

# Ultra™ 1 Creator Series Service Manual

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THE NETWORK IS THE COMPUTER™

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Adobe PostScript

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# Preface

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The *Ultra™ 1 Creator Series Service Manual* provides detailed procedures that describe the removal and replacement of field replaceable units (FRUs) in the Ultra 1 Creator series computer (system unit) and the Ultra Enterprise™ 1 server (server). People that should use this book include technicians, advanced computer system end-users with experience in replacing hardware and troubleshooting, system administrators, and qualified service providers.

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## Document Organization

This book is comprised of seven parts. Each part is divided into chapters as listed in here.

**TABLE P-1** Document Organization

Part Number/Title	Chapter Number/Title	Content Description
Part 1, "System Information"	Chapter 1, "Product Description"	Describes the major components of the Ultra 1 Creator series desktop system and the Ultra Enterprise 1 server
Part 2, "Troubleshooting"	Chapter 2, "SunVTS Overview"	Describes the execution of individual tests for verifying hardware configuration and functionality
	Chapter 3, "Power-On Self-Test (POST)"	Describes the execution of POST and provides examples of POST output patterns

**TABLE P-1** Document Organization (*Continued*)

<b>Part Number/Title</b>	<b>Chapter Number/Title</b>	<b>Content Description</b>
	Chapter 4, “Troubleshooting Procedures”	Provides actions to generalized hardware symptom casualty
Part 3, “Preparing for Service”	Chapter 5, “Safety and Tool Requirements”	Explains how to work safely when servicing the Ultra 1 Creator series
	Chapter 6, “Power On and Off”	Provides step-by-step procedures to power on and power off the Ultra 1 Creator series
Part 4, “Subassembly Removal and Replacement”	Chapter 7, “Internal Access”	Provides step-by-step procedures to remove the Ultra 1 Creator series cover, attach the wrist strap, and replace the cover
	Chapter 8, “Major Subassemblies”	Provides step-by-step procedures to remove and replace major subassemblies
	Chapter 9, “Storage Devices”	Provides step-by-step procedures to remove and replace storage devices
Part 5, “System Board”	Chapter 10, “System Board and Component Replacement”	Provides step-by-step procedures to remove and replace the system board, and to remove and replace various components associated with system board operation
Part 6, “Illustrated Parts Breakdown”	Chapter 11, “Replacement Parts”	Lists replaceable parts for the Ultra 1 Creator series system unit
Part 7, “Appendixes, Glossary, and Index”	Appendix A, B, and C	Provide product specifications, signal descriptions, and functional descriptions for the Ultra 1 Creator series, respectively
	Glossary	Provides a listing of acronyms, terms, and definitions
	Index	Provides a quick reference to specific topics



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# Warnings and Cautions



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**Caution** – This equipment contains lethal voltage. Accidental contact can result in serious injury or death. The surface of the UltraSPARC CPU<sup>™</sup> chip may be hot and cause personal injury if touched. Avoid contact.

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**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 resultant damage to the equipment.

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**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wriststrap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

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

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

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**Note** – Prior to performing service or repair, carefully read the associated procedure. If a similar repair has not been performed on comparable equipment, DO NOT ATTEMPT to perform the procedure.

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# Typographic Conventions

Typographic conventions used in this service manual are listed in here.

TABLE P-2 Typographic Conventions

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

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## Related Documentation

Additional information for servicing the Ultra 1 Series system are listed in here. These documents are also available on-line on the *Ultra 1 Series Hardware AnswerBook<sup>TM</sup>* or on Solaris<sup>TM</sup> on Sun Hardware AnswerBook <sup>TM</sup>.

TABLE P-3 Related Documents

Application	Title	Part Number
Installation	Sun <sup>®</sup> Ultra <sup>®</sup> 1 Creator Series Installation Guide (Southern Europe)	802-4145
Diagnostics	Sun <sup>®</sup> Ultra <sup>®</sup> 1 Creator Series Internal Storage Device User's Guide	802-4151
Configuration	Sun <sup>®</sup> Ultra <sup>®</sup> 1 Creator Series Reference Manual	802-4147
Specification	17-Inch Entry, 17-Inch Premium, and 20-Inch Premium Color Monitors Specifications	802-6168

**TABLE P-3** Related Documents *(Continued)*

<b>Application</b>	<b>Title</b>	<b>Part Number</b>
Specification	SunCD™ 4 Drive Specifications	802-4157
Specification	Diskette Drive Specification	802-5283
Specification	2.5-Gbyte QIC Tape Drive Specifications	802-3615
Specification	8-mm Tape Drive Specifications	802-5775
Specification	4-mm Tape Drive Specifications	802-5324
Diagnostic	SunVTS <sup>‰</sup> 1.0 User's Guide	801-7271
Diagnostic	SunVTS <sup>‰</sup> 1.0 Test Reference Manual	802-1448
Diagnostic	SunVTS <sup>‰</sup> 1.0 Quick Reference Card	802-3622
Diagnostics	SunVTS <sup>‰</sup> 2.0 User's Guide	802-5331
Diagnostics	SunVTS <sup>‰</sup> 2.0 Test Reference Manual	802-5330
Diagnostics	SunVTS <sup>‰</sup> 2.0 Quick Reference Card	802-5329

## Shell Prompts in Command Examples

The following table lists the default system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell.

**TABLE P-4** Shell Prompts

<b>Shell</b>	<b>Prompt</b>
C shell	machine_name%
C shell superuser	machine_name#
Bourne shell and Korn shell	\$
Bourne shell and Korn shell superuser	#

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The SunDocs™ Order Desk is a distribution center for Sun Microsystems technical documents. Technical documents may be purchased through major credit cards or company purchase orders. The following table lists the locations where you can order documents.

**TABLE P-5** Ordering Sun Documents

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France	05-90-61-57	05-90-61-58
Belgium	02-720-09-09	02-725-88-5
Luxembourg	32-2-720-09-09	32-2-725-88-5
Germany	01-30-81-61-91	01-30-81-61-92
The Netherlands	06-022-34-45	06-022-34-46
Sweden	020-79-57-26	020-79-57-27
Switzerland	155-19-26	155-19-27
Japan	0120-33-9096	0120-33-9097

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World Wide Web: <http://www.sun.com/sunexpress/>

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- Fax: SMCC Document Feedback  
1-415-786-6443



# Product Description

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The Ultra™ 1 Creator series desktop workstation and the Ultra Enterprise™ 1 server are uniprocessor devices that use the family of UltraSPARC™ processors. Both the desktop workstation and the server offer super-scalar processor technology, multiprocessing, high-performance memory interconnection, and high bandwidth input/output (I/O). In addition, the desktop workstation provides accelerated graphics.

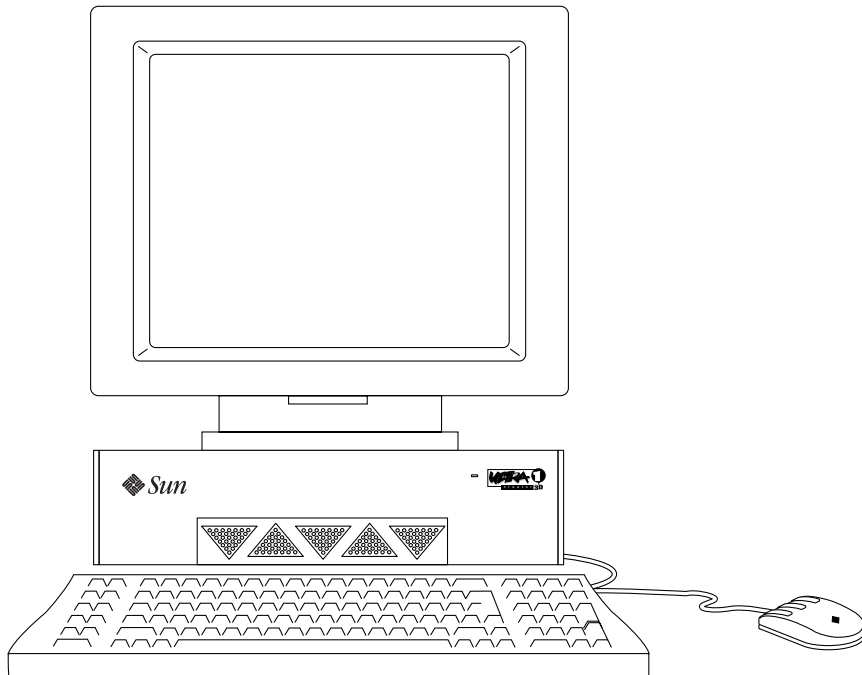
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## 1.1 Ultra 1 Series Overview

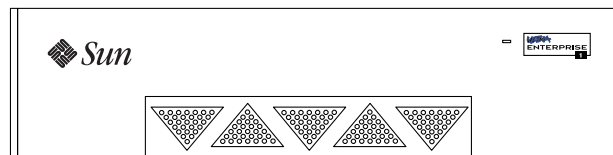
Major components comprising the Ultra 1 Creator series desktop workstation and the Ultra Enterprise 1 server include:

- I/O devices:
  - Monitor (included with desktop workstation)
  - Keyboard (included with desktop workstation)
  - Mouse (included with desktop workstation)
  - Microphone (not illustrated, included with desktop workstation)
  - Color camera (optional, not illustrated)
- External cables (not illustrated, included with desktop workstation and server)
- System unit

FIGURE 1-1 illustrates the Ultra 1 Creator series desktop workstation and Figure 1-2 illustrates the Ultra Enterprise 1 server.



**FIGURE 1-1** Ultra 1 Creator Series Desktop System



**FIGURE 1-2** Ultra Enterprise 1 Server

The following sections provide a brief description of the Ultra 1 Creator series desktop workstation I/O devices. Also included is a detailed overview of the Ultra 1 Creator series and the Ultra Enterprise 1 system unit features.



---

## 1.2 I/O Devices (Ultra 1 Creator Series Desktop)

The Ultra 1 Creator series desktop workstation uses the following I/O devices:

- Keyboard
- Optical mouse
- Microphone
- Color camera
- One of several types of monitors

The following table lists the supported I/O devices and provides a brief description of each device.

**TABLE 1-1** Supported I/O Devices

I/O Device	Description
17-inch (43-cm) color monitor	1152 x 900 resolution, 76- or 66-Hz refresh rate, 100 dots per inch (DPI)
	1280 x 1024 resolution, 76- or 66-Hz refresh rate, 110 DPI
	960 x 680 resolution, 112-Hz refresh rate, 81 DPI
20-inch (51-cm) color monitor	1152 x 900 resolution, 76- or 66-Hz refresh rate, 84 DPI
	1280 x 1024 resolution, 76- or 66-Hz refresh rate, 93 DPI
	960 x 680 resolution, 112-Hz refresh rate, 79 DPI
Microphone	SunMicrophone™ II
Color camera	Optional SunVideo™ and SunCamera™
Keyboard	Sun Type-5; AT 101 or UNIX layout available
Optical mouse	Optomechanical, 3-button

---

## 1.3 Supported I/O Devices (Ultra 1 Creator Series Desktop)

### 1.3.1 System Unit Features

System unit components are located in a Sun Ultra 1 Creator chassis. Overall chassis dimensions (width x depth x height) are 16.44 inches x 17.44 inches X 4.07 inches (418mm x 443mm x 104mm). System unit electronics are contained on a single 9.6-inch x 11.0-inch (244mm x 279mm) printed circuit board (system board). The system board contains the CPU cluster, memory, system control application specific integrated circuits (ASICs), and I/O ASICs. The CPU cluster consists of the UltraSPARC processor, five cache chips, and two UltraSPARC data buffer ASICs.

System unit electronics and peripherals contain (or may be upgraded to contain) the following features:

- SPARC™ V9 64-bit UltraSPARC™ processor
  - 167-Megahertz (MHz) processor
  - 200-MHz processor
- Solaris™ 2.5.1 operating system
- Solaris™ 2.5 Hardware: 1/96
- High performance UltraSPARC Port Architecture™ (UPA)
- High bandwidth memory system using 144-bit, 60-nanosecond (ns) dynamic random access memory (DRAM) single in-line memory module (SIMM)
- Eight DRAM SIMM (DSIMM) sockets providing from 32 Mbytes to 1 gigabyte (Gbyte) of memory using 16-Mbyte, 32-Mbyte, 64-Mbyte, or 128-Mbyte DSIMMs
- Fast frame buffer (FFB) graphics (67-MHz graphics clock) with 24-bit color and 8-bit overlay: single buffer FFB, double buffer FFB (Ultra 1 Creator series desktop only).
- Double buffer FFB with 66-MHz graphics clock (Ultra 1 Creator 3D series desktop only)
- 16-bit CD quality audio with support for line in/out, headphone, and stereo microphone
- 20-Mbyte-per-second small computer system interface (SCSI)
- 10-megabits-per-second (Mbps)/100-Mbps twisted-pair Ethernet (TPE) and media-independent interface (MII) networking

- Two IEEE 1496-compliant 25-MHz SBus input/output (I/O) slots
- Two DB25-type standard connector serial ports

Each serial port supports synchronous and asynchronous communication.

- DB25-type connector parallel port (Centronics compatible)
- Standard Sunness

---

**Note** – Standard Sunness includes the time of day (TOD)/nonvolatile random-access memory (NVRAM), and boot programmable read-only memory (PROM) or FlashPROM for Power-On Self-Test/OpenBoot PROM (POST/OBP)

---

- Built-in speaker
- Diagnostic LED
- Power conservation support

## 1.3.2 System Unit Components

System unit components are listed in TABLE 1-2. FIGURE 1-3 illustrates the system unit interior. FIGURE 1-4 illustrates the system unit rear panel.

---

**Note** – Part numbers listed in TABLE 1-2 are correct as of the service manual publication date but are subject to change without notice. Consult your authorized Sun sales representative or service provider to confirm a part number prior to ordering a replacement part.

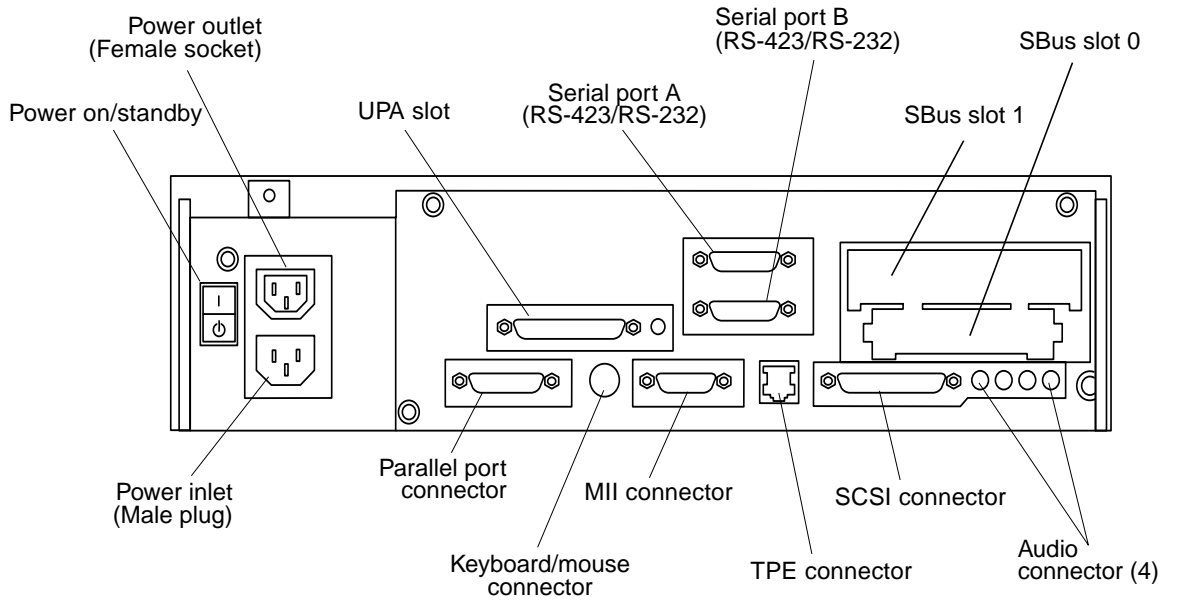
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TABLE 1-2 System Unit/Server Components

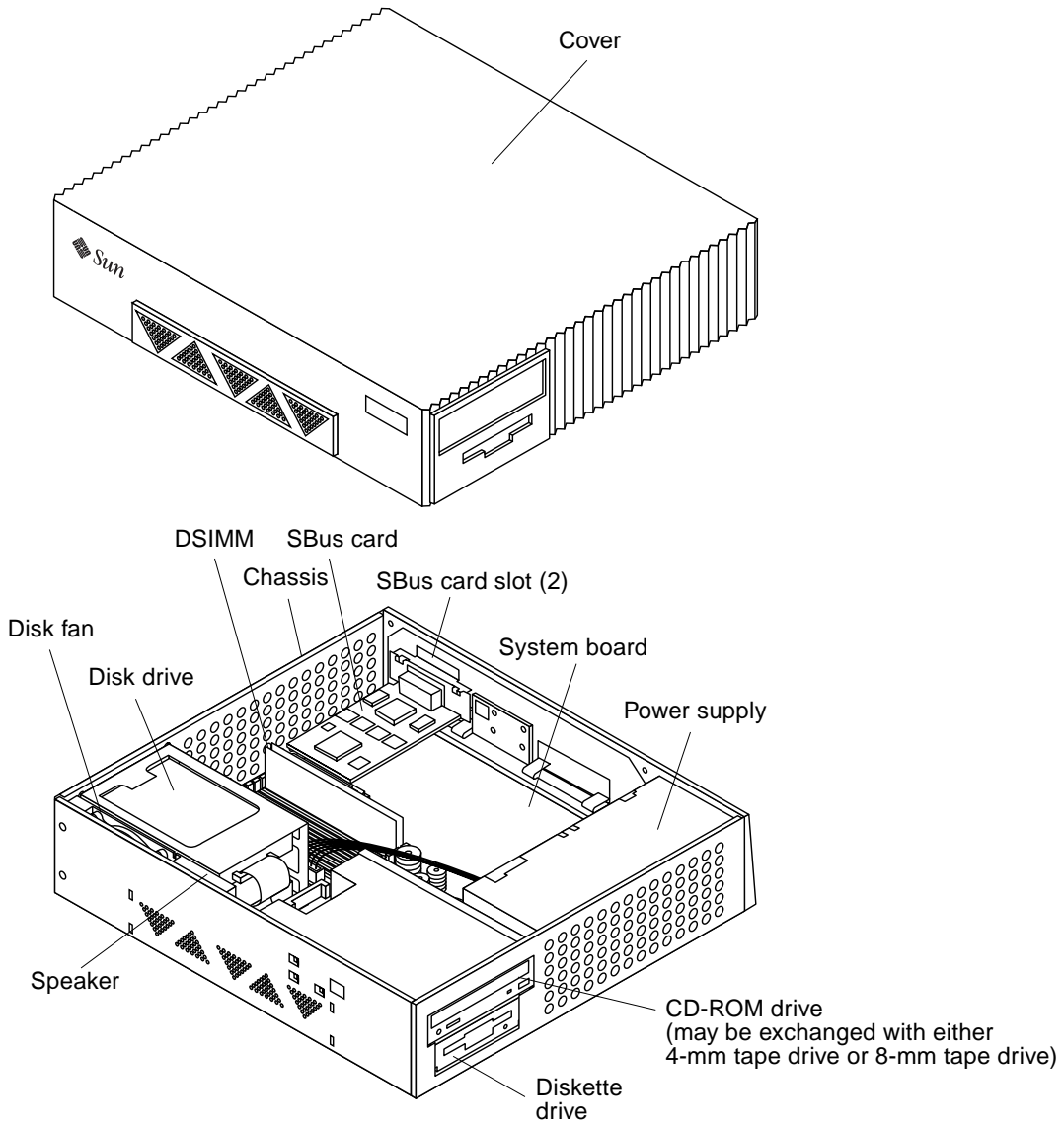
Component	Part Number	Description
CPU	501-2486	Ultra 1 Creator Series system board (167-MHz)
CPU	501-4134	Ultra 1 Creator Series system board (200-MHz)
TOD/NVRAM	525-1430	TOD/NVRAM
DSIMM	501-2479	DSIMM, 16-Mbyte
DSIMM	501-2622	DSIMM, 32-Mbyte

**TABLE 1-2** System Unit/Server Components *(Continued)*

<b>Component</b>	<b>Part Number</b>	<b>Description</b>
DSIMM	501-2480	DSIMM, 64-Mbyte
DSIMM	501-3136	DSIMM, 128-Mbyte
Graphics card (desktop workstation only)	501-2633	FFB board, double buffer, 67-MHz
Graphics card (desktop workstation only)	501-2634	FFB board, single buffer, 67-MHz
Graphics card (desktop workstation only)	501-4126	FFB board, double buffer, 67-MHz
Graphics card (desktop workstation only)	501-4127	FFB board, single buffer, 67-MHz
Drive	540-2729	1.05-Gbyte disk drive
Drive	540-2730	2.1-Gbyte disk drive
Drive	370-2102	CD-ROM drive 1.6-inch
Drive	370-2151	Diskette drive
Power supply	300-1308	180 W power supply
Fan assembly	540-2761	System board fan
Fan assembly	540-2666	Disk fan (80 mm)
Speaker	370-1579	Speaker
Cable assembly	530-1871	TPE cable type 5
Cable assembly	530-2153	SCSI cable/backplane assy
Cable assembly	530-2175	Cable, speaker/LED
Cable assembly	530-2176	Cable, peripheral power
Cable assembly	530-2187	Cable, diskette



**FIGURE 1-3** System Unit Rear View



**FIGURE 1-4** System Unit with Cover Removed

## SunVTS Overview

---

This chapter contains an overview of the Sun validation and test suite (SunVTS™) diagnostic tool/application. The following is the list of the SunVTS diagnostic topics presented in this chapter.

- “SunVTS Kernel” on page 2
- “SunVTS User Interface” on page 2
- “SunVTS Teletype” on page 3

---

### 2.1 SunVTS Overview

The SunVTS software executes multiple diagnostic hardware tests from a single user interface and is used to verify configuration and functionality of most hardware controllers and devices. SunVTS operates primarily from the OpenWindows™ user interface, allowing test parameters to be set quickly and easily while a diagnostic test operation is being performed.

The SunVTS operation is provided in the documents listed in TABLE 2-1. These documents furnish detailed information about SunVTS and are available on the *Solaris on Sun Hardware AnswerBook*. The *Solaris on Sun Hardware AnswerBook* is provided on the *SMCC Updates* CD for the Solaris release being operated.

TABLE 2-1 SunVTS Documentation

Title	Part Number	Description
SunVTS User's Guide	802-5331	Describes the SunVTS environment; starting and controlling various user interfaces; feature descriptions
SunVTS Test Reference Manual	802-5330	Describes each SunVTS test; provides various test options and command line arguments
<i>SunVTS Quick Reference Card</i>	802-5329	Provides overview of <code>vtsui</code> interface features

The main features of the SunVTS environment include:

- SunVTS kernel
- SunVTS user interface
- SunVTS teletype

## 2.1.1 SunVTS Kernel

The SunVTS kernel (`vtsk`) diagnostic tool controls all testing and operates in the OpenWindows background. When activated, `vtsk` probes the hardware configuration of the system tested and responds to `vtsui`. `vtsk` coordinates execution of individual tests and manages the messages sent by these tests.

## 2.1.2 SunVTS User Interface

The SunVTS user interface (`vtsui`) diagnostic tool operates in the OpenWindows background. Upon activation, `vtsui` provides `vtsk` control, various user options, tests, and read-log files.



## 2.1.3 SunVTS Teletype

The SunVTS teletype (`vtstty`) diagnostic tool controls the `vtsk` from either a command shell or a terminal attached to a serial port. Most options available in `vtstty` have equivalent options in `vtsui`.



## Power-On Self-Test

---

This chapter contains procedures to initiate the Power-on self-test (POST) diagnostics. Procedures are also included to support pre-POST preparation, POST data interpretation, and bypassing POST diagnostics. The following is a list of the POST diagnostic topics presented in this chapter.

- “POST Overview” on page 1
- “Pre-POST Preparation” on page 2
- “Initializing POST” on page 4
- “Max and Min Levels of POST” on page 5
- “POST Progress and Error Reporting” on page 10
- “Bypassing POST” on page 11
- “Additional Keyboard Control Commands” on page 12
- “System and Keyboard LEDs” on page 12
- “System Board Test” on page 13

---

### 3.1 POST Overview

POST is useful in determining if a portion of the system has failed and should be replaced. POST detects approximately 85 percent of Ultra 1Creator series system faults and is located in the system board OpenBoot™ PROM (OBP). The setting of the

diag-level switch determines the POST function. TABLE 3-1 lists the diag-level switch settings for disabling POST (off), enabling POST maximum (max), or enabling POST minimum (min).

TABLE 3-1 Diag-Level Switch Settings

Diag-Level Switch Setting	POST Initialization?	Serial Port A I/O	Serial Port A Error Output	Diag-Switch Setting
Off	No	N/A	N/A	Don't care
Max	Yes (power-on)	Enabled	Enabled	True
Min	Yes (power-on)	Disabled	Enabled	True

## 3.2 Pre-POST Preparation

Pre-POST preparation includes:

- Setting up a tip connection to another workstation or terminal to view POST progress and error messages.

See Section 3.2.1 “Setting Up a Tip Connection” on page 3-2.

- Verifying baud rates between a workstation and a monitor or a workstation and a terminal.

See Section 3.2.2 “Verifying the Baud Rate” on page 3-4.

If a terminal or a monitor is not connected to serial port A (default port) of a workstation or server to be tested, the keyboard LEDs are used to determine error conditions (see Section 3.9 “System and Keyboard LEDs” on page 3-12.)

### 3.2.1 Setting Up a Tip Connection

A tip connection permits a remote shell window to be used as a terminal to display test data of a system being tested. Serial port A or serial port B of a workstation or server being tested is used to establish the tip connection between the workstation or server being tested and another Sun workstation monitor or TTY-type terminal. The tip connection is used in a SunOS window and provides features to help with the OBP.

To set up a tip connection:

1. Connect serial port A of the system being tested to another Sun Workstation serial port B using a serial null modem cable (connect cable pins 2-3, 3-2, 7-20, and 20-7).
2. At the other Sun workstation, check the `/etc/remote` file:

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

---

**Note** – The example shows connection to serial port B, `ttyb`

---

3. To use serial port A:
  - a. Copy and paste the following:

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

- b. Then modify as follows:

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

4. In a shell tool window on the Sun Workstation, enter `tip hardwire`. The system replies:

```
hostname% tip hardwire
connected
```

---

**Note** – The shell window is now a `tip` window directed to the serial port of the Sun Workstation or server being tested. When power is applied to the system being tested, POST messages will be displayed in this window.

---

5. When POST is completed, disconnect the `tip` window as follows:
  - a. Open a shell tool.
  - b. Enter `ps -a` to view the active `tip` line and process ID (PID) number.

- c. Enter `kill -9 XXXX` (where **XXXX** is the PID number) of the **tip hardware process**.

```
hostname% kill -9 PID# of tip hardware process
```

## 3.2.2 Verifying the Baud Rate

To verify the baud rate between the system being tested and a terminal or another Sun workstation monitor:

1. **Open a shell tool.**
2. **Enter `eeprom`.**
3. **Verify the following serial port default settings as follows:**

```
ttyb-mode = 9600,8,n,1  
ttya-mode = 9600,8,n,1
```

---

**Note** – Ensure that the above settings are consistent with TTY-type terminal or workstation monitor settings.

---

---

## 3.3 Initializing POST

POST may be initialized by two ways: by setting the `diag-switch?` NVRAM variable to true and then power cycling the system or by simultaneously pressing the keyboard Stop and D keys while power is applied to the system.

To set the `diag-switch?` NVRAM variable to true and power cycle the system:

1. **At the system prompt, enter: `setenv diag-switch? true`. Verify the prompt, `diag-switch? true`, is displayed**
2. **At the Sun type-5 keyboard, power cycle the system by simultaneously pressing the shift key and the power-on key (FIGURE 3-1). After a few seconds, press the power-on key.**
3. **Verify the following:**

- a. The display prompt disappears.
  - b. The monitor power-on indicator flashes on and off.
  - c. The keyboard Caps Lock key indicator flashes on and off.
4. When the POST is complete, set the `diag-switch?` variable to false (default setting).

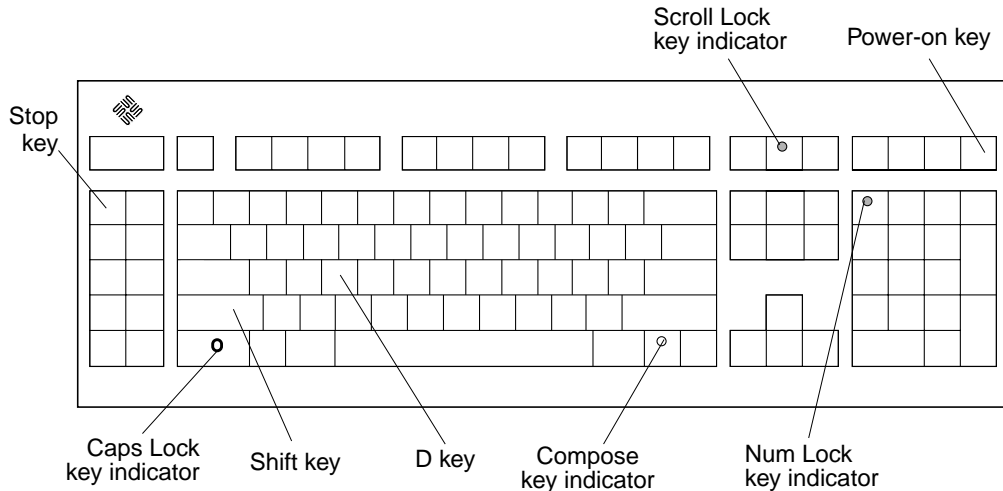


FIGURE 3-1 Sun Type-5 Keyboard

## 3.4 Max and Min Levels of POST

Two levels of POST are available: max (maximum level) and min (minimum level). The system initiates the selected level of POST based upon the setting of `diag-level`, a NVRAM variable.

