cable

**1. Feed the LED cable through the chassis wall opposite the light pipe.**

See FIGURE 8-4. Position the replacement LED cable so that the LED just fits inside the entrance of the LED light pipe.

**2. Press the LED cable between the tabs to secure it in place.**

See FIGURE 8-4.

Press LED cable between
tabs to secure it in place.

LED light pipe
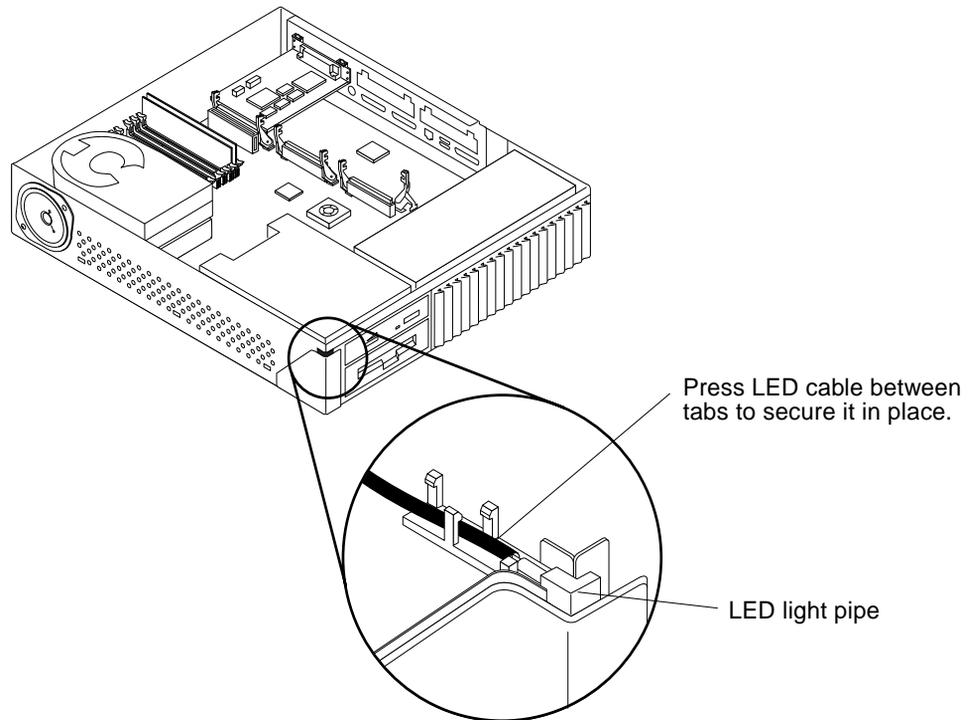
**FIGURE 8-4**   Routing the LED Cable

3. **Route the LED cable between the diskette drive bracket and the chassis wall and secure it beneath the metal cable clips on the chassis floor.**

   See FIGURE 8-3.

4. **Connect the speaker/LED cable to the speaker connectors.**

   See FIGURE 8-7.

5. **Reinstall the CD-ROM drive (if necessary).**

   See Section 9.2.2 "Replacing the CD-ROM Drive."

6. **Carefully secure the speaker/LED cable under the card guide cable clips.**

   See FIGURE 8-3.

7. **Connect the speaker/LED connector to the system board.**

   See FIGURE 8-3.

8. **Detach the wrist strap and replace the cover.**

   See Chapter 7.

9. **Power on the system.**

See Section 6.2 "Powering On the System."

# 8.3 Internal Speaker

## 8.3.1 Removing the Internal Speaker

The speaker cover is held in place by three tabs; two tabs are at the base of the cover, and one tab is near the top of the cover (see FIGURE 8-5).

1. **Shut down and power off the system.**

See Section 6.1 "Powering Off the System."

2. **Remove the cover and attach a wrist strap.**

See Chapter 7.

3. **Locate the two rectangular slots on the underside of the chassis, directly beneath the speaker cover.**

See FIGURE 8-5.

4. **Insert the tip of a small, flat-blade screwdriver into the slot that is furthest from the corner of the chassis.**

See FIGURE 8-5.

5. **Use the screwdriver to push on the tab inside the slot. At the same time, pull slightly on the speaker cover to disengage the tab from the chassis.**

6. **Repeat Step 1 for the second slot.**

Insert small, flat-blade screwdriver into slots on underside of chassis. Push up on tabs to disengage speaker cover.
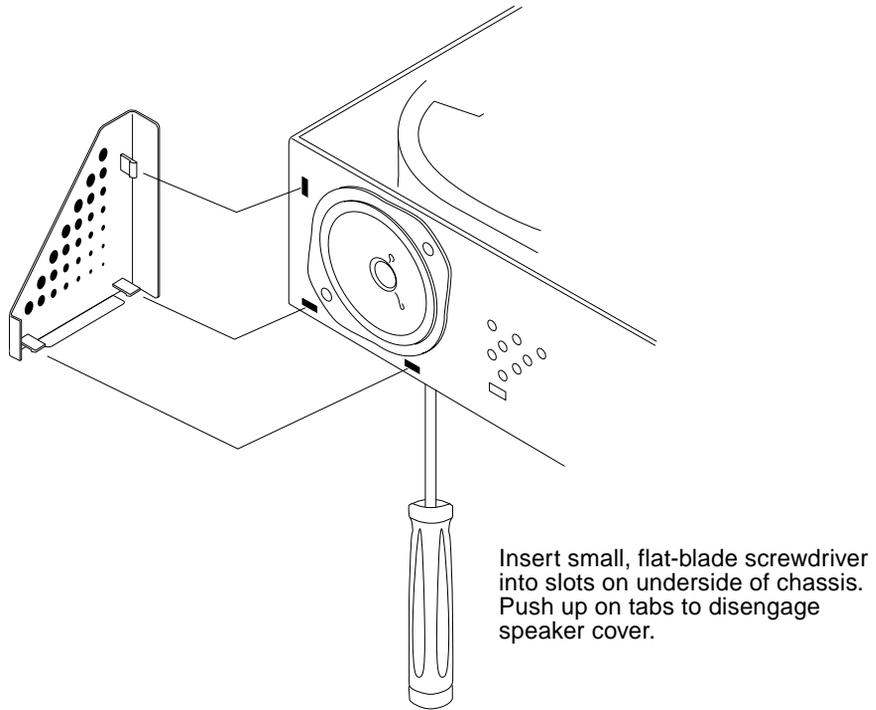
**FIGURE 8-5**  Removing the Speaker Cover

7. **Use the screwdriver to deflect the third tab, behind the top corner of the speaker cover, and remove the speaker cover.**

**Caution –** Use care when working near or handling the speaker to avoid damaging the speaker surface. Do not touch the diaphragm with tools or your fingers. Grasp the speaker by the metal edges only.

8. **Use a Phillips screwdriver to remove the two screws that secure the speaker to the system chassis.**

See FIGURE 8-6. Save the screws for installing the replacement speaker.
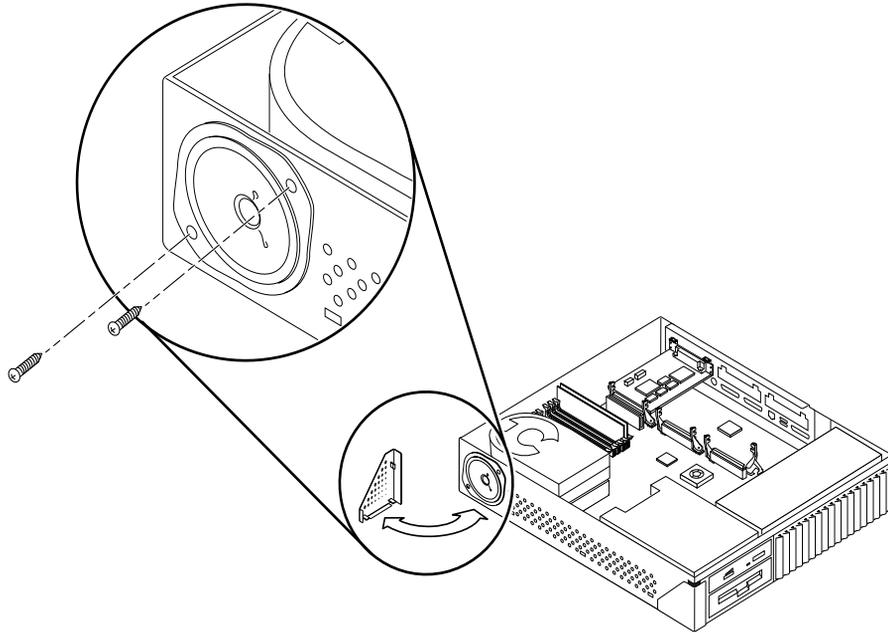
**FIGURE 8-6**  Removing the Speaker

   **9. Hold the speaker in one hand and disconnect the two fast-on connectors from the speaker terminals on the back of the speaker.**

   See FIGURE 8-7.

   **10. Set the speaker aside.**
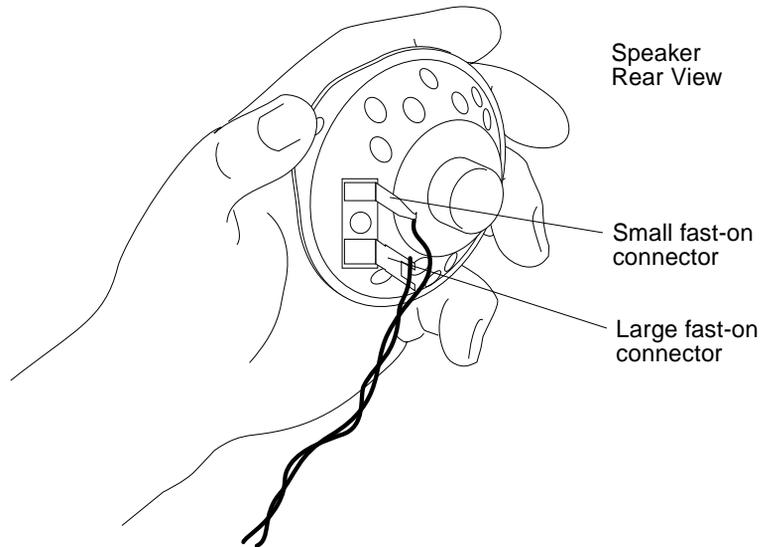
**FIGURE 8-7**   Speaker Connectors

## 8.3.2    Replacing the Internal Speaker

⚠ **Caution –** Do not touch the black inner surface of the speaker. Handle the speaker only by the metal frame to avoid damage.

1. **Pull the speaker end of the speaker/LED cable through the speaker opening in the chassis wall.**

2. **Unpack the replacement speaker.**

3. **Slide the fast-on connectors at the end of the speaker/LED cable onto the terminals of the replacement speaker.**

   See FIGURE 8-7.

**Note –** One connector and terminal pair is larger than the other. They are sized differently to ensure proper connection.

4. **Install the speaker within the opening on the left front of the system chassis and secure it with the two screws removed earlier.**

   See FIGURE 8-6.

5. **Replace the snap-on corner speaker cover. Press all three tab areas to ensure that the tabs snap securely into the chassis slots.**

6. **Detach the wrist strap and replace the cover.**

   See Chapter 7.

7. **Power on the system.**

   See Section 6.2 "Powering On the System."

## 8.4  SCSI Backplane

SCSI termination for internal drives is provided automatically by the SCSI backplane.

## 8.4.1  Removing the SCSI Backplane

The hard drive(s) connect to a SCSI backplane that provides SCSI data, power, and a target ID to the drive through a single connector.

1. **Shut down and power off the system.**

   See Section 6.1 "Powering Off the System."

2. **Remove the cover and attach a wrist strap.**

   See Chapter 7.

3. **Remove the hard disk drive(s).**

   See Section 9.1.1 "Removing a Hard Disk Drive."

4. **Disconnect the DC power and the SCSI data cables from the SCSI backplane.**
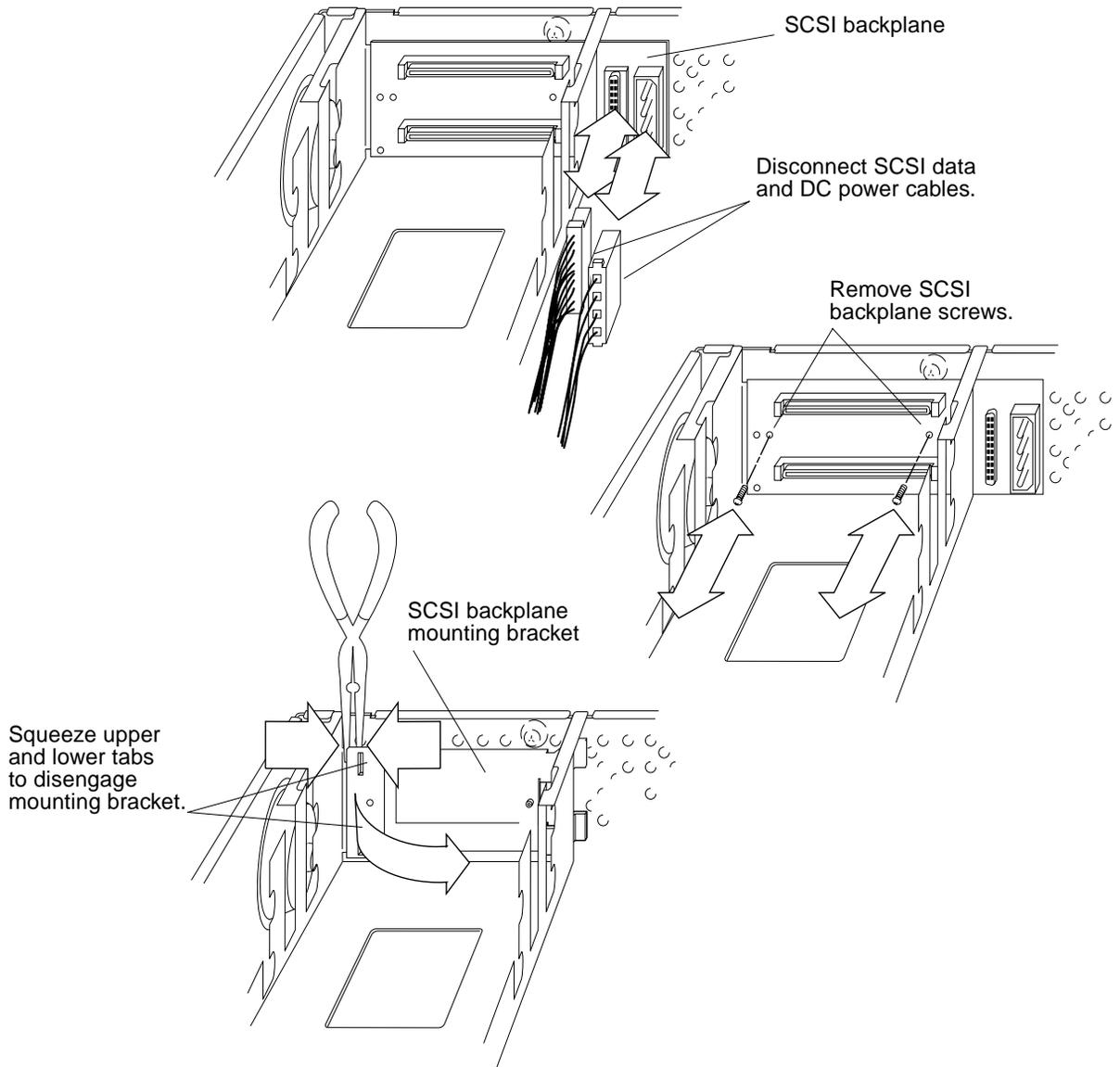
   See FIGURE 8-8.

**FIGURE 8-8** Removing the SCSI Backplane

5. **Remove the two Phillips screws that secure the SCSI backplane to its plastic mounting bracket.**

   See FIGURE 8-8. Remove the SCSI backplane from the system unit chassis.

6. **Use long needlenose pliers to squeeze the plastic tabs at the upper-left corner of the backplane mounting bracket. Pull slightly on the backplane to disengage the tabs.**

   See FIGURE 8-8.

7. **Repeat Step 1 for the tabs at the lower-left corner of the bracket.**

8. **Swing the left side of the backplane away from the chassis and remove it from the system.**

## 8.4.2      Replacing the SCSI Backplane

1. **Remove the replacement SCSI backplane and bracket assembly from the shipping bag and place it on an antistatic surface.**

2. **Position the backplane and bracket assembly so that the tabs on all four corners of the mounting bracket align with the corresponding slots in the chassis wall.**

   Insert the backplane at an angle to accomplish this.

3. **Push on the upper-left and lower-left corners of the backplane to snap it into place.**

   See FIGURE 8-8.

4. **Connect the SCSI data cable and DC power harness connectors to the SCSI backplane.**

   See FIGURE 8-8.

5. **Replace the hard disk drive(s).**

   See Section 9.1 "Hard Disk Drive."

6. **Remove the wrist strap from your wrist and then from the power supply.**

7. **Replace the cover.**

   See Section 7.3 "Replacing the Cover."

8. **Power on the system.**

   See Section 6.2 "Powering On the System."

# Storage Devices

This chapter includes information about how to remove and replace the system's internal storage devices and related cables.

- "Hard Disk Drive" on page 1
- "CD-ROM Drive" on page 5
- "Diskette Drive" on page 8
- "Internal SCSI Data Cable" on page 14
- "Peripherals DC Power Harness" on page 19
- "Diskette Data Cable" on page 25
- "CD-ROM Audio Cable" on page 27

# 9.1 Hard Disk Drive

The SPARCstation 5 system accommodates 535-Mbyte, and 1.05- and 2.0-Gbyte hard disk drives. All the drives have a single connector that connects to the SCSI backplane in the system unit chassis. A specially designed handle, fastened to the drive, speeds drive removal and installation.

---

**Note –** Do not remove the handle from the hard drive. It is part of the customer-replaceable unit (CRU).

---

FIGURE 9-1 shows the location of the drives.

CD-ROM drive (top)

Diskette drive (bottom)

Hard drives (stacked)
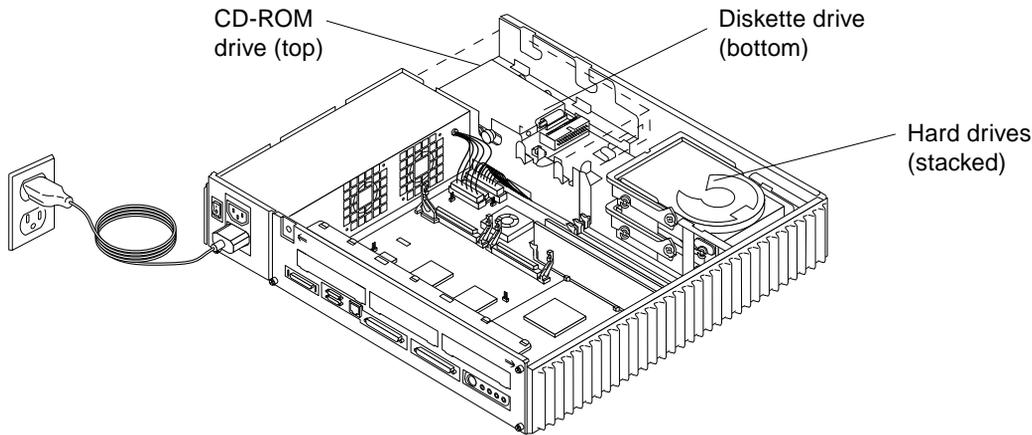
**FIGURE 9-1**  Drive Locations

# 9.1.1   Removing a Hard Disk Drive

1. **Shut down and power off the system.**

   See Section 6.1 "Powering Off the System."

2. **Remove the cover and attach a wrist strap.**

   See Chapter 7.

3. **Determine which drive you need to remove.**

   If you need to remove the bottom disk drive, follow the steps to remove the top disk drive first.

   ---
   **Note –** The position of a disk drive determines its SCSI target address. The bottom drive automatically becomes SCSI address 3 at power up. The top drive becomes SCSI address 1 at power up. SCSI termination for internal drives is provided automatically by the SCSI backplane.

   ---

   ---
   ⚠ **Caution –** Once a hard drive has been installed in the SPARCstation 5 system, do not change the position of that drive.

   ---

4. **A latch is located at the rear of the drive. Press the plastic latch to release the drive handle.**

5. **Lift the drive handle to its vertical position.**

   When lifted, the drive bracket acts as a lever to disconnect the drive from the chassis connector on the SCSI backplane.