The default setting for `diag-level` is max. An example of a max level POST output on serial port A is provided in Section 3.4.1 “Diag-Level NVRAM Variable Set to Max” on page 3-6. An example of a min level POST output on serial port A is provided in Section 3.4.2 “Diag-level NVRAM Variable Set to Min” on page 3-9.”

To set the `diag-level` variable to min, enter:

```
ok setenv diag-level min
```

To return to the default setting:

```
ok setenv diag-level max
```

### 3.4.1 Diag-Level NVRAM Variable Set to Max

When the `diag-level` NVRAM parameter is set to `max`, POST enables an extended set of diagnostic-level tests. This mode requires approximately 1.5 minutes to complete. CODE EXAMPLE 3-1 identifies a typical serial port A POST output with the `diag-level` NVRAM variable set to `max`.

---

**Note** – XXXX placeholders used in table entries represent numeric values that may change without notice.

---

**CODE EXAMPLE 3-1** Diag-level NVRAM Variable Set to Max

```
ok Hardware Power ON
Button Power ON
Button Power ON

@(#)Sun Ultra X UPA/SBus X.X X.X FCS Test PROM Version X created XXXX/XX/XX XX:XX
Clearing DTAGS 0000.0000.0008.0000 Done
Probing keyboard Done
%o0 = 0000.0000.0000.4001

Executing Power On SelfTest
0>@(#) Sun Ultra Enterprise X POST, FCS_Version XX.XX.XX X/XX/XX XX:XX XX
0>@(#) Sun Ultra Enterprise X POST, FCS_Version XX.XX.XX X/XX/XX XX:XX XX
0> UltraSparcX Version X.X
0>Ecache Probe
0> Ecache size XXXX Kb
0> Ecache size XXXX Kb
0>Ecache Tag Test
0>Ecache RAM Test
0>Ecache Address Line Test
0>Initialize and Verify Ecache
0>SC Initialization
0> SC_MP id=XXXX, UPA Number=X, Impl=X, Ver=X

0>BMX Test
```



**CODE EXAMPLE 3-1** Diag-level NVRAM Variable Set to Max (Continued)

```
0> Checking BMX's 0>Probing Memory
0> Found Memory Group (Variable based upon memory configuration)
0> Found (Variable based upon memory configuration) of usable Main Memory
0>SIMM Group      Base Addr      Size      Group Status
0>  0              00000000.00000000 08000000 00
0>  1              00000000.20000000 08000000 00

0>Quick Memory Test
0>Clear and Test Stack Memory

SelfTest Initializing
0>Basic CPU Test
0> Instruction Cache Tag RAM Test
0> Instruction Cache Instruction RAM Test
0> Instruction Cache Next Field RAM Test
0> Instruction Cache Pre-decode RAM Test
0> Data Cache RAM Test
0> Data Cache Tags Test
0>MMU Enable Test
0> DMMU Registers Access Test
0> DMMU TLB DATA RAM Access Test
0> DMMU TLB TAGS Access Test
0> IMMU Registers Access Test
0> IMMU TLB DATA RAM Access Test
0> IMMU TLB TAGS Access Test
0> DMMU Init
0> IMMU Init
0> Mapping Selftest Enabling MMUs
0>FPU Register Test
0> FPU Registers and Data Path Test
0> FSR Read/Write Test
0>EPROMs Test
0> PROM Datapath Test
0>Serial Ports Test
0> Slavio Serial Ports Test
0>NVRAM TOD Test
0> M48T59 (TOD) Init
0> M48T59 (TOD) Functional Part 1 Test

SelfTest Initializing
0>Memory Test
0> Memory Clear Test
0> Test being relocated into Cache
0> Memory RAM (blk) Test
0> Test being relocated into Cache
```

**CODE EXAMPLE 3-1** Diag-level NVRAM Variable Set to Max (Continued)

```
0> Memory Stress Test
0> Test being relocated into Memory
0> Memory Address Line Test
0> Test being relocated into Memory

> Memory Address Line Test
0> Test being relocated into Memory
0>Forcing ECC Faults Test
0> ECC CE Pattern Test
0> ECC CE Check bit Test
0> ECC UE Pattern Test
0> ECC UE Check bit Test
0>SysIO Registers Test
0> SysIO Regsiter Initialization
0> IOMMU Registers and RAM Test
0> Streaming Buffer Registers and RAM Test
0> SBus Control and Config Registers Test
0> SysIO RAM Initialization
0>SysIO Functional Test
0> Mapping Selftest Enabling MMUs
0> Clear Interrupt Map and State Registers
0> SysIO Interrupts Test
0> SysIO Timers/Counters Test
0> IOMMU Virtual Address TLB Tag Compare Test
0> Streaming Buffer Flush Test
0> DMA Merge Buffer Test

0>CPU Speed
0> CPU 0 Running at XXX MHZ.
0>Ecache Stress Test
0> Ecache Stress Test
0>APC Test
0> APC Registers Tests Test
0> APC DVMA Test

0>Data Cache Test
0> Dcache Init
0> Dcache Enable Test
0> Dcache Functionality Test

0>FEPS Test
0> Parallel Port Registers Test
0> Parallel Port ID is: XxX
0> Parallel Port DVMA burst mode read/write Test
```

**CODE EXAMPLE 3-1** Diag-level NVRAM Variable Set to Max (*Continued*)

```
0> FAS366 Registers Test
0> ESP FAS366 DVMA burst mode read/write Test
0> FEPS Internal Loopbacks Test
0> Ethernet Transceiver Internal Loopbacks Test
0>CPU Functional Test
0> Mapping Selftest Enabling MMUs
0> SPARC Atomic Instructions Test
0> CPU Dispatch Control Register Test
0> CPU Softint Registers and Interrupts Test
0> CPU Tick and Tick Compare Registers Test
0> Uni-Processor Cache Coherence Test
0> UltraSPARC-2 Prefetch Instructions Test
0> *UltraSparc-1 module detected, tests skipped
0>Cross Calls Test (Dual CPU configuration only)
0> Cross Calls Test
0>Cache Coherency Test
0> Multi-Processor Cache Coherence Test
0>
    << POST COMPLETE(0) >>
```

## 3.4.2 Diag-level NVRAM Variable Set to Min

When the `diag-level` NVRAM parameter is set to `min`, POST enables an abbreviated set of diagnostic-level tests. This mode requires approximately 30 seconds to complete. CODE EXAMPLE 3-2 identifies a serial port A POST output with the `diag-level` NVRAM variable set to `min`.

---

**Note** – XXXX placeholders used in table entries represent numeric values that may change without notice.

---

**CODE EXAMPLE 3-2** Diag-Level NVRAM variable Set to Min

```
Hardware Power ON
Button Power ON
Button Power ON

@(#) Sun Ultra X UPA/SBus X.X X.X FCS Test PROM Version Xcreated XXXX/XX/XX XX:XX
Clearing DTAGS 0000.0000.0008.0000 Done
Probing keyboard Done
%o0 = 0000.0000.0000.2001

Executing Power On SelfTest

0>@(#) Sun Ultra Enterprise X POST, FCS_Version XX.XX.XX X/XX/XXXX XX:XX XX
1>@(#) Sun Ultra Enterprise X POST, FCS_Version XX.XX.XX X/XX/XXXX XX:XX XX
0> UltraSparcX Version X.X
1> UltraSparcX Version X.X
0 << POST COMPLETE(0) >>

Power On Selftest Completed
    Status = 0000.0000.0000.0000 0000.XXXX.XXXX.XXXX XXXX.XXXX.XXXX.XXXX

Software Power ON
```

---

## 3.5 POST Progress and Error Reporting

While POST is initialized, the Caps Lock key on the Sun type-5 keyboard flashes on and off to indicate that POST tests are being executed. Additional POST progress indications are also visible when a TTY-type terminal or a tip line is connected between serial port A (default port) of the system being tested and a POST monitoring system.

If an error occurs during the POST execution, the keyboard Caps Lock key indicator stops flashing and an error code is displayed using the Caps Lock, Compose, Scroll Lock, and Num Lock key indicators. The error code indicates a particular system hardware failure.

---

**Note** – An error code may only be visible for a few seconds. Observe the Caps Lock, Compose, Scroll Lock, and Num Lock key indicators closely while POST is active.

---

In most cases, POST also attempts to send a failure message to the POST monitoring system. TABLE 3-1 identifies the typical appearance of a failure message. If a keyboard error code is displayed, determine the meaning of the error code by comparing the keyboard error code pattern to the corresponding error code meaning listed in TABLE 3-2 on page 3-13.

---

**Note** – The system does not automatically boot if a POST error occurs; it halts at the `ok` prompt to alert the user of a failure.

---

---

## 3.6 Typical Error Code Failure Message

```
Power On Self Test Failed.  
Cause: SIMM U0701 or System Board  
ok
```

---

## 3.7 Bypassing POST

POST may be disabled and thereby bypassed. To bypass POST:

1. **Prior to powering on the system, press and hold the Stop key on the Sun type-5 keyboard.**
2. **With the Stop key pressed, turn on the system by pressing the power-on key (FIGURE 3-1 on page 3-5).**

---

## 3.8 Additional Keyboard Control Commands

- Stop Key

If the `diag-switch?` variable is set to `true` and POST is not to be executed when the system is powered on, press and hold the keyboard Stop key and press the keyboard power-on key.

- Stop and N Keys

If the system NVRAM parameters are set to the original default settings, press and hold the Stop and N keys before powering on the system. Continue to hold the Stop and N keys until the system banner appears on the monitor.

---

## 3.9 System and Keyboard LEDs

The power LED, located at the chassis front, remains lighted when the system is operating normally. FIGURE 3-2 shows the location of the power LED.

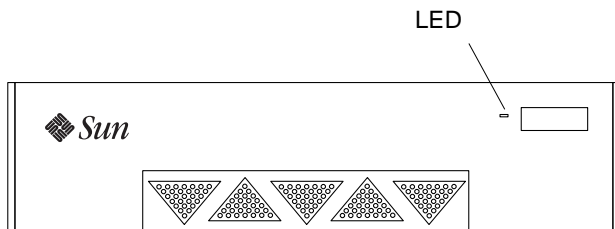


FIGURE 3-2 Power LED

This section describes the keyboard light-emitting diode (LED) patterns as a result of POST and their meaning. While POST is executing and making progress, the Caps Lock key LED blinks while the rest of the LEDs are off. If POST finds an error, a pattern is encoded in the LEDs to indicate the defective part. If POST completes with no errors, all LEDs will be turned off before returning to the OpenBoot<sup>™</sup> PROM (OBP).

TABLE 3-2 defines the keyboard LED patterns. FIGURE 3-1 on page 3-5 shows the location of the LED keys on the Sun type 5-c keyboard.

TABLE 3-2 Keyboard LED Patterns

Caps Lock	Compose	Scroll Lock	Num Lock	Bit Value	Meaning of LED Pattern
Blink	Off	Off	Off	x000(2)	POST in progress
Off	Off	Off	Off	0000(2)	POST successful completion
Off	Off	Off	On	0001(2)	DSIMM in slot U 0601 failure
Off	Off	On	Off	0010(2)	DSIMM in slot U 0701 failure
Off	Off	On	On	0011(2)	DSIMM in slot U 0602 failure
Off	On	Off	Off	0100(2)	DSIMM in slot U 0702 failure
Off	On	Off	On	0101(2)	DSIMM in slot U 0603 failure
Off	On	On	Off	0110(2)	DSIMM in slot U 0703 failure
Off	On	On	On	0111(2)	DSIMM in slot U 0604 failure
On	Off	Off	Off	1000(2)	DSIMM in slot U 0704 failure
On	Off	Off	On	1001(2)	System board failure
On	Off	On	Off	1010(2)	No memory found
On	Off	On	On	1011(2)	Reserved
On	On	Off	Off	1100(2)	Reserved
On	On	Off	On	1101(2)	Reserved
On	On	On	Off	1110(2)	Reserved
On	On	On	On	1111(2)	Reserved

## 3.10 System Board Test

To initialize the POST system board test:

1. **At the Sun type-5 keyboard:**
  - a. **Simultaneously press and hold the Stop and D keys.**
  - b. **While holding the Stop and D keys, press the power-on key.**

2. **Verify the keyboard LEDs light to confirm the system is in the POST mode and the keyboard Caps Lock key LED flashes on and off to indicate the system has enabled the POST.**
3. **If a failure occurs during POST, a keyboard key LED other than the Caps Lock key LED may light, indicating a failed system component.**  
See Section 3.9 “System and Keyboard LEDs” on page 3-12.
4. **If the Caps Lock key LED fails to flash after the Stop and D keys are pressed, POST has failed.**  
See Section 3.9 “System and Keyboard LEDs” on page 3-12.

---

**Note** – The most probable cause of this type of failure is the system board. However, optional system components could also cause POST to fail.

---

5. **Before replacing the system board, remove any optional components such as SBus cards and memory, and repeat the POST.**

---

**Note** – Non-optional components such as: two DSIMMs in slots U601 and U701; the system board; the power supply; and the keyboard must be installed for POST to execute properly. Removing the optional system components and retesting the system isolates the possibility that those components are the cause of the failure.

---

6. **To receive additional POST failure information, establish a tip connection.**  
See Section 3.2.1 “Setting Up a Tip Connection” on page 3-2.



# Troubleshooting Procedures

---

This chapter describes how to troubleshoot possible problems and includes the corrective actions you can take.

- “Power-On Failure” on page 1
- “Video Output Failure” on page 2
- “Disk or CD-ROM Drive Failure” on page 2
- “Power Supply Test” on page 4
- “DSIMM Failure” on page 7
- “OpenBoot PROM On-Board Diagnostics” on page 8

---

## 4.1 Power-On Failure

The following provides examples of power-on failure symptoms and suggested actions.

### **SYMPTOM**

The system unit does not power up when the keyboard power switch is pressed.

### *ACTION*

Check the AC power cord. Ensure that the AC power cord is properly connected to the system unit and to the wall receptacle. Verify that the wall receptacle is supplying AC power to the system.

Press the power switch at the rear of the system unit. If the system powers on, the keyboard may be defective or the system unit is unable to accept the keyboard power-on signal. Power off the system unit and press the keyboard power-on switch again. If the system unit powers on, no further action is required. If the system unit does not power on, the keyboard may be defective. Connect a spare Sun type-5 keyboard to the system unit and press the power-on key.

If the wall receptacle AC power has been verified and the system unit does not power up, the system unit power supply may be defective. See Section 4.4 “Power Supply Test” on page 4-4.

*SYMPTOM*

The system unit attempts to power up but does not boot or initialize the monitor.

*ACTION*

Press the power-on switch and watch the keyboard. You should see the keyboard LEDs light briefly and hear a tone from the keyboard. If you do not hear a tone or if the keyboard LEDs do not light briefly, the system unit power supply may be defective. See Section 4.4 “Power Supply Test” on page 4-4. If you hear a keyboard tone and see the keyboard LEDs light briefly but the system unit still fails to initialize, refer to Section 3.9 “System and Keyboard LEDs” on page 3-12.

---

## 4.2 Video Output Failure

The following provides an example of a video output failure symptom and suggested action.

*SYMPTOM*

No video at the system monitor.

*ACTION*

Check the monitor AC power cord. Ensure that the AC power cord is connected to the monitor and to the wall receptacle. Verify that the wall receptacle is supplying AC power to the monitor. Check the video cable connection between the monitor and the system unit graphics card output port at the rear of the system unit. If the AC connection to the monitor is correct and the video cable is correctly connected, the system monitor or the system unit graphics card may be defective. Replace the monitor or the graphics card.

---

## 4.3 Disk or CD-ROM Drive Failure

The following provides examples of disk drive and CD-ROM drive failure symptoms and suggested actions.

*SYMPTOM*

- A disk drive read, write, or parity error is reported by the operating system or customer application.
- A CD-ROM drive read error or parity error is reported by the operating system or customer applications.

*ACTION*

- Replace the drive indicated by the failure message. The operating system identifies the internal drives as identified in TABLE 4-1.

**TABLE 4-1** Internal Drives Identification

Operating System Address	Drive Physical Location and Target
c0t0d0s#	Lower SCSI Disk, target 0
c0t1d0s#	Upper SCSI Disk, target 1
c0t6d0s#	CD-ROM drive, target 6 (optional)
c0t5d0s#	Tape drive, target 5 (optional)

---

**Note** – The # symbol in the examples may be a numeral between 0 and 7 that describes the slice or partition on the drive.

---

*SYMPTOM*

Disk drive or CD-ROM drive fails to boot or is not responding to commands.

*ACTION*

Test the drive response to the `probe-scsi` command as follows:

1. **At the system `ok` prompt:**
  - a. Enter `reset-all`.
  - b. Enter `probe-scsi`.
2. **If the disk drive responds correctly to `probe-scsi`, the message identified in CODE EXAMPLE 4-4 on page 4-11 appears.**

If the drives respond and a message is displayed, the system SCSI controller has successfully probed the devices. This is an indication that the system board is operating correctly. If one drive does not respond to the SCSI controller probe but the others do, replace the unresponsive drive.

If one internal disk drive is configured with the system and the `probe-scsi` test fails to show the device in the message, replace the drive. If the problem is still evident after replacing the drive, replace the system board. If replacing both the disk drive and the system board does not correct the problem, replace the internal disk drive cable and SCSI backplane assembly.

---

## 4.4 Power Supply Test

The following provides instructions to test the power supply.

---

**Note** – FIGURE 4-1 and TABLE 4-2 identify power supply connector J2601. FIGURE 4-2 and TABLE 4-3 identify power supply connector J2603.

---

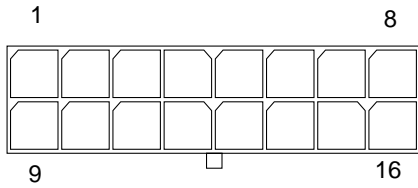
- **Use a digital voltage meter (DVM) to check the power supply output voltages as follows:**

---

**Note** – Power supply connectors J2601 through J2603 must remain connected to the system board.

---

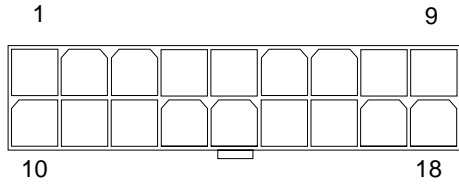
- With the negative probe of the VOM placed on a connector ground (Gnd) pin, position the positive probe on each power pin.**
- Verify +12 VDC, -12 VDC, +5 VDC, +3.3 VDC and +3.0 VDC.**
- If any power pin signal is not present with the power supply active and properly connected to the system board, replace the power supply.**



**FIGURE 4-1** Power Supply Connector J2601

**TABLE 4-2** Connector 2601 Pin Description

Pin	Description	Pin	Description
1	+12V	9	Thermal sensor
2	Gnd	10	-12V
3	Power on	11	Power off
4	Not used	12	Undefined
5	Not used	13	Undefined
6	+3V sense	14	Gnd
7	+3V set	15	Thermal sensor
8	+3V ovp	16	Power on reset



**FIGURE 4-2** Power Supply Connector J2603

**TABLE 4-3** Connector 2603 Pin Description

Pin	Description	Pin	Description
1	+5V	10	Gnd
2	+5V	11	Gnd
3	+5V	12	Gnd
4	+3.3V	13	Gnd
5	+3.3V	14	Gnd
6	+3.3V	15	Gnd
7	+3.0V	16	Gnd
8	+3.0V	17	Gnd
9	+3.0V	18	Gnd

---

## 4.5 DSIMM Failure

At times the operating system, diagnostic program, or POST may not display a DSIMM location (U number) as part of a memory error message. In this situation, the only available information is a physical memory address and failing byte (or bit). TABLE 4-4 to locate the defective DSIMM.

**TABLE 4-4** DSIMM Physical Memory Address

<b>DSIMM Slot Location</b>	<b>Physical Memory Address Start</b>	<b>Physical Memory Address End</b>
<b>Bank 0</b>	<b>0000 0000</b>	<b>0fff ffff</b>
U0701 (byte 00-15, bits 000-127)		
U0601 (byte 16-31, bits 128-255)		
<b>Bank 1</b>	<b>1000 0000</b>	<b>1fff ffff</b>
U0702 (byte 00-15, bits 000-127)		
U0602 (byte 16-31, bits 128-255)		
<b>Bank 2</b>	<b>2000 0000</b>	<b>2fff ffff</b>
U0703 (byte 00-15, bits 000-127)		
U0603 (byte 16-31, bits 128-255)		
<b>Bank 3</b>	<b>3000 0000</b>	<b>3fff ffff</b>
U0704 (byte 00-15, bits 000-127)		
U0604 (byte 16-31, bits 128-255)		

Each bank listed in TABLE 4-4 (Bank 0, Bank 1, Bank 2, and Bank 3) allows enough address space to accommodate two 16-Mbyte, two 32-Mbyte, two 64-Mbyte, or two 128-Mbyte DSIMMs. Unused addresses are mapped out by the memory management hardware. Regardless of the installed DSIMM capacity, the physical memory starting address is as listed in TABLE 4-4.

---

## 4.6 OpenBoot PROM On-Board Diagnostics

The following sections describe the OpenBoot PROM (OBP) on-board diagnostics. To execute the OBP on-board diagnostics, the system must be at the `ok` prompt. The OBP on-board diagnostics are listed as follows:

<code>watch-clock</code>	—page 4-8
<code>watch-net</code> , <code>watch-tpe</code> , and <code>watch-net-all</code>	—page 4-9
<code>probe-scsi</code> and <code>probe-scsi-all</code>	—page 4-10
<code>test &lt;Alias Name&gt;</code> , <code>&lt;Device Path&gt;</code> , <code>-All</code>	—page 4-12
FFB Card	—page 4-12

### 4.6.1 `watch-clock`

`watch-clock` reads a register in the NVRAM/TOD chip and displays the result as a seconds counter. During normal operation, the seconds counter repeatedly increments from 0 to 59 until interrupted by pressing any key on the Sun type-5 keyboard. CODE EXAMPLE 4-1 identifies the `watch-clock` output message.

#### CODE EXAMPLE 4-1 `watch-clock` Output Message

```
ok watch-clock

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

41                                   41 is an example. Counter
                                   increments from 0 to 59
```



## 4.6.2 watch-net, watch-tpe, and watch-net-all

watch-net, watch-tpe, and watch-net-all monitor Ethernet packets on the Ethernet cable(s) connected to the system. Good packets received by the system are indicated by a period (.). Errors such as the framing error and the cyclic redundancy check (CRC) error are indicated with an X and an associated error description. CODE EXAMPLE 4-2 identifies the watch-net output message. CODE EXAMPLE 4-3 identifies the watch-net-all output message.

### CODE EXAMPLE 4-2 watch-net Output Message

```
ok watch-net
Internal loopback test --
succeeded.
Transceiver check -- Using
Onboard Transceiver - Link up.
passed
                Using Onboard
                Transceiver - Link
                up.
Looking for Ethernet packets.
'.' is a good packet.'X' is a
bad packet.
Type any key to stop.
```

#### CODE EXAMPLE 4-3 watch-net-all Output Message

```
ok watch-net-all

/sbus@1f,0/lebuffer@1,40000/le@1,60000
  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.
.....
.....
.....(keyboard key pressed here)
/sbus@1f,0/SUNW,hme@e,8c00000
Internak loopback test -- succeeded.
Transceiver check -- Using Onboard Transceiver - Link Up.
passed
Using Onboard Transceiver - Link Up.
Looking for Ethernet packets.
 '.' is a good packet.  'X' is a bad packet.
Type any key to stop.
.....
.....
```

### 4.6.3 probe-scsi and probe-scsi-all

`probe-scsi` transmits an inquiry command to internal and external SCSI devices connected to the Ultra 1 Creator series on-board SCSI interface. If the SCSI device is connected and active, the target address, unit number, device type, and manufacturer name is displayed. `probe-scsi-all` transmits an inquiry command to SCSI devices connected to the system SCSI host adapters. 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.

CODE EXAMPLE 4-4 identifies the probe-scsi output message and CODE EXAMPLE 4-5 identifies the probe-scsi-all output message.

**CODE EXAMPLE 4-4** probe-scsi Output Message

```
ok probe-scsi

This command may hang the system
if a Stop-A or halt command has
been executed. Please type reset-
all to reset the system before
executing this command.
Do you wish to continue? (y/n)      Enter n
                                     Enter reset-all
                                     Verify display blanks for
                                     approximately 5 seconds and
                                     returns to the ok prompt.

ok probe-scsi

This command may hang the system
if a Stop-A or halt command has
been executed. Please type reset-
all to reset the system before
executing this command.
Do you wish to continue? (y/n)      Enter y

Target 0                             SEAGATE ST32550W
  Unit 0   Disk                       Sun2.1G041200000000
                                     Copyright (c) 1995 Seagate
                                     All rights reserved ASA2

Target 1                             SEAGATE ST32550W
  Unit 0   Disk                       Sun2.1G041200000000
                                     Copyright (c) 1995 Seagate
                                     All rights reserved ASA2

Target 6                             TOSHIBA XM-
  Unit 0   Removable Read Only       5301TASUN4XCD173506/22/95
device
```

#### CODE EXAMPLE 4-5 probe-scsi-all Output Message

```
ok probe-scsi-all

This command may hang the system if
a Stop-A or halt command has been
executed. Please type reset-all to
reset the system before executing
this command.
Do you wish to continue? (y/n)          Enter n
                                         Enter reset-all
                                         Verify display blanks for
                                         approximately 5 seconds
                                         and returns to the ok
                                         prompt.

ok probe-scsi-all

This command may hang the system if
a Stop-A or halt command has been
executed. Please type reset-all to
reset the system before executing
this command.
Do you wish to continue? (y/n)

                                         Enter y

/sbus@1f,0/SUNW, fas@e, 8800000

Target 0                                SEAGATE ST32550W
  Unit 0   Disk                         Sun2.1G041200000000
                                         Copyright (c) 1995 Seagate
                                         All rights reserved ASA2

Target 1                                SEAGATE ST32550W
  Unit 0   Disk                         Sun2.1G041200000000
                                         Copyright (c) 1995 Seagate
                                         All rights reserved ASA2

Target 6                                TOSHIBA XM-
  Unit 0   Removable Read Only device   5301TASUN4XCD173506/22/95
```

### 4.6.4 test <Alias Name>, <Device Path>, -All

The test command, combined with a device alias or device path, enables a device self-test program. If a device has no self-test program, the message: No selftest method for <device name> is displayed. To enable the self-test program for a device, enter the test command followed by the device alias or

device path name. CODE EXAMPLE 4-6 identifies the test output message. TABLE 4-5 lists test <alias name> selections, a description of the selection, and preparation.

---

**Note** – The floppy drive is selected as the test <alias name> example.

---

**CODE EXAMPLE 4-6** test Output Message

```
ok test floppy

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

**TABLE 4-5** Selected OBP On-Board Diagnostic Tests

Type of Test	Description	Preparation
test screen	Tests system video graphics hardware and monitor	Diag-switch? NVRAM parameter must be true for the test to execute.
test floppy	Tests floppy drive response to commands	A formatted diskette must be inserted into the drive.
test net	Performs internal/external loopback test of the system auto-selected Ethernet interface	An Ethernet cable must be attached to the system and to an Ethernet tap or hub or the external loopback test fails.
test ttya test ttyb	Outputs an alphanumeric test pattern on the system serial ports:ttya, serial port A; ttyb, serial port B	A terminal must be connected to the port being tested to observe the output.
test keyboard	Executes the keyboard selftest.	Four keyboard LEDs should flash once and a message is displayed: Keyboard Present.
test-all	Sequentially test system-configured devices containing selftest.	Tests are sequentially executed in device-tree order (viewed with the show-devs command).

## 4.6.5 FFB Card

The FFB card contains a built-in diagnostic test that is enabled through the OBP. The FFB card built-in diagnostic test verifies basic graphics functionality without booting the operating system software.

To execute the built-in diagnostic test, the system must be at the OBP monitor `ok` prompt.

To initialize the FFB card diagnostic:

1. **Enter** `setenv diag-switch? true` **at the `ok` prompt. The `diag-switch? = true` prompt and the `ok` prompt are displayed.**

---

**Note** – If the FFB card is being used as the system display device, perform Steps 2 and 4. If the FFB card is not being used as the system display device, perform Steps 3 and 4.

---

2. **Enter** `test screen` **at the `ok` prompt.**

**CODE EXAMPLE 4-7**

```
Verifying Console Mode for Frame Buffer Board
This will take a few minutes.

Verifying Frame Buffer Memory used for console mode
This will take about two minutes.
```

- a. **A series of patterns are displayed.**
  - b. **FFB Frame Buffer functional test passed appears.**
3. **Enter** `test /SUNW,ffb` **at the `ok` prompt.**

**CODE EXAMPLE 4-8**

```
Verifying Console Mode for Frame Buffer Board
This will take a few minutes.

Verifying Frame Buffer Memory used for console mode
This will take about two minutes.
```

- a. **A series of patterns are displayed.**
  - b. **FFB Frame Buffer functional test passed appears.**
4. **When the FFB on-board diagnostics are completed, enter** `setenv diag-switch? false`. **The `diag-switch? = false` is displayed.**

# Safety and Tool Requirements

---

This chapter provides a description of safety requirements, symbols, safety precautions, and tools required.

- “Safety Requirements” on page 1
- “Symbols” on page 1
- “Safety Precautions” on page 2
- “Tools Required” on page 3

---

## 5.1 Safety Requirements

For protection, observe the following safety precautions when setting up the equipment:

- Follow all cautions, warnings, and instructions marked on the equipment.
- Ensure that the voltages and frequency rating of the power receptacle match the electrical rating label on the equipment.
- Never push objects of any kind through openings in the equipment. They may touch dangerous voltage points or short components resulting in fire or electric shock.
- Refer servicing of equipment to qualified personnel.

---

## 5.2 Symbols

The following symbols mean:



---

**Caution** – Risk of personal injury and equipment damage. Follow the instructions.

---



---

**Caution** – Hazardous voltages are present. To reduce the risk of electric shock and danger to personal health, follow the instructions.

---



---

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

---

---

## 5.3 Safety Precautions

The following safety precautions mean:

### 5.3.1 Modification to Equipment



---

**Caution** – Do not make mechanical or electrical modifications to the equipment. Sun Microsystems is not responsible for regulatory compliance of a modified Sun product.

---

### 5.3.2 Placement of a Sun Product



---

**Caution** – To ensure reliable operation of the Sun product and to protect it from overheating, openings in the equipment must not be blocked or covered. A Sun product should never be placed near a radiator or hot air register.

---



---

## 5.4 Power Cord Connection



**Caution** – Not all power cords have the same current ratings. Household extension cords do not have overload protection. Do not use household extension cords with the Sun product. The power switch of this product functions as a standby type device only. The power cord serves as the primary disconnect device for the system. Be sure to connect the power cord into a grounded electrical receptacle that is nearby the system and is readily accessible. Do not connect the power cord when the power supply has been removed from the system chassis.

---

### 5.4.1 Electrostatic Discharge



**Caution** – The boards and hard disk drive contain electronic components that are extremely sensitive to static electricity. Ordinary amounts of static electricity from clothes or work environment can destroy components. Do not touch the components themselves or any metal parts. Wear a wrist strap when handling the drive assemblies, boards or cards.

---

### 5.4.2 Lithium Battery



**Caution** – On Sun system boards, a lithium battery is molded into the real-time clock, SDS No. M48T59Y, MK48TXXB-XX, M48T18-XXXPCZ or M48T59W-XXXPCZ. Batteries are not customer replaceable parts. They may explode if mistreated. Do not dispose of the battery in fire. Do not disassemble it or attempt to recharge it.

---

---

## 5.5 Tools Required

The following tools are required to service the Ultra 1 series desktop workstation and the Ultra Enterprise 1 server.

- No. 1 Phillips screwdriver
- Needle-nose pliers

- Grounding wrist strap
- Digital voltage meter (DVM)
- Antistatic surface

Place ESD-sensitive components such as system board, circuit cards, disk drives, and TOD/NVRAM on an antistatic surface. The following items can be used as an antistatic surface:

- Bag used to wrap a Sun replacement part
- Shipping container used to package a Sun replacement part
- Inner side (metal part) of the system unit cover
- Sun ESD mat, part no. 250-1088 (may be purchased through your Sun sales representative)
- Disposable ESD mat; shipped with replacement parts or optional system features

# Power On and Off

This chapter explains how to work safely when servicing the Ultra 1 Creator series.

- “Powering On the System” on page 1
- “Powering Off the System” on page 2

---

## 6.1 Powering On the System

To power-on the system, proceed as follows.

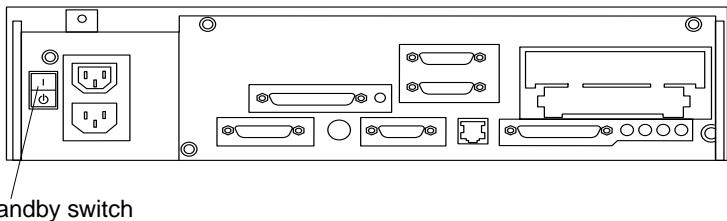
1. **Turn on power to all connected peripherals.**

---

**Note** – Peripheral power is activated prior to system power so the system can recognize the peripherals when it is activated.

---

2. **Set the power on/standby switch to the on (I) position (FIGURE 6-1) or press the Sun type-5 keyboard power-on key (FIGURE 6-2).**



**FIGURE 6-1** Rear View of the System

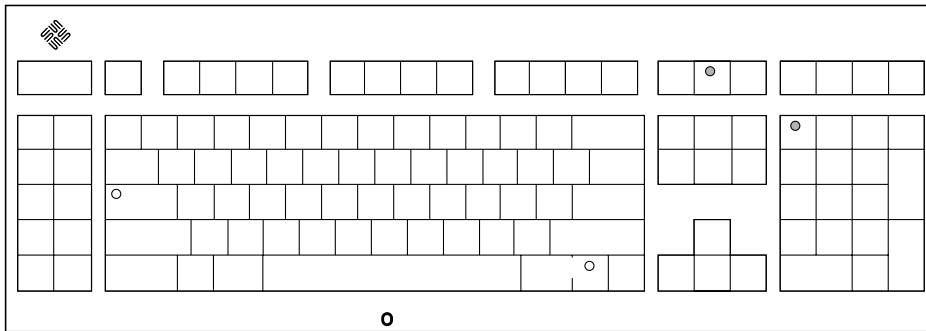


FIGURE 6-2 Sun Type-5 Keyboard

---

## 6.2 Powering Off the System

To power-off the system, proceed as follows.

---

**Caution** – Prior to turning off system power, exit from the operating system. Failure to do so may result in loss of data.

---

1. **Notify users that the system is going down.**
2. **Back up system files and data.**
3. **Halt the system.**
4. **Set the power on/standby switch to the stand-by (O) position**  
(FIGURE 6-1) or **press the Sun Type-5 keyboard power-on key** (FIGURE 6-2).
5. **Verify the following:**
  - a. **Front panel LED is off.**
  - b. **System fans are not spinning.**



---

**Caution** – Disconnect the AC power cord from the AC receptacle prior to handling the power supply. When servicing system components other than the power supply, the AC power cord should remain connected to the AC receptacle.

---

- 6. When the power on/standby switch is in stand-by (0) and the AC power cord remains connected to a power receptacle, AC voltage is present in the power supply primary.**
- 7. Turn off the power to the monitor.**
- 8. Disconnect cables to any peripheral equipment.**



# Internal Access

This section provides step-by-step procedures to remove the Ultra 1 Creator series cover, attach the wrist strap, and replace the cover.

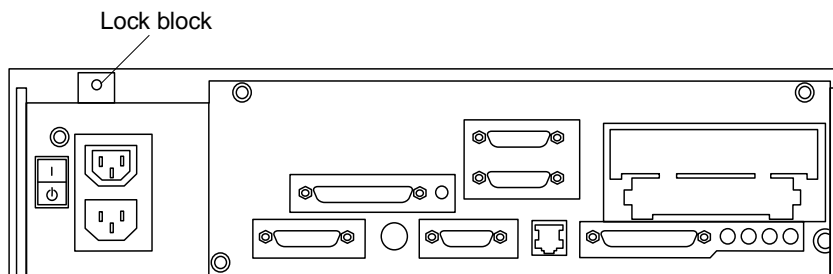
- “Removing the Cover” on page 1
- “Attaching the Wrist Strap” on page 2
- “Replacing the Cover” on page 3

---

## 7.1 Removing the Cover

To remove the cover:

- 1. Power off the system.**  
See Section 6.2 “Powering Off the System” on page 6-2
- 2. Use a No. 1 Phillips screwdriver to remove the lock block (FIGURE 7-1).**



**FIGURE 7-1** Location of Lock Block

- 3. Loosen the captive screws securing the cover (FIGURE 7-2).**

4. Grasping the sides of the cover, lift the cover up from the rear. After the cover clears the back panel, push the cover away from the front panel.

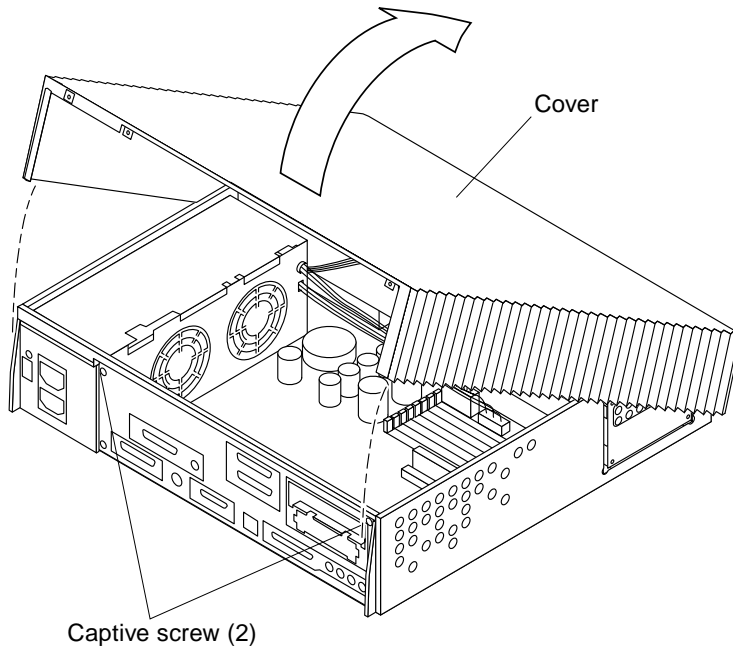


FIGURE 7-2 Removing the Cover

---

## 7.2 Attaching the Wrist Strap

To attach the wrist strap:



---

**Caution** – Wear an antistatic wrist strap and use an ESD-protected mat when handling components. When removing components other than the power supply, leave the power cord connected to both the system/server unit and the wall receptacle. When removing the power supply, attach the copper end of the wrist strap to the system/server unit chassis, not the power supply. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

1. Unwrap the first two folds of the wrist strap; wrap the adhesive side firmly against the wrist (FIGURE 7-3).



2. Peel the liner from the copper foil at the opposite end of the wrist strap. Attach the copper end of the wrist strap to the power supply top.

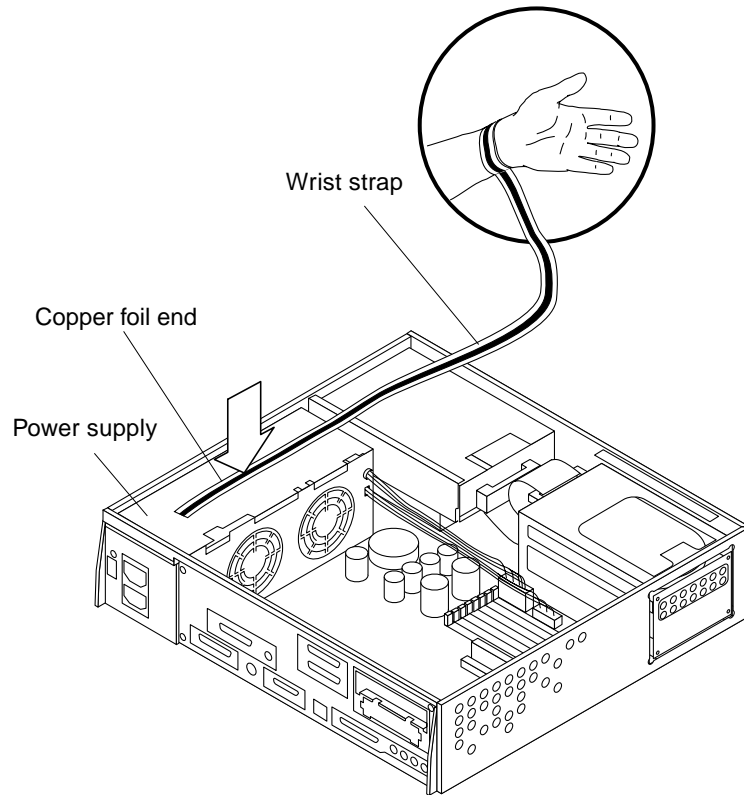


FIGURE 7-3 Attaching the Wrist Strap

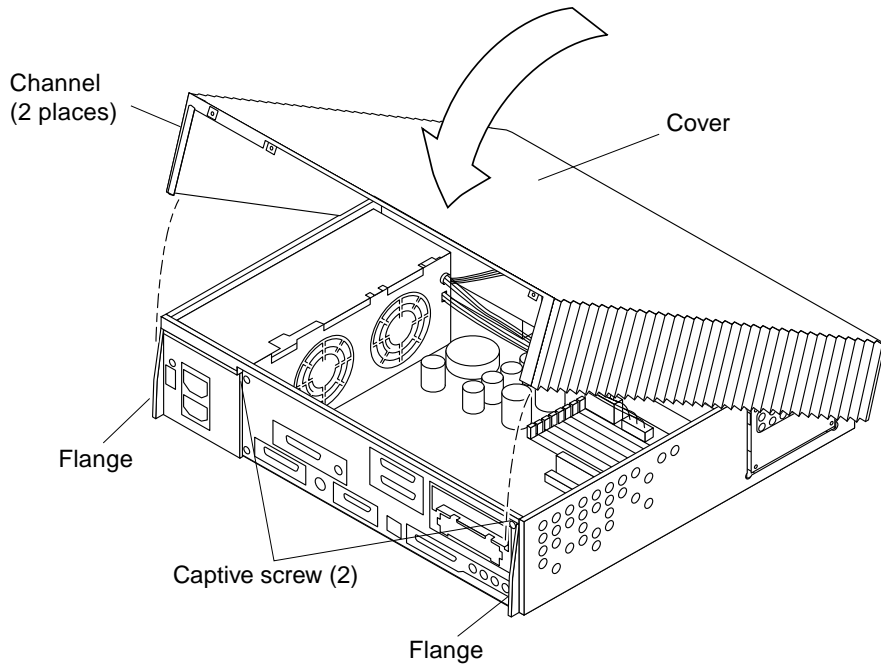
---

## 7.3 Replacing the Cover

To replace the cover:

1. Position the cover on the system (FIGURE 7-4).
2. Lower the rear of the cover until the cover channels align with the chassis flanges. Press down on each side of the cover until the cover firmly seats (FIGURE 7-4).
3. Tighten the captive screws securing the cover.
4. Use a No. 1 Phillips screwdriver to replace the lock block (FIGURE 7-1).

**5. Power-on the system.**



**FIGURE 7-4** Replacing the Cover

## Major Subassemblies

---

This chapter contains procedures to remove and replace the major subassemblies of the system and server units. The following is a list of the major subassemblies:

- “Power Supply” on page 1
- “Disk Drive Fan” on page 5
- “Speaker” on page 9
- “Diskette Cable” on page 14
- “SCSI Cable/Backplane Assembly” on page 18
- “Peripheral Power Cable” on page 23
- “Speaker/LED Cable” on page 29

---

### 8.1 Power Supply

To remove and replace the power supply, proceed as follows.