6. **Grasp the drive bracket handle and lift the drive straight up and out of the chassis.**

   See FIGURE 9-2. Place the drive on an antistatic surface.
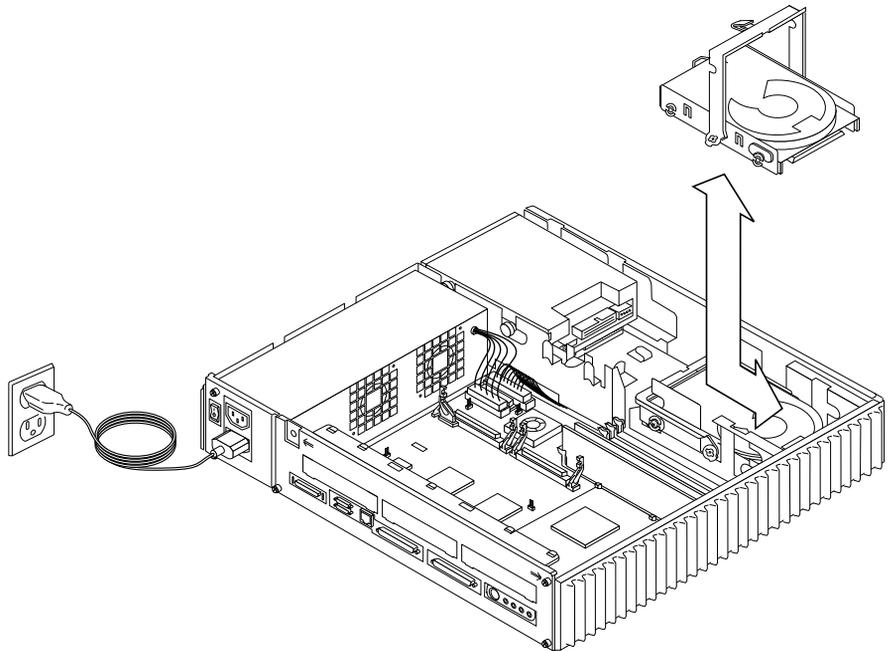


**FIGURE 9-2**   Removing a Hard Disk Drive

7. **Repeat Steps 4 through 6 to remove the bottom disk drive (if necessary).**


## 9.1.2   Replacing a Hard Disk Drive

**Note –** No jumper settings are required for the hard drives.

1. **Remove the replacement drive from its antistatic shipping bag.**

2. **Release the handle latch near the rear of the drive and lift the handle until it is in the vertical position.**

3. **Grasp the drive bracket handle with one hand; with your other hand, hold the drive steady. Maintain the drive in a horizontal position and lower it into the chassis.**

    Be sure that the connector on the hard drive is pointed toward the SCSI backplane. You may need to adjust the drive assembly. Make sure that the drive is properly seated in the peripheral bracket side-rail mounting slots.

4. **Push the drive bracket handle down toward the end opposite the connector until the handle locks into the clip at the end of the drive bracket.**

    See FIGURE 9-3. Do not force the handle. If the handle does not move easily into the latched position, connecting the drive to the SCSI backplane, remove the drive and try again.

    When lowered, the drive bracket handle acts as a mechanism to engage the drive and the SCSI backplane connector. The position of the drive in the chassis determines its SCSI address. The lower disk drive is automatically assigned SCSI address 3, while the upper drive (if present) is automatically assigned SCSI address 1.

---

**Note –** If a drive is not installed in the upper bay, SCSI address 1 is available for use by an external peripheral on the SCSI bus. However, if a drive is installed later in the upper bay, its automatic address will conflict with that of the external peripheral.

---

Peripheral bracket side rails
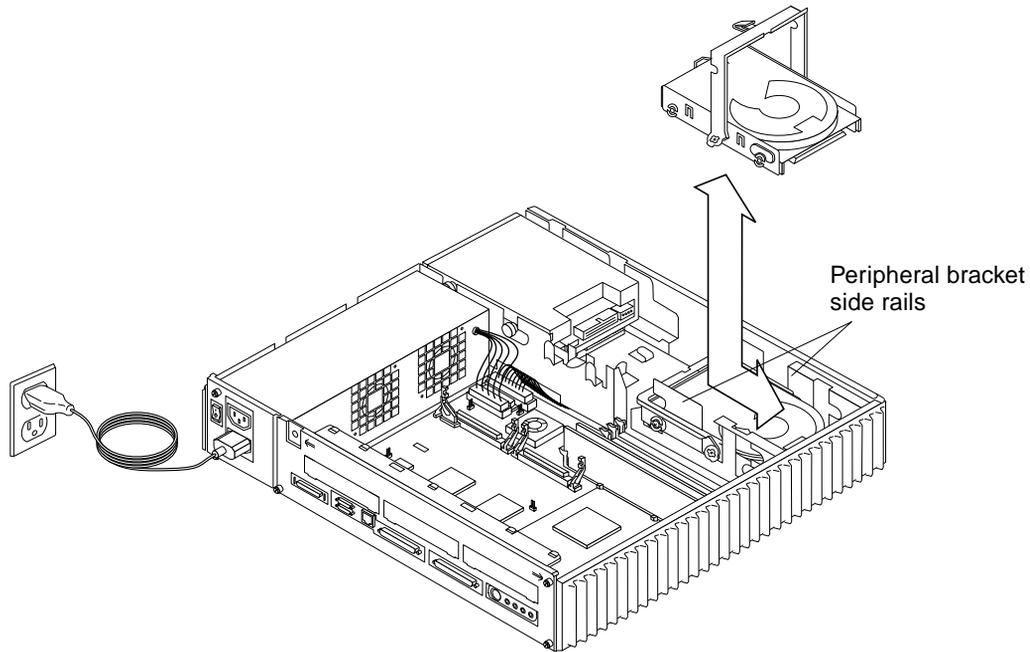
**FIGURE 9-3**  Replacing a Hard Disk Drive

**5. Repeat Steps 3 and 4 to reinstall the top disk drive (if necessary).**

**6. Detach the wrist strap and replace the cover.**
See Chapter 7.

**7. Power on the system.**
See Section 6.2 "Powering On the System."

# 9.2    CD-ROM Drive

## 9.2.1    Removing the CD-ROM Drive

**1. Shut down and power off the system.**
See Section 6.1 "Powering Off the System."

**2. Remove the cover and attach a wrist strap.**

See Chapter 7.

**3. To disengage the CD-ROM drive, push it toward the edge of the chassis.**

See FIGURE 9-4. The CD-ROM drive is installed above the diskette drive.

**4. Disconnect the SCSI data, DC power, and audio cables from the CD-ROM drive.**

Leave the cables plugged in to the system board.

**5. Lift the drive out of the chassis and place it on an antistatic surface.**
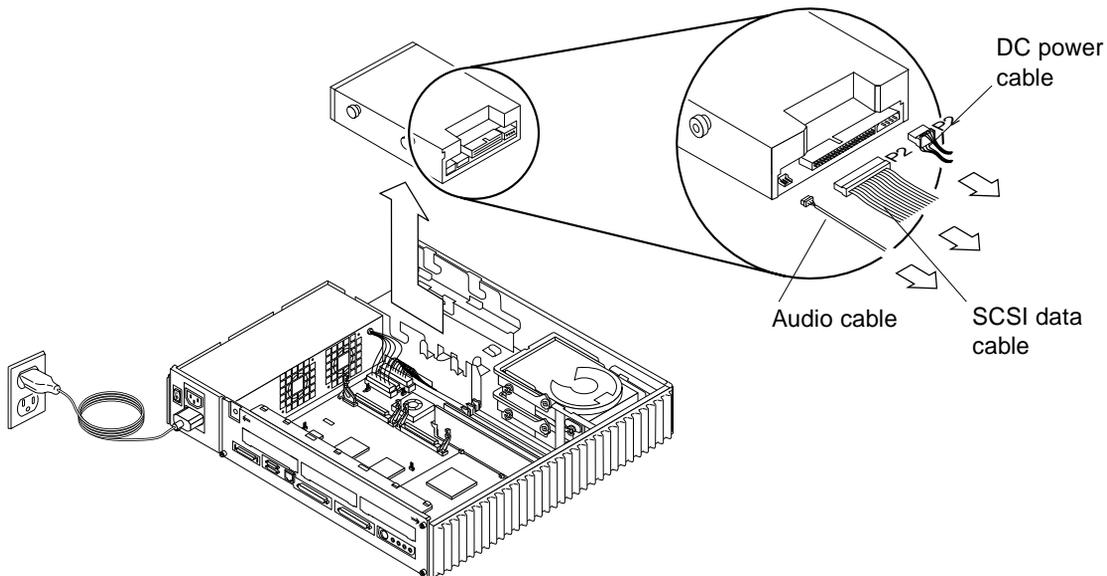


**FIGURE 9-4** Removing the CD-ROM Drive

## 9.2.2    Replacing the CD-ROM Drive

**1. Remove the replacement CD-ROM drive from its antistatic bag.**

All necessary brackets and grommets are installed on the CD-ROM drive when it is shipped to you.

**2. Ensure that the jumper settings on the replacement drive match those shown in**
FIGURE 9-5**.**

Jumpers should be present for SCSI address 6 (jumpers ID4 and ID2 set) and Term power should be set, all other jumpers should be removed.

> **Note –** If you are adding the CD-ROM drive, ensure that no external SCSI devices are using the SCSI address 6.
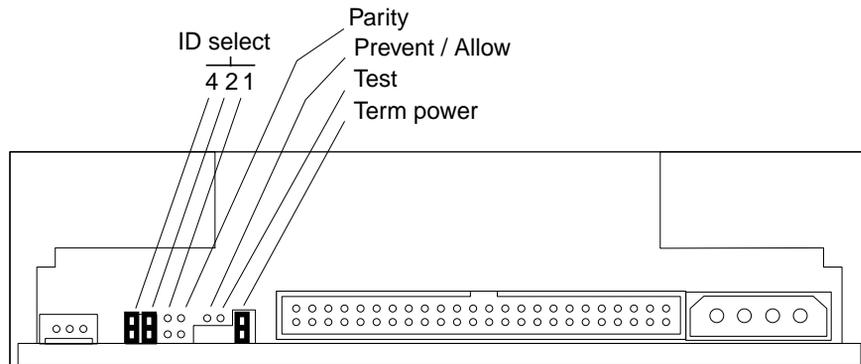


**FIGURE 9-5**   Jumper Settings for the CD-ROM Drive

**3. Install the drive as shown in** FIGURE 9-6.

The CD-ROM drive sits on the shelf above the diskette drive. Push the drive toward the center of the unit so that the grommets lock into place.

**4. Attach the SCSI data cable (labeled P2), the DC power cable (also labeled P2), and the audio cable to the CD-ROM drive.**

See FIGURE 9-6.
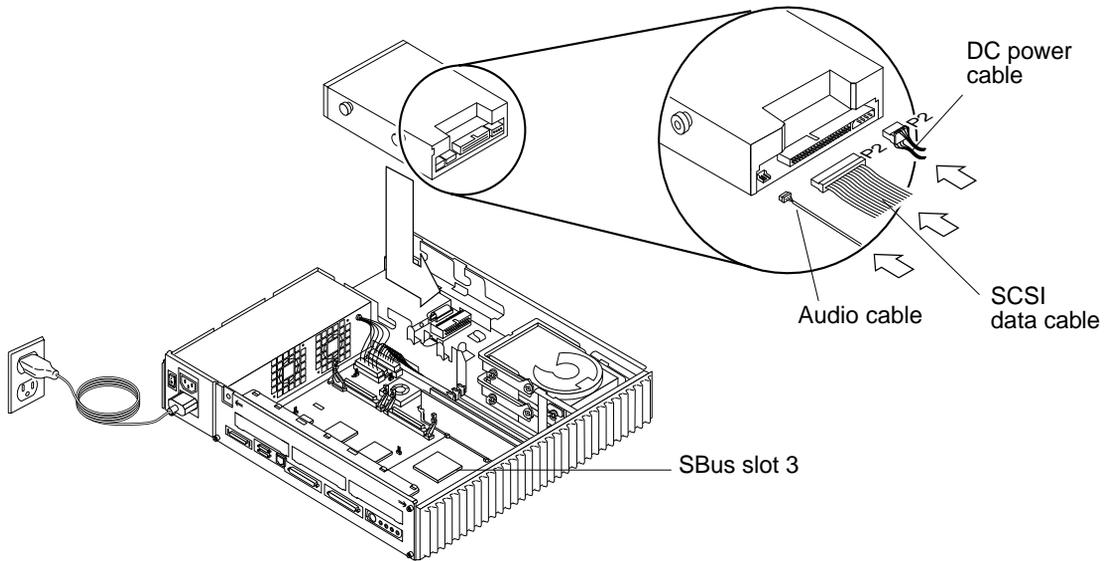
**FIGURE 9-6** Replacing the CD-ROM Drive

5. **Detach the wrist strap and replace the cover.**

   See Chapter 7.

6. **Power on the system.**

   See Section 6.2 "Powering On the System."

# 9.3 Diskette Drive

The diskette drive is located under the CD-ROM drive, adjacent to the power supply. In order to remove or install the diskette drive, you must first remove the CD-ROM drive if it is present. FIGURE 9-7 shows the locations of both drives.

The diskette drive is not a SCSI device. Some of the other drives in your system are SCSI devices—such as the CD-ROM drive and the hard disk drives. The diskette drive connects to an 8-bit internal bus in the SPARCstation 5 system.
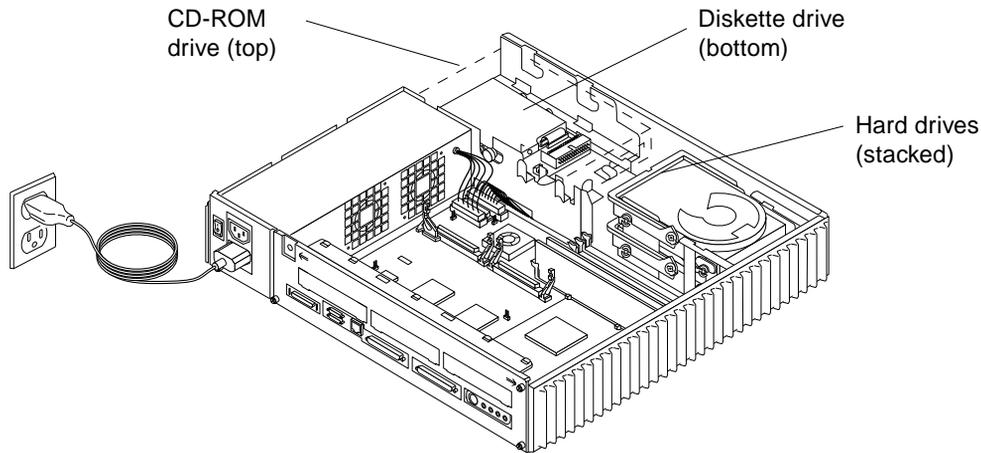
**FIGURE 9-7**   Diskette Drive Location

# 9.3.1   Removing the Diskette Drive

1. **Shut down and power off the system.**

   See Section 6.1 "Powering Off the System."

2. **Remove the cover and attach a wrist strap.**

   See Chapter 7.

3. **If the CD-ROM drive is not installed, remove the CD-ROM filler panel as shown in** FIGURE 9-8**. If the CD-ROM drive is installed, remove it.**

   See Section 9.2.1 "Removing the CD-ROM Drive," if you need to remove the CD-ROM drive.

Push tabs inward
and pull panel out.
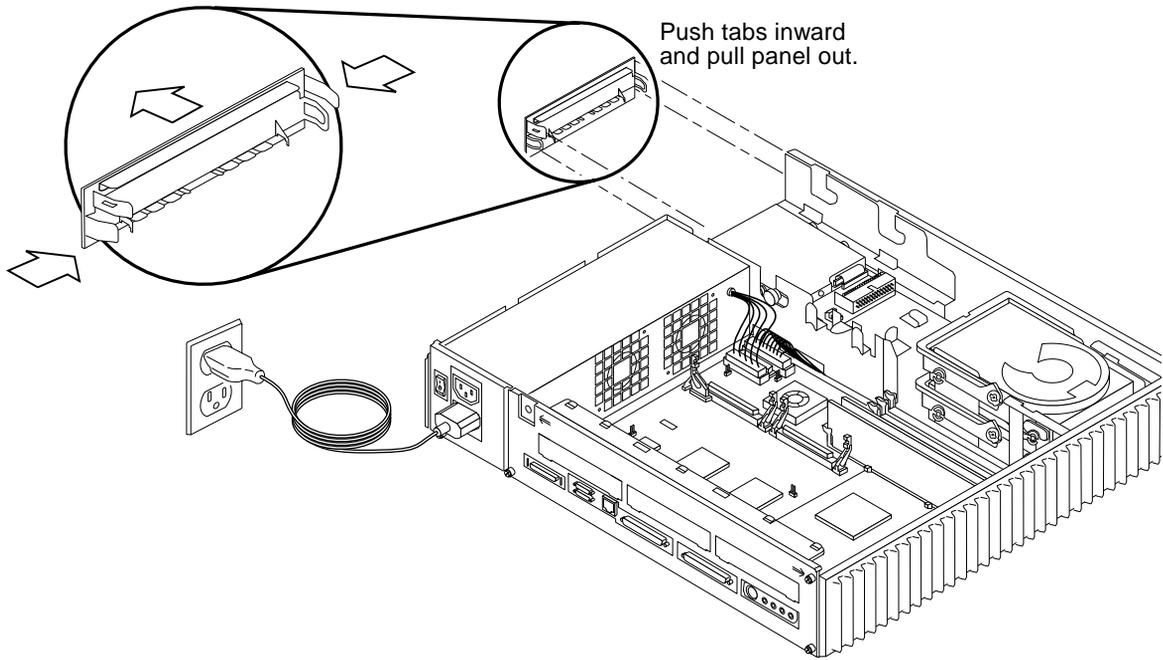
**FIGURE 9-8**    Removing the CD-ROM Filler Panel

**4. Remove the diskette drive filler panel (if present) in the same way as you remove the CD-ROM filler panel, as shown in** FIGURE 9-8**. If the diskette drive is installed, push the diskette drive toward the center of the chassis to disengage it.**

Do not push on the drive's front bezel. You may need to use a screwdriver for leverage. Use the screwdriver to push on the drive grommets as shown in FIGURE 9-9.
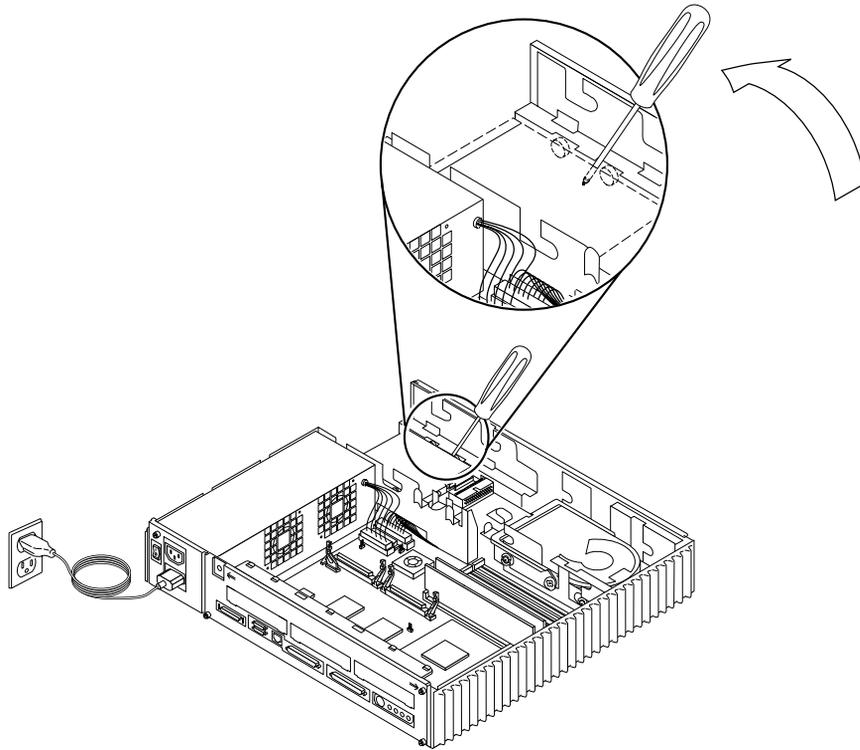
**FIGURE 9-9**  Disengaging the Diskette Drive

**5. Lift the diskette drive out of the drive bracket. Holding the drive in one hand, detach the diskette data and DC power cables from the drive with your other hand.**

See FIGURE 9-10.
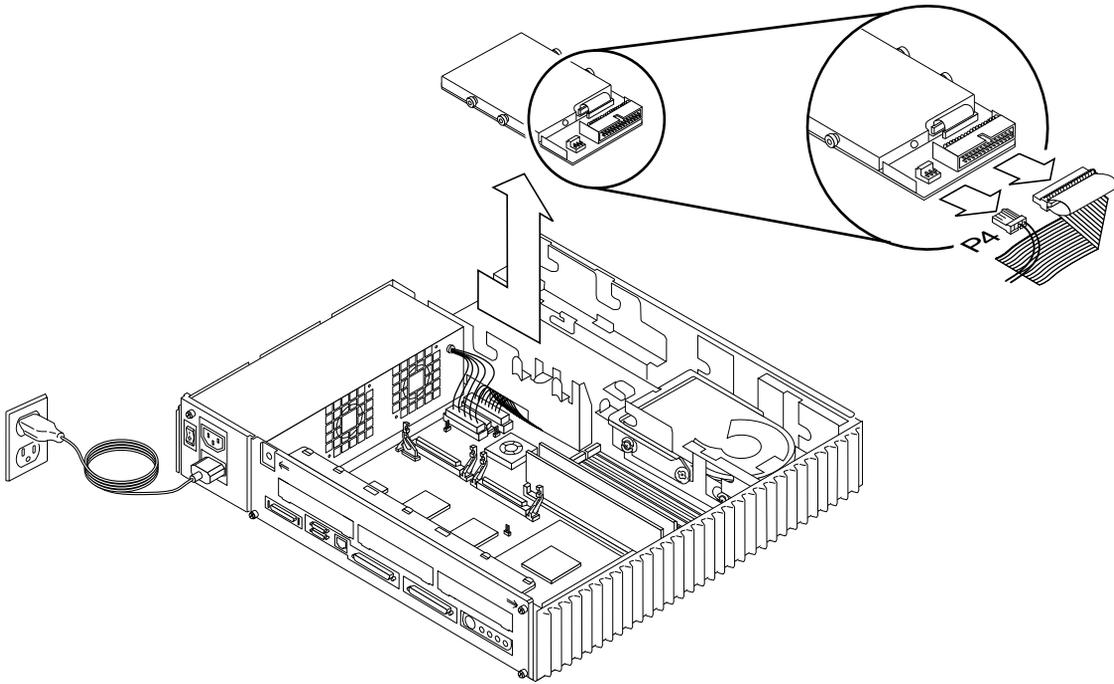
**FIGURE 9-10**  Removing the Diskette Drive

**6. Lift the diskette drive out of the chassis and place it on an antistatic mat.**

## 9.3.2      Replacing the Diskette Drive

**1. Remove the new diskette drive and its related parts from the antistatic bag, and place them on an antistatic surface.**

Read the diskette drive specifications sheet for related installation information.