---

**Caution** – When removing the power supply, attach the copper end of the wrist strap to the system/server unit chassis, vice power supply. When removing components other than the power supply, leave the AC power cord connected to both the system unit and the wall receptacle.

---

#### 8.1.1 Removing the Power Supply

**1. Power-off the system.**

See Section 6.2 “Powering Off the System” on page 6-2.

**2. Remove the system unit cover.**

See Section 7.1 “Removing the Cover” on page 7-1.



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---



---

**Caution** – When removing the power supply, attach the copper end of the wrist strap to the system/server unit chassis, not the power supply.

---

**3. Attach the wrist strap.**

See Section 7.2 “Attaching the Wrist Strap” on page 7-2.

**4. Disconnect the AC power cord from the system.**

**5. Disconnect the power supply as follows** FIGURE 8-1:

- a. Disconnect the power supply connector from the system board at J2603.**
- b. Disconnect the power supply connector from the system board at J2601.**
- c. Remove the DC harness from the clip; disconnect the DC connector from the peripheral power cable at P1.**

**6. Loosen the power supply captive screw from the back panel.**

**7. Push the power supply toward the front side of the chassis to disengage the mounting hooks.**

**8. Tilt the power supply slightly toward the system board; lift the power supply from the chassis.**

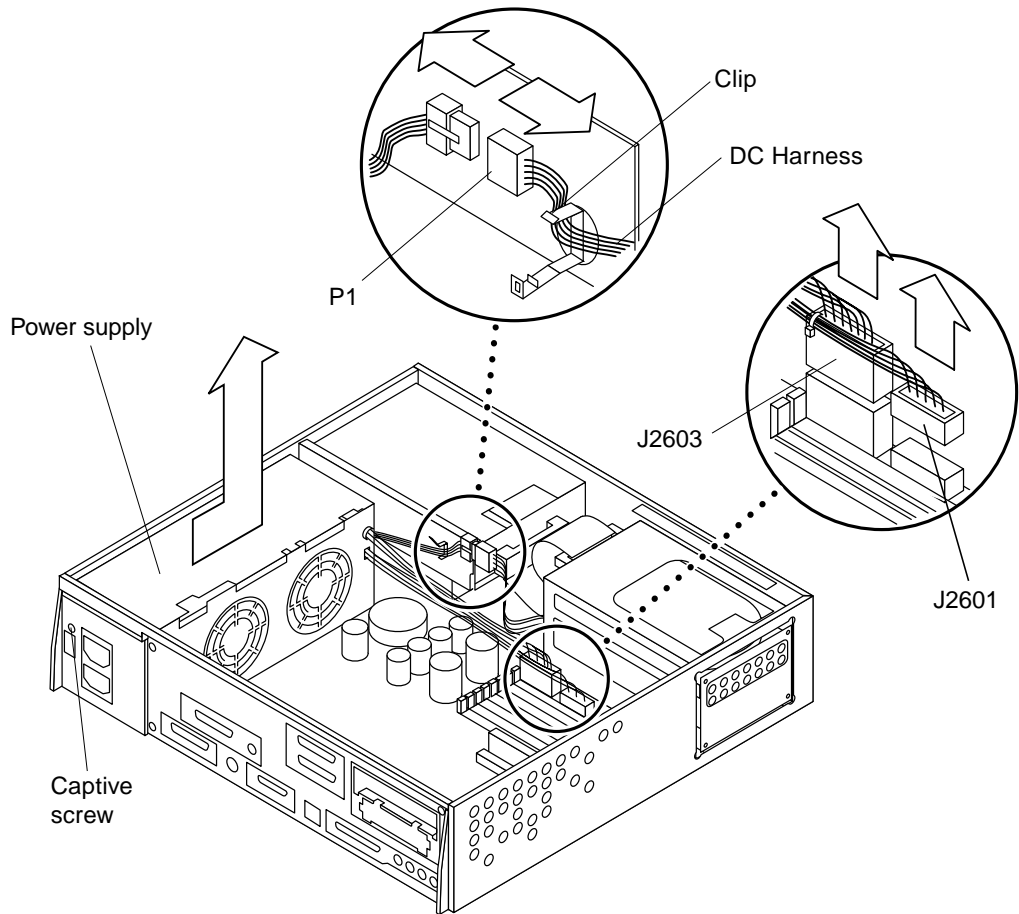


FIGURE 8-1 Removing the Power Supply

## 8.1.2 Replacing the Power Supply



**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. **Position the power supply into the chassis.**
2. **Push the power supply toward the chassis rear, engaging the mounting hooks (FIGURE 8-2).**

---

**Note** – Ensure that the hooks located on the chassis base engage with the cutouts located on the bottom of the power supply.

---

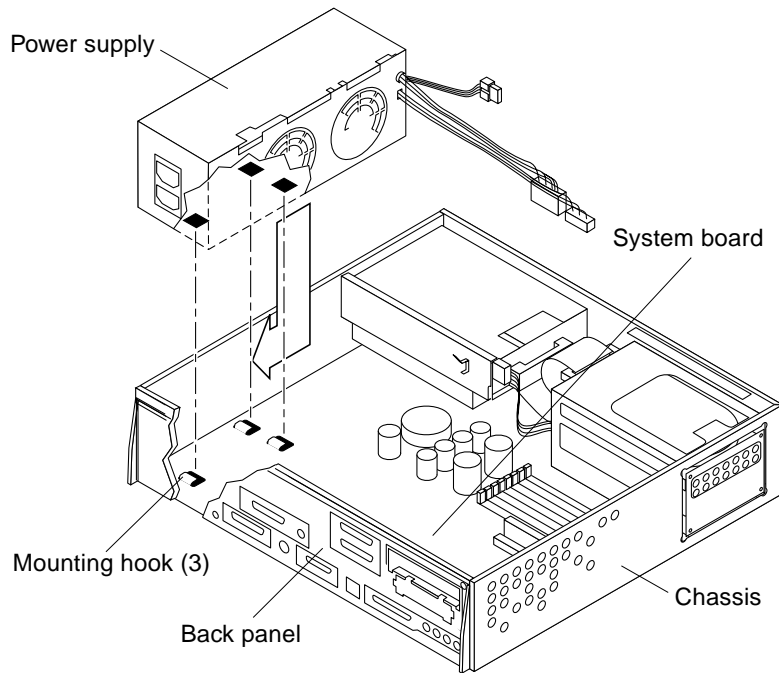


FIGURE 8-2 Replacing the Power Supply

3. **Tighten the captive screw securing the power supply to the back panel.**
4. **Connect the power supply as follows (FIGURE 8-3):**
  - a. **Connect the DC connector to the peripheral power cable at P1.**
  - b. **Route and insert the DC harness through the clip on the drive bracket.**
  - c. **Connect the power supply connector to the system board at J2603.**
  - d. **Connect the power supply connector to the system board at J2601.**
5. **Detach the wrist strap.**
6. **Replace the system unit cover.**

See Section 7.3 “Replacing the Cover” on page 7-3.

## 7. Power-on the system.

See Section 6.1 “Powering On the System” on page 6-1.

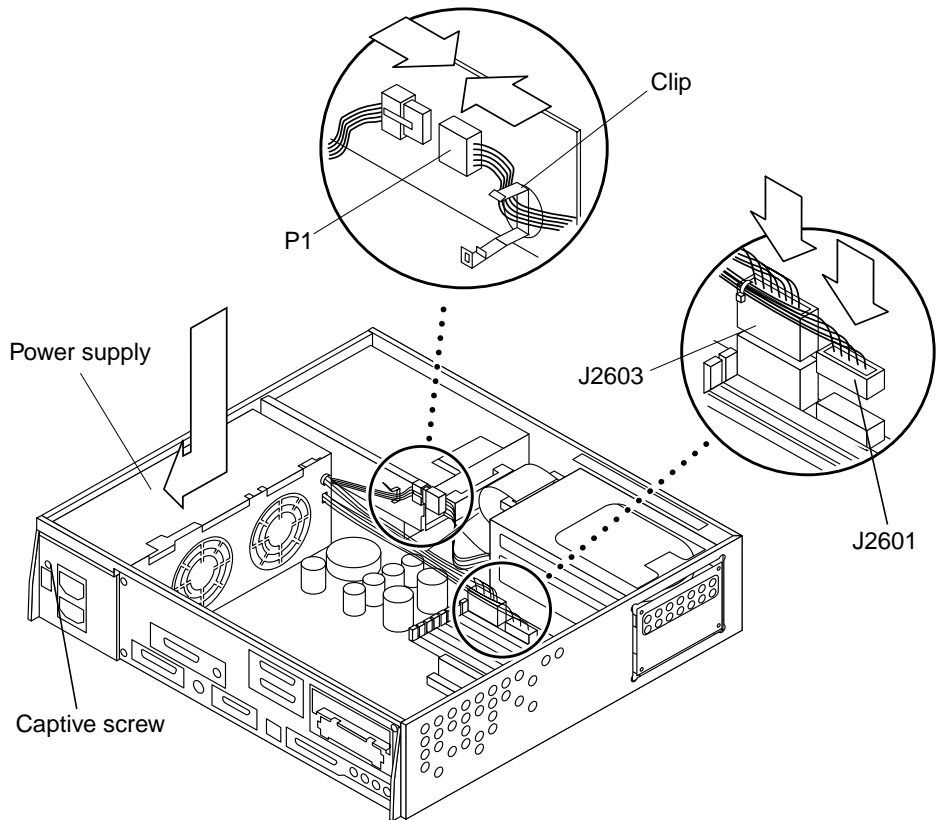


FIGURE 8-3 Securing and Connecting the Power Supply

---

## 8.2 Disk Drive Fan

To remove and replace the disk drive fan assembly, proceed as follows.

## 8.2.1 Removing the Disk Drive Fan Assembly

### 1. Power-off the system.

See Section 6.2 “Powering Off the System” on page 6-2.

### 2. Remove the system unit cover.

See Section 7.1 “Removing the Cover” on page 7-1.



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

### 3. Attach the wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-2.

### 4. Disconnect the fan power cable from the fan (FIGURE 8-4).

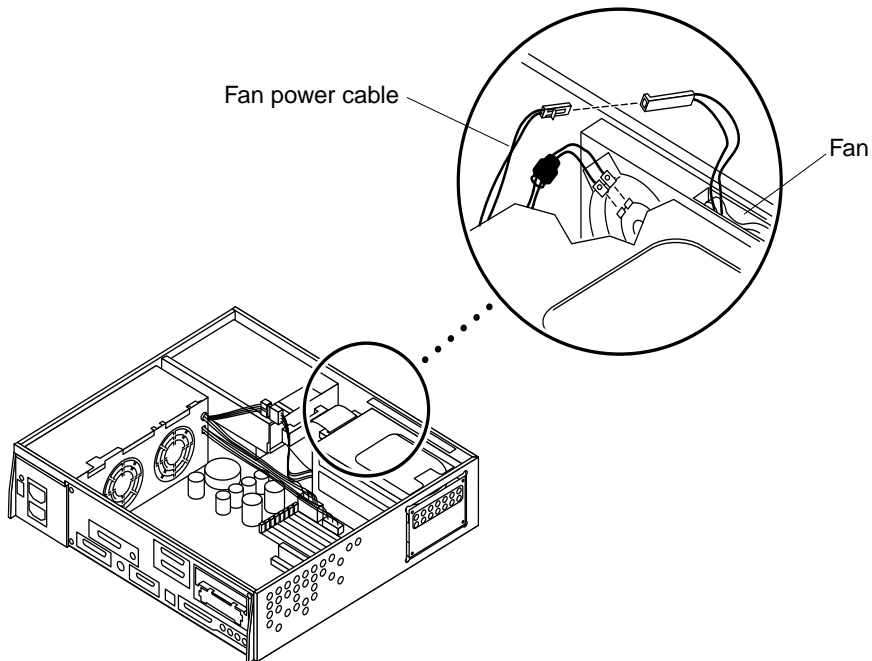


FIGURE 8-4 Fan Power Cable Connection

### 5. Prepare to remove the fan assembly as follows FIGURE 8-5:



- a. Press the middle tab on the fan/speaker bracket toward the center of the chassis.
- b. Grasp the fan and pull it from the fan/speaker bracket.

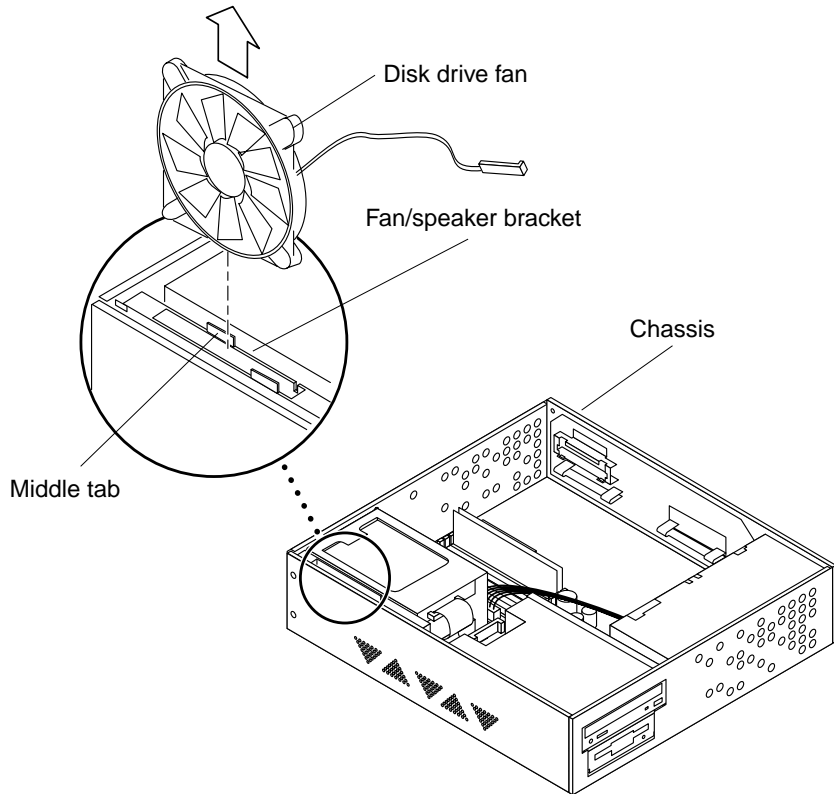


FIGURE 8-5 Disk Drive Fan

## 8.2.2 Replacing the Disk Drive Fan

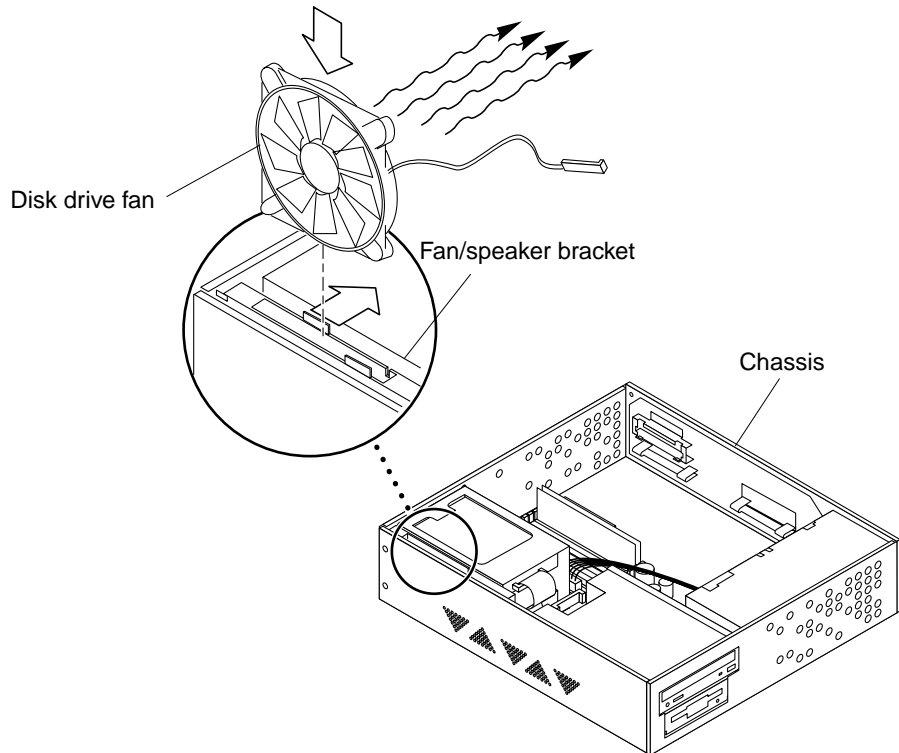


---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

1. Position the fan assembly so the arrow on the fan (not illustrated) faces the chassis and the harness faces the power supply (FIGURE 8-6).



**FIGURE 8-6** Replacing the Disk Drive Fan

---

**Note** – The arrow on the fan assembly indicates the airflow direction.

---

- 2. Insert the fan assembly into the fan/speaker bracket in the chassis.**
- 3. Connect the fan connector to the fan power cable (FIGURE 8-4).**
- 4. Detach the wrist strap.**
- 5. Replace the system unit cover.**  
See Section 7.3 “Replacing the Cover” on page 7-3.
- 6. Power-on the system.**  
See Section 6.1 “Powering On the System” on page 6-1.

---

## 8.3 Speaker

To remove and replace the speaker, proceed as follows.

### 8.3.1 Removing the Speaker

**1. Power-off the system.**

See Section 6.2 “Powering Off the System” on page 6-2.

**2. Remove the system unit cover.**

See Section 7.1 “Removing the Cover” on page 7-1.



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

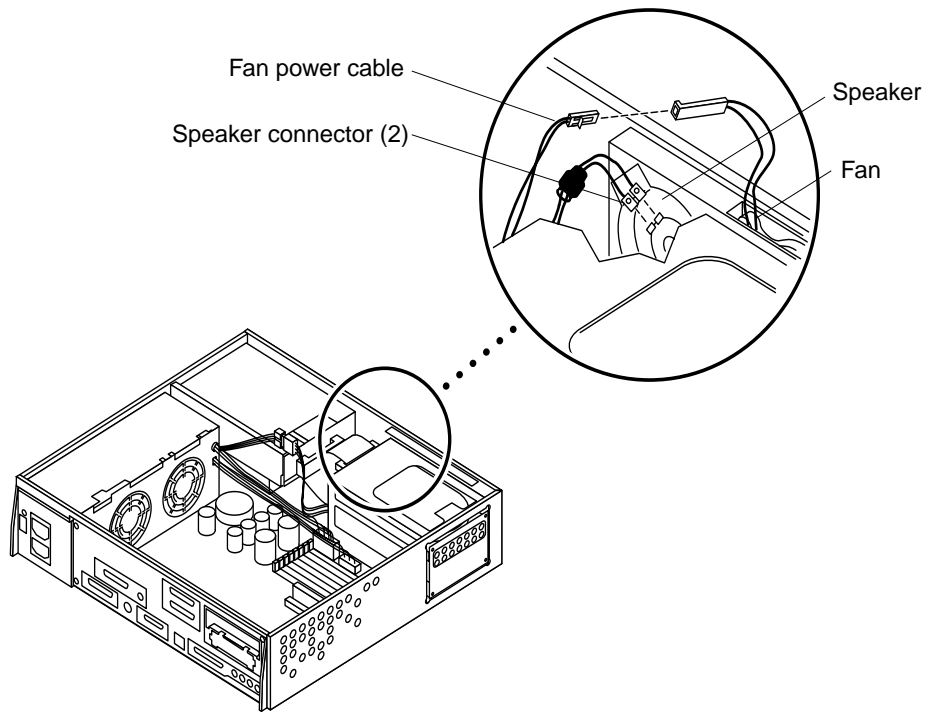
---

**3. Attach the wrist strap.**

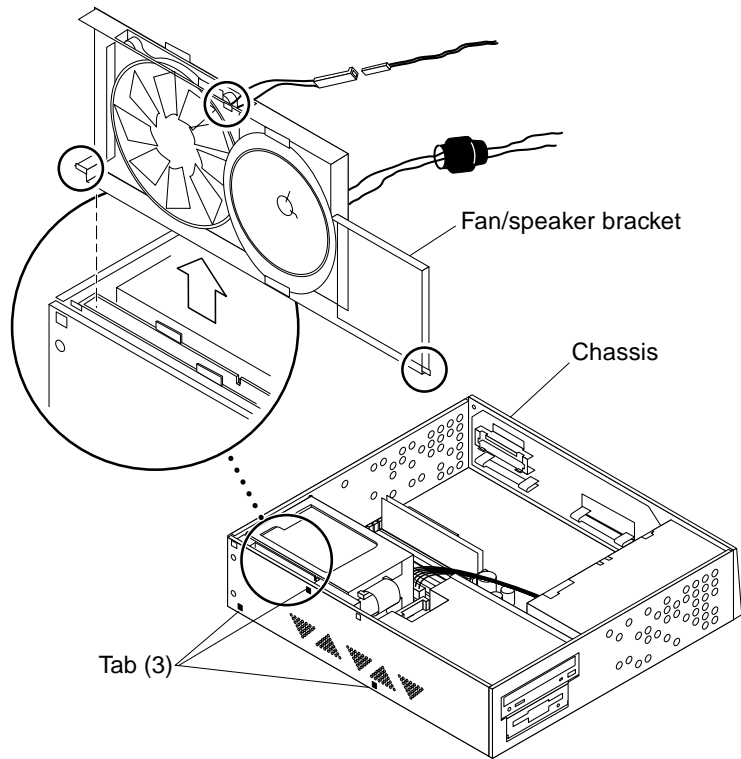
See Section 7.2 “Attaching the Wrist Strap” on page 7-2.

**4. Disconnect the speaker as follows (FIGURE 8-7 and FIGURE 8-8):**

- a. Disconnect the fan power cable from the fan.**
- b. Use needle-nose pliers to disconnect the speaker connectors.**
- c. Push in the tabs of the fan/speaker bracket on the chassis.**
- d. Remove the fan/speaker bracket from the chassis.**

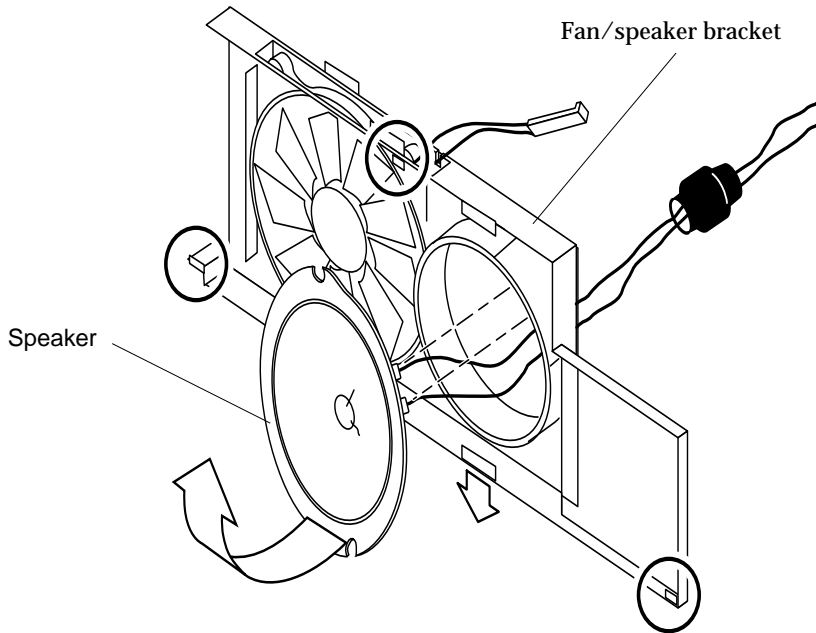


**FIGURE 8-7** Fan and Speaker Cable Connection



**FIGURE 8-8** Removing the Fan/Speaker Bracket

- 5. Release the bottom portion of the speaker from the bracket and remove the speaker (FIGURE 8-9).**



**FIGURE 8-9** Removing the Speaker from the Fan/Speaker Bracket

## 8.3.2 Replacing the Speaker

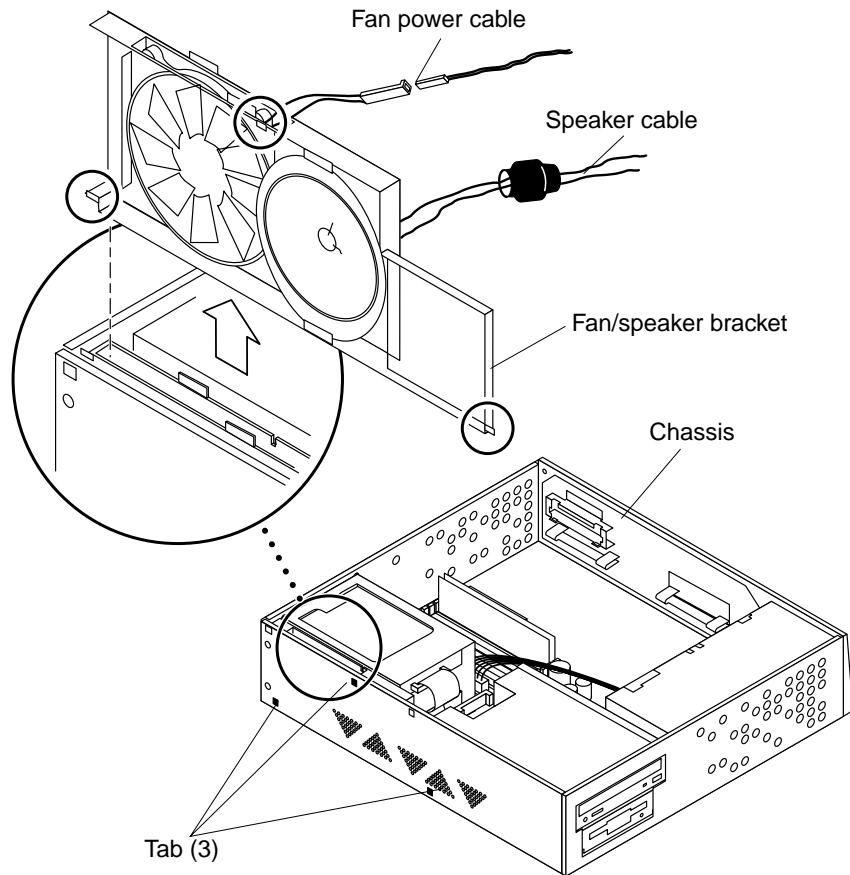


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**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

1. **Replace the fan/speaker bracket as follows (FIGURE 8-10):**
  - a. **Position the speaker in the fan/speaker bracket.**
  - b. **Insert the fan/speaker bracket into the chassis.**
  - c. **Verify the tabs are locked into the chassis to ensure proper replacement.**



**FIGURE 8-10** Replacing the Fan/Speaker Bracket

---

**Note** – Ensure the speaker connectors are on the top.

---

**2. Connect the speaker as follows (FIGURE 8-7):**

**a. Use needle-nose pliers to connect the speaker cable to the speaker.**

---

**Note** – Speaker cable connectors are keyed to ensure correct connection.

---

**b. Connect the fan power cable to the fan.**

**3. Detach the wrist strap.**

**4. Replace the system unit cover.**

See Section 7.3 “Replacing the Cover” on page 7-3.

**5. Power-on the system.**

See Section 6.1 “Powering On the System” on page 6-1.

---

## 8.4 Diskette Cable

To remove and replace the diskette cable, proceed as follows.

### 8.4.1 Removing the Diskette Cable

---

**Note** – If the system is configured with a CD-ROM drive or a tape drive, complete Step 1. If the system is not configured with a CD-ROM drive or a tape drive, skip Step 4 and proceed to Step 5.

---

**1. Power-off the system.**

See Section 6.2 “Powering Off the System” on page 6-2.

**2. Remove the system unit cover.**

See Section 7.1 “Removing the Cover” on page 7-1.



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

**3. Attach the wrist strap.**

See Section 7.2 “Attaching the Wrist Strap” on page 7-2.

**4. Remove the drive bracket as follows (FIGURE 8-11 and FIGURE 8-12):**

**a. Remove the two mounting screws securing the drive bracket to the chassis.**

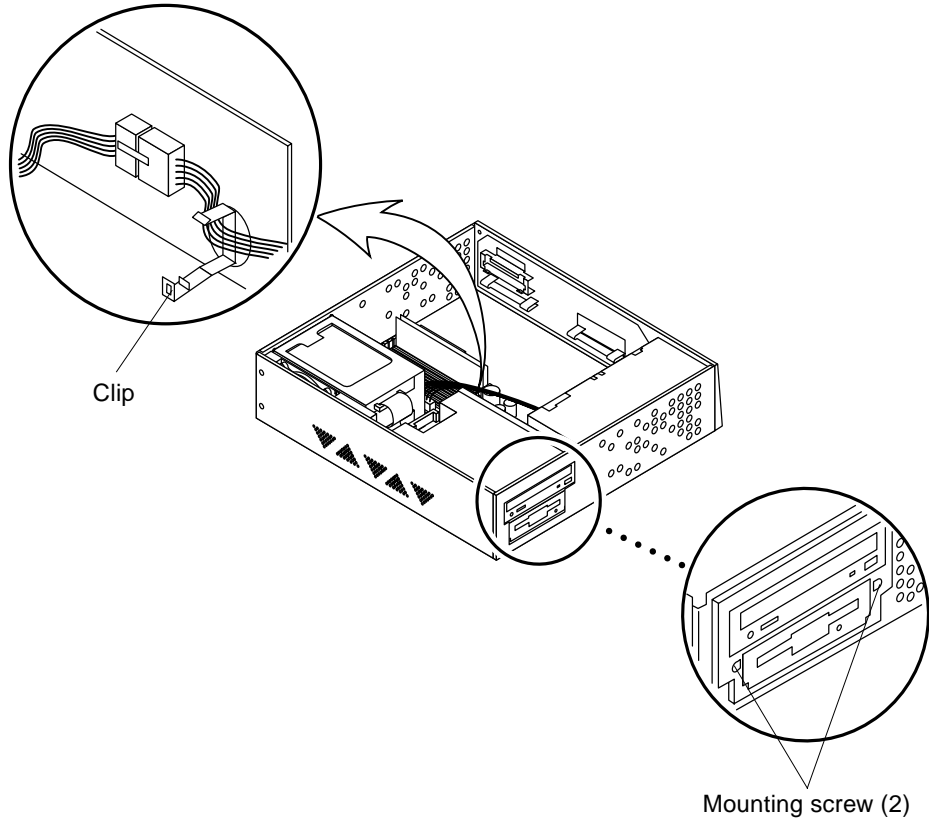
**b. Remove the DC harness from the clip located on the drive bracket.**

**c. Push the drive bracket toward the disk drive bay; gently flip the drive bracket over.**

**d. Place the drive bracket on top of the disk drive bay.**



5. Disconnect the diskette cable from the diskette drive.
6. Disconnect the diskette cable from the SCSI backplane.
7. Remove the diskette cable.



**FIGURE 8-11** Removing the Drive Bracket

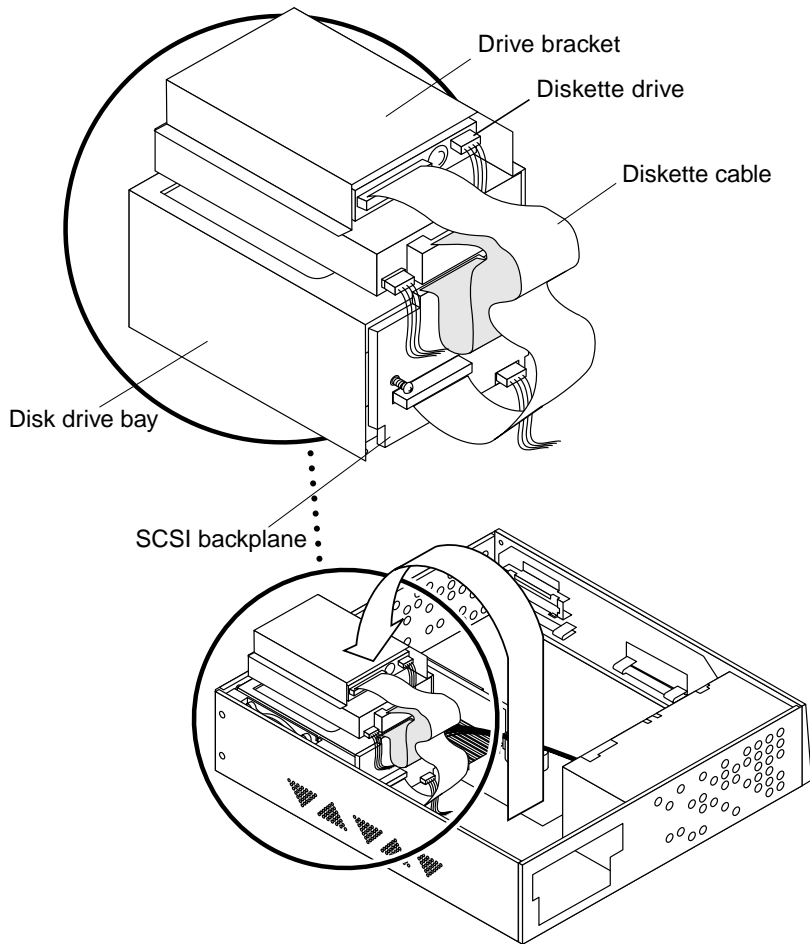


FIGURE 8-12 Diskette Cable

## 8.4.2 Replacing the Diskette Cable



**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. Connect the diskette cable to the socket (marked **FLOPPY**) on the SCSI backplane.
2. Connect the diskette cable to the diskette drive (FIGURE 8-12).

---

**Note** – If a CD-ROM drive or a tape drive is installed in the system, perform Step 3.

---

**3. Replace the drive bracket as follows (FIGURE 8-12 and FIGURE 8-13):**

- a. Position the drive bracket in the chassis.**
- b. Slide it away toward the openings in the side of the chassis.**

---

**Note** – The hooks in the chassis base must lock into the holes in the bottom of the drive bracket.

---

- c. Route the DC harness through the clip on the side of the drive bracket.**
  - d. Replace the two drive bracket mounting screws.**
- 4. Detach the wrist strap.**
- 5. Replace the system unit cover.**  
See Section 7.3 “Replacing the Cover” on page 7-3.
- 6. Power-on the system.**  
See Section 6.1 “Powering On the System” on page 6-1.

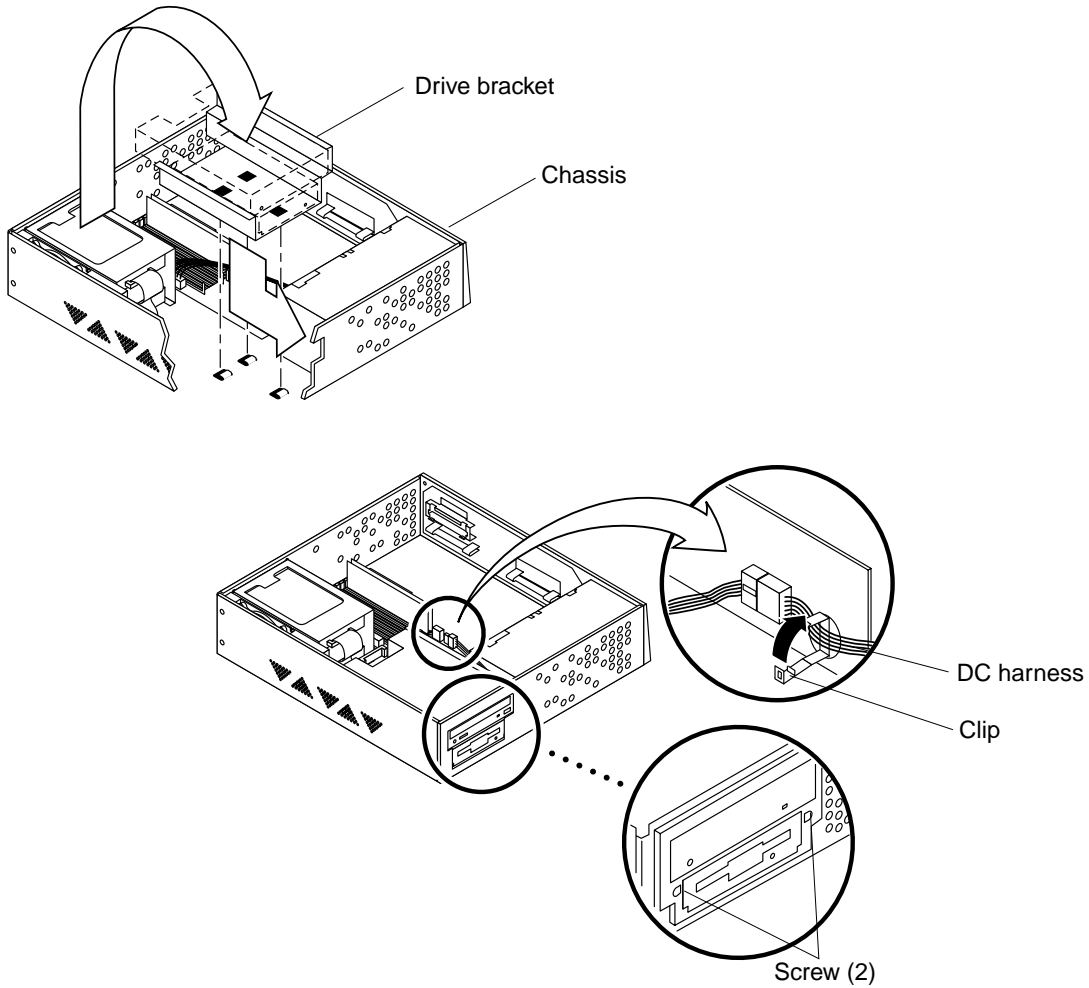


FIGURE 8-13 Replacing the Drive Bracket

## 8.5 SCSI Cable/Backplane Assembly

To remove and replace the SCSI cable/backplane assembly, proceed as follows.

## 8.5.1 Removing the SCSI Cable/Backplane Assembly

**1. Power-off the system.**

Section 6.2 “Powering Off the System” on page 6-2.

**2. Remove the system unit cover.**

See Section 7.1 “Removing the Cover” on page 7-1.



**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

**3. Attach the wrist strap.**

See Section 7.2 “Attaching the Wrist Strap” on page 7-2.

**4. Remove the drive bracket from the chassis.**

See Section 9.2.1 “Removing the Chassis Bracket” on page 9-5.



**Caution** – Each drive slot has a unique SCSI target address (lower drive slot is target address 0, upper drive slot is target address 1). Make note of the drive slot for each disk drive. Installing a disk drive into the incorrect drive slot could result in file system or system boot problems.

---

**5. Remove the disk drive assembly.**

See Section 9.1.1 “Removing a Disk Drive” on page 9-1.

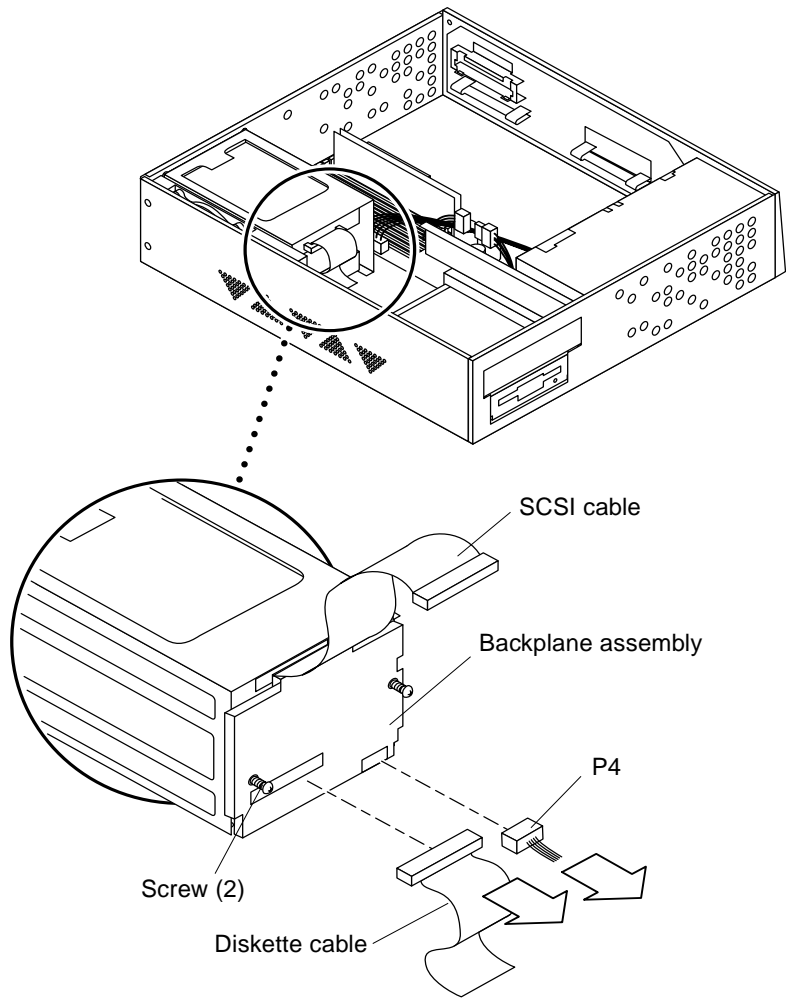
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**Note** – If the system is configured with two disk drives are, remove each.

---

**6. Disconnect the following (FIGURE 8-14 and FIGURE 8-15):**

- a. The peripheral power cable (P4) from the backplane assembly connector marked PWR.
- b. The diskette cable (if present) from the backplane assembly connector marked FLOPPY.



**FIGURE 8-14** SCSI/Backplane Assembly Cable Connection

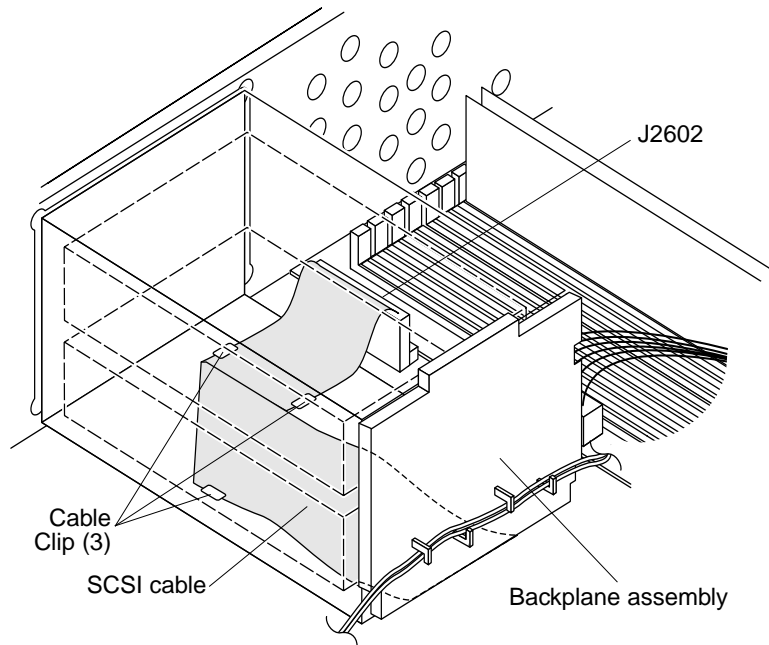


FIGURE 8-15 Removing the Backplane Assembly

7. Remove the two screws securing the backplane assembly to the bracket.
8. Disconnect the SCSI cable from J2602 on the system board.

---

**Note** – J2602 is located between the disk drive bay and the system board.

---

9. Pull the SCSI cable out through the disk drive bay.
10. Remove the SCSI cable from the cable clips in the base of the chassis.
11. Remove the backplane assembly from the bracket.

## 8.5.2 Replacing the SCSI Cable/Backplane Assembly



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

1. Route the SCSI cable under the three cable clips in the base of the chassis and through the opening near the front edge of the system board (FIGURE 8-15).
2. Connect the SCSI cable to J2602 on the system board.
3. Position the backplane assembly on the disk drive bay so the backplane assembly slots sit on the tabs (FIGURE 8-16).
4. Replace the two screws securing the backplane assembly to the bracket.

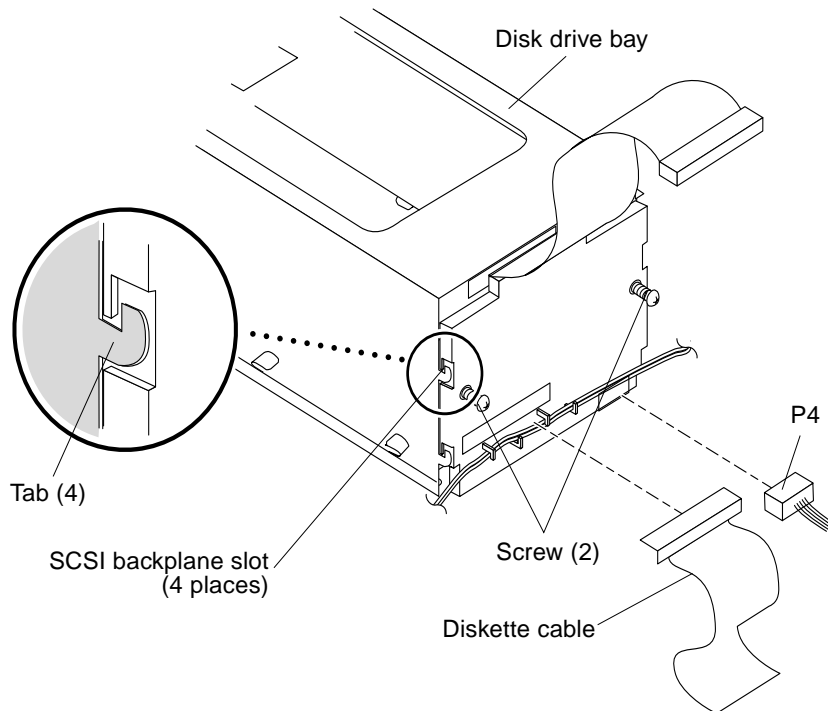


FIGURE 8-16 Replacing the SCSI Backplane

5. Connect the following (FIGURE 8-14):
  - a. The peripheral power cable (P4) to the backplane assembly connector marked PWR.
  - b. The diskette cable (if present) to the backplane assembly connector marked FLOPPY.



---

**Caution** – Each drive slot has a unique SCSI target address (lower drive slot is target address 0, upper drive slot is target address 1). Make note of the drive slot for each disk drive. Installing a disk drive into the incorrect drive slot could cause file system or system boot problems.

---

**6. Replace the disk drive assembly(ies).**

See Section 9.4.2 “Replacing a Diskette Drive” on page 9-14.

**7. Replace the bracket into the chassis.**

See Section 9.2.2 “Replacing the Chassis Bracket” on page 9-7.

**8. Detach the wrist strap.**

**9. Replace the system unit cover.**

See Section 7.3 “Replacing the Cover” on page 7-3.

**10. Power-on the system.**

See Section 6.1 “Powering On the System” on page 6-1.

---

## 8.6 Peripheral Power Cable

To remove and replace the peripheral power cable, proceed as follows.

### 8.6.1 Removing the Peripheral Power Cable

**1. Power-off the system.**

See Section 6.2 “Powering Off the System” on page 6-2.

**2. Remove the system unit cover.**

See Section 7.1 “Removing the Cover” on page 7-1.



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

**3. Attach the wrist strap.**

See Section 7.2 “Attaching the Wrist Strap” on page 7-2.

4. **Disconnect the DC harness as follows (Figure 8-17):**
  - a. **Remove the two screws securing the drive bracket to the chassis.**
  - b. **Remove the DC harness from the drive bracket clip.**
  - c. **Disconnect the DC harness from the peripheral power cable at P1.**

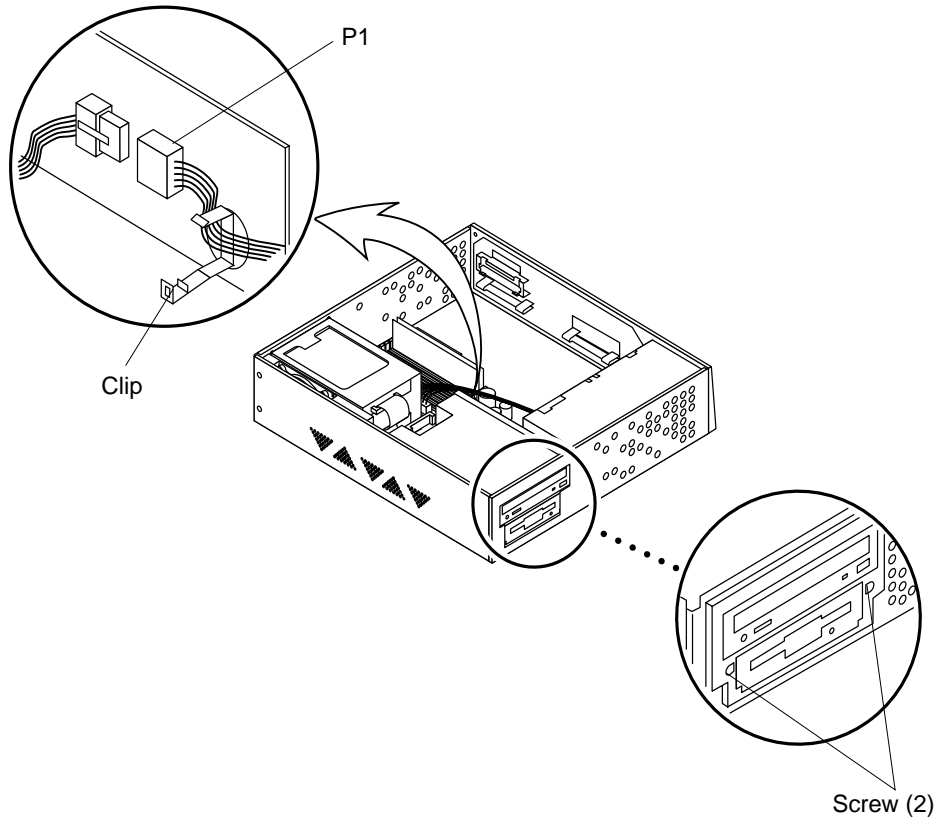
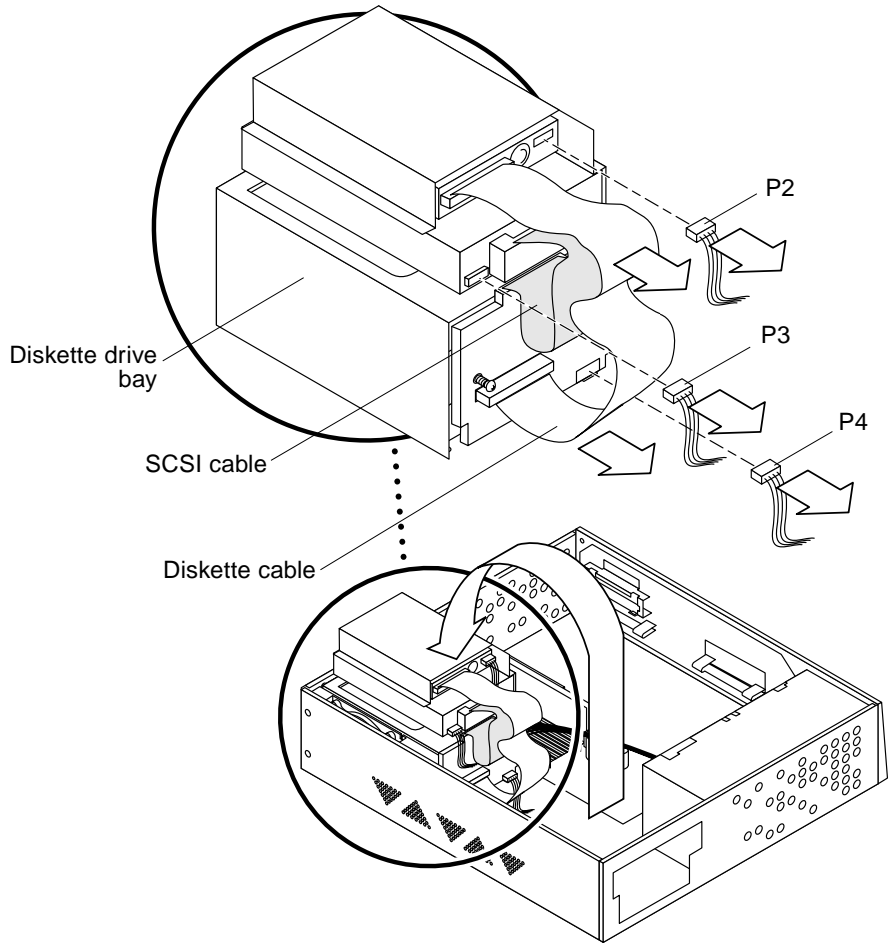


FIGURE 8-17 Removing the Drive Bracket

5. **Position the drive bracket as follows 8-18:**
  - a. **Push the drive bracket toward the disk drive bay.**
  - b. **Gently flip the drive bracket over and set on top of the disk drive bay.**
  - c. **Disconnect the peripheral power cable from the peripherals and the fan (TABLE 8-1).**
6. **Remove the peripheral power cable from the cable clips on the backplane assembly.**

**7. Remove the peripheral power cable.**



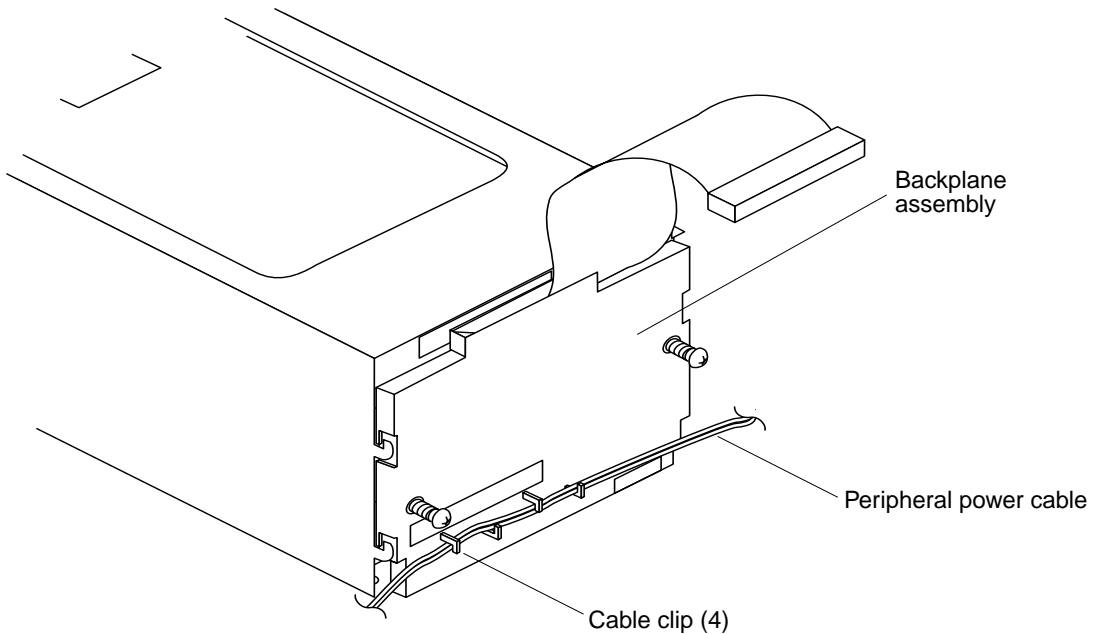
**FIGURE 8-18** Removing the Peripheral Power Cable Connection

**TABLE 8-1** Peripheral Power Cable Connections

Connector	Peripheral
P2	Diskette drive

**TABLE 8-1** Peripheral Power Cable Connections

Connector	Peripheral
P3	CD-ROM/tape drive
P4	SCSI backplane (PWR)
Fan power connector	Fan



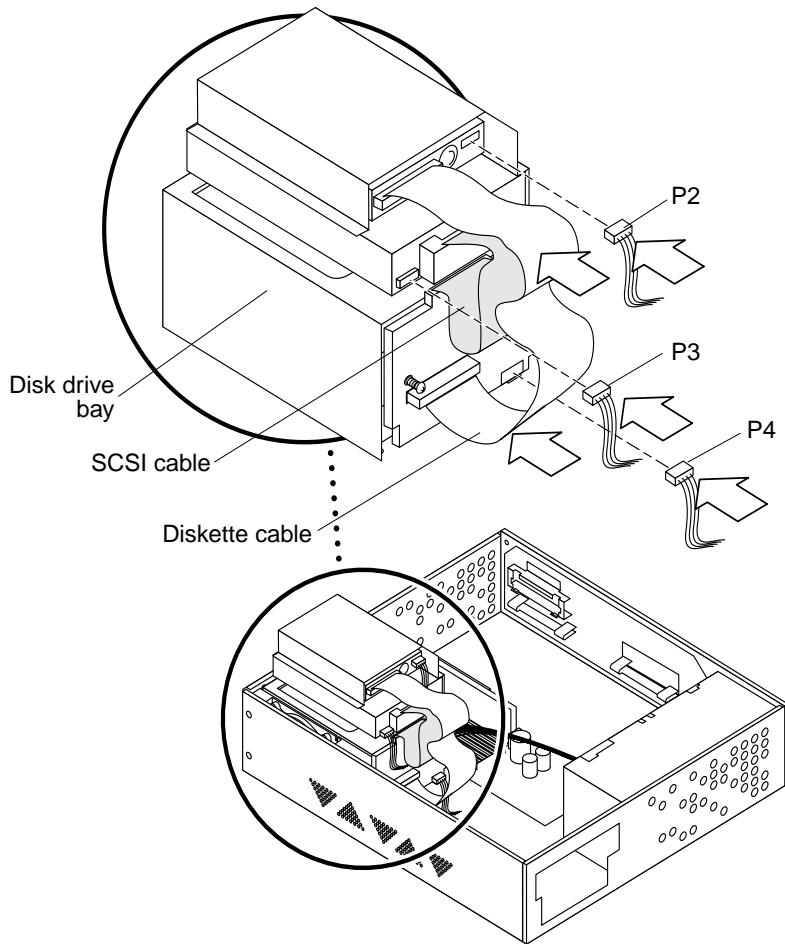
**FIGURE 8-19** Backplane Assembly Peripheral Power Cable Routing

## 8.6.2 Replacing the Peripheral Power Cable



**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. **Connect the peripheral power cable to each peripheral (TABLE 8-1 and FIGURE 8-20).**



**FIGURE 8-20** Replacing the Peripheral Power Cable Connection

2. **Route the peripheral power cable through the backplane assembly cable clips (FIGURE 8-19).**
3. **Position and secure the drive bracket as follows (FIGURE 8-21):**
  - a. **Position the drive bracket in the chassis; slide the drive bracket toward the opening in the chassis side.**
  - b. **Connect the DC harness to the peripheral power cable at P1.**
  - c. **Route the DC harness through the drive bracket clip.**
  - d. **Replace the two screws securing the drive bracket to the chassis.**

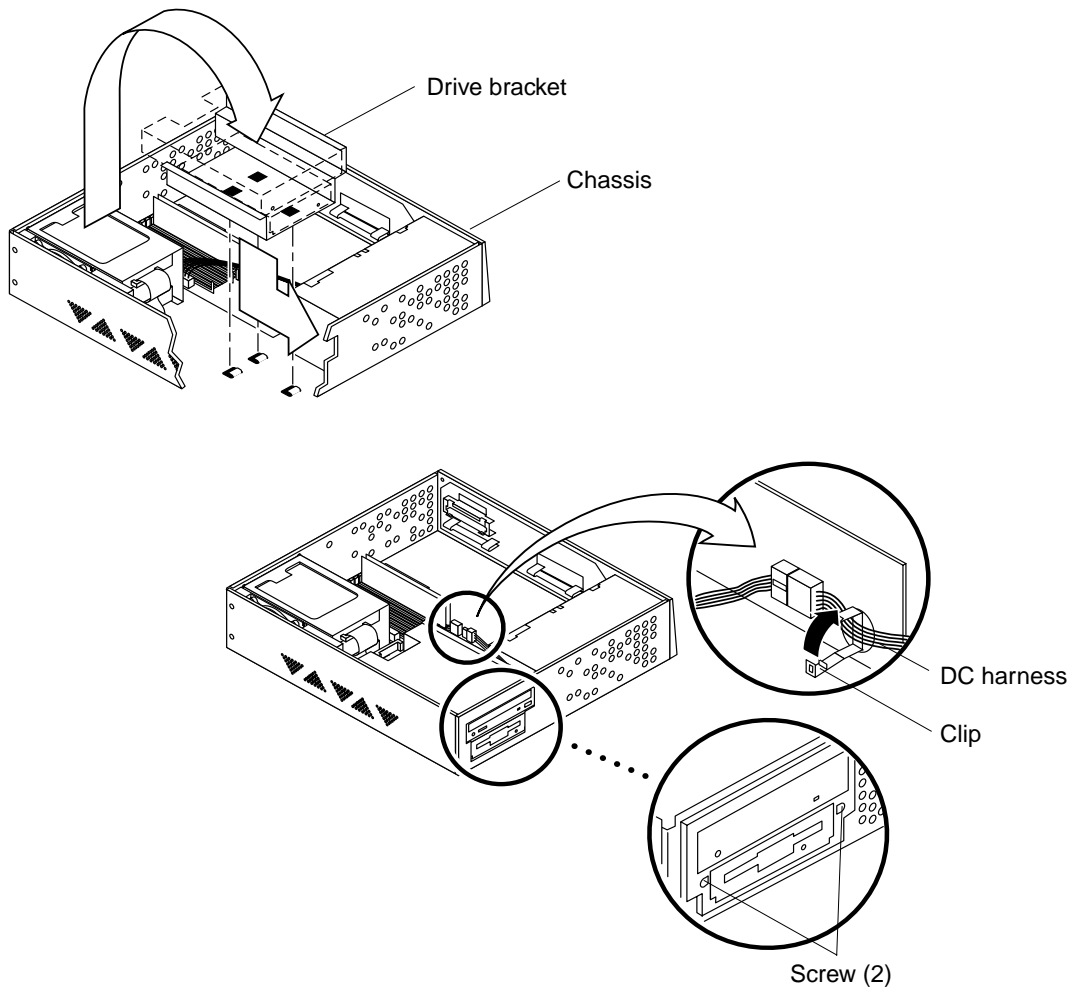
**4. Detach the wrist strap.**

**5. Replace the system unit cover.**

See Section 7.3 “Replacing the Cover” on page 7-3.

**6. Power-on the system.**

See Section 6.1 “Powering On the System” on page 6-1.



**FIGURE 8-21** Replacing the Drive Bracket

---

## 8.7 Speaker/LED Cable

To remove and replace the speaker/LED cable, proceed as follows.

### 8.7.1 Removing the Speaker/LED Cable

**1. Power-off the system.**

See Section 6.2 “Powering Off the System” on page 6-2.

**2. Remove the system unit cover.**

See Section 7.1 “Removing the Cover” on page 7-1.



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

**3. Attach the wrist strap.**

See Section 7.2 “Attaching the Wrist Strap” on page 7-2.

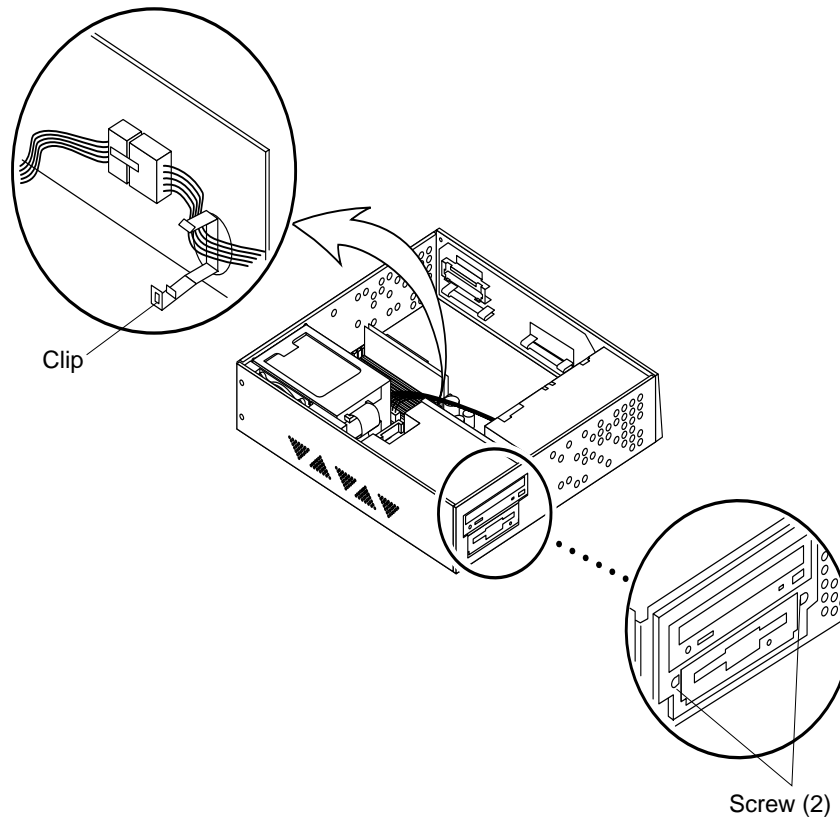
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**Note** – If the system is not configured with a CD-ROM drive or a tape drive, proceed to Step 5.

---

**4. Disconnect the DC harness as follows (FIGURE 8-22):**

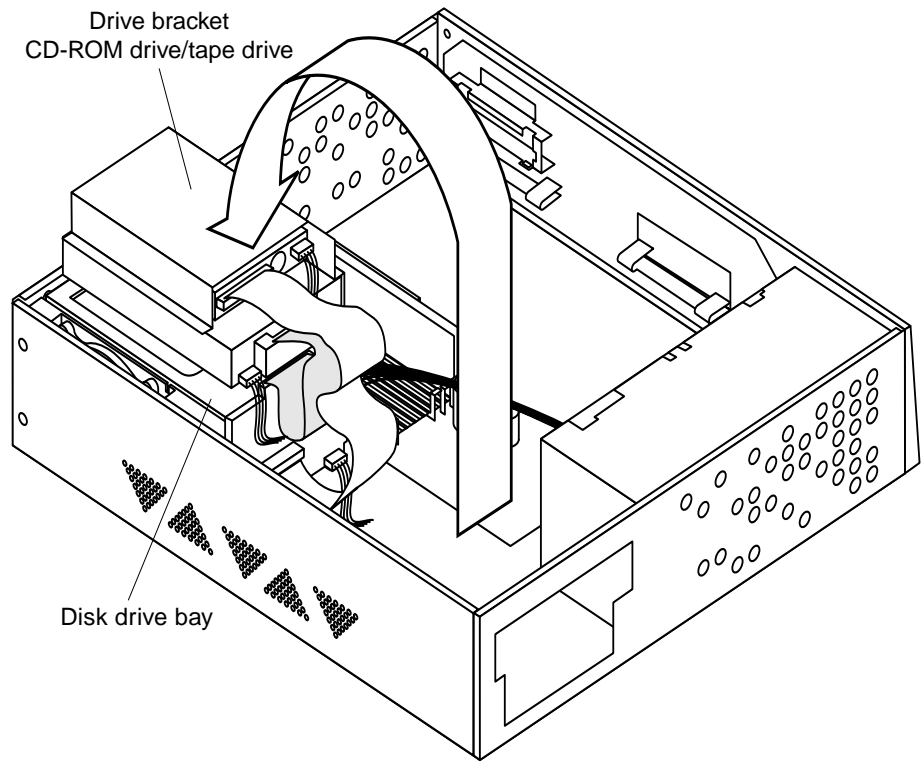
- a. Remove the two screws securing the drive bracket to the chassis.
- b. Remove the DC harness from the drive bracket clip.



**FIGURE 8-22** Removing the Drive Bracket

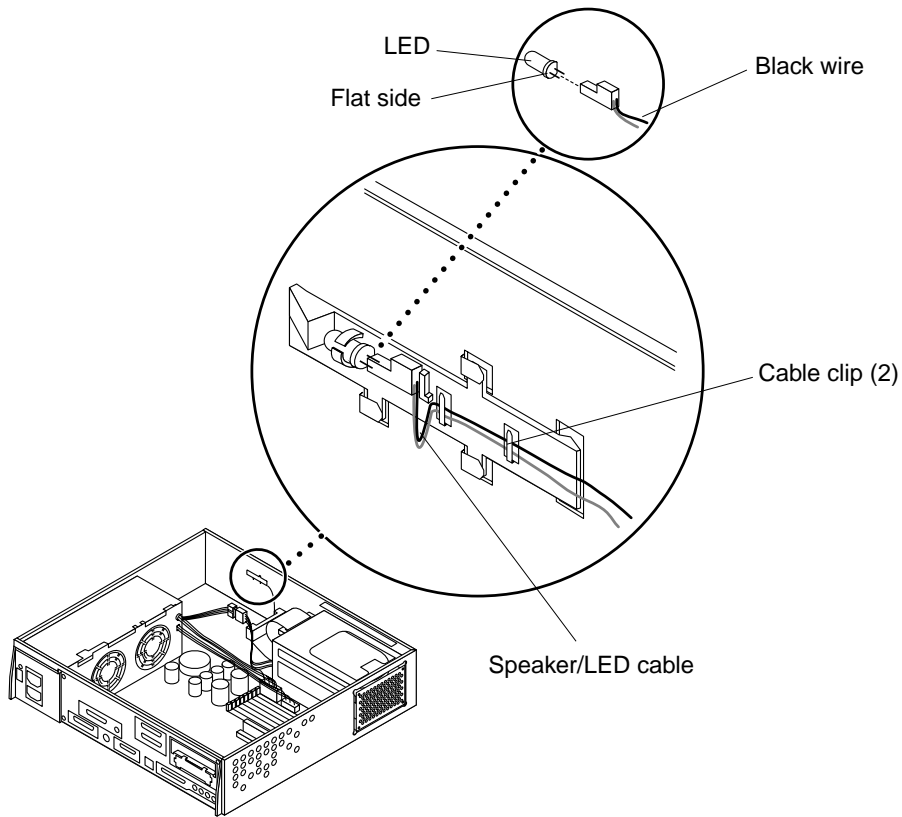
- 5. Position the CD-ROM/tape drive bracket as follows (FIGURE 8-23):**
  - a. Push the CD-ROM/tape drive bracket toward the disk drive bay and gently flip it over.**
  - b. Place the CD-ROM/tape drive bracket on top of the disk drive bay.**





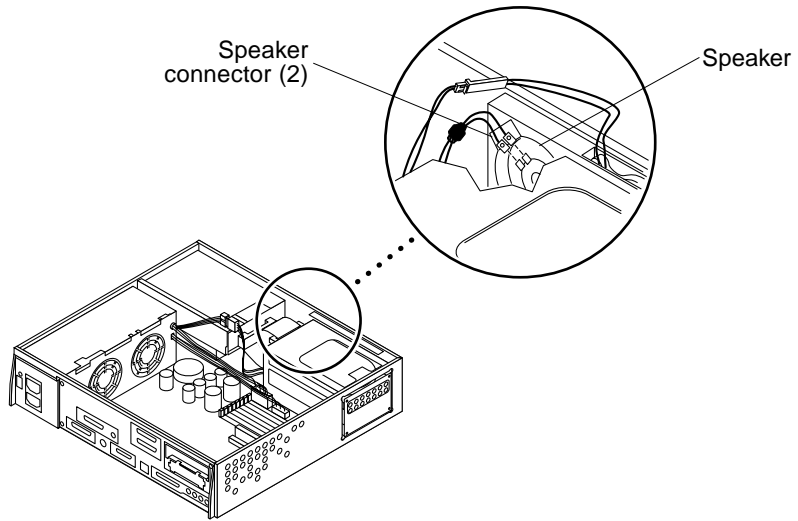
**FIGURE 8-23** Placing the Bracket on Top of the Disk Drive

- 6. Slide the LED from the cavity and remove the speaker/LED cable from the two cable clips (FIGURE 8-24).**

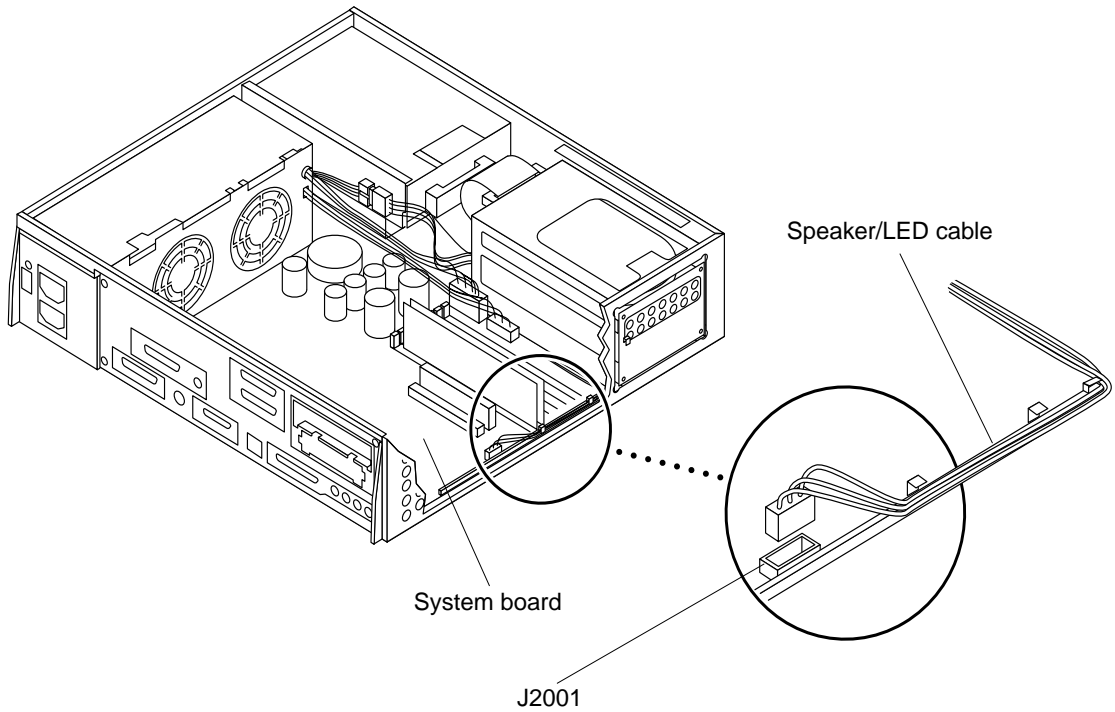


**FIGURE 8-24** Removing/Replacing the Speaker/LED Cable

- 7. Use the needle-nose pliers to disconnect the speaker/LED cable from the speaker (FIGURE 8-25).**
- 8. Remove any SBus card(s).**  
See Section 10.3.1 “Removing an SBus Card” on page 10-14.
- 9. Disconnect the speaker/LED cable from the system board at J2001 (FIGURE 8-26).**
- 10. Pull the speaker/LED cable from the chassis, removing it from the backplane assembly clips.**



**FIGURE 8-25** Speaker/LED Cable Connection



**FIGURE 8-26** Speaker Connector on the System Board

## 8.7.2 Replacing the Speaker/LED Cable



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