**2. Hold the diskette drive in one hand, and lower it far enough into the chassis to connect the cables to the back of the drive.**

**3. Attach the diskette data cable and the DC power cable (labeled P4) to the drive connectors.**

See FIGURE 9-11.

**4. Lower the drive grommets into their corresponding slots in the side rails, and slide the drive until it is fully secured in the bracket.**

See FIGURE 9-11.

5. **Install the diskette drive outer filler panel by inserting the bottom tabs into the corresponding slots in the chassis, and rotating the panel upward into position.**
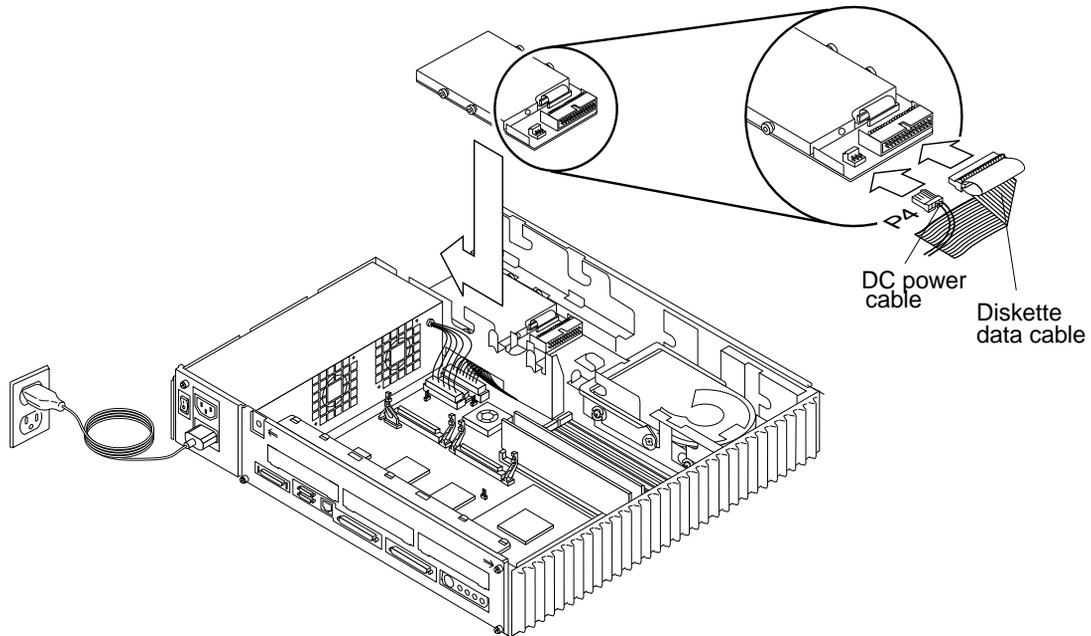


**FIGURE 9-11**  Replacing the Diskette Drive

6. **If there is a CD-ROM drive, reinstall it. Otherwise, replace the CD-ROM drive filler panel.**

   See FIGURE 9-8. If you need to install the CD-ROM drive, see Section 9.2.2 "Replacing the CD-ROM Drive."

7. **Detach the wrist strap and replace the cover.**

   See Chapter 7.

8. **Power on the system.**

   See Section 6.2 "Powering On the System."

# 9.4 Internal SCSI Data Cable

## 9.4.1 Removing the Internal SCSI Cable

1. **Shut down and power off the system.**

   See Section 6.1 "Powering Off the System."

2. **Detach all external cables from the rear panel except the power cord.**

3. **Remove the cover and attach a wrist strap.**

   See Chapter 7.

4. **Unplug the DC power, SCSI data, diskette data, speaker/LED, and CD-ROM audio cables from the system board.**

   See FIGURE 9-12. You may need to remove an SBus card to access the audio connector. See Section 11.1.1 "Removing an SBus Card."
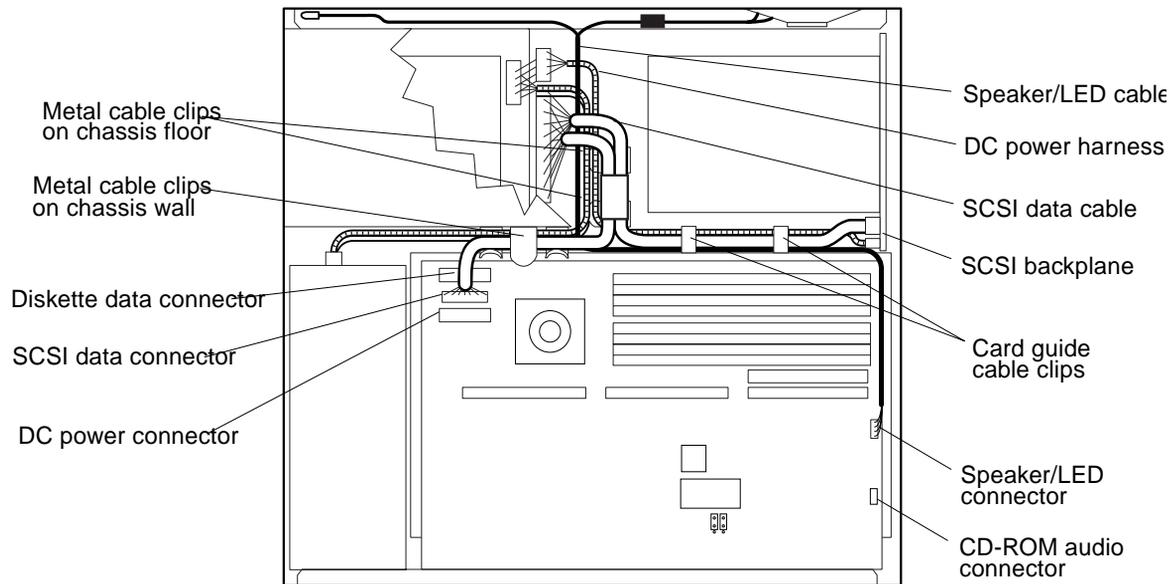


**FIGURE 9-12** System Board Cable Connections

5. **Loosen the two captive Phillips screws that secure the system board to the rear of the chassis.**

   See FIGURE 9-13.



Captive screw                    Captive screw
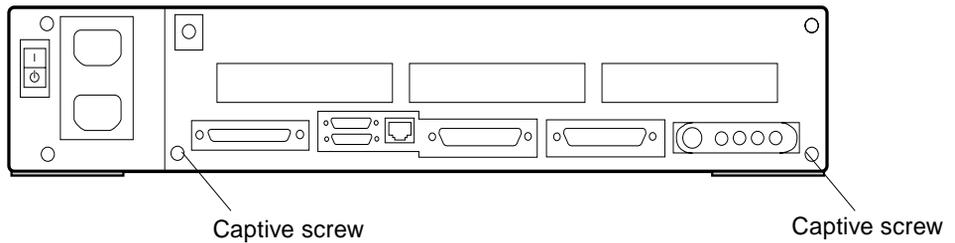
**FIGURE 9-13** Rear Panel Captive Screws

6. **Pull the board out of the back of the chassis until it clears the plastic card guide.**

   See FIGURE 9-14. Place the board on an antistatic surface.



Card guide
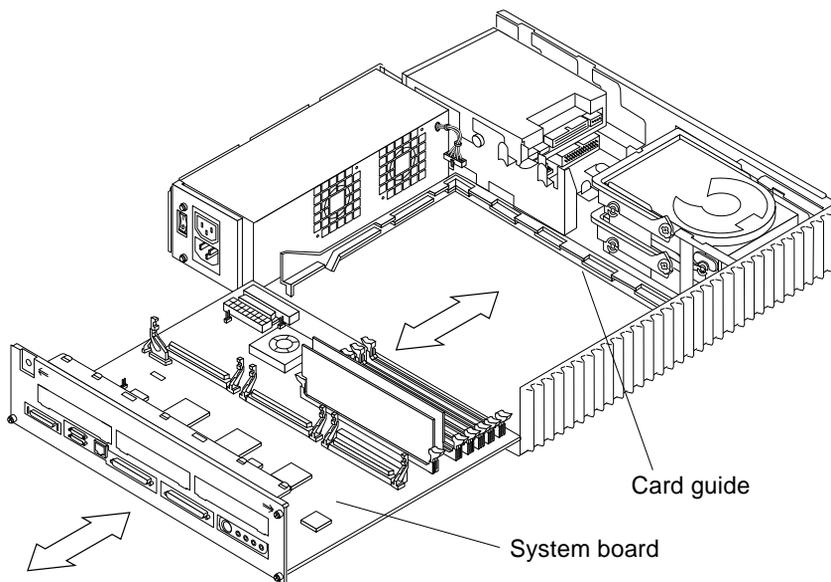
System board

**FIGURE 9-14** Removing the System Board

7. **Free the SCSI data cable from the metal cable clips on the chassis wall, and from the plastic cable clips on the card guide.**

   See FIGURE 9-12.

8. **Disconnect the DC power harness and the internal SCSI data cable from the SCSI backplane.**

    See FIGURE 9-12.

9. **Remove the internal SCSI data cable from the chassis.**

## 9.4.2    Replacing the Internal SCSI Data Cable

The internal SCSI cable assembly has three cable connectors; colored tape joins two of the cables close to the P2 connector. Markers on the cables will help you align them properly. The markers are a part-number (on a tape) and three connector labels (P1, P2, and P3).

When properly installed, the P1 cable of the assembly connects to the SCSI backplane with the part number aligned between the plastic cable clips on the card guide (see FIGURE 9-15). The P3 cable connects to the system board and is threaded through the chassis wall metal cable guides. The P2 connector is routed through the gap between the hard disk drive and the chassis wall. The P2 cable connects to the CD-ROM drive (if installed), or is secured under the metal cable clips on the chassis floor.

1. **Secure the SCSI data cable under the plastic card guide cable clips.**

    See FIGURE 9-15. The part number portion of the SCSI data cable should be positioned directly between the plastic card guide cable.
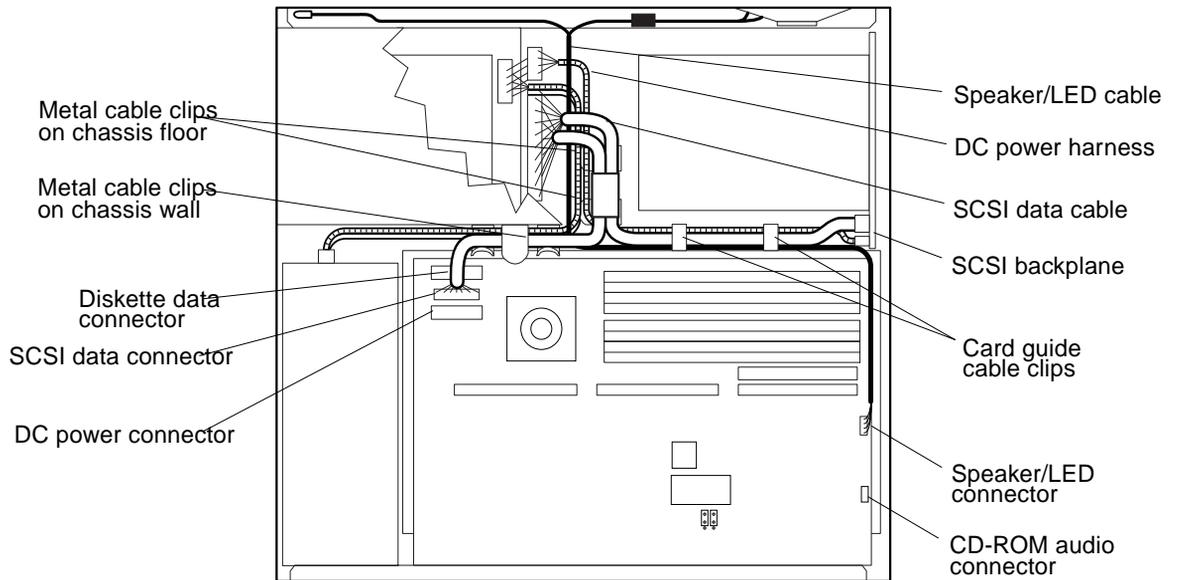
**FIGURE 9-15** Internal Cable Routing

**2. Connect the SCSI data cable to the SCSI backplane.**

**3. Connect the DC power harness to the SCSI backplane.**

**4. Insert the front edge of the system board into the card guide. Lift the rear of the board slightly and slide it along the card guide until it is fully inserted.**

See FIGURE 9-16.
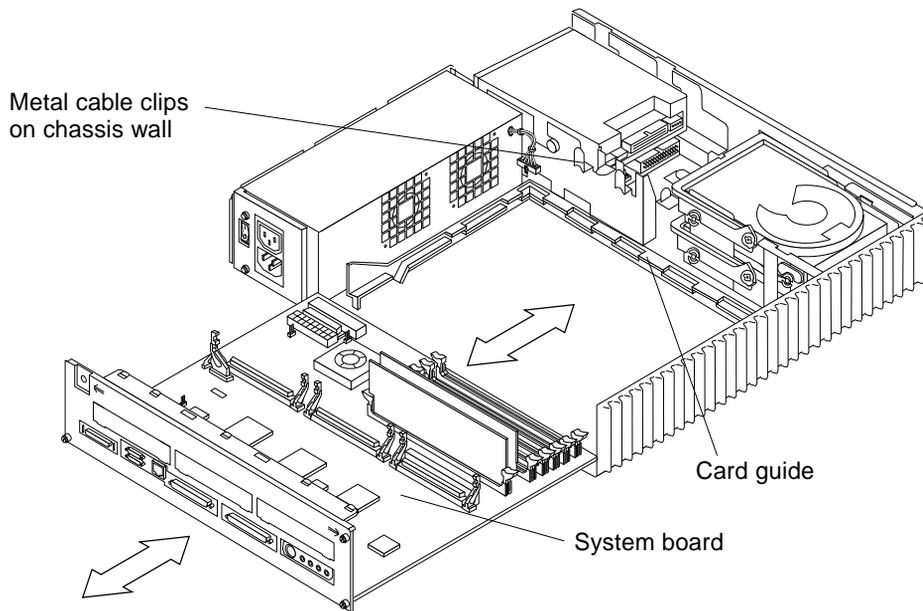
**FIGURE 9-16**  Replacing the System Board

**5. Reconnect the DC power, SCSI data, diskette data, speaker/LED, and CD-ROM audio cables to the system board.**

See FIGURE 9-15. Thread the SCSI data cable through the metal cable clips on the chassis wall *after* it is plugged in to the system board.

**6. Reinstall the SBus card (if necessary).**

See Section 11.1.2 "Replacing an SBus Card."

**7. Tighten the two captive Phillips screws that secure the board to the rear of the chassis.**

See FIGURE 9-17.
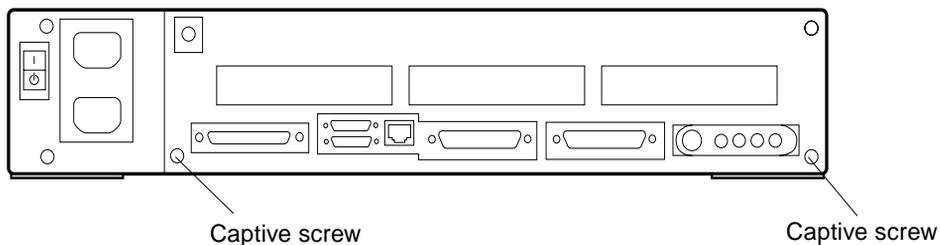


**FIGURE 9-17**  Backpanel Captive Screws

8. **Detach the wrist strap and replace the cover.**

   See Chapter 7.

9. **Reconnect all external cables to the rear panel.**

10. **Power on the system.**

    See Section 6.2 "Powering On the System."

# 9.5 Peripherals DC Power Harness

## 9.5.1 Removing the Peripherals DC Power Harness

1. **Shut down and power off the system.**

   See Section 6.1 "Powering Off the System."

2. **Detach all external cables from the rear panel, including the power cord.**

3. **Remove the cover and attach a wrist strap.**

   See Chapter 7.

4. **Unplug the DC power, SCSI data, diskette data, speaker/LED, and CD-ROM audio cables from the system board.**

   See FIGURE 9-18. You may need to remove an SBus card to access the audio connector. See Section 11.1.1 "Removing an SBus Card."

Diskette data connector

SCSI data connector

DC power connector

Speaker/LED connector

CD-ROM audio connector
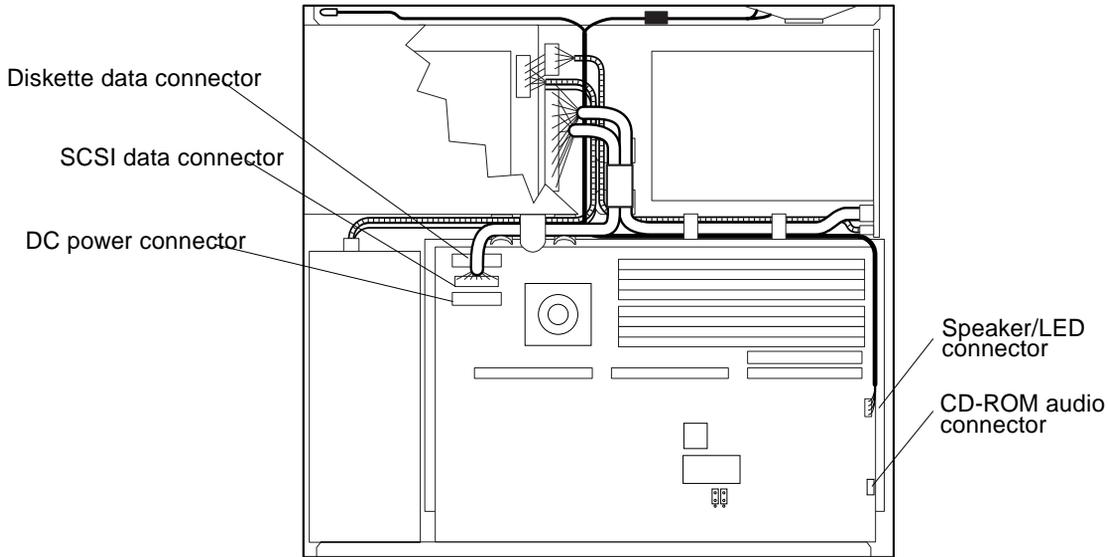
**FIGURE 9-18** System Board Cable Connections

5. **Loosen the two captive Phillips screws that secure the system board to the rear of the chassis.**

See FIGURE 9-19.



Captive screw
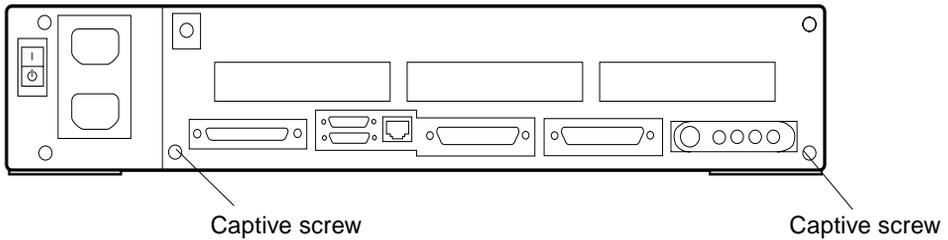
Captive screw

**FIGURE 9-19** Rear Panel Captive Screws

6. **Pull the board out of the back of the chassis until it clears the plastic card guide.**

See FIGURE 9-20. Place the board on an antistatic surface.

Card guide
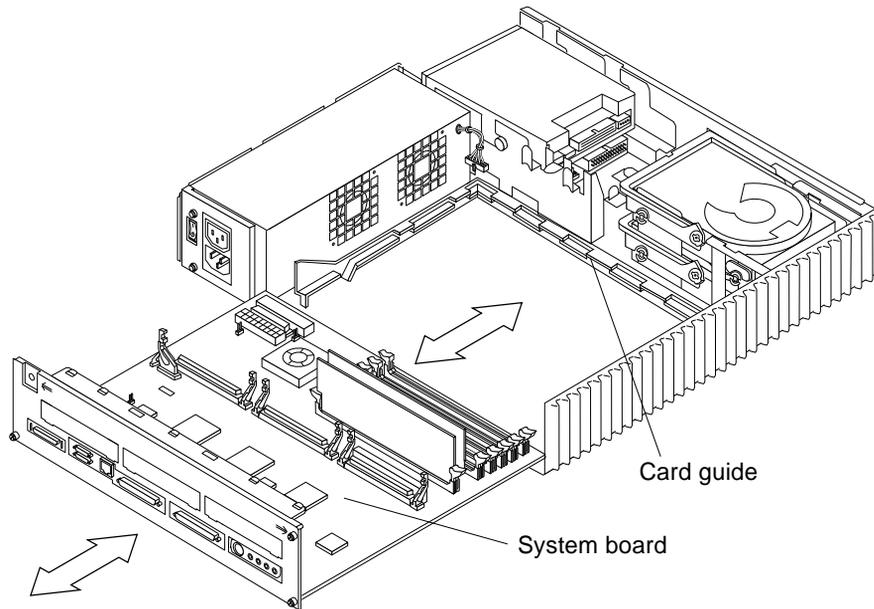
System board

**FIGURE 9-20**  Removing the System Board

7. **Remove the CD-ROM drive (if present).**

   See Section 9.2.1 "Removing the CD-ROM Drive."

8. **Disconnect the DC power harness from the diskette drive.**

9. **Free the SCSI data cable from the metal cable clips on the chassis wall and from the card guide plastic cable clips.**

   See FIGURE 9-21.

10. **Disconnect the SCSI data cable from the SCSI backplane.**

    See FIGURE 9-21.