1. **Route the speaker/LED cable as follows (FIGURE 8-26):**
  - a. **Connect the speaker/LED cable to the system board at J2001.**
  - b. **Route the harness as shown.**
  - c. **Secure the cable through the backplane assembly clips.**
2. **Replace any SBus card(s).**

See Section 10.3.2 “Replacing an SBus Card” on page 10-16.
3. **Use the needle-nose pliers to connect the speaker/LED cable to the speaker (FIGURE 8-25).**

---

**Note** – The speaker/LED cable connectors are keyed to ensure correct connection.

---

4. **Route the speaker/LED cable through the cable clips and insert the LED into the cavity (FIGURE 8-24).**

---

**Note** – If the LED is being replaced, verify that the flat side of the LED is aligned with the black wire.

---

---

**Note** – Complete Steps 5 through 8 if the system is configured with a CD-ROM drive or tape drive.

---

5. **Position the bracket assembly into the chassis as follows (FIGURE 8-27):**
  - a. **Slide the bracket assembly toward the opening in the chassis side.**
  - b. **Ensure the chassis base hooks lock into the holes in the bottom of the drive bracket.**
6. **Connect the DC harness to the peripheral power cable at P1.**
7. **Route the DC power harness through the drive bracket clip.**
8. **Replace the two screws securing the drive bracket to the chassis.**

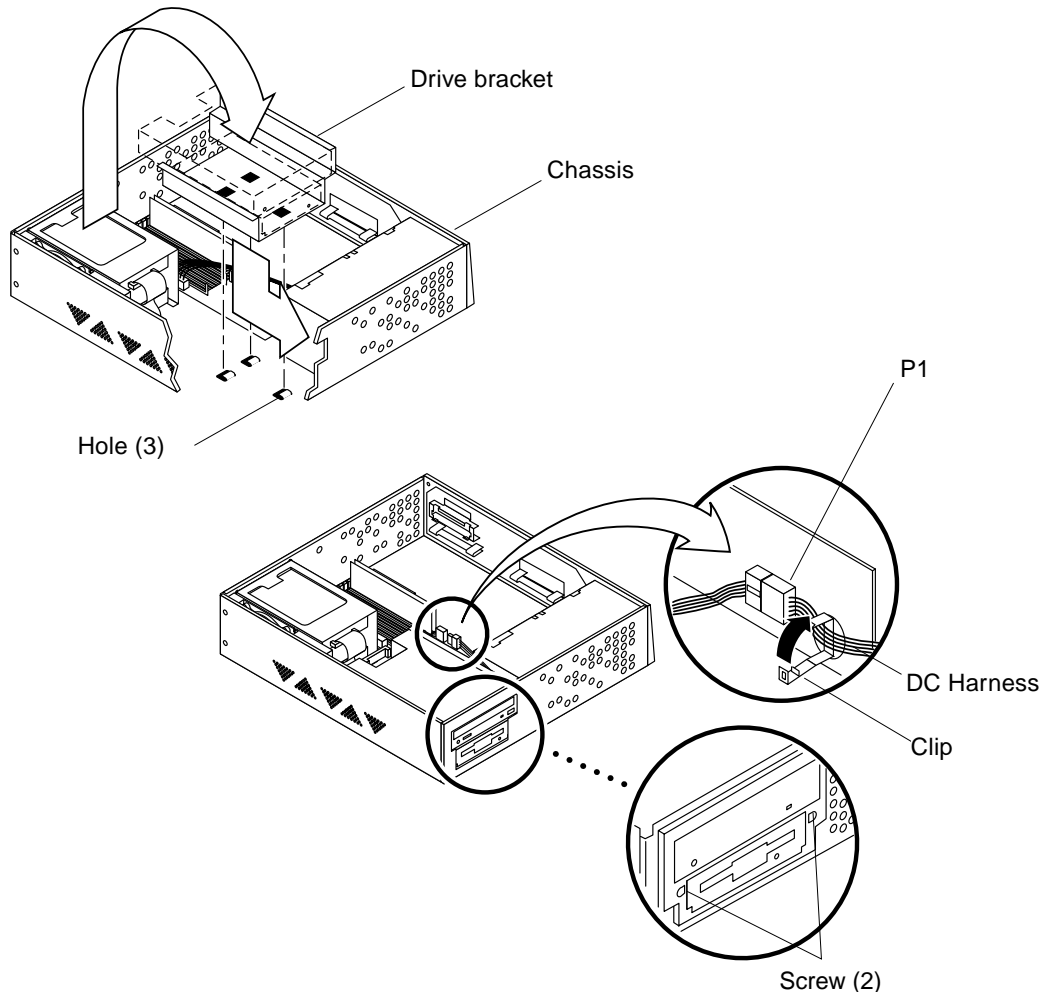


FIGURE 8-27 Replacing the Drive Bracket



# Storage Devices

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This chapter contains procedures to remove and replace the storage devices of the system and server units. The following is the list of the storage devices and support hardware:

- “Disk Drive” on page 1
- “Media Bay Chassis Bracket” on page 5
- “CD-ROM Drive or 4-mm/8-mm Tape Drive” on page 10
- “Diskette Drive” on page 12

---

## 9.1 Disk Drive

To remove and replace a disk drive, proceed as follows.

### 9.1.1 Removing a Disk Drive

**1. Power-off the system.**

See Section 6.2 “Powering Off the System” on page 6-2.

**2. Remove the system unit cover.**

See Section 7.1 “Removing the Cover” on page 7-1.



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

**3. Attach the wrist strap.**

See Section 7.2 “Attaching the Wrist Strap” on page 7-2.

4. Remove the EMI door from the right side of the chassis (FIGURE 9-1).
5. Open the disk drive handle.

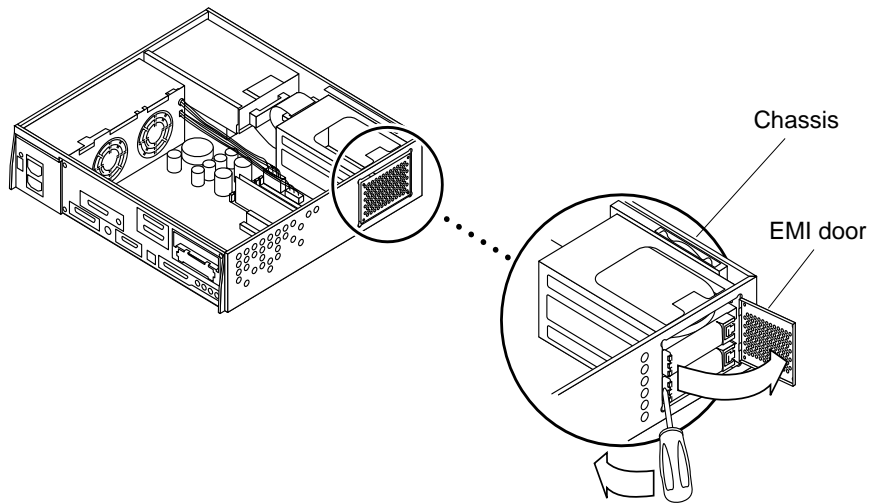


FIGURE 9-1 EMI Door

6. Fully extend the disk drive handle to disconnect the disk drive from the system (FIGURE 9-2).

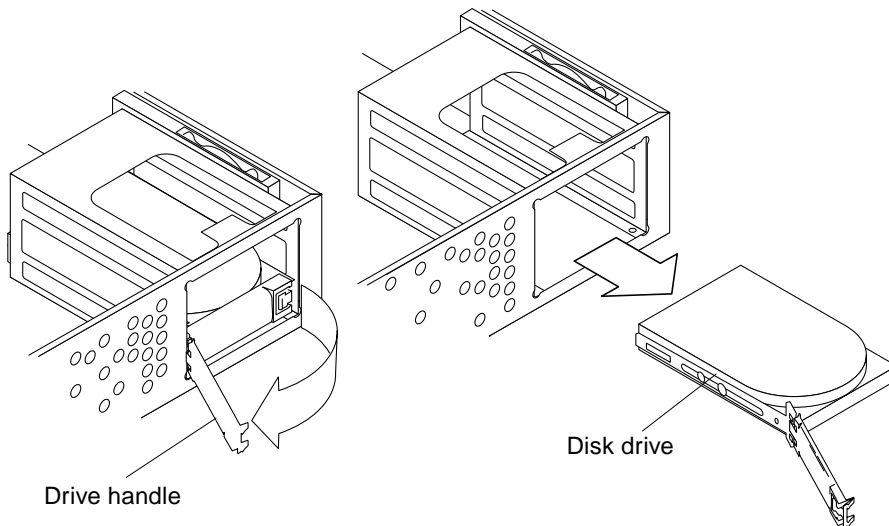


FIGURE 9-2 Removing the Disk Drive



7. Hold the drive handle and pull it out to remove the disk drive from the chassis.

---

**Note** – The disk drive rear connector is disconnected when the disk drive is ejected.

---

8. Place the disk drive on an antistatic surface.

## 9.1.2 Replacing a Disk Drive



---

**Caution** – Each drive slot has a unique SCSI target address (lower drive slot is target address 0, upper drive slot is target address 1). Make note of the drive slot for each disk drive. Installation of a disk drive into an incorrect drive slot can cause file system or system boot problems.

---



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

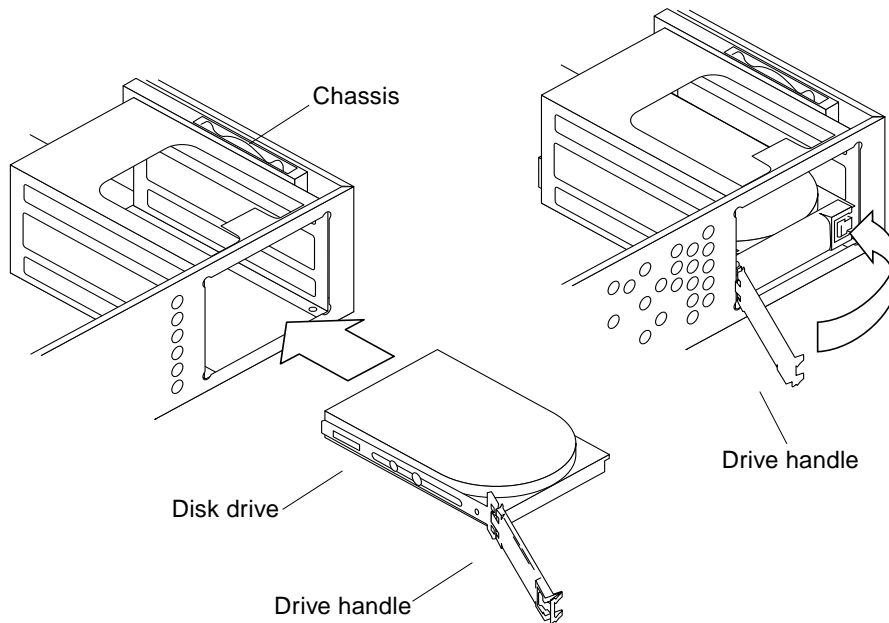
---

1. With the drive handle open, press on the disk drive end and insert the disk drive into the chassis; connect the disk drive to the backplane assembly (FIGURE 9-3).
2. Close the drive handle until the release latch clicks and the handle is securely latched to the chassis.

---

**Note** – The drive handle does not latch if the disk drive is not properly seated into the slot.

---



**FIGURE 9-3** Replacing the Disk Drive

**3. Replace the EMI door as follows (FIGURE 9-4):**

---

**Note** – The EMI door must be flush with the chassis or the top cover will not fit correctly.

---

- a. **Position the EMI door on the chassis; the two tabs should be hooked into the two slots.**
  - b. **Push the EMI door in until it is flush with the chassis.**
4. **Detach the wrist strap.**
  5. **Replace the system unit cover.**  
See Section 7.3 “Replacing the Cover” on page 7-3.
  6. **Power-on the system.**  
See Section 6.1 “Powering On the System” on page 6-1.

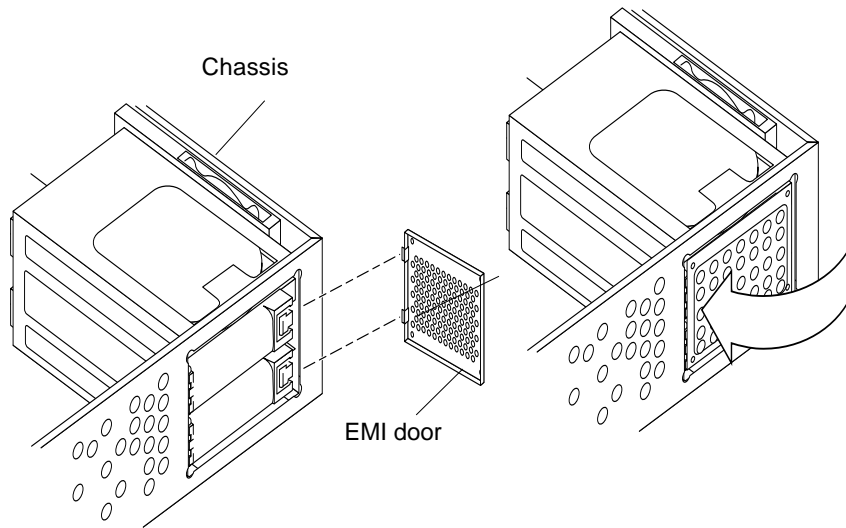


FIGURE 9-4 Replacing the EMI Door

---

## 9.2 Media Bay Chassis Bracket

It is necessary to remove and replace the media bay chassis bracket (chassis bracket) in order to remove and replace either the CD-ROM drive (or 4-mm/8-mm tape drive) or the diskette drive. The chassis bracket *is not* a field replaceable unit (FRU).

To remove and replace the chassis bracket, proceed as follows.

### 9.2.1 Removing the Chassis Bracket

1. Remove the DC harness as follows (FIGURE 9-5):
  - a. Remove the two screws securing the chassis to the chassis bracket.
  - b. Remove the DC harness from the chassis bracket clip.
2. Disconnect the DC harness from the peripheral power cable at P1.

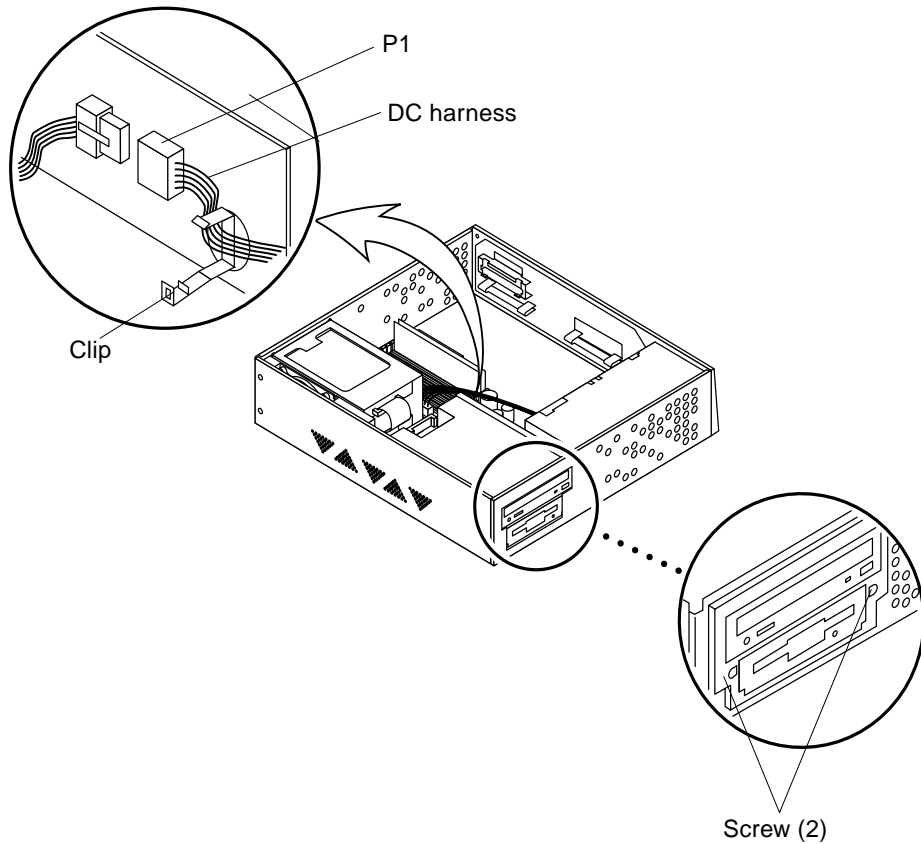


FIGURE 9-5 Chassis Bracket

3. **Disconnect the following from the chassis bracket as follows (FIGURE 9-6):**
  - a. **Push the chassis bracket toward the disk drive bay and gently flip the chassis bracket over and place it on top of the disk drive bay.**
  - b. **Disconnect the SCSI cable from the CD-ROM/tape drive.**
  - c. **Disconnect the peripheral power cable from the CD-ROM drive or tape drive (P3), and from the diskette drive (P2) if any.**
  - d. **Disconnect the diskette cable from the diskette drive (if any).**
4. **Place the chassis bracket on an antistatic surface.**

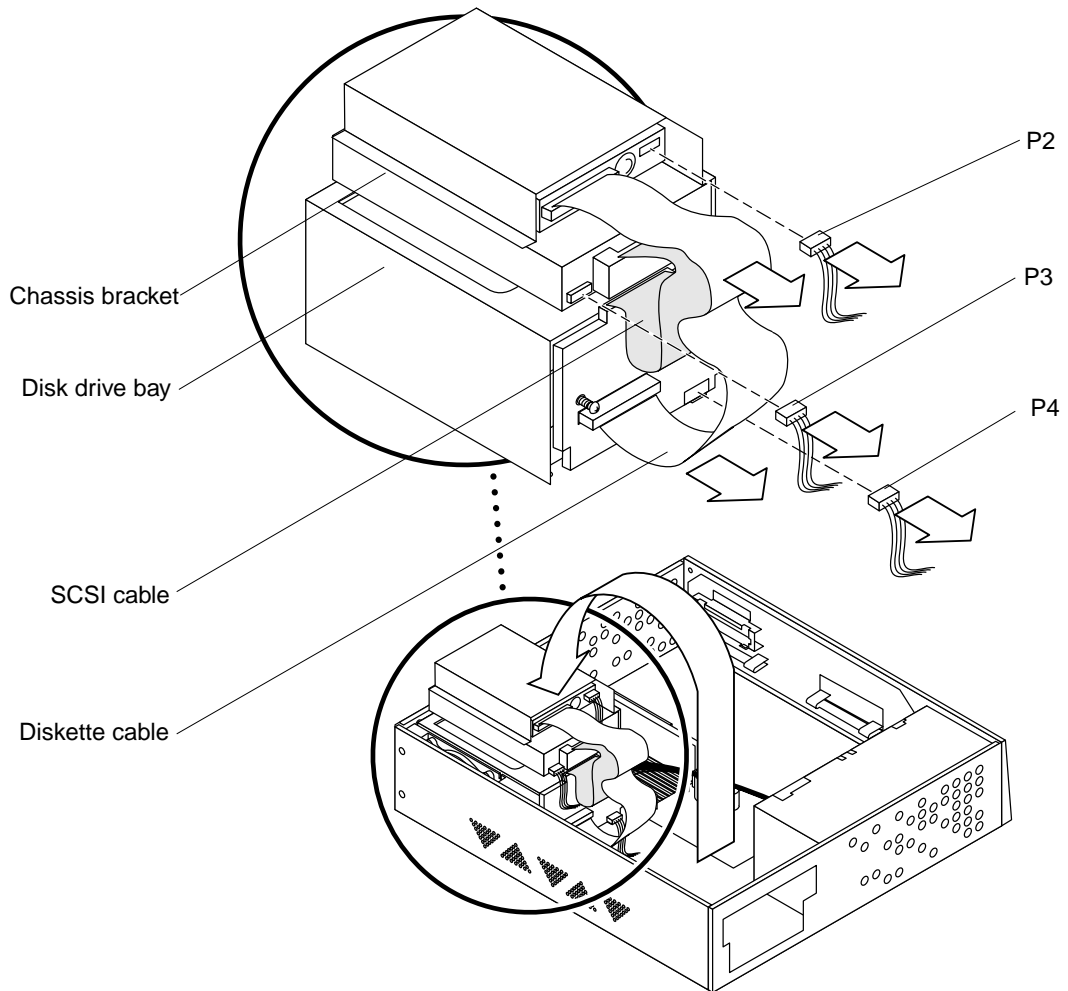


FIGURE 9-6 Placing the Chassis Bracket on Top of the Disk Drive

## 9.2.2 Replacing the Chassis Bracket

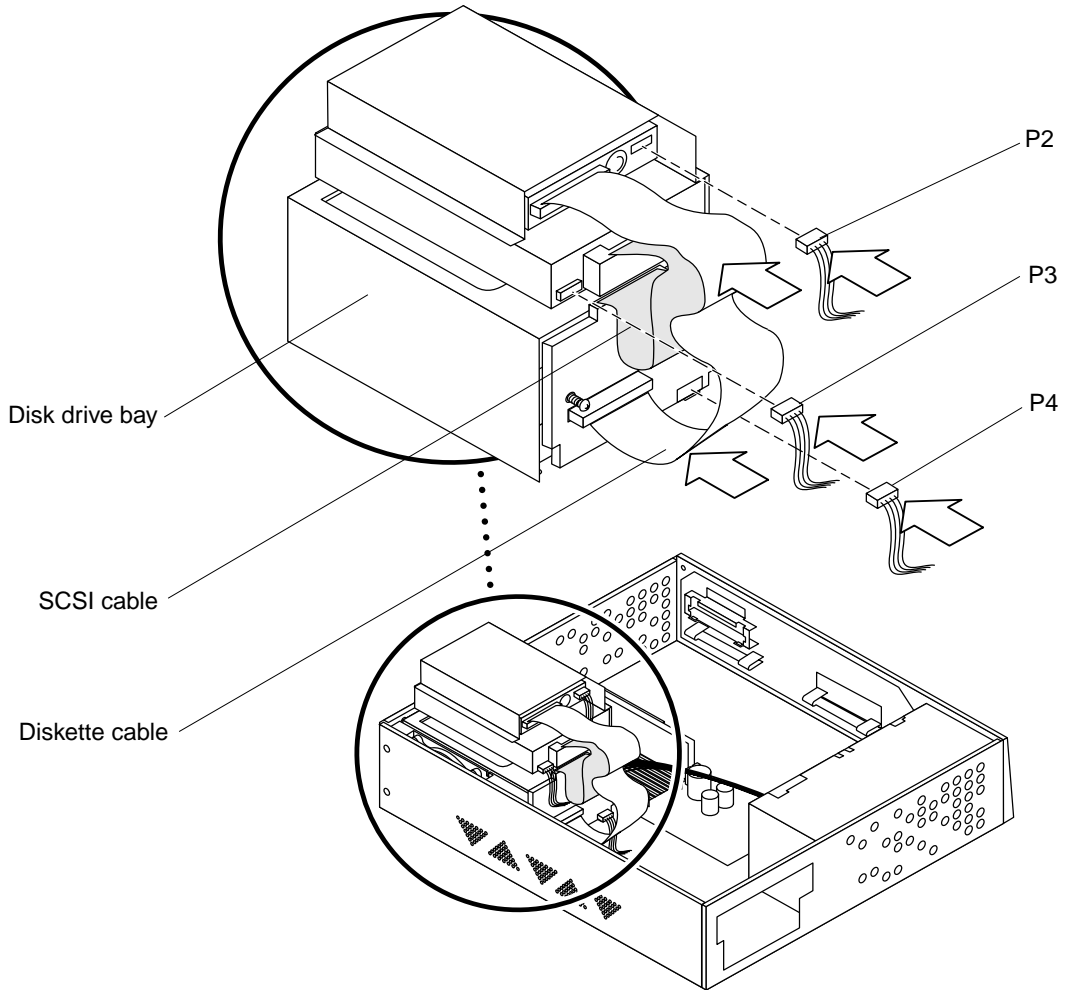


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**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

1. Place the chassis bracket on top of the disk drive bay and connect the following to the chassis bracket if present (FIGURE 9-7):
  - a. The diskette cable to the diskette drive.
  - b. The peripheral power cable to the CD-ROM drive or tape drive (P3), and to the diskette drive (P2).
  - c. The SCSI cable to the CD-ROM drive or tape drive.



**FIGURE 9-7** Connecting Cables to the CD-ROM Drive, 4-mm/8-mm Tape Drive, and Diskette Drive

2. Position the chassis bracket in the chassis and slide the chassis bracket toward the opening in the chassis side (FIGURE 9-8).
3. Connect the DC harness to the peripheral power cable at P1.

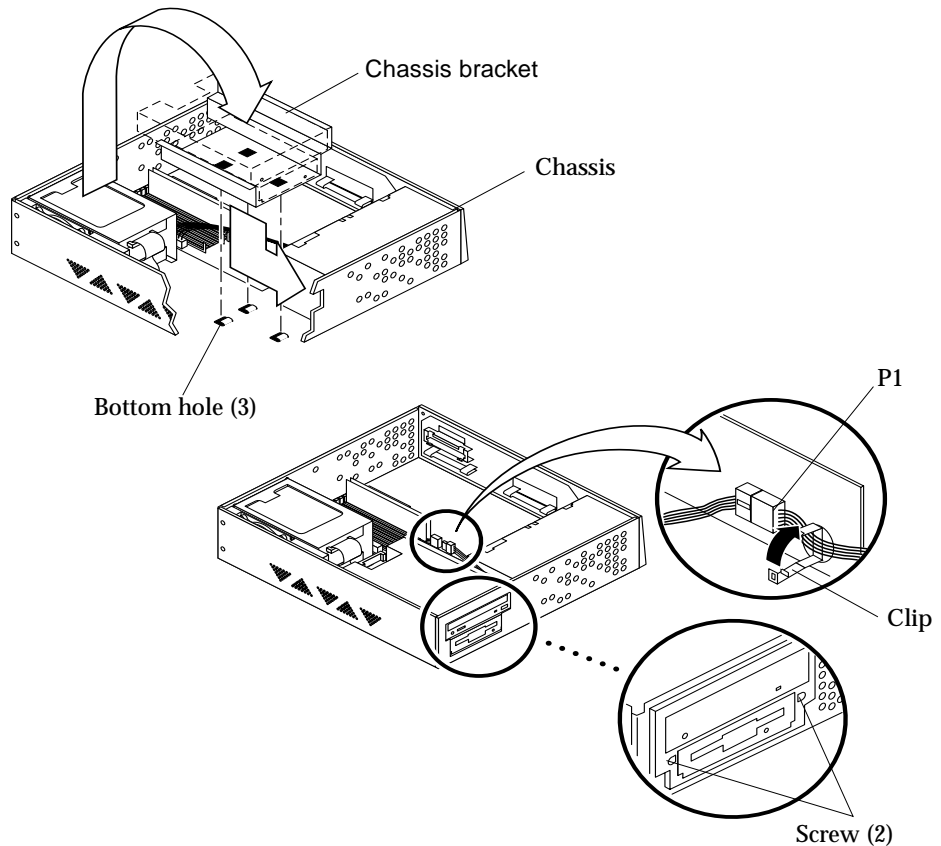


FIGURE 9-8 Positioning the Chassis Bracket

---

**Note** – Hooks at the chassis base must lock into the bottom holes of the drive bracket.

---

4. Replace the DC harness as follows (FIGURE 9-5):
  - a. Route the DC harness through the drive bracket clip.
  - b. Replace the two screws securing the chassis to the chassis bracket.
5. Place the chassis bracket on an antistatic surface.

---

## 9.3 CD-ROM Drive or 4-mm/8-mm Tape Drive

To remove and replace the CD-ROM drive or the 4-mm/8-mm tape drive, proceed as follows.

### 9.3.1 Removing a CD-ROM Drive or 4-mm/8-mm Tape Drive

**1. Power-off the system.**

See Section 6.2 “Powering Off the System” on page 6-2.

**2. Remove the system unit cover.**

See Section 7.1 “Removing the Cover” on page 7-1.



**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

**3. Attach the wrist strap.**

See Section 7.2 “Attaching the Wrist Strap” on page 7-2.

**4. Remove the chassis bracket.**

See Section 9.2.1 “Removing the Chassis Bracket” on page 9-5.

**5. Remove the CD-ROM drive as follows (FIGURE 9-9):**

**a. Position the chassis bracket on top of a flat, antistatic surface, so that the CD-ROM drive or 4-mm/8-mm tape drive is flat.**

**b. Remove the four screws securing the CD-ROM drive or 4-mm/8-mm tape drive to the chassis bracket.**

**6. Remove the CD-ROM drive or 4-mm/8-mm tape drive.**

**7. Place the CD-ROM drive or 4-mm/8-mm tape drive aside on an antistatic surface.**



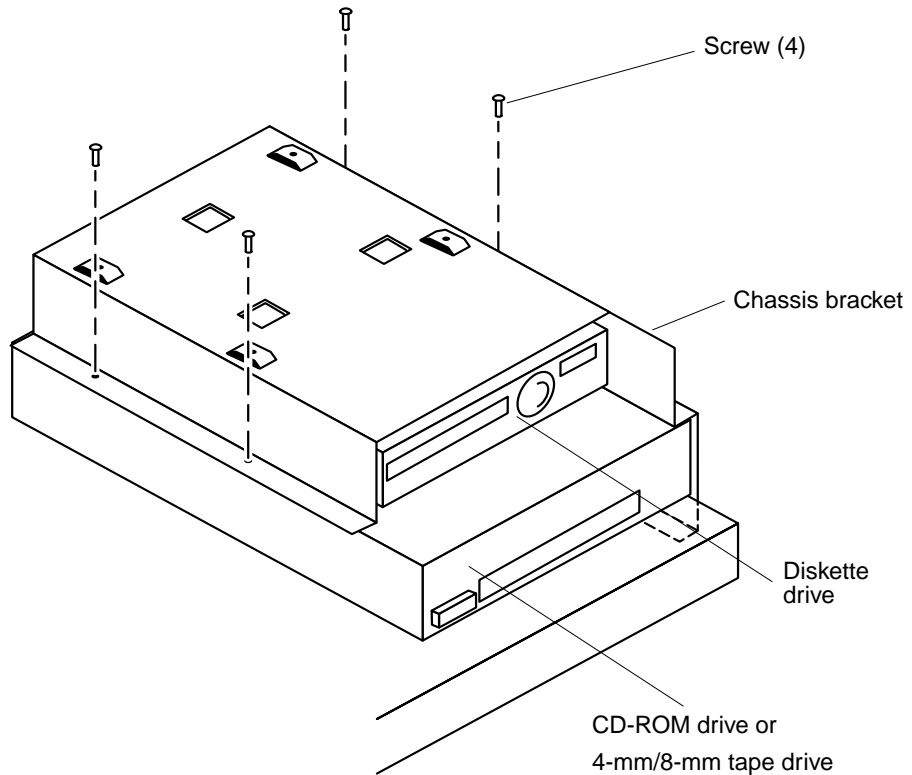


FIGURE 9-9 Positioning the CD-ROM Drive or 4-mm/8-mm Tape Drive

## 9.3.2 Replacing a CD-ROM Drive or 4-mm/8-mm Tape Drive



**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. Position and align the CD-ROM drive or 4-mm/8-mm tape drive on the surface edge of an antistatic surface (FIGURE 9-9).
2. Position the chassis bracket on top of the CD-ROM drive or the 4-mm/8-mm tape drive.

---

**Note** – If the system is configured with a diskette drive, the diskette drive is assembled on the chassis bracket.

---

3. **Replace the four screws securing the CD-ROM drive or the 4-mm/8-mm tape drive to the chassis bracket.**