11. **Work the DC power harness (labeled P3) free from the card guide clips and disconnect it from the SCSI backplane.**

    See FIGURE 9-21.

Metal cable clips
on chassis floor

Metal cable clips
on chassis wall

Diskette data connector

SCSI data connector

DC power connector

Speaker/LED cable

DC power harness

SCSI data cable

SCSI backplane

Card guide
cable clips

Speaker/LED
connector

CD-ROM audio
connector
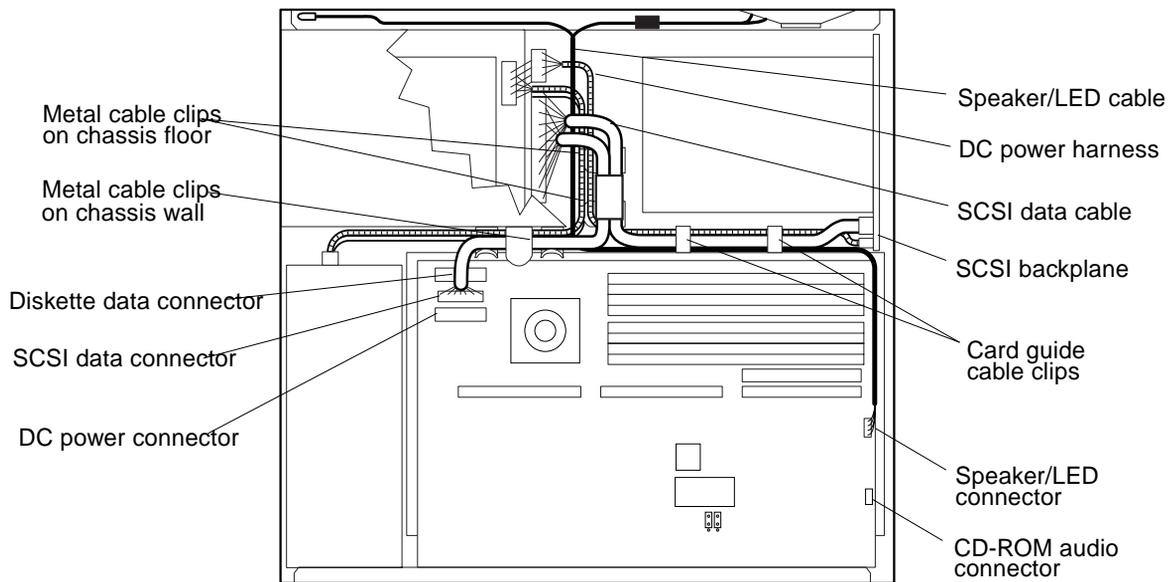
**FIGURE 9-21**  Internal Cable Routing

**12. Remove the power supply.**

See Section 8.1.1 "Removing the Power Supply."

**13. Disconnect the DC power harness (labeled P1) from the power supply and remove the harness from the system chassis.**

## 9.5.2    Replacing the Peripherals DC Power Harness

Markers on the DC power harness will help you to route the harness through the cable clips. The markers are either tie-wrap cords or colored tape affixed to each cable.

When properly installed, the two colored tape marks on the P1 (power supply) harness should straddle the metal cable clips on the chassis wall that is closest to the system board. The P2 (CD-ROM drive) harness connects to the CD-ROM DC power connector. The second colored tape mark (farthest from the P3 connector) on the P3 (SCSI backplane) harness  should be centered under the second plastic cable guide clip. The P4 (diskette drive) harness should be threaded through the chassis wall with the diskette data cable, and secured under the first metal cable clip on the chassis floor.

1. **Route the power supply harness (labeled P1) through the metal cable clips on the chassis wall.**

   See FIGURE 9-21. The two colored tape marks on the DC power harness should straddle the cable clips.

2. **Route the SCSI backplane DC power harness (labeled P3) under the plastic cable clips on the card guide to the SCSI backplane.**

   See FIGURE 9-21.

3. **Thread the diskette drive DC power harness (labeled P4) through the hole in the chassis wall with the diskette data cable.**

   See FIGURE 9-22.

4. **Route the SCSI data cable (labeled P1) between the plastic clips at the rear of the card guide and connect it to the SCSI backplane.**

   See FIGURE 9-21.

5. **Connect the DC power harness (labeled P3) to the SCSI backplane.**

   See FIGURE 9-21.

6. **Reinstall the power supply.**

   See Section 8.1.2 "Replacing the Power Supply."

7. **Connect the DC power harness (labeled P4) to the diskette drive (if present).**

8. **Insert the front edge of the system board into the card guide. Lift the rear of the board slightly and slide it along the card guide until it is fully inserted.**

   See FIGURE 9-22.
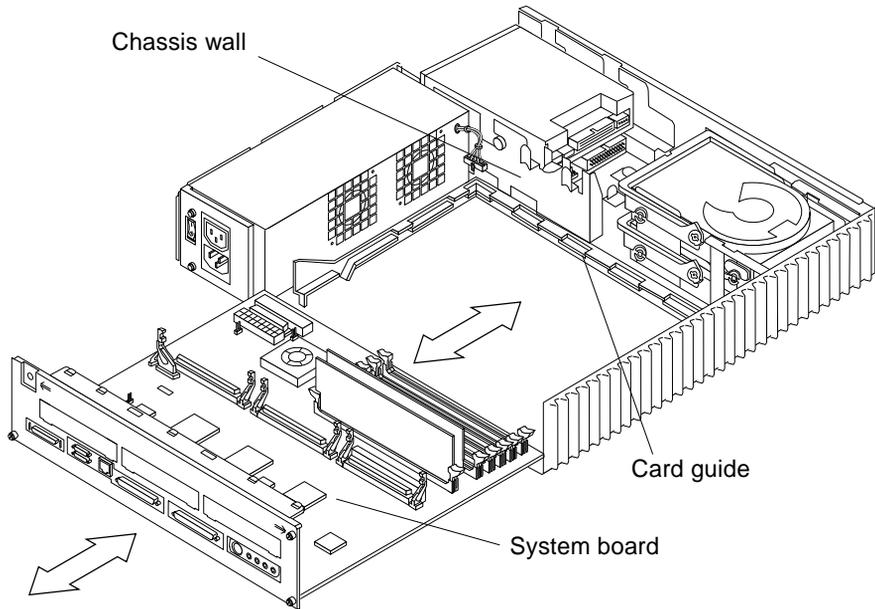
**FIGURE 9-22** Replacing the System Board

9. **Reconnect the DC power, diskette data, SCSI data, speaker/LED, and the audio cables to the system board.**

   See FIGURE 9-21. Thread the SCSI data cable through the metal cable clips on the chassis wall *after* it is plugged in to the system board.

10. **Reinstall the SBus card (if necessary).**

    See Section 11.1.2 "Replacing an SBus Card."

11. **Tighten the two captive Phillips screws that secure the board to the rear of the chassis.**

    See FIGURE 9-23.
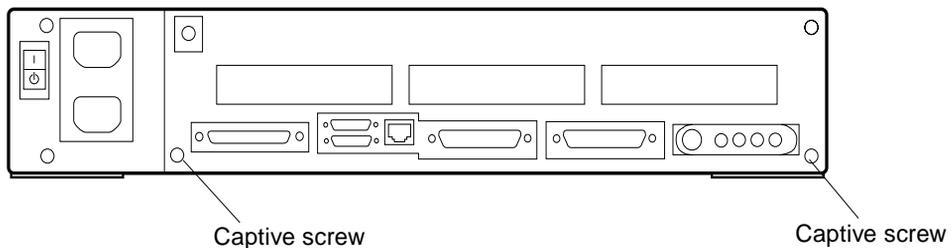


**FIGURE 9-23** Rear Panel Captive Screws

12. **Reinstall the CD-ROM drive (if necessary).**

See Section 9.2.2 "Replacing the CD-ROM Drive."

13. **Detach the wrist strap and replace the cover.**

See Chapter 7.

14. **Reconnect all external cables to the rear panel.**

15. **Power on the system.**

See Section 6.2 "Powering On the System."

# 9.6 Diskette Data Cable

## 9.6.1 Removing the Diskette Data Cable

1. **Shut down and power off the system.**

See Section 6.1 "Powering Off the System."

2. **Remove the cover and attach a wrist strap.**

See Chapter 7.

3. **Remove the CD-ROM drive (if present).**

See Section 9.2.1 "Removing the CD-ROM Drive."

4. **Remove the diskette drive.**

See Section 9.3.1 "Removing the Diskette Drive."

5. **Unplug the diskette data cable from the system board.**

See FIGURE 9-24.

6. **Carefully note how the diskette data cable is routed, and then remove it from the system chassis.**

Diskette data connector
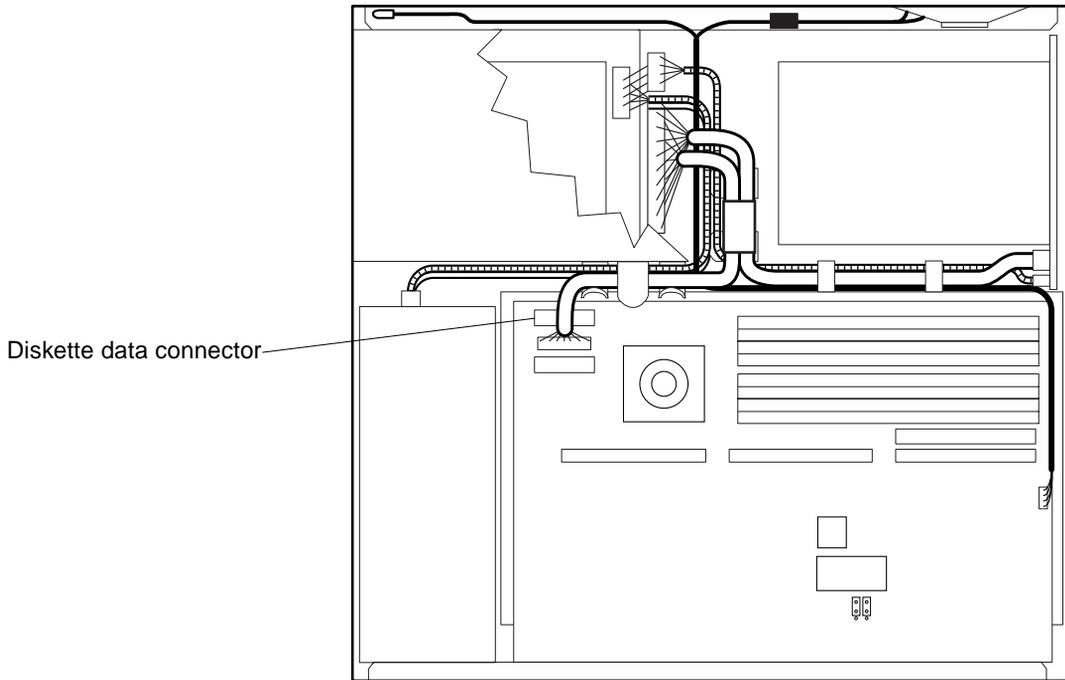
**FIGURE 9-24** System Board Cable Routing

## 9.6.2 Replacing the Diskette Data Cable

1. **Route the replacement cable in the same manner as the defective cable that you just removed.**

   The cable should run under the first metal cable clip in the chassis floor.

2. **Connect the diskette data cable to the system board.**

   See FIGURE 9-24.

3. **Install the diskette drive.**

   See Section 9.3.2 "Replacing the Diskette Drive."

4. **Install the CD-ROM drive (if necessary).**

   See Section 9.2.2 "Replacing the CD-ROM Drive."

5. **Detach the wrist strap and replace the cover.**

   See Chapter 7.

**6. Power on the system.**

See Section 6.2 "Powering On the System."

# 9.7 CD-ROM Audio Cable

## 9.7.1 Removing the CD-ROM Audio Cable

**1. Shut down and power off the system.**

See Section 6.1 "Powering Off the System."

**2. Remove the cover and attach a wrist strap.**

See Chapter 7.

**3. Disconnect the CD-ROM audio cable from the CD-ROM drive.**

See FIGURE 9-25.

CD-ROM audio
cable connector
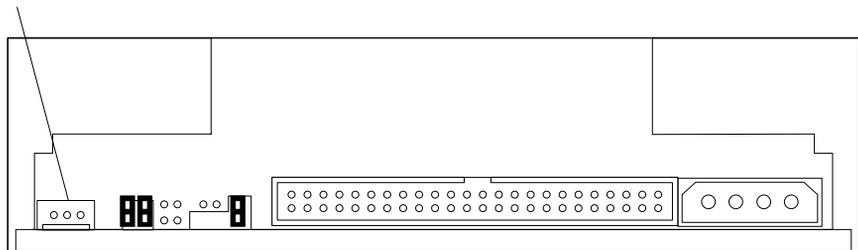


**FIGURE 9-25**  Audio Cable Connector on the CD-ROM Drive

**4. Disconnect the CD-ROM audio cable from its connector on the system board.**

See FIGURE 9-26. You may need to remove an SBus card to access the audio connector.
See Section 11.1.1 "Removing an SBus Card."

**5. Carefully note how the CD-ROM audio cable is routed, and remove it from the
system chassis.**

Card guide
cable clips

CD-ROM audio
connector
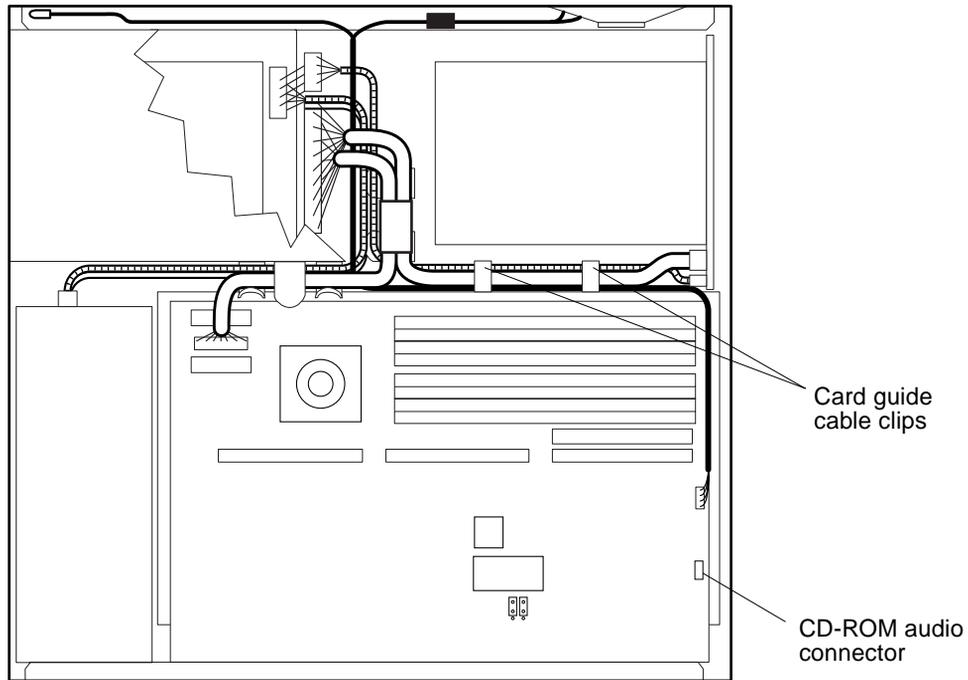
**FIGURE 9-26**  CD-ROM Audio Connector on the System Board

## 9.7.2    Replacing the CD-ROM Audio Cable

1. **Route the replacement cable in the same manner as the defective cable that you just removed.**

   Secure the cable beneath the plastic cable clips on the card guide. See FIGURE 9-26.

2. **Connect the CD-ROM audio cable to the system board.**

   See FIGURE 9-26.

3. **Connect the CD-ROM audio cable to the audio connector on the CD-ROM drive.**

   See FIGURE 9-25.

4. **Reinstall the SBus card (if necessary).**

   See Section 11.1.2 "Replacing an SBus Card."

5. **Detach the wrist strap and replace the cover.**

   See Chapter 7.

**6. Power on the system.**

See Section 6.2 "Powering On the System."

# System Board Overview

This chapter describes precautions you should take when handling the system board. It also shows the layout of the system board and identifies the replaceable components of the system board.

- "Damage Prevention" on page 1
- "Handling System Boards and Assemblies" on page 1
- "System Board Layout" on page 2
- "Replaceable System Board Components" on page 3

## 10.1    Damage Prevention

⚠ **Caution –** Use an antistatic mat when working with the system board. An antistatic mat contains the amount of cushioning needed to protect the underside components, to prevent board flexing, and to provide antistatic protection. Part numbers for antistatic mats from Sun Microsystems are listed in Chapter 12 "Illustrated Parts Breakdown.

## 10.2    Handling System Boards and Assemblies

⚠ **Caution –** The system chassis power switch must be set to Standby, and the AC power cord must remain plugged in to ensure a proper ground.

**Caution –** Surfaces are *hot* and may cause personal injury if touched. Avoid contact.

**Caution –** The system board and related modules and cards have surface-mount components that may break if the board is flexed.

To minimize the amount of board flexing, observe the following precautions:

■ Hold the system board only by the edges.
■ Do not place the system board, SBus cards, DSIMMs, or chips on a hard surface. Use a cushioned antistatic mat. See Chapter 12 "Illustrated Parts Breakdown."
■ Transport the board in an antistatic bag.

Protect yourself and the equipment by observing the safety precautions described in Chapter 5.

# 10.3    System Board Layout

FIGURE 10-1 shows the major components on the system board.
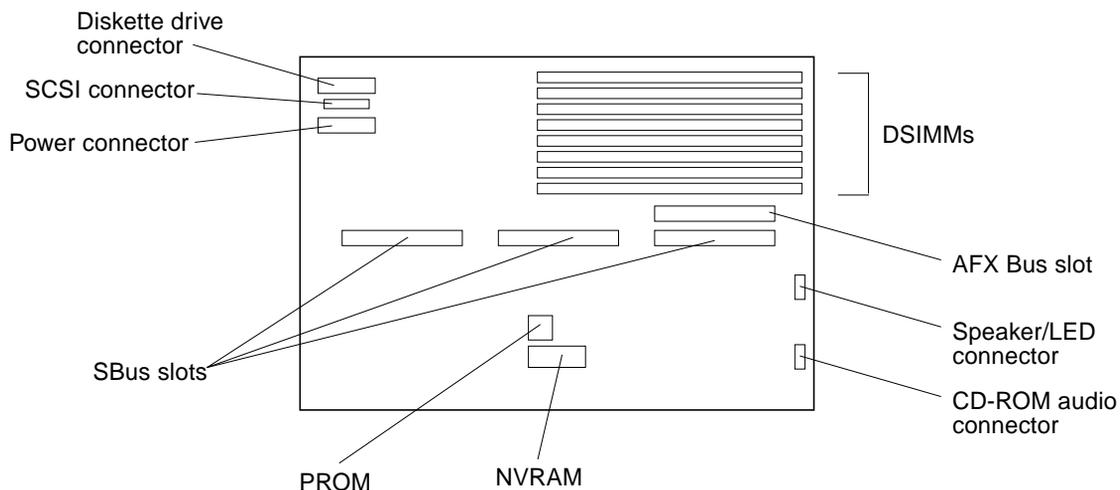


**FIGURE 10-1**  SPARCstation 5 System Board

# 10.4 Replaceable System Board Components

The following system board components are replaceable:

- DSIMMs
- S24 card
- SBus cards
- NVRAM
- System board

Chapter 11 "System Board and Component Replacement, describes how to remove and replace these components.

# System Board and Component Replacement

This chapter describes how to remove, replace, and configure the SPARCstation 5 system board and its replaceable parts.

- "SBus Cards" on page 1
- "S24 Frame Buffer Card" on page 8
- "DSIMMs" on page 13
- "System Board" on page 18
- "NVRAM" on page 24

## 11.1    SBus Cards

The system board has three locations for SBus cards (see FIGURE 11-1).
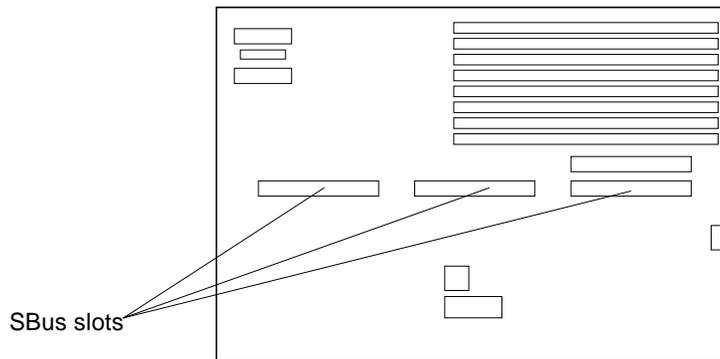
**FIGURE 11-1** SBus Slot Locations

**Note –** An SBus card extractor is included with all SBus card customer-replaceable units (CRUs). You must remove the extractor from the replacement card and install it on the defective card. Then use the SBus card extractor to remove the defective card from the system unit. If you need to remove an SBus card temporarily, and you do not have a replacement card, try to find an extractor from some other source. If an extractor is not available, place both thumbs beneath the corners of the card where it connects to the system board. Carefully push upward with your thumbs until the card disconnects from the system board.

## 11.1.1    Removing an SBus Card

1. **Shut down and power off the system.**

   See Section 6.1 "Powering Off the System."

2. **Remove the cover and attach a wrist strap.**

   See Chapter 7.

3. **Push the card retainers back from the edge of the SBus card.**

   See FIGURE 11-2.

Push back both
card retainers.
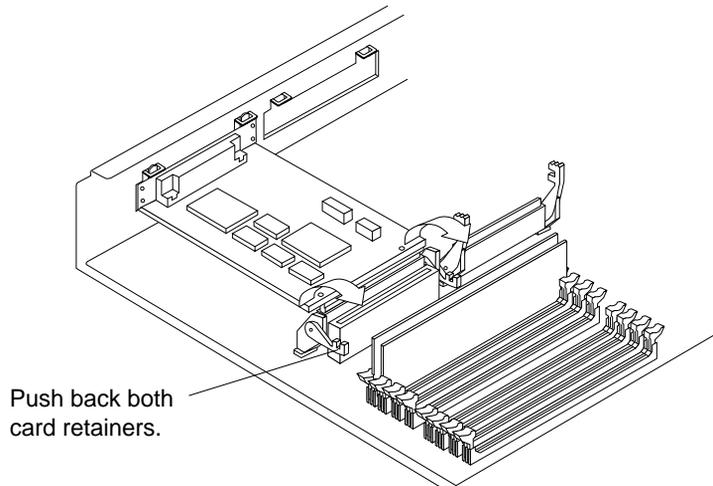
**FIGURE 11-2**  Opening the SBus Card Retainers

**4. Remove the SBus card extractor from the replacement SBus card:**

**a. Bend one leg of the extractor slightly to the outside until the hook clears the hole in the SBus card.**

See FIGURE 11-3.

**b. Remove the other side of the extractor, which should come out easily without bending it.**

Place the replacement SBus card on an antistatic surface.

SBus card
extractor

Replacement
SBus card
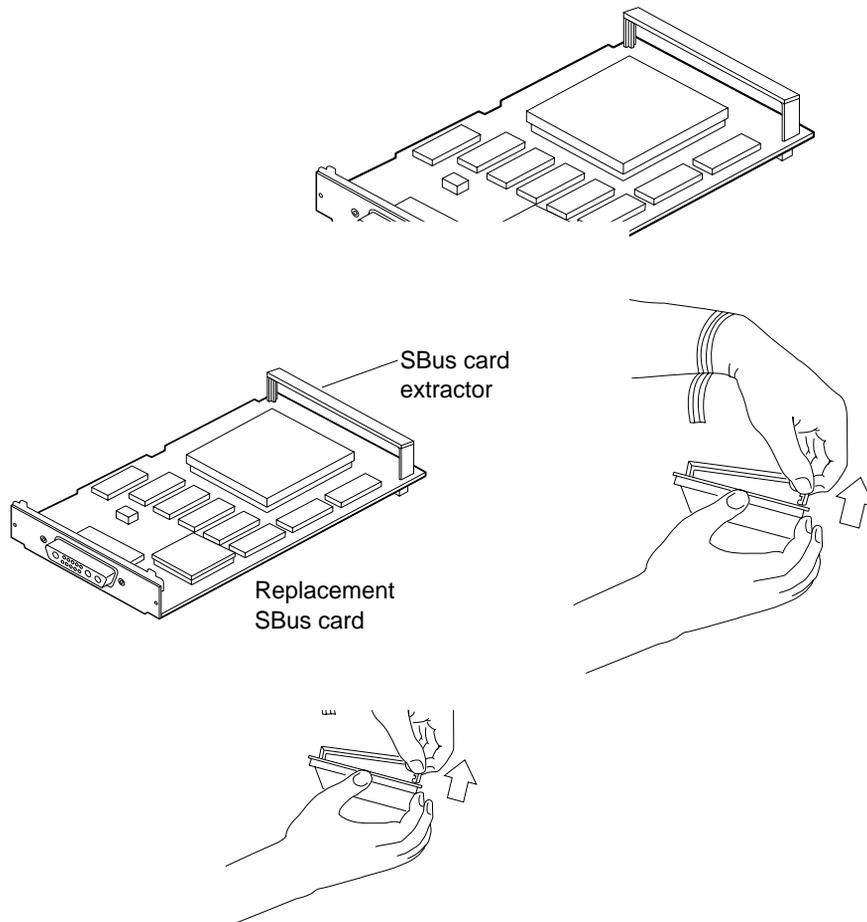
**FIGURE 11-3**  Removing the Extractor From the SBus Card

**5. Insert the legs of the card extractor into the holes on the faulty SBus card.**

See FIGURE 11-4. Use two extractors for a double-width card.

Install card
extractor.
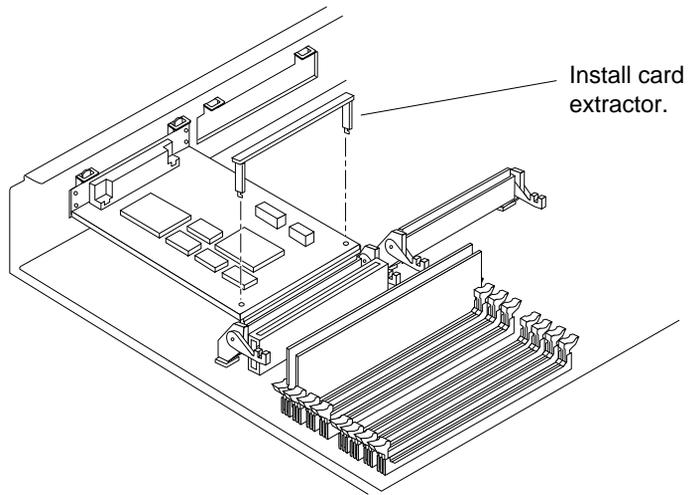
**FIGURE 11-4**  Installing the SBus Card Extractor

**6. Hold both ends of the card extractor. Pull upward slowly until the connector is detached from the slot.**

See FIGURE 11-5 and FIGURE 11-6.
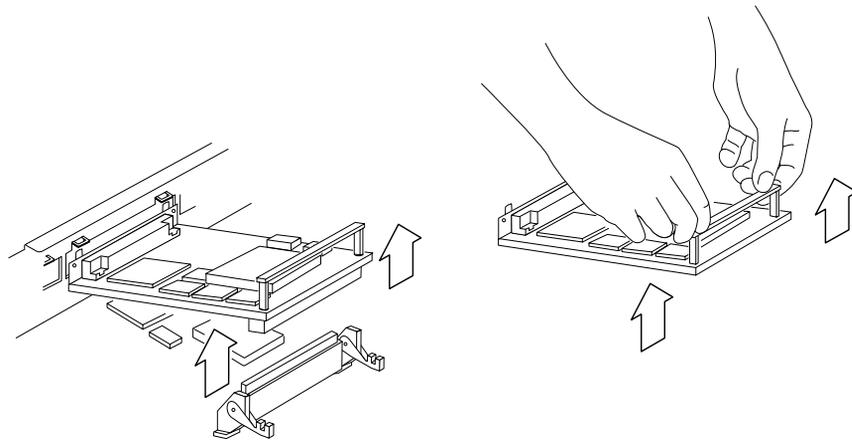


**FIGURE 11-5**  Removing a Single-Width SBus Card
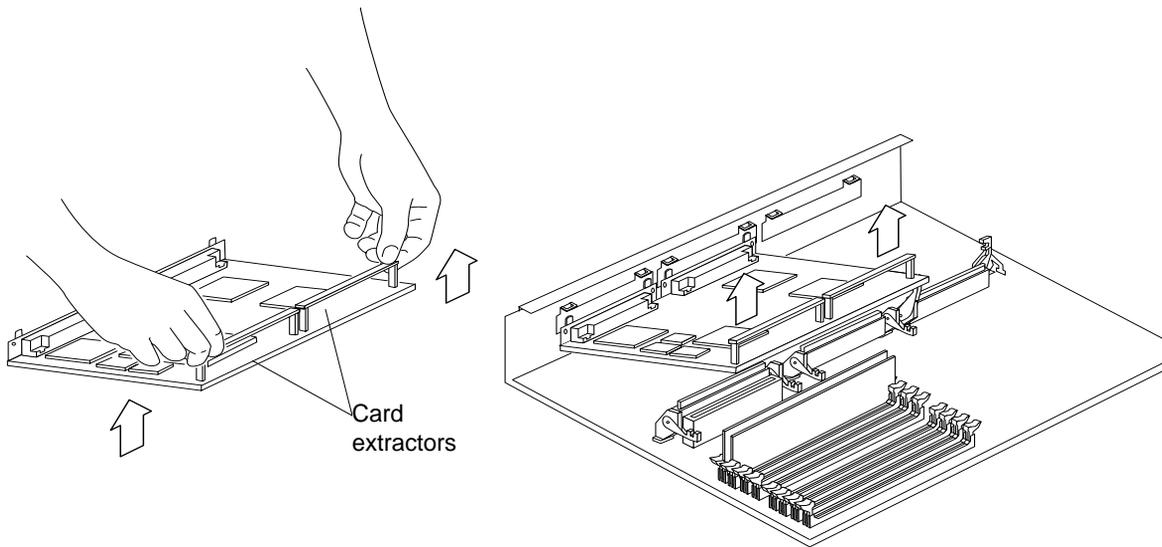
Card extractors

**FIGURE 11-6**  Removing a Double-Width SBus Card

7. **Remove the card extractor from the SBus card:**

   a. **Bend one leg of the extractor slightly to the outside until the hook clears the hole in the SBus card.**

      See FIGURE 11-3.

   b. **Remove the other side of the extractor, which should come out easily without bending.**

8. **Place the faulty SBus card on an antistatic surface.**

   Do not confuse it with the replacement card.

## 11.1.2  Replacing an SBus Card

1. **If required for your card, set the jumpers or switches on the replacement card.**

   See the manual for your SBus product.

2. **Push back the two card retainers on the SBus connector (if necessary).**

   See FIGURE 11-7.

3. **Holding the card at an angle to the rear panel, insert the tabs on the card backplate into the corresponding slots on the rear panel.**

   See FIGURE 11-7.
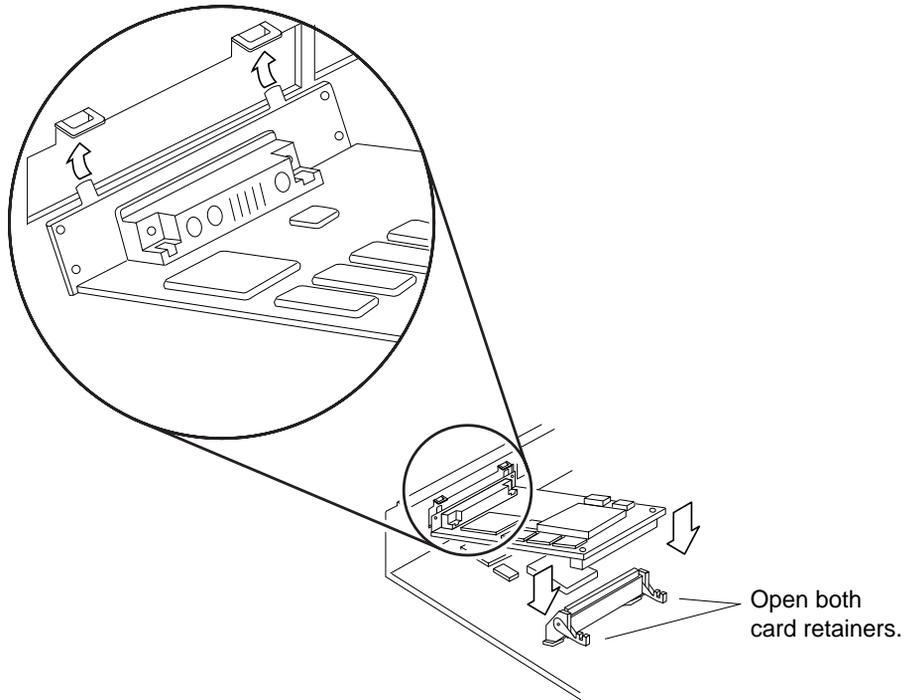
**FIGURE 11-7** Inserting the SBus Card

**4. Carefully align the SBus card connector with the socket on the system board. Press the corners of the card to push the connector into the socket.**

See FIGURE 11-7.

**Caution –** Do not force the card. Align the card connector and socket properly or you may damage the pins on the card.

Close both
card retainers.
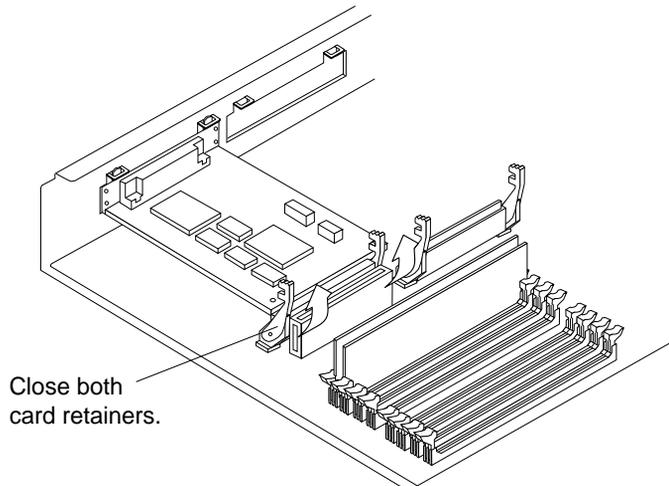
**FIGURE 11-8**  Closing the SBus Card Retainers

5. **Push the card retainers forward to clamp down the SBus card.**

   See FIGURE 11-8.

6. **Detach the wrist strap and replace the cover.**

   See Chapter 7 ".

7. **Power on the system.**

   See Section 6.2 "Powering On the System."

# 11.2   S24 Frame Buffer Card

The S24 frame buffer card plugs in to the AFX Bus slot shown in FIGURE 11-9.
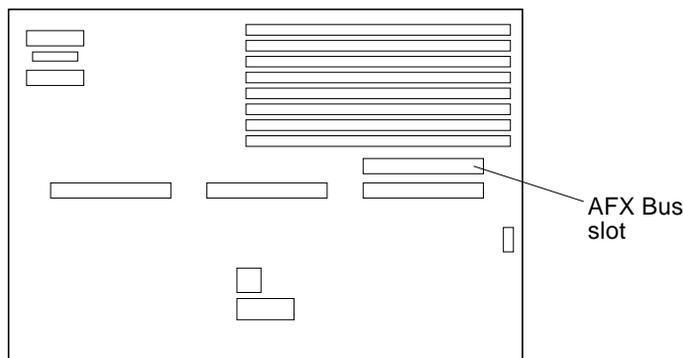
AFX Bus slot

**FIGURE 11-9**  AFX Bus Slot

---

**Note –** A card extractor is included with all S24 card CRUs. You must install the card extractor on the defective card to remove the card from the system unit. If you need to remove the S24 card temporarily, and you do not have a replacement card, try to find an extractor from some other source. If an extractor is not available, push the card retainers back and place both thumbs beneath the corners of the card where it connects to the system board. Carefully push upward with your thumbs, applying equal pressure to both corners, until the card disconnects from the system board.

---

## 11.2.1    Removing an S24 Frame Buffer Card

1. **Shut down and power off the system.**

   See Section 6.1 "Powering Off the System."

2. **Remove the cover and attach a wrist strap.**

   See Chapter 7.

3. **Unpack the S24 replacement card and locate the card extractor that comes with it.**

   Handling the replacement card only by its edges, place it on an antistatic surface. The card's protective packaging makes a good antistatic surface. See FIGURE 11-10 to identify the card extractor.

4. **Locate the defective S24 card and push the card retainers back from the edge of the card.**

   See FIGURE 11-10.

5. **Insert the legs of the card extractor into the holes on the faulty S24 card.**

   See FIGURE 11-10.

Install card
extractor.

Push back both
card retainers.
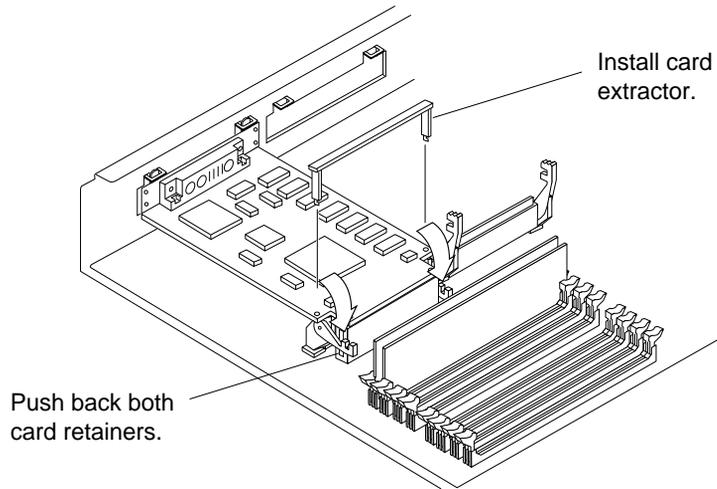
**FIGURE 11-10** Opening the Card Retainers

**6. Hold both ends of the card extractor. Pull upward slowly and evenly until the connector is detached from the slot.**

See FIGURE 11-11.

Lift both ends of card
extractor simultaneously
to prevent pin damage.
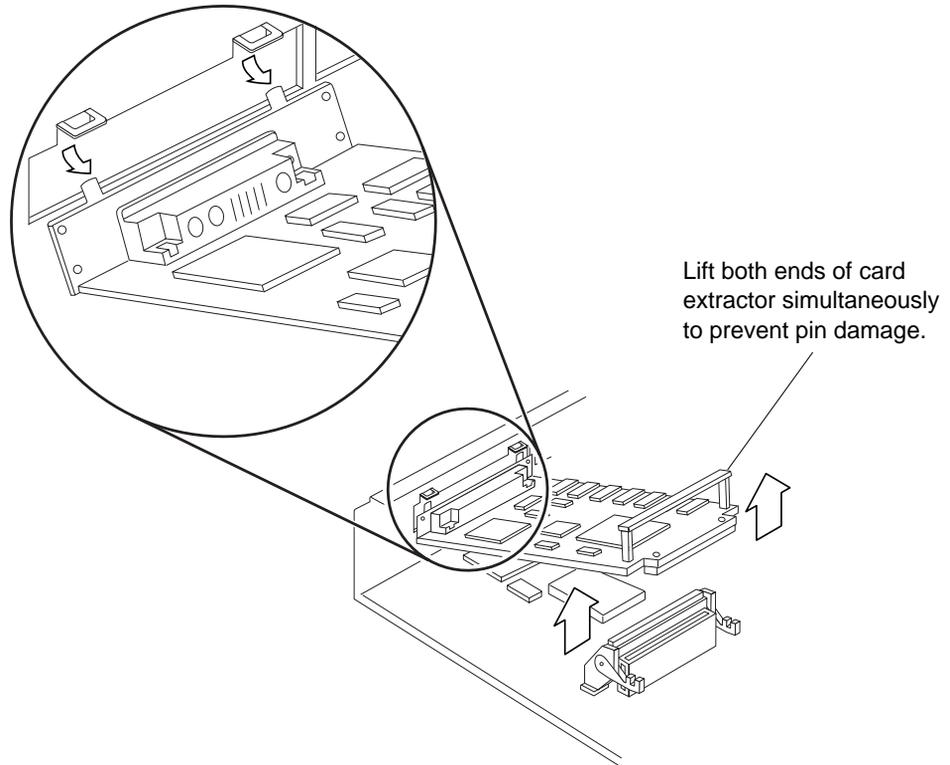
**FIGURE 11-11** Removing an S24 Frame Buffer Card

7. **Continue to lift the extractor while lowering the opposite end of the card to free it from the back panel.**

   Place the faulty S24 card on an antistatic surface.

## 11.2.2    Replacing an S24 Frame Buffer Card

1. **Locate the AFX Bus slot on the system board.**

   See FIGURE 11-9.

2. **Push back the two card retainers on the AFX Bus slot (if necessary).**

   See FIGURE 11-12.

---

**Note –** Before installing the S24 card, inspect the AFX Bus slot for bent pins. Do not install the S24 card if a pin in the slot is bent. If necessary, straighten bent pins with needlenose pliers.

---

3. **Holding the replacement S24 card at an angle to the rear panel, insert the tabs on the card backplate into the corresponding slots on the rear panel.**

   See FIGURE 11-12.

4. **Carefully align the S24 card connector with the AFX Bus slot on the system board. Press evenly on the corners of the card to push the connector into the socket.**

   ![caution symbol] **Caution –** Do not force the card. Align the card connector and slot properly or you may damage the pins on the card.



Open both
card retainers.
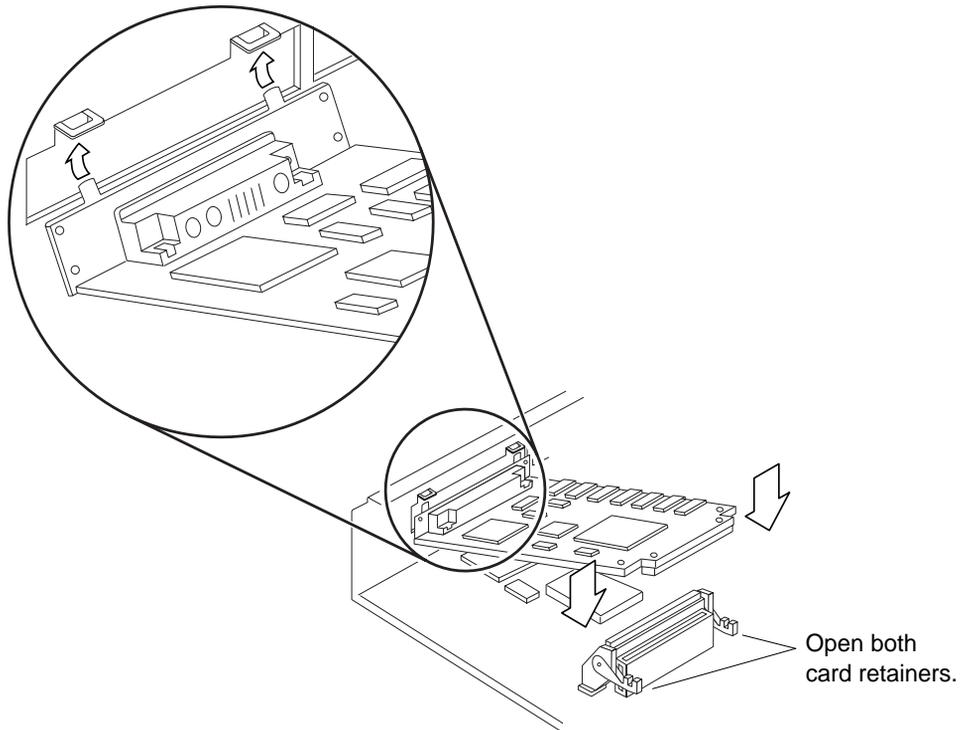
**FIGURE 11-12** Inserting an S24 Frame Buffer Card

5. **Push the card retainers forward to clamp down the S24 card.**

   See FIGURE 11-13.