4. **Replace the chassis bracket.**  
See Section 9.2.2 “Replacing the Chassis Bracket” on page 9-7.
5. **Detach the wrist strap. Replace the system unit cover.**  
See Section 7.3 “Replacing the Cover” on page 7-3.
6. **Power-on the system.**  
See Section 6.1 “Powering On the System” on page 6-1.

---

## 9.4 Diskette Drive

To remove and replace the diskette drive, proceed as follows.

### 9.4.1 Removing a Diskette Drive

1. **Power-off the system.**  
See Section 6.2 “Powering Off the System” on page 6-2.
2. **Remove the system unit cover.**  
See Section 7.1 “Removing the Cover” on page 7-1.



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

3. **Attach the wrist strap.**  
See Section 7.2 “Attaching the Wrist Strap” on page 7-2.
4. **Remove the chassis bracket.**  
See Section 9.2.1 “Removing the Chassis Bracket” on page 9-5.

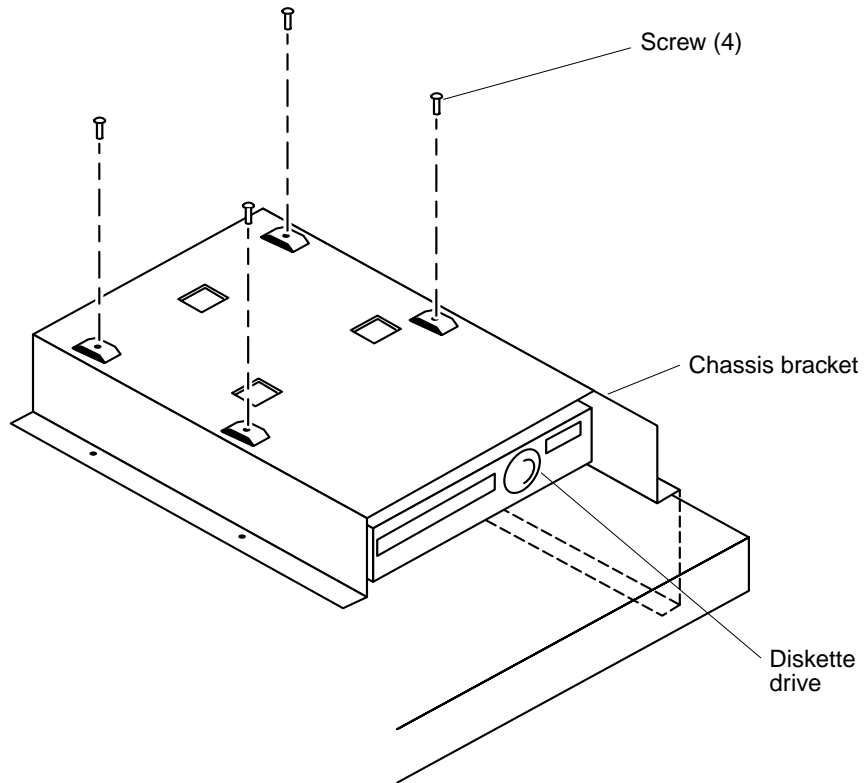
**5. Remove the CD-ROM drive or 4-mm/8-mm tape drive.**

See Section 9.3.1 “Removing a CD-ROM Drive or 4-mm/8-mm Tape Drive” on page 9-10.

**6. Remove the four screws securing the diskette drive to the chassis bracket (FIGURE 9-10).**

**7. Remove the diskette drive.**

**8. Place the diskette drive on an antistatic surface.**



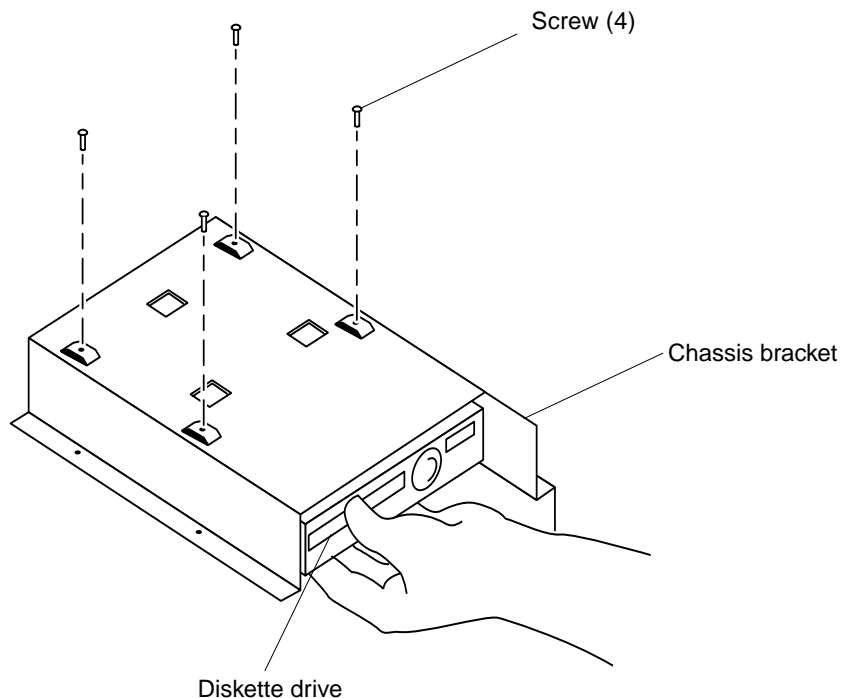
**FIGURE 9-10** Positioning the Diskette Drive

## 9.4.2 Replacing a Diskette Drive



**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. **Position the diskette drive in the chassis bracket (FIGURE 9-11).**



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

2. **Replace the four screws.**
3. **Replace the CD-ROM drive or 4-mm/8-mm tape drive.**  
See Section 9.3.2 “Replacing a CD-ROM Drive or 4-mm/8-mm Tape Drive” on page 9-11.
4. **Replace the chassis bracket into the chassis.**  
See Section 9.2.2 “Replacing the Chassis Bracket” on page 9-7.
5. **Detach the wrist strap.**

**6. Replace the system unit cover.**

See Section 7.3 “Replacing the Cover” on page 7-3.

**7. Power-on the system.**

See Section 6.1 “Powering On the System” on page 6-1.



# System Board and Component Replacement

---

This chapter contains removal and replacement procedures for the system board and components of the system board. The following is a list of topics presented.

- “System Board” on page 1
- “NVRAM/TOD” on page 12
- “SBus Card” on page 14
- “FFB Card (Workstation Only)” on page 19
- “DSIMM” on page 23
- “System Board Fan” on page 28

---

## 10.1 System Board

To remove and replace a system board, proceed as follows.



---

**Caution** – Use an antistatic mat when working with the system board. An antistatic mat contains the cushioning needed to protect the underside components, to prevent board flexing, and to provide antistatic protection.

---

---

**Note** – If the system board is being replaced, remove all DSIMMs, FFB card, and SBus card(s) prior to removing the system board. Note the chassis slot location for each DSIMM, FFB card, and SBus card prior to removal.

---

---

**Note** – The NVRAM/TOD clock contains the system host identification (ID) and Ethernet address. If the same ID and Ethernet address are to be used on the replacement system board, remove the NVRAM/TOD from the defective system board and install it on the replacement system board after the replacement system board is installed.

---

## 10.1.1 Removing a System Board

### 1. Power-off the system.

See Section 6.2 “Powering Off the System” on page 6-2.

### 2. Disconnect all cables, excluding the power cable, from the back of the system or server unit.

### 3. Remove the unit cover.

See Section 7.1 “Removing the Cover” on page 7-1.

### 4. Attach a wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-2.



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

### 5. Depopulate the system board as follows:

#### a. Remove the NVRAM/TOD with carrier.

See Section 10.2.1 “Removing a NVRAM/TOD” on page 10-12.

#### b. Remove all SBus card(s).

See Section 10.3.1 “Removing an SBus Card” on page 10-14.

#### c. Remove all DSIMMs.

See Section 10.5.1 “Removing a DSIMM” on page 10-24.

#### d. Remove the FFB card (workstation only).

See Section 10.4.1 “Removing an FFB Card” on page 10-19.

### 6. Disconnect the following:

#### a. SCSI cable.

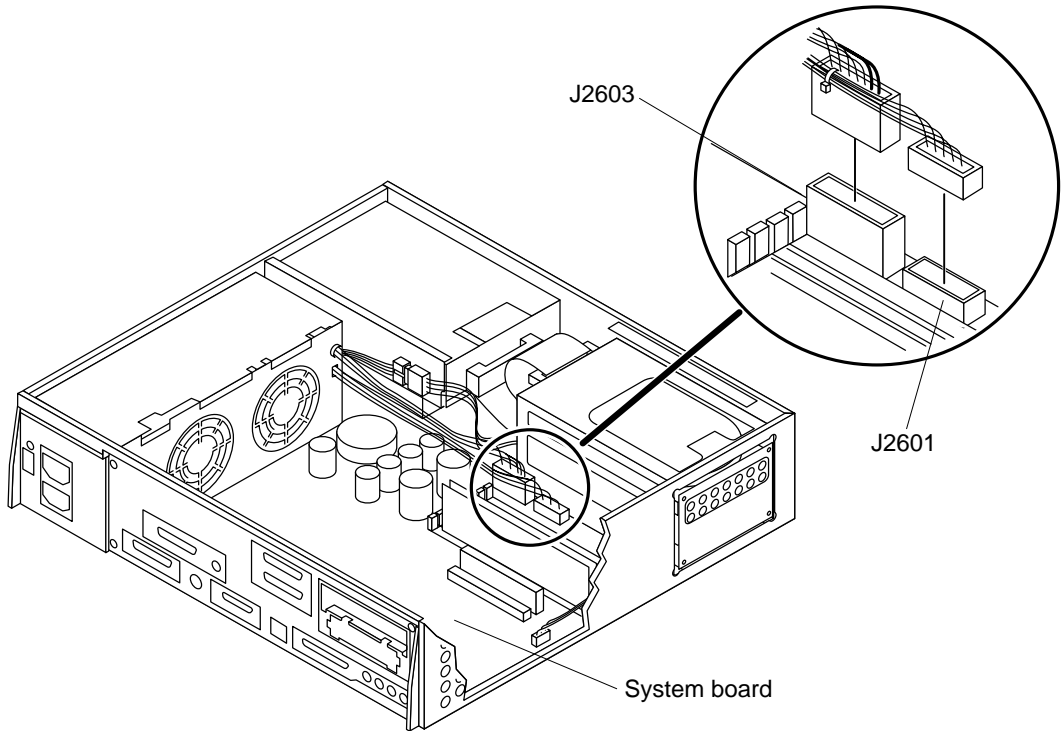
See Section 8.5.1 “Removing the SCSI Cable/Backplane Assembly” on page 8-19.



**b. Speaker/LED cable.**

See Section 8.7.1 “Removing the Speaker/LED Cable” on page 8-29.

**c. DC power cables at J2601 and J2603 (FIGURE 10-1).**



**FIGURE 10-1** DC Power Disconnection

7. Loosen the two captive screws that secure the system board back panel to the chassis (FIGURE 10-2).
8. Grasp the system board and slide it out of the chassis (FIGURE 10-3).



---

**Caution** – Handle the system board by the back panel or by the edges only.

---

9. Place the system board on an antistatic surface.

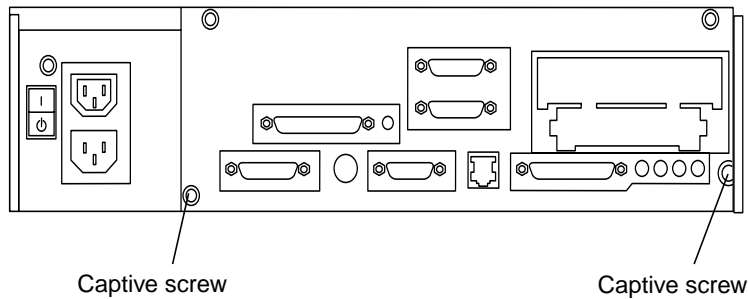


FIGURE 10-2 Captive Screws on the Back Panel

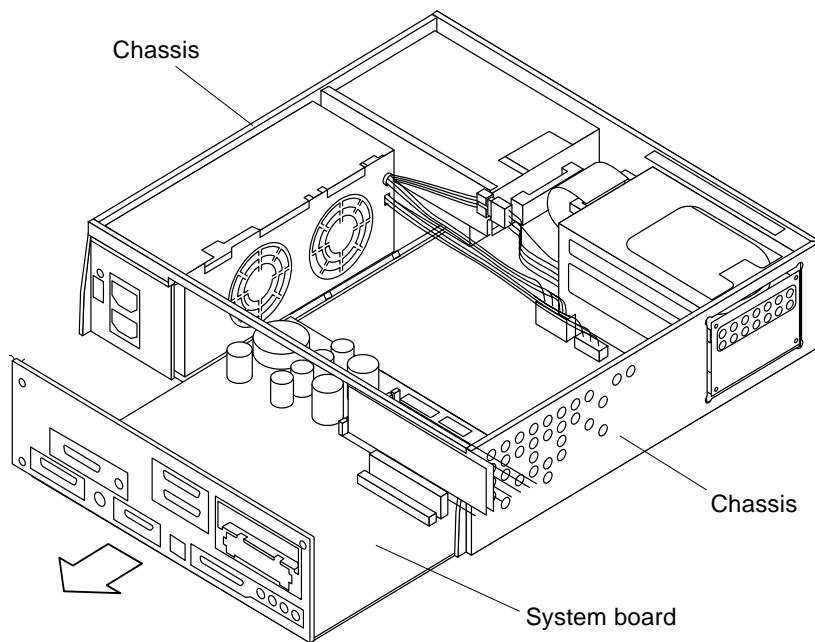


FIGURE 10-3 Sliding the System Board Out of the Chassis

## 10.1.2 Replacing a System Board



**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. Remove the SBus filler panel(s) from the replacement system board as follows:
  - a. Squeeze the filler panel bottom locking tabs to unhook them from the back panel (FIGURE 10-4).

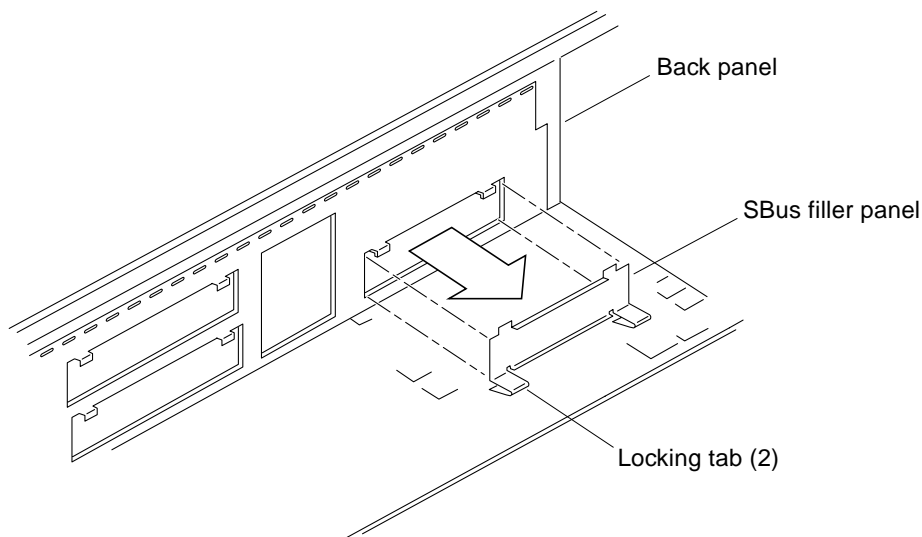


FIGURE 10-4 Removing SBus Filler Panels from the Back Panel

- b. Pull the filler panel away from the back panel.



---

**Caution** – Handle the system board by the back panel or by the edges only.

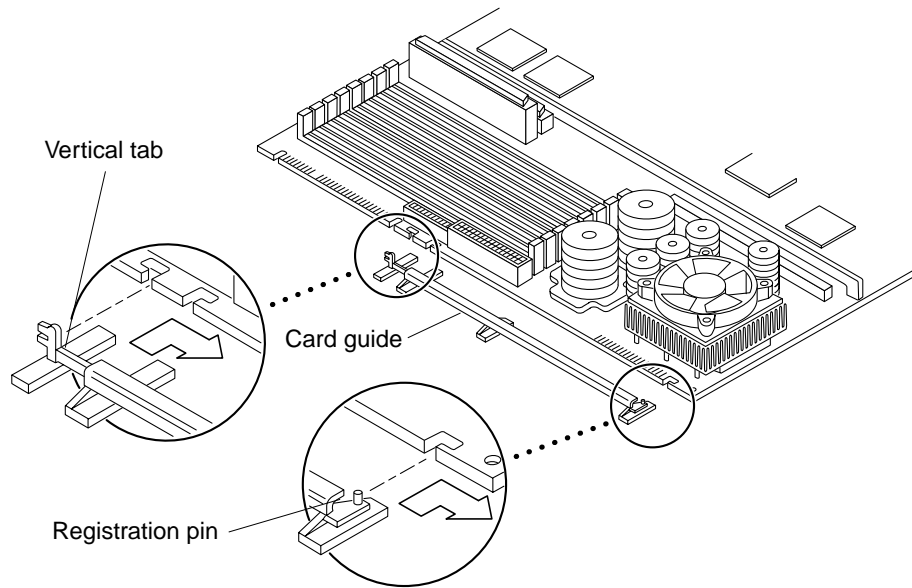
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2. Prepare to install the system board as follows (FIGURE 10-5 and FIGURE 10-6):
  - a. Install the front card guide.
  - b. Insert the vertical tab on the far left of the front card guide into the slot at the front edge of the system board.
  - c. Swing the card guide forward until the registration pin on the far right side of the card guide clicks into engagement with the motherboard front edge slot.

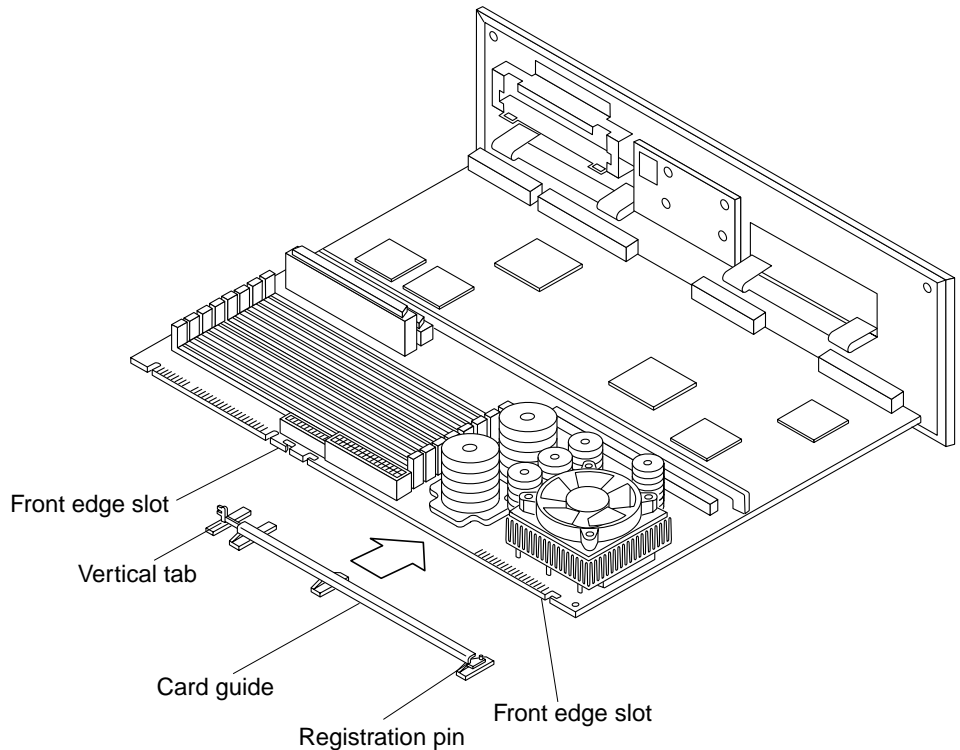
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**Note** – The card guide will flex enough to allow the vertical tab to fit into its slot and hold the card guide in position.

---

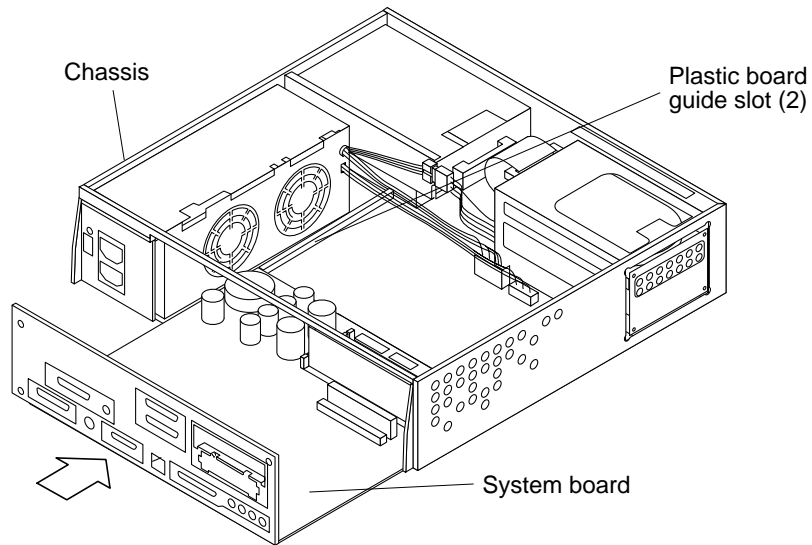


**FIGURE 10-5** Card Guide Exploded view



**FIGURE 10-6** Installing the Card Guide

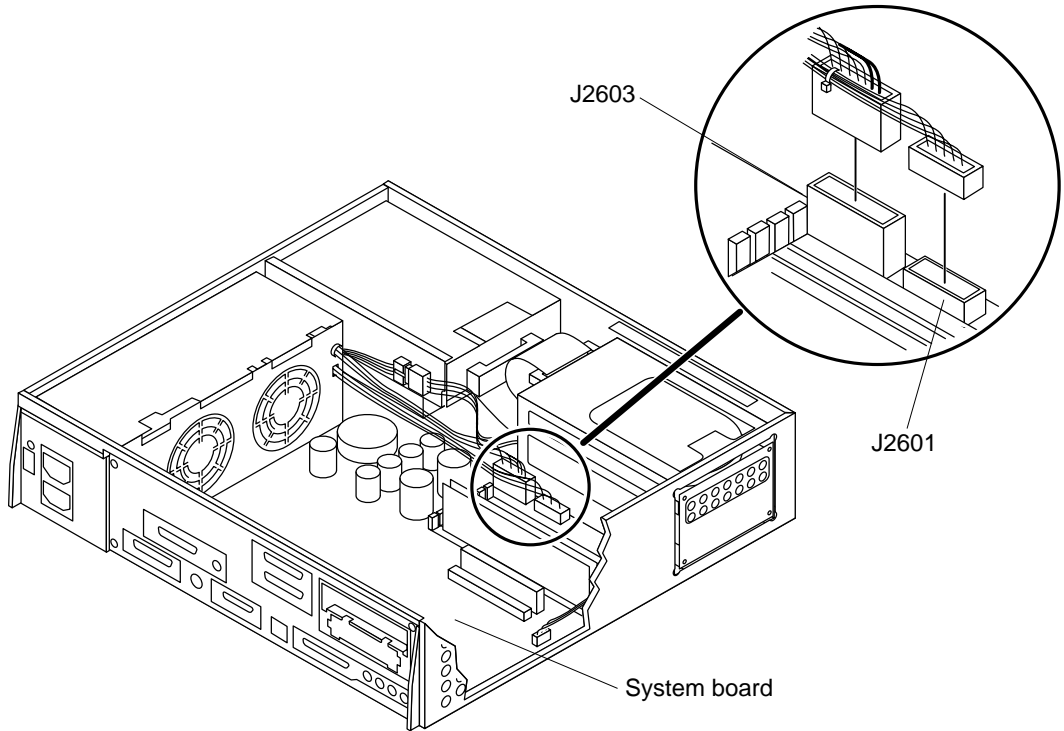
- 3. Slide the system board into the chassis rear. Verify that both sides of the system board fit into the chassis plastic board guide slots (FIGURE 10-7).**
- 4. Tighten the two captive screws that secure the system board back panel to the chassis (FIGURE 10-2).**
- 5. Populate the system board as follows:**
  - a. Connect the following to the system board:**
    - SCSI cable  
See Section 8.5.2 “Replacing the SCSI Cable/Backplane Assembly” on page 8-21.
    - Speaker/LED cable  
See Section 8.7.2 “Replacing the Speaker/LED Cable” on page 8-34.
    - DC power cables at J2601 and J2603 (FIGURE 10-8).



**FIGURE 10-7** Sliding the System Board Into The Chassis

**b. Replace the following to the system board:**

- NVRAM/TOD with carrier (removed in Section 10.1.1 “Removing a System Board” on page 10-2). See Section 10.2.2 “Replacing a NVRAM/TOD” on page 10-13.
- All SBus card(s). See Section 10.3.2 “Replacing an SBus Card” on page 10-16.
- All DSIMMs. See Section 10.5.2 “Replacing a DSIMM” on page 10-26.
- The FFB card (workstation only). See Section 10.4.2 “Replacing an FFB Card” on page 10-21.



**FIGURE 10-8** DC Power Connection

6. Use a pair of long-nose pliers to set the system board serial port jumpers J2104 and J2105.

See TABLE 10-1 and FIGURE 10-9.

**TABLE 10-1** Serial Port Jumper Settings

Jumper	Pins 1 + 2 Select	Pins 2 + 3 Select	Default Shunt on Pins
J2104	RS-232	RS-423	2 + 3
J2105	RS-232	RS-423	2 + 3

**Note** – Jumpers J2104 and J2105 can be set to either RS-423 or RS-232 serial interface. The jumpers are preset for RS-423. RS-232 is required for digital telecommunication within the European Community.

---

**Note** – System board jumpers are identified with part numbers. Jumper pins are located immediately adjacent to the part number. Pin 1 is marked with an asterisk in any of the positions shown (FIGURE 10-10). Ensure that the serial port jumpers are set correctly.

---

7. **Reset the #power-cycles NVRAM variable to zero as follows:**

a. **Set system power to on.**

See Section 6.1 “Powering On the System” on page 6-1.

b. **Press the keyboard Stop and A keys after the system banner appears on the monitor.**

c. **At the ok prompt, type:**