Close both
card retainers.
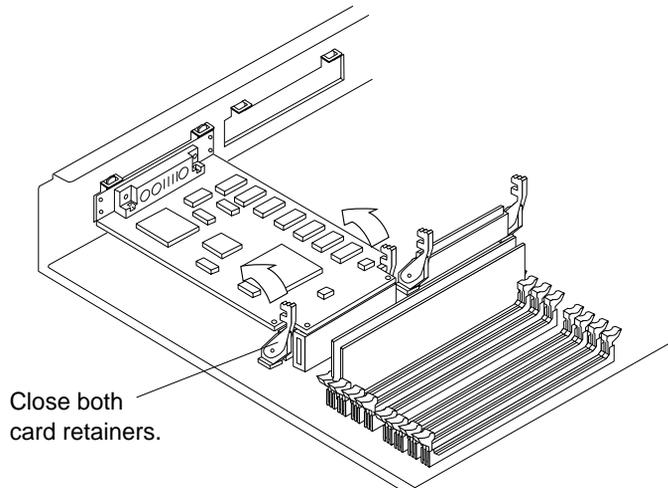
**FIGURE 11-13** Closing the Card Retainers

**6. Detach the wrist strap and replace the cover.**

See Chapter 7.

**7. Power on the system.**

See Section 6.2 "Powering On the System."

# 11.3    DSIMMs

This section describes the procedures for removing and replacing faulty DSIMMs. To determine the location of a faulty DSIMM, see Section 4.4 "Determining Faulty DSIMM Locations."

SPARCstation 5 system units come equipped with a minimum of 16 Mbytes of dynamic random access memory (DRAM), expandable to 256 Mbytes. Physically, DRAM chips are grouped in single in-line memory modules (DSIMMs) that plug in to each of the eight DSIMM slots located on the system unit's main logic board.

The SPARCstation 5 system accepts industry-standard JEDEC SIMMs, which are widely available from a number of different suppliers. Sun Microsystems offers two different types of DSIMMs for this system—an 8-Mbyte DSIMM and a 32-Mbyte DSIMM. The maximum memory configuration is 256 Mbytes using eight 32-Mbyte DSIMMs.

⚠ **Caution –** DSIMMs installed in your system must have been specifically designed to operate in it. *Do not* remove DSIMMs from a different Sun system and install them in a SPARCstation 5 system.

⚠ **Caution –** A DSIMM is made of delicate electronic components that are extremely sensitive to static electricity. Ordinary amounts of static from your clothes or work environment can destroy a DSIMM. Handle a DSIMM only by the edges. Do not touch the components on the DSIMM or any metal parts. Wear a grounding strap before unpacking and during handling of a DSIMM. *Do not disconnect the power cord from the system unit's power receptacle. The power cord should be left plugged in to a grounded power outlet.* This connection provides the ground path necessary so that you can safely remove and install DSIMMs and other components. Be sure that the system unit power is in Standby mode. Check the green light-emitting diode (LED) at the front of the chassis to be sure it is not lit.

## 11.3.1    Removing a DSIMM

1. **Shut down and power off the system.**

   See Section 6.1 "Powering Off the System."

2. **Remove the cover and attach a wrist strap.**

   See Chapter 7.

3. **Place an antistatic surface next to the system.**

4. **Locate the slot for the DSIMM you need to remove.**

   See FIGURE 11-14.

DSIMMs
Slot 7 – J0403
Slot 6 – J0402
Slot 5 – J0401
Slot 4 – J0400
Slot 3 – J0303
Slot 2 – J0302
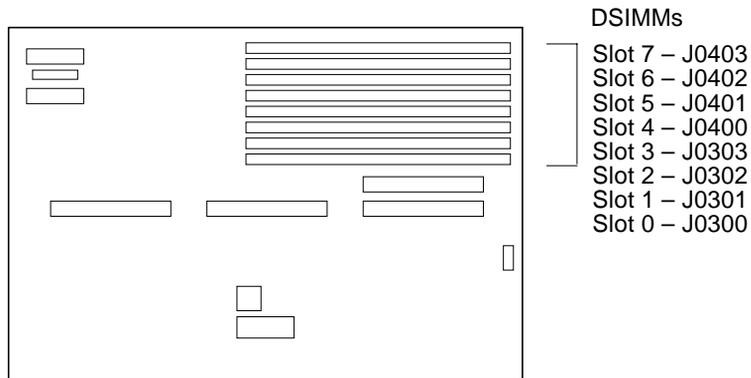Slot 1 – J0301
Slot 0 – J0300

**FIGURE 11-14** DSIMM Slot Locations on the System Board

5. **To eject the faulty DSIMM, press down on the ejection levers on both sides of the DSIMM connector.**
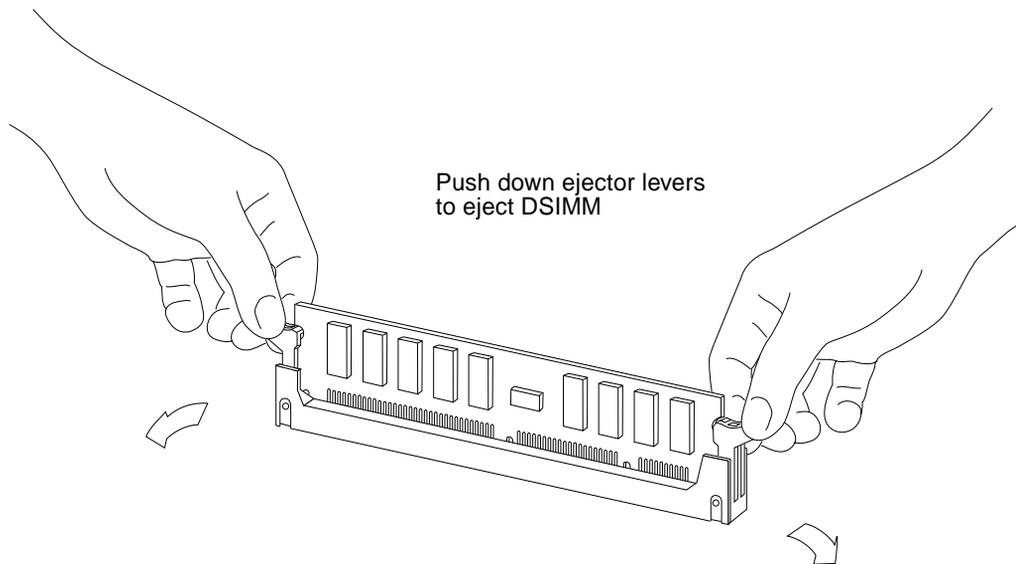
See FIGURE 11-15.



Push down ejector levers
to eject DSIMM

**FIGURE 11-15** Ejecting a DSIMM

6. **Holding the DSIMM by its edges, remove it from the slot and place it on an antistatic surface.**

## 11.3.2    Replacing a DSIMM

1. **Carefully remove the new DSIMM from its protective packaging and place it on an antistatic surface.**

2. **Choose any available slot and unlock (press down) the ejector levers at both ends of the connector.**

3. **Align the DSIMM with the slot.**

   See FIGURE 11-16. Hold the DSIMM by its edges and orient it so that the two notches at the bottom of the DSIMM line up with the two tabs in the DSIMM connector.

   ---

   **Note –** Slot J0300 (the one closest to the rear panel) must always contain a DSIMM. If you combine different capacity DSIMMs in the same system, this slot must contain the highest-capacity DSIMM.

   ---



Align notches with corresponding tabs in DSIMM connector.
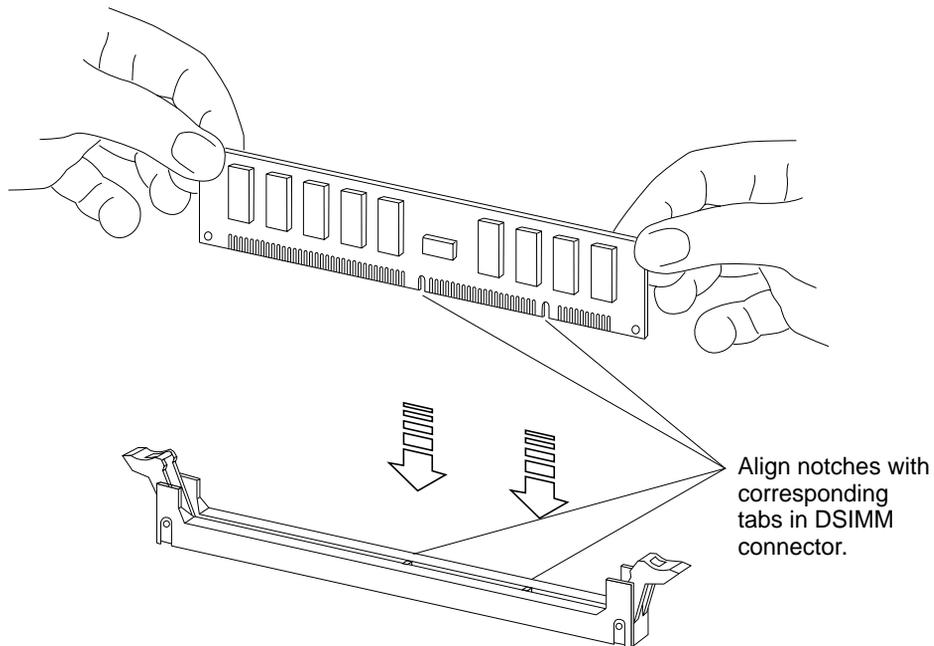
**FIGURE 11-16** Orienting a DSIMM

4. **Place your thumbs as shown in** FIGURE 11-17 **and push the DSIMM firmly into its connector.**

5. **To lock the DSIMM in place, lift up both ejector levers.**

Push the DSIMM
firmly into its connector
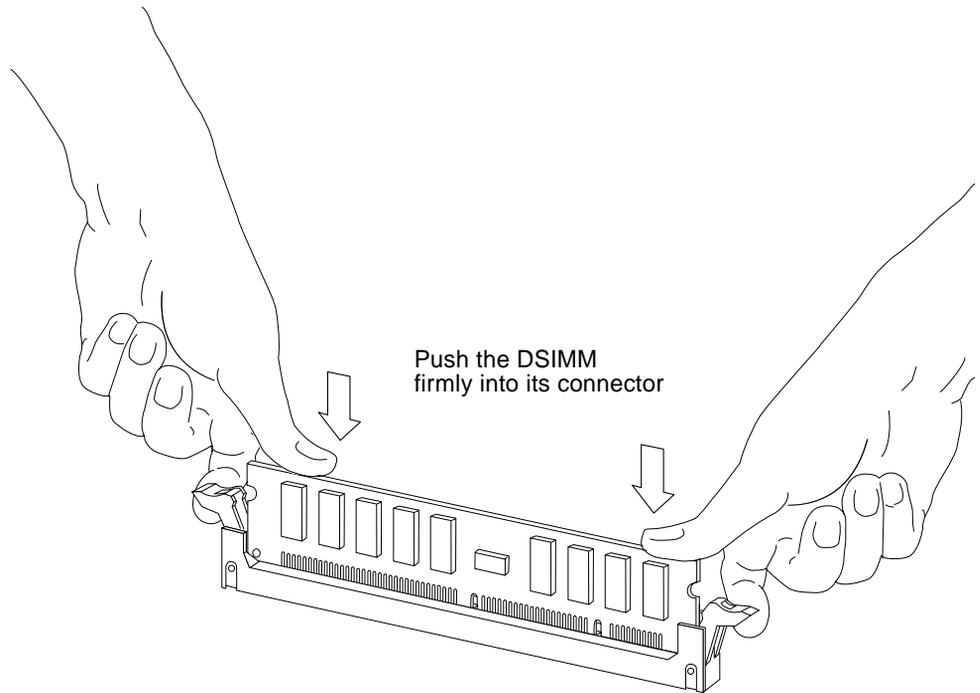
**FIGURE 11-17** Installing a DSIMM

**6. Detach the wrist strap and replace the cover.**

See Chapter 7.

**7. Power on the system.**

See Section 6.2 "Powering On the System."

**8. Watch for the system banner to verify that the new memory is recognized by the system.**

The system banner appears at the top of the screen a few seconds after you power on the system. Check the amount of memory listed in the system banner to verify that the new memory is recognized by the system.

# 11.4 System Board

## 11.4.1 Removing the System Board

1. **Shut down and power off the system.**

   See Section 6.1 "Powering Off the System."

2. **Detach all external cables from the rear panel except the power cord.**

3. **Remove the cover and attach a wrist strap.**

   See Chapter 7.

4. **Remove all SBus cards.**

   See Section 11.1.1 "Removing an SBus Card."

5. **Remove all DSIMMs.**

   See Section 11.3.1 "Removing a DSIMM."

6. **Remove the NVRAM.**

   See Section 11.5.1 "Removing the NVRAM Chip."

7. **Unplug the DC power, SCSI data, diskette data, speaker/LED, and CD-ROM audio cables from the system board.**

   See FIGURE 11-18. You may need to remove an SBus card to access the audio connector. See Section 11.1.1 "Removing an SBus Card."

Diskette data connector

SCSI data connector

DC power connector

Speaker/LED cable

DC power harness

SCSI backplane

SCSI data cable

Speaker/LED connector

CD-ROM audio connector
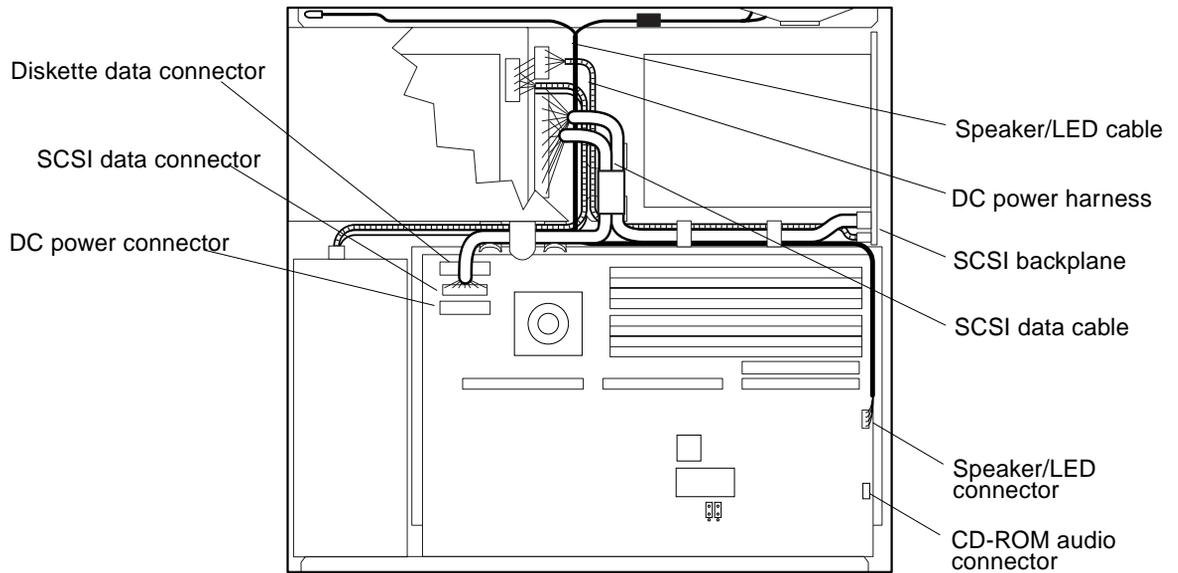
**FIGURE 11-18** System Board Cable Connections

8. **Loosen the two captive Phillips screws that secure the system board to the rear of the chassis.**

   See FIGURE 11-19.



Loosen captive screw                    Loosen captive screw

**FIGURE 11-19** System Board Captive Screws

9. **Pull the board out of the back of the chassis until it clears the plastic card guide.**

   See FIGURE 11-20.

10. **Place the board on an antistatic surface.**
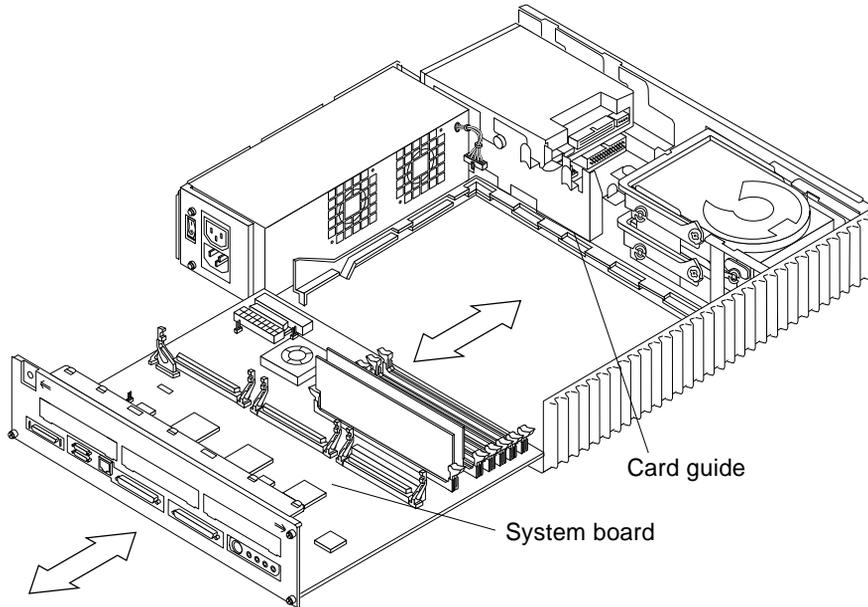
**FIGURE 11-20** Removing the System Board

## 11.4.2   Replacing the System Board

The serial port jumpers are preset for RS-423 mode. See Section 11.4.3 "Setting Jumpers," if you need to change the jumpers on the system board to RS-232.

1. **Install the new system board.**

   See FIGURE 11-21.

   a. **Insert the front edge of the board (the edge with the DSIMMs) into the card guide.**

   b. **Lift the rear panel of the board slightly to make sure that the "foot" on the underside of the board doesn't catch the metal edge of the chassis.**

   c. **Slide the board along the card guide until it is fully inserted.**
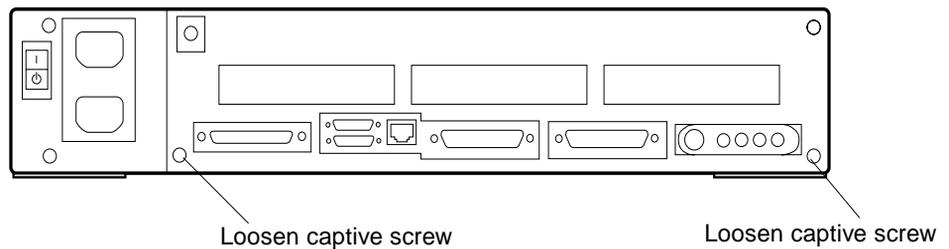
Card guide
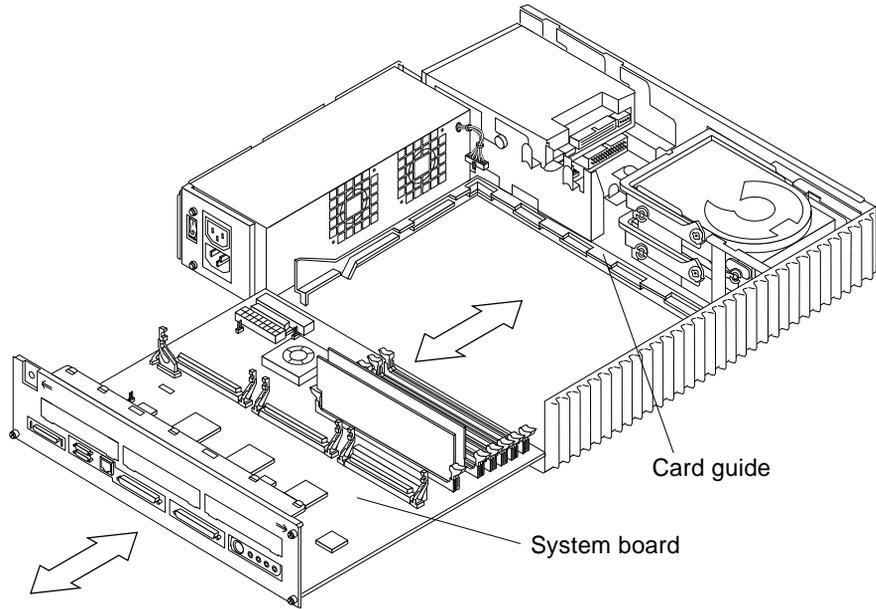
System board

**FIGURE 11-21** Installing the System Board

**2. Tighten the two captive Phillips screws that secure the board to the rear of the chassis.**

See FIGURE 11-22. Do not overtighten these screws.



Captive screw

Captive screw

**FIGURE 11-22** System Board Captive Screws

**3. Reconnect the DC power, SCSI data, diskette data, speaker/LED, and CD-ROM audio cables to the system board.**

See FIGURE 11-18.

**4. Take the following components that you removed from the defective system board and install them on the new system board:**

a. **NVRAM**

See Section 11.5.2 "Replacing the NVRAM Chip."

b. **DSIMMs**

See Section 11.3.2 "Replacing a DSIMM." Install the DSIMMs in the same locations on the new system board.

c. **SBus cards**

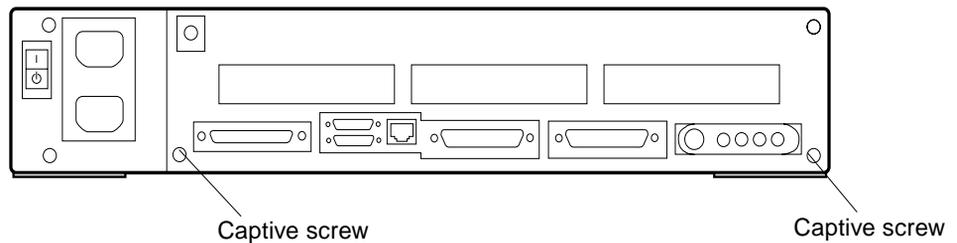See Section 11.1.2 "Replacing an SBus Card." Install the SBus cards in the same locations on the new system board.

5. **Detach the wrist strap and replace the cover.**

See Chapter 7.

6. **Reconnect all external cables to the rear panel.**

7. **Power on the system.**

See Section 6.2 "Powering On the System."

## 11.4.3    Setting Jumpers

There are two serial port jumpers on the system board. The jumpers are factory-set to RS-423 mode (position B in FIGURE 11-23). The ports can be reset to RS-232 mode (position A) for connection to an X.25 network in Europe or Australia.

To change the jumper settings from RS-423 mode to RS-232 mode:

1. **Shut down and power off the system.**

See Section 6.1 "Powering Off the System."

2. **Remove the cover and attach a wrist strap.**

See Chapter 7.

3. **Use needlenose pliers to move both serial port jumpers from position B to position A.**

See FIGURE 11-23.
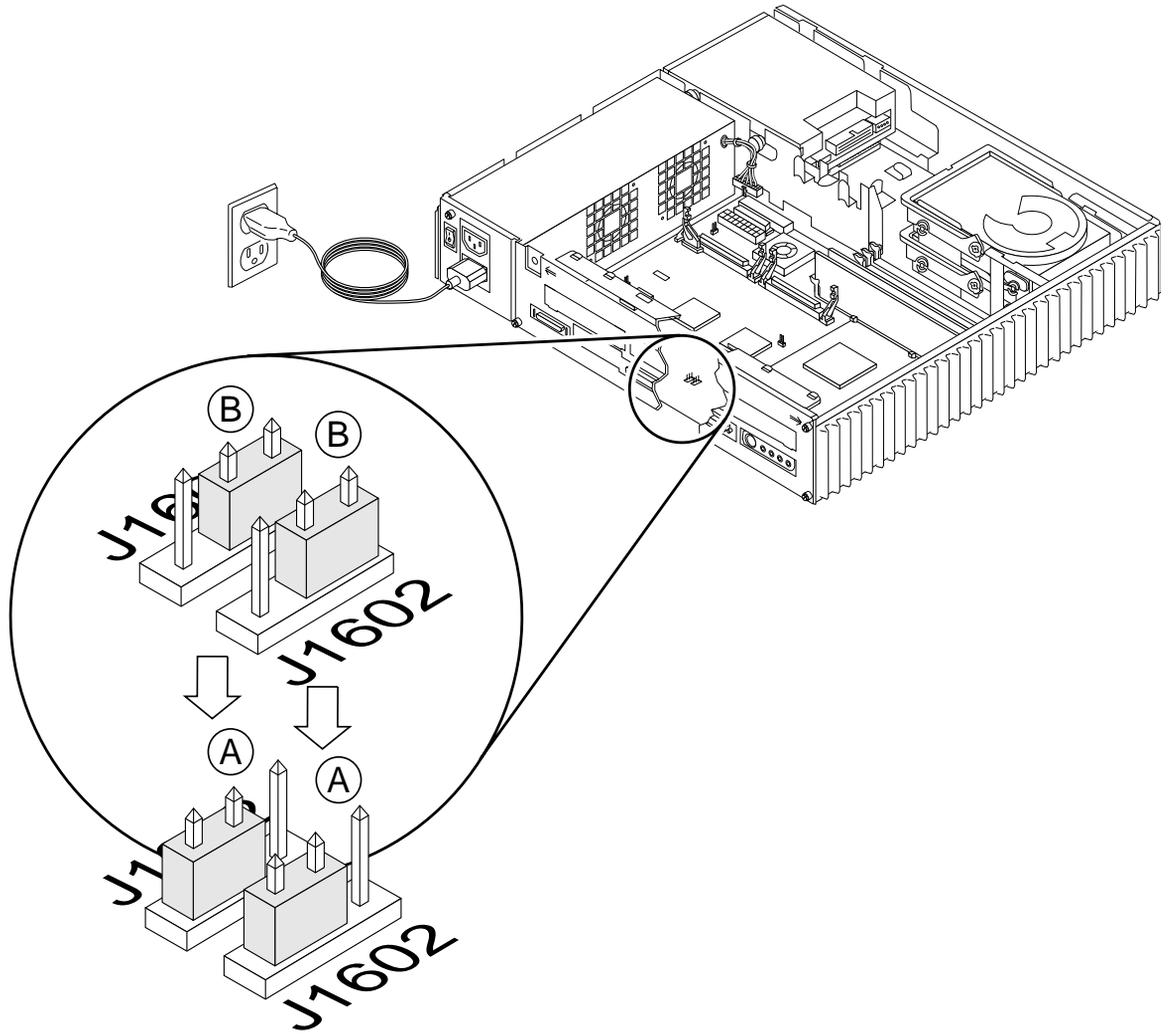
**FIGURE 11-23** Setting the Serial Port Jumpers

# 11.5 NVRAM

## 11.5.1 Removing the NVRAM Chip

1. **Shut down and power off the system.**

   See Section 6.1 "Powering Off the System."

2. **Remove the cover and attach a wrist strap.**

   See Chapter 7.

3. **If an SBus card is installed in the center SBus slot, remove it.**

   See Section 11.1.1 "Removing an SBus Card."

4. **Locate the NVRAM chip on the system board.**

   See FIGURE 11-24.



NVRAM

**FIGURE 11-24** Locating the NVRAM

5. **Hold the NVRAM chip carrier on both ends and lift it straight up to remove it.**

   Gently wiggle the chip carrier as necessary.

6. **Put the NVRAM in its chip carrier on an antistatic surface.**

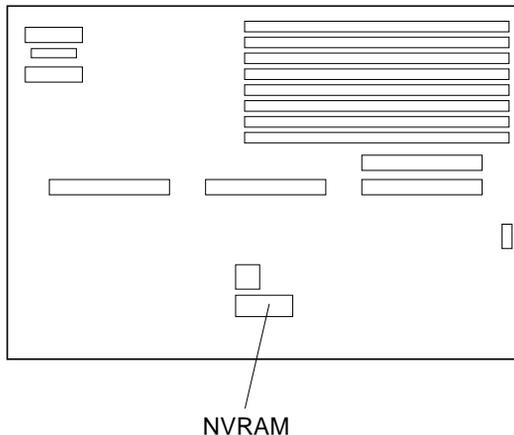## 11.5.2    Replacing the NVRAM Chip

1. **Locate the NVRAM chip on the system board.**

   See FIGURE 11-24.

2. **Carefully align the pins and insert the NVRAM chip into the socket; make certain that the notches on the socket and chip are aligned properly.**

   The carrier is keyed so that the NVRAM can be installed only one way.

3. **Push the NVRAM chip into the carrier until it sits tightly in the socket.**

4. **Reinstall the SBus card in the center SBus slot (if applicable).**

   See Section 11.1.2 "Replacing an SBus Card."

5. **Detach the wrist strap and replace the cover.**

   See Chapter 7.

6. **Power on the system.**

   See Section 6.2 "Powering On the System."

# Illustrated Parts Breakdown

This chapter provides an illustrated parts breakdown (IPB) of the major parts that comprise the SPARCstation 5 system, and a list of customer-replaceable units (CRUs) and their part numbers.

- "Illustrations of Selected CRUs" on page 1
- "Replacement Parts List" on page 4

## 12.1 Illustrations of Selected CRUs

FIGURE 12-1 through FIGURE 12-4 illustrate selected CRUs for the SPARCstation 5 system.
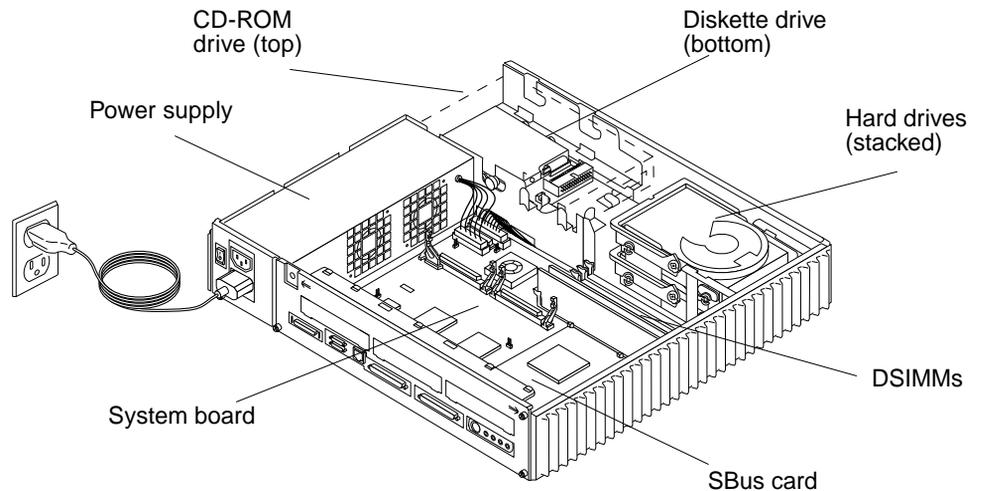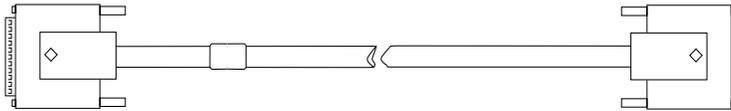


**FIGURE 12-1**  Selected CRUs in the System Unit

AC power cord
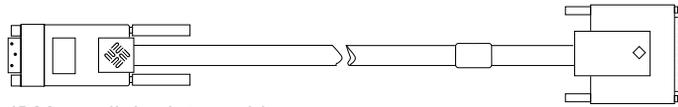


Twisted-pair Ethernet cable
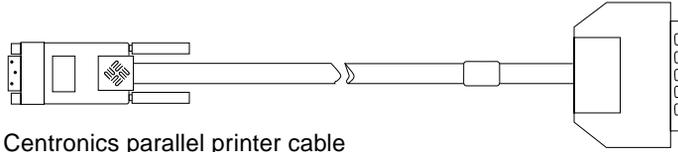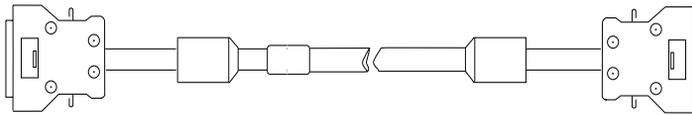


13W3 video cable



Keyboard cable

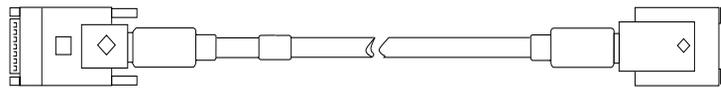**FIGURE 12-2** Standard External Cables

IBM parallel printer cable



Centronics parallel printer cable



SCSI cable



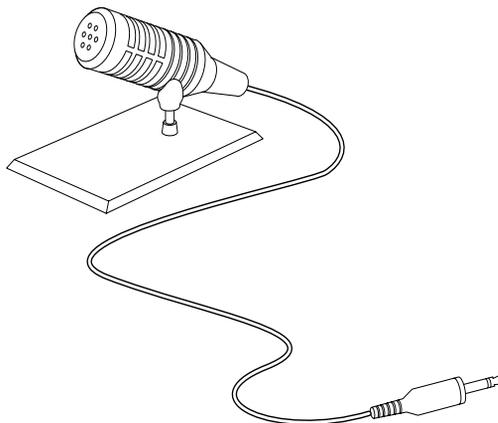AUI Ethernet adapter cable

**FIGURE 12-3**  Optional External Cables



**FIGURE 12-4**  Microphone and Cable

## 12.2 Replacement Parts List

TABLE 12-1 provides the part numbers for customer-replaceable units. TABLE 12-2 provides part numbers for miscellaneous items.

---

**Note –** Although the part numbers are correct as of the publication date of this document, they are subject to change. Consult your authorized Sun sales representative or service provider to confirm part numbers before you order new or replacement parts.

---

**TABLE 12-1** Part Number List—Customer-Replaceable Units

| Item | Description | Sun Part No. |
|------|-------------|--------------|
| 1 | 8-Mbyte DSIMM Module | 501-2470 |
| 2 | 32-Mbyte DSIMM Module | 501-2471 |
| 3 | NVRAM/TOD | 525-1369 |
| 4 | Main Logic Board (0 Mbyte, 70 MHz) | 501-2798 |
| 5 | Main Logic Board (0 Mbyte, 85 MHz) | 501-2799 |
| 6 | Main Logic Board (0 Mbyte, 85 MHz) | 501-2815 |
| 7 | Main Logic Board (0 Mbyte, 110 MHz) | 501-2778 |
| 8 | Main Logic Board (0 Mbyte, 170  MHz) | 501-3059 |
| 9 | 535-Mbyte Internal Disk Drive | 540-2443 |
| 10 | 1.05-Gbyte Internal Disk Drive | 540-2560 |
| 11 | 2-Gbyte Internal Disk Drive | 540-2699 |
| 12 | Internal CD-ROM Drive | 540-2852 |
| 13 | 3.5-inch Internal Diskette Drive | 540-2854 |
| 14 | 150-Watt Power supply | 300-1215 |
| 15 | Internal Speaker Assembly | 370-1579 |
| 16 | SCSI Backplane | 501-2462 |
| 17 | CD-ROM Audio Cable (Internal) | 530-2280 |
| 18 | Diskette Drive Cable (Internal) | 530-2277 |
| 19 | Speaker/LED Cable (Internal) | 530-2341 |
| 20 | SCSI Cable (Internal) | 530-2278 |

**TABLE 12-1**  Part Number List—Customer-Replaceable Units  *(Continued)*

| Item | Description | Sun Part No. |
|------|-------------|--------------|
| 21 | DC Power Harness | 530-2279 |
| 22 | 1-Mbyte TGX Frame Buffer Card | 501-2325 |
| 23 | 4-Mbyte TGX Frame Buffer Card | 501-2253 |
| 24 | S24 Frame Buffer Card | 501-2337 |
| 25 | Type-5 Mouse and Pad | 370-1398 |
| 26 | Keyboard Cable | 530-1442 |
| 27 | Twisted-Pair Ethernet Cable | 530-1871 |
| 28 | 13W3 Video Cable | 530-1870 |
| 29 | IBM Parallel Printer Cable (DB25 style) | 530-1861 |
| 30 | Centronics Parallel Printer Cable | 530-1857 |
| 31 | AUI Ethernet Adapter Cable | 530-2021 |
| 32 | SunMicrophone II | 370-1678 |

**TABLE 12-2**  Part Number List—Miscellaneous Items

| Item | Description | Sun Part No. |
|------|-------------|--------------|
| 1 | Wrist Strap | 250-1007 |
| 2 | Antistatic Mat with Sun Logo | 250-1088 |
| 3 | Disposable Antistatic Mat | 330-1145 |

# System Specifications

This appendix contains SPARCstation 5 system specifications, including physical specifications, input power requirements, and environmental requirements.

■  "Physical Specifications" on page 1
■  "Input Power Requirements" on page 2
■  "Environmental Requirements" on page 2

# A.1      Physical Specifications

TABLE A-1 lists the physical specifications for the system unit, keyboard, and optical mouse.

**TABLE A-1**      Physical Specifications

| Component | Height inches (mm) | Width inches (mm) | Depth inches (mm) | Net Weight lbs (kg) |
|---|---|---|---|---|
| System Unit | 3.07 (78) | 16.40 (417) | 16.10 (409) | 27.0 (12.7) |
| Keyboard | 1.7 (44) | 20.1 (510) | 7.2 (182) | 3.5 (1.6) |
| Mouse | 2.0 (50) | 4.0 (100) | 3.0 (80) | 0.3 (0.14) |

# A.2 Input Power Requirements

TABLE A-2 lists the input power requirements for the system unit.

**TABLE A-2** Input Power Requirements and Power Dissipation

| Parameter | Specification |
| --- | --- |
| Nominal Frequencies | 50 Hz or 60 Hz nominal |
| Nominal Voltage Range | 100-120 Vac or 200-240 Vac (100-240 Vac Auto) |
| Maximum Current AC RMS* | 2 A @ 100-120 Vac, 1 A @ 200-240 Vac |
| AC Operating Range | 87-264 Vrms, 47-63 Hz |
| Maximum VA Rating | 200 VA |
| Maximum Power Consumption | 200 Watts |
| Maximum Heat Output | 683 BTU/hr |

*Maximum input current with accessory connected to accessory outlet is 6 A.

# A.3 Environmental Requirements

TABLE A-3 lists the environmental requirements for both operating and non-operating environments.

**TABLE A-3** Environmental Requirements

| Operating Environment: | |
| --- | --- |
| Temperature range | 0 ˚C to 40 ˚C (32 ˚F to 104 ˚F) at 20%–70% Relative Humidity (RH), noncondensing—IEC 68-2-1, 68-2-2 |
| Humidity | 5% to 95% RH, noncondensing—IEC 68-2-2, 68-2-3 |
| Altitude range | 0 to 3000 meters (0 to 9840 feet), 10 ˚C to 40 ˚C (50 ˚F to 104˚F)—IEC 68-2-40, 68-2-41 |
| Vibration | 0.25 gravity (g) peak, 5–500 Hz, 3 perpendicular axes—IEC 68-2-6 |
| Shock | 5 g peak, 11 milliseconds half-sine pulse—IEC 68-2-27 |

**TABLE A-3**    Environmental Requirements *(Continued)*

| Operating Environment: | |
|---|---|
| **Non-Operating Environment:** | |
| Temperature range | -40 ˚C to 75 ˚C (-40 ˚F to 167 ˚F) at 20%–70% RH, noncondensing—IEC 68-2-1, 68-2-2 |
| Humidity | 95% RH, noncondensing—IEC 68-2-2, 68-2-3 |
| Vibration | 1 g peak, 5–500 Hz, 3 perpendicular axes—IEC 68-2-6 |
| Shock | 30 g peak, 11 milliseconds half-sine pulse— IEC 68-2-27e |

# Input/Output Connectors

This appendix contains pinouts and illustrations of the SPARCstation 5 system input/output (I/O) connectors. The following connectors are described.

- "SCSI Connector (External)" on page 1
- "Parallel Port Micro-D Connector" on page 2
- "Attachment Unit Interface (AUI) Micro-D Connector" on page 3
- "Twisted-Pair Ethernet Connector" on page 4
- "Serial Connector Ports A and B" on page 5
- "Keyboard/Mouse Connector" on page 6
- "Audio Ports" on page 7
- "13W3 Video Connector" on page 8
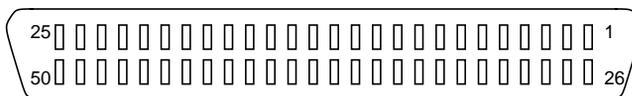
## B.1 SCSI Connector (External)



**FIGURE B-1** External SCSI Connector

**TABLE B-1** Pinout Signals[1] for External SCSI Connector

| Pin | Description | Pin | Description | Pin | Description |
| --- | --- | --- | --- | --- | --- |
| 1 | Ground | 19 | Ground | 37 | Ground |
| 2 | Ground | 20 | Ground | 38 | Termpower |
| 3 | Ground | 21 | Ground | 39 | Ground |
| 4 | Ground | 22 | Ground | 40 | Ground |

| Pin | Description | Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|-----|-------------|
| 5 | Ground | 23 | Ground | 41 | Attention |
| 6 | Ground | 24 | Ground | 42 | Ground |
| 7 | Ground | 25 | Ground | 43 | Busy |
| 8 | Ground | 26 | Data 0 | 44 | Acknowledge |
| 9 | Ground | 27 | Data 1 | 45 | Reset |
| 10 | Ground | 28 | Data 2 | 46 | Message |
| 11 | Ground | 29 | Data 3 | 47 | Select |
| 12 | Ground | 30 | Data 4 | 48 | Control data |
| 13 | N/C | 31 | Data 5 | 49 | Request |
| 14 | Ground | 32 | Data 6 | 50 | Direction |
| 15 | Ground | 33 | Data 7 | | |
| 16 | Ground | 34 | Parity | | |
| 17 | Ground | 35 | Ground | | |
| 18 | Ground | 36 | Ground | | |

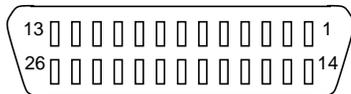1. All signals are active low.

# B.2    Parallel Port Micro-D Connector
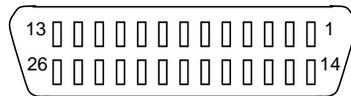


FIGURE B-2    Parallel Port Micro-D Connector

TABLE B-2    Pinout for Parallel Port Micro-D Connector

| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 1 | Strobe_out_l | 14 | Auto_feed_out_l |
| 2 | Data[0] | 15 | Errpr_in_l |
| 3 | Data[1] | 16 | Init_out_l |
| 4 | Data[2] | 17 | Select_in_l |

**TABLE B-2**   Pinout for Parallel Port Micro-D Connector

| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 5 | Data[3] | 18 | Ground |
| 6 | Data[4] | 19 | Ground |
| 7 | Data[5] | 20 | Ground |
| 8 | Data[6] | 21 | Ground |
| 9 | Data[7] | 22 | Ground |
| 10 | Ack_out_l | 23 | Ground |
| 11 | Busy_out_l | 24 | Ground |
| 12 | Pe_in | 25 | Ground |
| 13 | Select_out | 26 | Ground |

# B.3   Attachment Unit Interface (AUI) Micro-D Connector



**FIGURE B-3**   Attachment Unit Interface (AUI) Micro-D Connector

**TABLE B-3**   Pinout for Attachment Unit Interface (AUI) Micro-D Connector

| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 1 | Transmit - | 14 | Transmit + |
| 2 | Receive + | 15 | Receive - |
| 3 | Collision - | 16 | Collision + |
| 4 | Power | 17 | Ground |
| 5 | N/C | 18 | N/C |
| 6 | N/C | 19 | N/C |
| 7 | N/C | 20 | N/C |
| 8 | N/C | 21 | N/C |
| 9 | N/C | 22 | N/C |

**TABLE B-3**    Pinout for Attachment Unit Interface (AUI) Micro-D Connector *(Continued)*

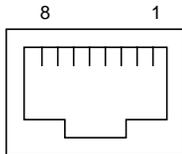| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 10 | N/C | 23 | Ground |
| 11 | N/C | 24 | Ground |
| 12 | N/C | 25 | N/C |
| 13 | N/C | 26 | Ground |

# B.4    Twisted-Pair Ethernet Connector



**FIGURE B-4**    Twisted-Pair Ethernet Connector

**TABLE B-4**    Pinout for Twisted-Pair Ethernet Connector

| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 1 | Transmit Data + | 5 | N/C |
| 2 | Transmit Data - | 6 | Receive Data - |
| 3 | Receive Data + | 7 | Presence detect |
| 4 | N/C | 8 | Presence detect |

# B.5 Serial Connector Ports A and B



**FIGURE B-5**  Serial Connector

**TABLE B-5**  Pinout for Serial Connector Ports A and B

| Pin | Description | Pin | Description |
|---|---|---|---|
| 1 | N/C | 14 | N/C |
| 2 | Transmit Data (TxD) | 15 | Transmit Clock IN (TRxC) |
| 3 | Receive Data (RxD) | 16 | N/C |
| 4 | Request to Send (RTS) | 17 | Receive Clock (RTxC) |
| 5 | Clear to Send (CTS) | 18 | N/C |
| 6 | Data Set Ready (DSR) | 19 | N/C |
| 7 | Signal Ground | 20 | Data Terminal Ready (DTR) |
| 8 | Data Carrier Detect (DCD) | 21 | N/C |
| 9 | N/C | 22 | N/C |
| 10 | N/C | 23 | N/C |
| 11 | N/C | 24 | Transmit Clock OUT (TRxC) |
| 12 | N/C | 25 | N/C |
| 13 | N/C | | |

# B.6 Keyboard/Mouse Connector
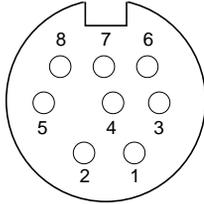


**FIGURE B-6**   Keyboard/Mouse Connector

**TABLE B-6**   Pinout for Keyboard/Mouse Connector

| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 1 | Ground | 5 | Keyboard Out |
| 2 | Ground | 6 | Keyboard In |
| 3 | +5 Vdc | 7 | Power Key In |
| 4 | Mouse In | 8 | +5 Vdc |

**Note –**  All signals are standard TTL levels. The +5V supply is fuse-protected.
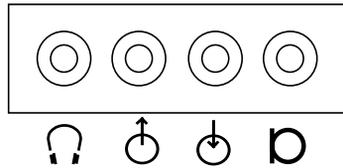
# B.7 Audio Ports



**FIGURE B-7**  Audio Ports

**TABLE B-7**  Signals for the SPARCstation 5 Audio Ports

|  | Headphone | Line-Out | Line-In | Microphone (new) |
|---|---|---|---|---|
| Tip | Left Channel | Left Channel | Left Channel | Left Channel |
| Ring (Center) | Right Channel | Right Channel | Right Channel | Right Channel |
| Shield | Ground | Ground | Ground | Ground |

## B.7.1 Headphone Connector



**FIGURE B-8**  Headphone Connector

This connector is used to connect a set of stereophonic headphones to the system for private listening of audio output.

## B.7.2 Audio Line-Out Connector



**FIGURE B-9**  Audio Line-out Connector

This connector is used to connect the system audio output to a stereophonic amplifier and external loudspeakers.

## B.7.3   Audio Line-In Connector

**FIGURE B-10**  Audio Line-in Connector

This connector is used to connect external stereophonic sound sources such as a compact disc player or cassette tape player to the system.

## B.7.4   Microphone Connector

**FIGURE B-11**  Microphone Connector

This connector is used to connect the SunMicrophone™ II (or other suitable microphone) to the system.

---

**Note –** The SPARCstation 5 microphone port accepts stereophonic input; however, the SunMicrophone II is a monophonic device. Note also that the older SunMicrophone is not compatible with the SPARCstation 5 system.

---

# B.8   13W3 Video Connector

FIGURE B-12 shows a 13W3 video connector. The 13W3 connector's pin assignments and functions are described in TABLE B-8. The connector is built into the SBus or S24 frame buffer card.
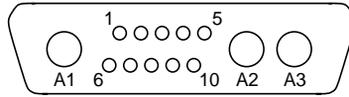
**FIGURE B-12** 13W3 Video Connector

**TABLE B-8**    13W3 Video Connector Pin Assignments

| Pin | Function | I/O | Level |
|-----|----------|-----|-------|
| A1 | Red | O | Analog |
| A2 | Green | O | Analog |
| A3 | Blue | O | Analog |
| 1 | Serial Read | | TTL |
| 2 | Vert Sync | O | TTL |
| 3 | Sense <0> | I | TTL |
| 4 | Ground | | GND |
| 5 | Comp Sync | O | TTL |
| 6 | Hort Sync | O | TTL |
| 7 | Serial Write | | TTL |
| 8 | Sense <1> | I | TTL |
| 9 | Sense <2> | I | TTL |
| 10 | Ground | | GND |

# APPENDIX C

# SCSI Targeting

This appendix describes the SCSI targeting for the internal SCSI devices in the SPARCstation 5 system. It also describes the SCSI targeting conventions for external SCSI peripherals that you can add to the system. For complete SCSI target information about SCSI peripherals, see the installation manual that came with the SCSI peripheral.

**Note –** Assign each SCSI device on the SCSI chain a different SCSI target.

Each internal SCSI disk drive present in a SPARCstation 5 system is automatically assigned a SCSI target (see TABLE C-1 and TABLE C-2); these targets are only assigned if the device is present. When assigning SCSI targets to external devices, make sure that none of the external targets conflict with targets automatically assigned to the internal disk drives.

**Note –** SCSI termination for internal drives is provided automatically by the SCSI backplane. SCSI target 7 is reserved for the SCSI processor of the computer system or the SCSI host adapter card.

TABLE C-1    SCSI Targeting—Solaris 1.x (SunOS 4.x) Operating Systems

| SCSI Device | SCSI Target |
|---|---|
| Internal disk, lower bay (SCSI target automatically assigned, if present) | 3* |
| Internal disk, upper bay (SCSI target automatically assigned, if present) | 1 |
| Internal CD-ROM drive (SCSI target factory-configured) | 6 |
| External disk drives | 0, 1, 2* |
| External tape drives | 4, 5 |
| External CD-ROM drive | 6* |

\* Do not assign target 1, 3, or 6 to an external device if it is automatically assigned to an internal device.

**TABLE C-2**    SCSI Targeting—Solaris 2.x (SunOS 5.x) Operating Systems

| SCSI Device | SCSI Target |
|---|---|
| Internal disk, lower bay (SCSI target automatically assigned, if present) | 3* |
| Internal disk, upper bay (SCSI target automatically assigned, if present) | 1 |
| Internal CD-ROM drive (SCSI target factory-configured) | 6 |
| External disk drives | 0, 1, 2, 4, 5, 6* |
| External tape drives | 0, 1, 2, 4, 5, 6* |
| External CD-ROM drive | 0, 1, 2, 4, 5, 6* |

\* Do not assign target 1, 3, or 6 to an external device if it is automatically assigned to an internal device.

# FORTH Diagnostics

This appendix explains FORTH Diagnostic tests. The following topics and tests are described.

- Running the FORTH Diagnostics
- test <alias name>, test <device path>
- `test-all`
- `watch-clock`
- watch-net, watch-aui, watch-tpe, and watch-net-all
- probe-scsi, probe-scsi-all
- `module-info`
- `test-memory`
- Returning to the Old-Style Sunmon Compatibility Mode Prompt

You have access to a number of additional tests in the boot PROM called FORTH Diagnostics. To invoke these tests, you must enter the FORTH Monitor.

> **Caution –** To run the FORTH Diagnostics, you must halt the system in an orderly manner. When the operating system or any other standalone program has already booted, do not press Stop-a to halt the system. Abruptly aborting program execution may cause damage to data files.

# D.1    Running the FORTH Diagnostics

1. **Save all your work and quit all applications.**

   Consult your software documentation for instructions on ending a work session and saving your files.

2. **Return to the operating system environment.**

   If you are in a windowing environment, exit from it and wait for the operating system prompt to appear. See the documentation supplied with your windowing system.

3. **Halt the operating system.**

   See the documentation supplied with your operating system for instructions on how to halt it.

   a. **For Solaris 2.x (SunOS 5.x) systems, type:**

   ```
   % su
   Password: superuser password
   # /usr/sbin/shutdown -y -g60 -i0
   ```

   b. **For Solaris 1.x (SunOS 4.x) systems, type:**

   ```
   % su
   Password: superuser password
   # /usr/etc/shutdown -h +1
   ```

   The operating system warns other users of your system of the impending shutdown, and then halts itself after a one-minute delay. If you wish to provide a longer delay, see the man page for shutdown(1).

   The system synchronizes the file systems and brings you to either the > or ok prompt.

   If you see the ok prompt, *skip ahead to Step 5; otherwise, continue with Step 4.*

4. **Enter n at the > prompt to get to the ok prompt.**

5. **Enter reset at the ok prompt.**

6. **When you see the system banner, press Stop-a to access the FORTH Monitor.**

7. **If you see the > prompt, enter n to get to the ok prompt.**

8. **Enter help diag at the ok prompt to get a list of tests that comprise the FORTH Diagnostics.**

9. **Enter the name of the test that you wish to execute.**

CODE EXAMPLE D-1 shows a list of FORTH Diagnostic tests.

CODE EXAMPLE D-1    Displaying FORTH Diagnostics

```
ok help diag
     Category: Diag (diagnostic routines)
test   device-specifier ( -- ) run selftest method for specified device
     Examples:
         test /memory    - test memory
         test /iommu/sbus/ledma/le    - test net
         test floppy      - test floppy disk drive
         test net         - test net (device-specifier is an alias)
         test scsi        - test scsi(device-specifier is an alias)
watch-clock         (--)   show ticks of real-time clock
watch-net           (--)   - monitor broadcast packets using auto-selected
interface
watch-aui           (--)   - monitor broadcast packets using AUI interface
watch-tpe           (--)   - monitor broadcast packets using TPE interface
watch-net-all       (--)   - monitor broadcast packets on all net interfaces
probe-scsi          (--)   - show attached SCSI devices
probe-scsi-all      (--)   - show attached SCSI devices for all host adapters
test-all            (--)   - execute test for all devices with selftest method
test-memory         (--)   - test all memory if diag-switch? is true, otherwise
test memory
                           specified by selftest-#meg
```

# D.1.1    test <alias name>, test <device path>

The test command, combined with a device alias or device path name, will execute
that device self-test program. If a device has no self-test program, this message will
be displayed: No selftest method for <*device name*>. To run the self-test
program for a device, type the test command followed by the device alias or device
path name. An example is shown below.

```
ok test floppy
Testing floppy disk system. A formatted disk should be in the drive.
Test succeeded.
```

## D.1.2    `test-all`

The `test-all` command tests all devices in the system that have a self-test program. Tests are executed in order, using the device tree (viewed with the `show-devs` command) as reference. Disks, tapes, and CD-ROMs are not tested by `test-all`.

## D.1.3    `watch-clock`

This test reads a register in the NVRAM/TOD (nonvolatile RAM/Time-of-Day) chip on the main logic board and displays the result as a seconds counter. The counter should count from 0 to 59 repeatedly until you interrupt it by pressing any key on the keyboard.

The following screen gives you an example of a `watch-clock` test.

```
ok watch-clock
Watching the 'seconds' register of the real-time clock chip.
It should be 'ticking' once a second.
Type any key to stop
41
```

## D.1.4    `watch-net`, `watch-aui`, `watch-tpe`, and `watch-net-all`

These tests monitor broadcast Ethernet packets on the Ethernet cable(s) connected to the system. Good packets received by the system are indicated by a period (.) displayed on the screen. Errors are indicated with an `X` and the error description.

For example:

```
ok watch-net
Using AUI Ethernet Interface
 Lance register test -- succeeded
 Internal loopback test -- succeeded
 External loopback test -- Lost Carrier (transceiver cable
problem?) send failed

Using TP Ethernet Interface
 Lance register test -- succeeded
 Internal loopback test -- succeeded
 External loopback test -- succeeded
Looking for Ethernet packets.
'.' is a good packet. "X" is a bad packet.
Type any key to stop.
...........................................................
...........................................................
................Framing error CRC error X..................
```

SPARCstation 5 systems have two types of Ethernet interfaces, 10BASE-T (also called twisted-pair Ethernet or TPE) and 10BASE5 (also called thick Ethernet or AUI). Only one Ethernet interface may be connected at a time. The system can automatically select which interface is connected and active.

The AUI port is first tested by transmitting packets and checking for "no carrier" or response packets. If the AUI test fails, the TPE port is then tested.

Entering watch-aui causes this automatic selection to take place. You may see these messages:

```
ok watch-aui
Using AUI Ethernet Interface
 Lance register test -- succeeded
 Internal loopback test -- succeeded
 External loopback test -- Lost Carrier (transceiver cable
problem?) send failed.
ok
```

You may also control the selection of Ethernet interfaces to monitor by using specific commands. Use watch-tpe to monitor the 10BASE-T (TPE) connection or watch-aui to monitor the 10BASE5 (thick Ethernet) connection.

For example:

```
ok watch-tpe
Using TP Ethernet Interface
 Lance register test -- succeeded
 Internal loopback test -- succeeded
 External loopback test -- succeeded
Looking for Ethernet packets.
'.' is a good packet. "X" is a bad packet.
Type any key to stop.
.............................................................
...........................................................
```

The `watch-net-all` command monitors Ethernet packets on any Ethernet interface installed in the system. For example, if you have an SBus Ethernet card installed in one of the system SBus slots, `watch-net-all` will start by monitoring Ethernet transmissions detected by that card.

When you interrupt the test on that interface by pressing any key, `watch-net-all` then goes on to test the next Ethernet interface it finds in the system.

For example:

```
ok watch-net-all
/iommu@0,100000000/sbus@0,10001000/ledma@5,8400010/le@5,8c00000

Using AUI Ethernet Interface
 Lance register test -- succeeded
 Internal loopback test -- succeeded
 External loopback test -- Lost Carrier (transceiver cable
problem?) send failed.

Using TP Ethernet Interface
 Lance register test -- succeeded
 Internal loopback test -- succeeded
 External loopback test -- succeeded
Looking for Ethernet packets.
'.' is a good packet. "X" is a bad packet.
Type any key to stop.
.............................................................
...........................................................
ok
```

## D.1.5 `probe-scsi`, `probe-scsi-all`

The `probe-scsi` test sends an inquiry command to internal and external SCSI devices connected to the system's internal SCSI interface. If a SCSI device is connected and powered up, the target address, unit number, device type, and manufacturer name should be displayed.

For example:

```
ok probe-scsi
Target 3
  Unit 0 Disk SEAGATE ST1480 SUN04245828 Copyright (c) 1991 Seagate All rights
reserved.
```

The `probe-scsi-all` test sends an inquiry command to all SCSI devices on all the SCSI host adapters installed in the system. The first identifier listed in the display is the SCSI host adapter address in the system device tree, followed by the SCSI device identification data.

For example:

```
ok probe-scsi-all
/iommu@0,100000000/sbus@0,10001000/espdma@5,8400000/esp@5,8800000
Target 1
  Unit 0 Disk CONNER  CP30548  SUN0535AEBX93081QTT
Target 3
  Unit 0 Disk CONNER  CP30548  SUN0535AEBX93081QTT
Target 6
  Unit 0 Removable Read Only device  TOSHIBA CD-ROM XM-4101TA289310/16/93
```

## D.1.6 `module-info`

This command reports back the system CPU information including: the microprocessor name, its revision, the speed at which it is running in megahertz, and the SBus speed in megahertz.

For example:

```
ok module-info
CPU FMI,MB86904 Rev. 2.0: 70.0 Mhz
SBus (Divide By 3)      : 23.3 Mhz
ok
```

## D.1.7    `test-memory`

All of the system main memory will be tested if the system `diag-switch?` parameter is `true`. If the `diag-switch?` parameter is `false`, this test uses the `selftest-#megs` parameter in NVRAM to determine how much memory to test. The default for the `selftest-#megs` parameter is `1`, so only 1 megabyte of memory is tested.

To change the default amount of memory tested using the `selftest-#megs` default parameter, type this command:

```
ok setenv selftest-#megs 256
```

This sets the desired memory size to be tested to 256 megabytes.

When testing the installed memory alone, if `diag-switch?=false`, the `selftest-#megs` parameter takes a default value of 1 megabyte (factory-defined value) or the value you set using `setenv` shown in the example above.

Any whole number may be used up to 256, and if the number exceeds the amount of installed memory, all the installed memory in the system is tested. When the `test-memory` diagnostic is running, the number of megabytes being tested is displayed and counted down to zero during the test.

See the OpenBoot Command Reference for a detailed description and step-by-step instructions for the available FORTH Diagnostic tests.

# D.2    Returning to the Old-Style Sunmon Compatibility Mode Prompt

If you need to return to the `>` prompt from the FORTH Monitor, type **old-mode** at the `ok` prompt.

```
ok old-mode
>
```

# Glossary

**address**   A location within a computer system memory. Reference is usually made to an *address* for the purpose of retrieving or storing information.

**A RMS**   Amperes root mean square. RMS is often used in power measurements for electronic equipment.

**attachment unit interface (AUI) port**   The port on the SPARCstation 5 system unit where the AUI adapter cable is connected.

**boot**   To load the system software into memory and start the system running.

**boot PROM**   A PROM chip on the system board that contains the boot code and a FORTH Monitor program. The boot PROM is connected to the I/O data bus.

**boot PROM diagnostics**   The diagnostic firmware contained in the boot PROM.  These diagnostics include the Power-On Self-Test (POST) and on-board diagnostics.

**buffer**   The auxiliary data-storage device that holds data temporarily, and that may also perform other functions in conjunction with various I/O machines.

**cache**   A mechanism for accelerating a microprocessor performance. A cache is a small, fast memory between the microprocessor and main memory. It stores the most recently used information (data, instructions, etc.), and provides such information again to the microprocessor more rapidly than could main memory.

**CRU**   Customer-replaceable unit.

**DMA**   Direct memory access.

**DRAM**   Dynamic random access memory.

**DSIMM**   DRAM single in-line memory module. A small printed circuit card that contains dynamic random access memory (DRAM) chips.

| | |
|---|---|
| **Ecache** | External cache. Cache that is located external to the microprocessor. See also *cache*. |
| **FORTH** | A high-level programming language. A major feature of FORTH is that user-defined operators can be used as if they were primitives. |
| **FORTH Toolkit** | An interactive command interpreter based on the FORTH programming language. While in the Toolkit, you will see the ok prompt. The Toolkit gives you access to an extensive set of functions for performing fault isolation and debugging. |
| **frame buffer board** | A printed circuit board installed in an SBus slot of the system unit that controls a video display. |
| **LED** | Light-emitting diode. |
| **MBus module** | A printed circuit board installed in an MBus slot of the system unit that contained the CPU circuitry and components. |
| **Monitor (1)** | Indicated by the > prompt. From the > prompt, you can boot the system, continue the execution of a halted program, or enter the FORTH Toolkit. |
| **Monitor (2)** | A video display unit that is part of the SPARCstation 5 system. |
| **MMU** | Memory management unit. |
| **NVRAM** | Nonvolatile ram. |
| **On-Board Diagnostics** | A test that allows you to test the control registers, the network controller, the diskette drive system, memory, the cache, the system clock, and watch the network for valid packets. |
| **Pok** | Power ok. A signal from the power supply that is activated after DC voltages have risen. |
| **POST** | Power-On Self-Test. The POST runs when you turn on the system power switch or reboot the system and press and hold the L1-d keys. The POST, stored in the boot PROM, is a series of rudimentary tests designed to verify that the major components on the system board are working properly. |
| **PROM** | Programmable read only memory. |
| **RAM** | Random access memory. |
| **ROM** | Read only memory. |
| **SBus card** | A printed circuit board installed in an SBus slot of the system unit. |
| **SCC** | Serial communications controller. |
| **SCSI** | Small computer system interface; pronounced "scuzzy." |
| **SIA** | Serial interface adapter. |

**SunDiag System
Exerciser** Diagnostic software that runs under SunOS system software; displays real-time use of system resources and peripheral equipment such as Desktop Storage Packs and External Storage Modules.

**system Monitor** See *Monitor (1)* or *(2).*

**terminal** A character device that consists of a video display and keyboard that is used to type and display information. A terminal may be connected to either of the serial interface ports on the back panel of the SPARCstation 5 system. It is not the same thing as a monitor.

**TOD** Time-of-Day clock.

**TPE** Twisted-pair Ethernet.

**UART** Universal asynchronous receiver/transmitter.

# Index