```
ok setenv #power-cycles 0
```

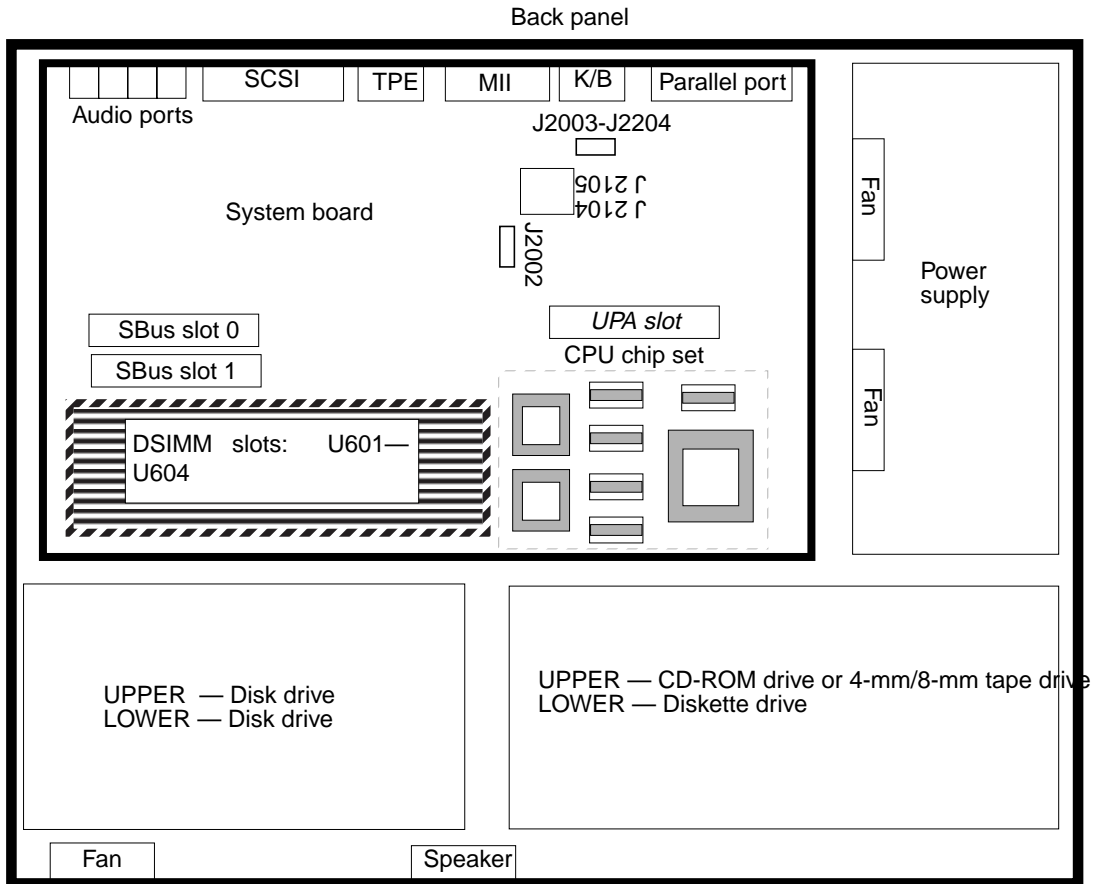
d. **Verify the #power-cycles NVRAM variable increments each time the system is power cycled.**

---

**Note** – The Solaris operating environment Power Management software uses the #power-cycles NVRAM variable to control the frequency of automatic system shutdown if automatic shutdown is enabled.

---





**FIGURE 10-9** Location of the Serial Port Jumpers



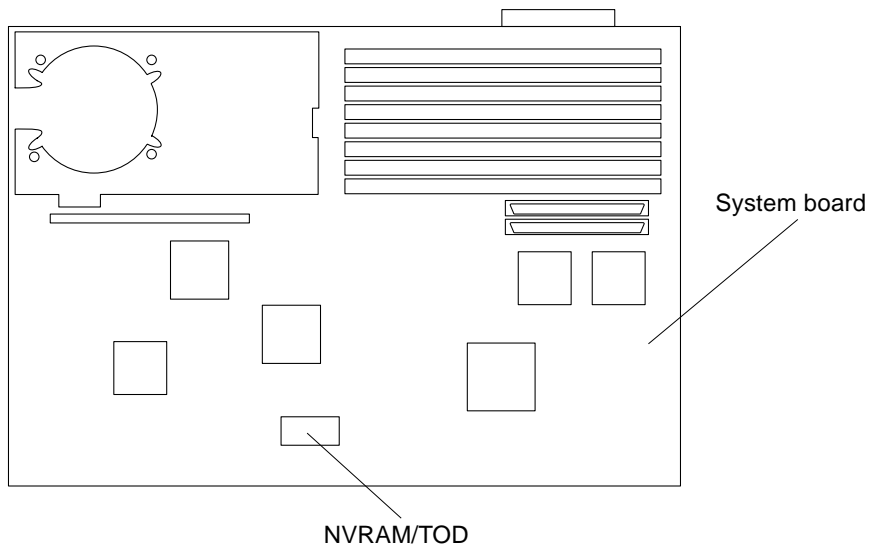


FIGURE 10-11 NVRAM/TOD

## 10.2.2 Replacing a NVRAM/TOD



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

1. **Position the replacement NVRAM/TOD and carrier on the system board (FIGURE 10-11).**
2. **Carefully insert the NVRAM/TOD and carrier into the socket.**

---

**Note** – The carrier is keyed so the NVRAM/TOD can be installed only one way.

---

3. **Push the NVRAM/TOD into the carrier until properly seated.**
4. **Detach the wrist strap.**
5. **Replace the unit cover.**

See Section 7.3 “Replacing the Cover” on page 7-3.

## 6. Power-on the system.

See Section 6.1 “Powering On the System” on page 6-1.

---

# 10.3 SBus Card

To remove and replace the SBus card, proceed as follows.

## 10.3.1 Removing an SBus Card

---

**Note** – If there are two SBus cards in the system and the defective SBus card is installed in SBus slot 0, perform the following steps to remove the SBus card from slot 1 followed by the removal of the defective card from slot 0.

---

### 1. Power-off the system.

See Section 6.2 “Powering Off the System” on page 6-2.

### 2. Disconnect all cables from the SBus slots (FIGURE 10-12).

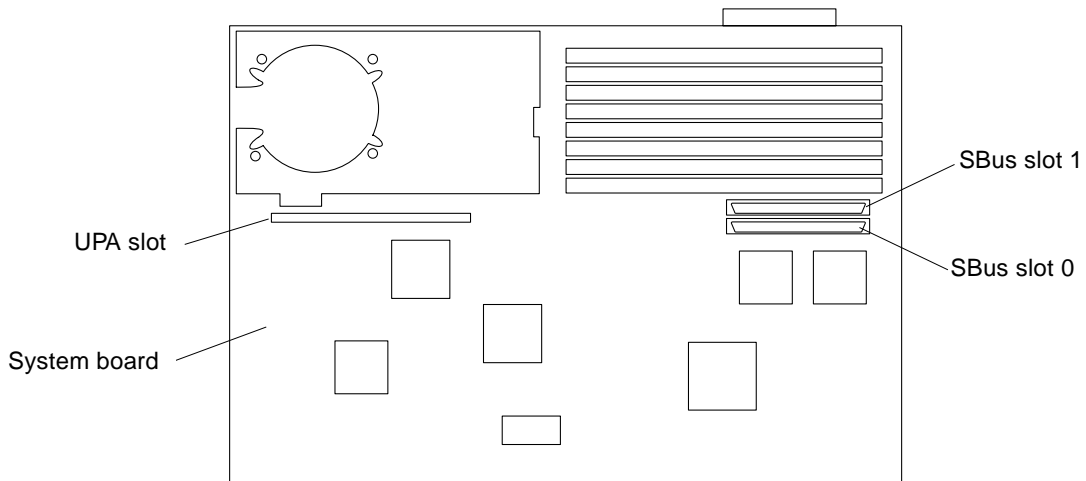


FIGURE 10-12 SBus Slot Locations.

### 3. Remove the unit cover.

See Section 7.1 “Removing the Cover” on page 7-1.



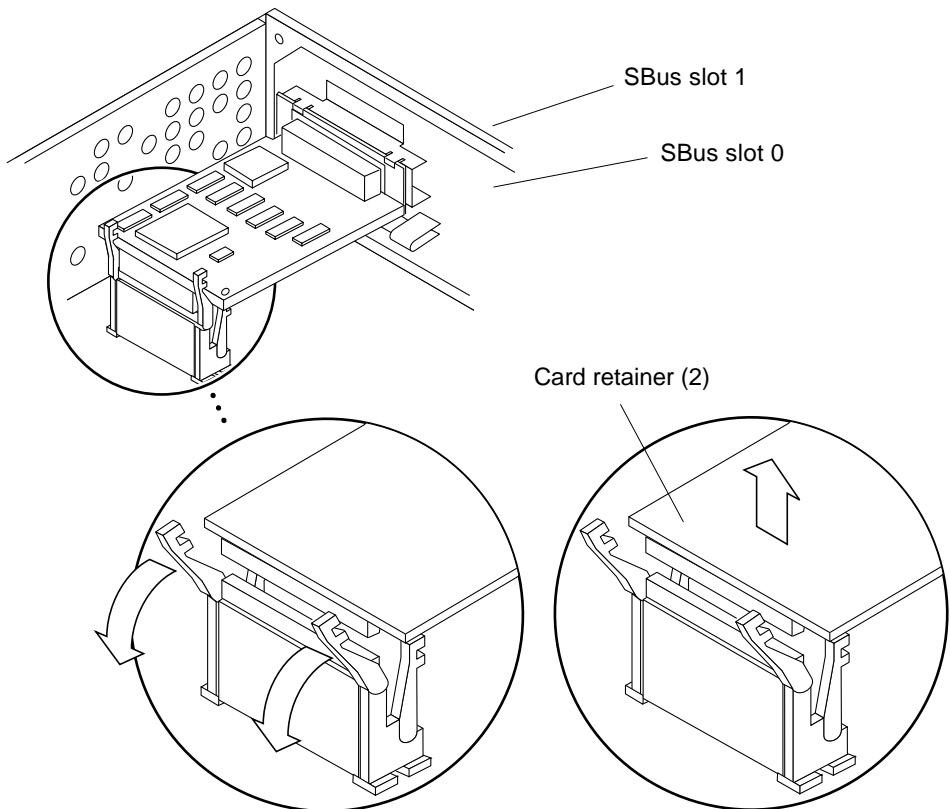
**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

### 4. Attach the wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-2.

### 5. Unlock the card retainers at the back edge of the SBus card by pushing the card retainers back from the edge of the SBus card (FIGURE 10-13).

### 6. Grasp the SBus card at each corner and pull upwards slowly until the connector is out of the slot.



**FIGURE 10-13** Removing an SBus Card from Slot 0 or 1



---

**Caution** – Avoid applying force to one end or one side of the board or connector pin damage may occur.

---

7. Place the SBus card on an antistatic surface.

## 10.3.2 Replacing an SBus Card



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

---

**Note** – Read the SBus card product guide for information about jumper or switch settings, slot requirements, and required tools.

---

1. Identify the SBus slot and open the SBus card retainers.
2. As applicable, remove SBus filler panels as follows:
  - a. Use both hands to grasp the tabs at the base of the SBus filler panel.
  - b. Squeeze both tabs until the filler panel base disengages from the chassis.
  - c. Swing the filler panel base toward you and remove.
3. Holding the SBus card by the edges, proceed as follows:
  - a. Unpack the SBus card.
  - b. Place the SBus card on an antistatic surface.
  - c. If required, set the SBus card jumpers or switches (refer to the SBus card product guide).
4. If the SBus card being installed has backplate tabs, proceed as follows:
  - a. Remove the two screws that secure the backplate adapter to the backplate.
  - b. Remove the backplate adapter.
  - c. Identify the SBus slot and open the SBus card retainers.
  - d. Discard the screws and backplate adapter.

## 10.3.3 Removing the SBus Card Adapter Bracket

1. Remove the SBus card extractor (if any) as follows (FIGURE 10-14):
  - a. Slightly bend one extractor leg towards the outside until the extractor leg hook clears the SBus card hole.
  - b. Remove the other side of the extractor.

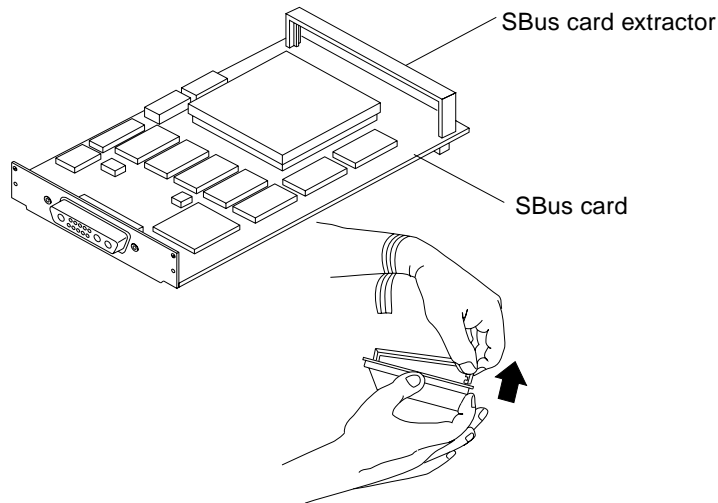


FIGURE 10-14 Removing the SBus Card Extractor

2. Install the SBus card into the chassis as follows (FIGURE 10-15):
  - a. Holding the SBus card at an angle, insert the SBus card backplate behind the tabs at the top of the card opening.
  - b. Lower the SBus card into position.
  - c. Push the SBus card into the SBus slot by carefully pressing the SBus card corners.



---

**Caution** – Do not force the card or SBus slot pin damage may occur. Ensure the card backplate is visible through the back panel slot.

---

3. Push the card retainers forward over the edge of the SBus card.

---

**Note** – Refer to the SBus product guide to complete any required software installation, configuration, or setup procedures.

---

**4. Detach the wrist strap.**

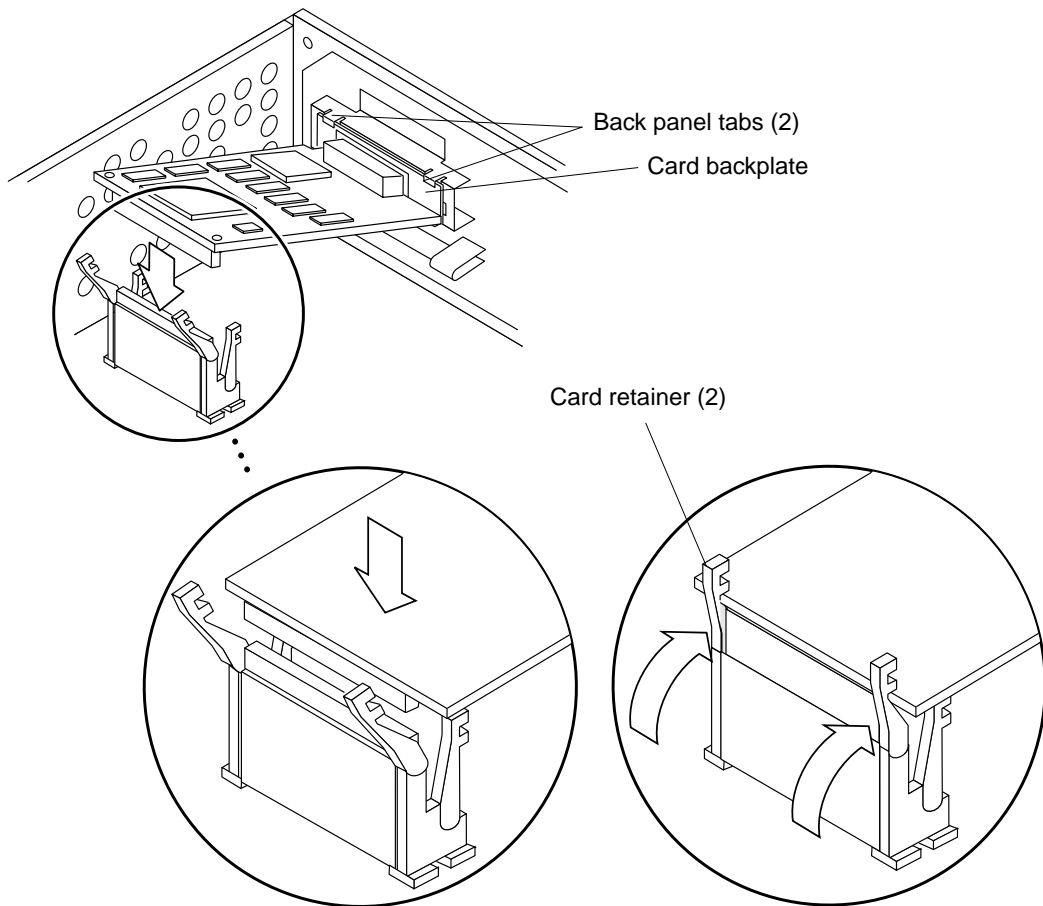
**5. Replace the unit cover.**

See Section 7.3 “Replacing the Cover” on page 7-3.

**6. Connect all cables to the SBus slots.**

**7. Power-on the system.**

See Section 6.1 “Powering On the System” on page 6-1.



**FIGURE 10-15** Replacing the SBus Card



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## 10.4 FFB Card (Workstation Only)

To remove and replace the FFB card, proceed as follows.

---

**Note** – Illustrations supporting the FFB card removal and replacement are not representative of a system unit or server chassis.

---

### 10.4.1 Removing an FFB Card

**1. Power-off the system.**

See Section 6.2 “Powering Off the System” on page 6-2.

**2. Disconnect the video cable from the graphics card 13W3 video connector.**

**3. Remove the unit cover.**

See Section 7.1 “Removing the Cover” on page 7-1.



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

**4. Attach the wrist strap.**

See Section 7.2 “Attaching the Wrist Strap” on page 7-2.

**5. Unlock the card retainers (FIGURE 10-16).**

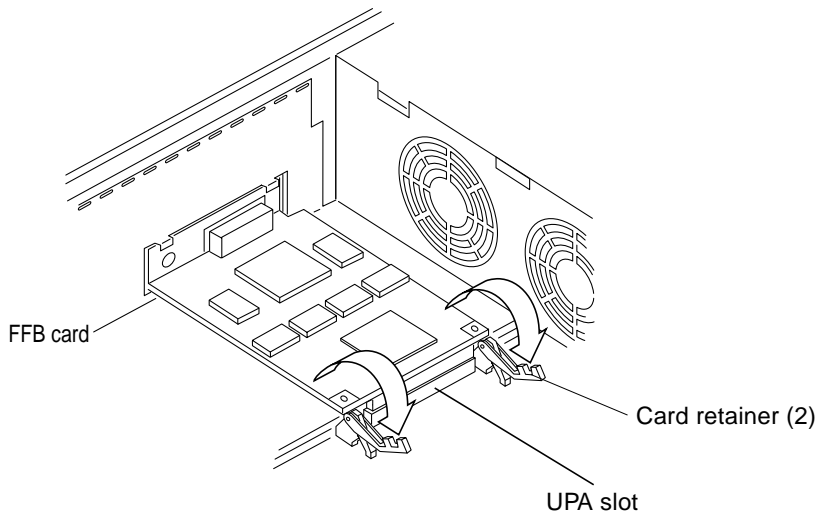


FIGURE 10-16 Preparing to Remove the FFB Card

6. Hold the FFB card at each corner and gently pull the FFB card up to disconnect it from the UPA socket (FIGURE 10-17).

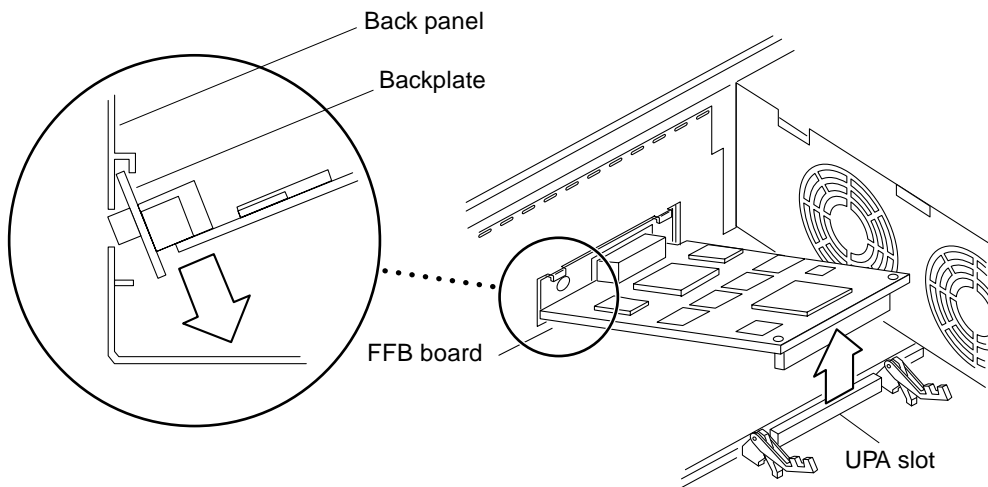


FIGURE 10-17 Removing the FFB Card



---

**Caution** – Avoid applying unequal force to one end or one side of the FFB card or connector pin damage may occur.

---

7. Slowly lift the FFB card at an upward angle.
8. Lower the FFB card backplate.
9. Disengage the FFB card backplate from the back panel.
10. Place the FFB card on antistatic surface.

## 10.4.2 Replacing an FFB Card

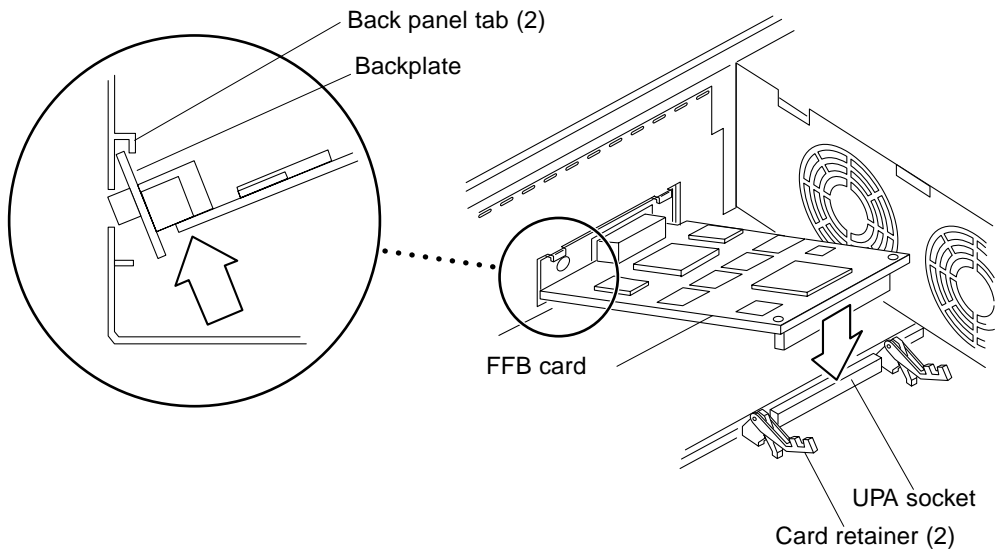


---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

1. Verify that both card retainers are pushed back (FIGURE 10-18).



**FIGURE 10-18** Replacing the FFB Card

2. Remove the replacement FFB card from its container.

3. At an angle, lower the FFB card into the chassis over the UPA socket.
4. Hook the FFB card backplate under the chassis back panel tabs. Ensure that the FFB card backplate is visible through the back panel slot.
5. Carefully press both corners of the FFB card evenly to seat the FFB card connector into the UPA socket (FIGURE 10-19).

---

**Caution** – Avoid applying force to one end or one side of the FFB board or the connector pin may be damaged.

---

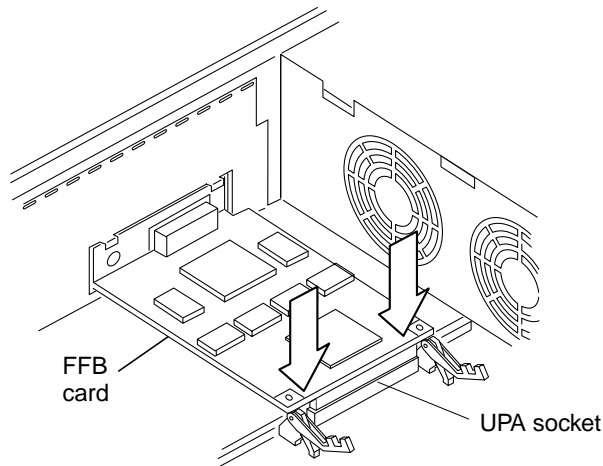


FIGURE 10-19 Seating an FFB Card Into the UPA Socket

6. Push the card retainer onto the board (FIGURE 10-20).
7. Detach the wrist strap.
8. Replace the unit cover.  
See Section 7.3 “Replacing the Cover” on page 7-3.
9. Connect the video cable to the 13W3 video connector.
10. Power-on the system.  
See Section 6.1 “Powering On the System” on page 6-1.

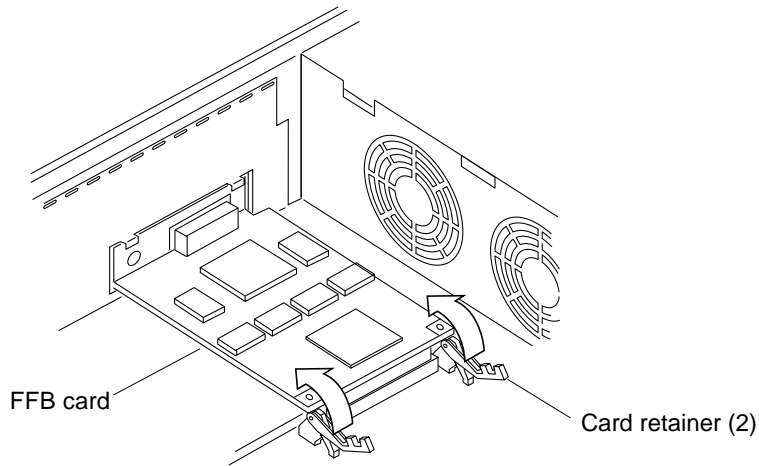


FIGURE 10-20 Securing the FFB Card Into the Chassis

---

## 10.5 DSIMM

To remove and replace a DSIMM, proceed as follows.



---

**Caution** – DSIMMs consist of electronic components that are extremely sensitive to static electricity. Ordinary amounts of static electricity from clothing or work environment can destroy the DSIMM.

---



---

**Caution** – When removing a DSIMM an identical replacement is required. The replacement DSIMM must be inserted into the same socket as the removed DSIMM.

---

The Ultra 1 Creator series system *must* have at least two identical DSIMMs installed in paired sockets of any DSIMM bank. TABLE 10-2 identifies DSIMM installation locations.

---

**Caution** – Each DSIMM bank must contain two DSIMMs of equal density (for example: two 16-Mbyte DSIMMs to function properly. Do not mix DSIMM densities in any bank.

---

**TABLE 10-2** DSIMM Bank and Socket Pair Locations

Bank	Socket Pair
0	U0701 + U0601
1	U0702 + U0602
2	U0703 + U0603
3	U0704 + U0604

## 10.5.1 Removing a DSIMM



---

**Caution** – Handle DSIMMs only by the edges. Do not touch the DSIMM components or metal parts. Always wear a grounding strap when handling a DSIMM.

---

**1. Power-off the system.**

See Section 6.2 “Powering Off the System” on page 6-2.

**2. Remove the unit cover.**

See Section 7.1 “Removing the Cover” on page 7-1.



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

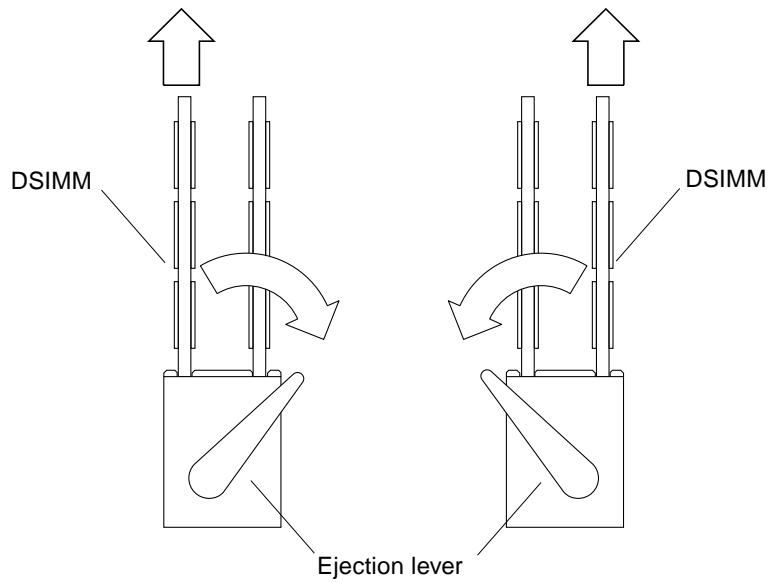
---

**3. Attach the wrist strap.**

See Section 7.2 “Attaching the Wrist Strap” on page 7-2.

**4. Locate the DSIMM to be removed.**

**5. Push the lever away from the DSIMM (FIGURE 10-21).**



**FIGURE 10-21** DSIMM Ejection Lever

**6. Remove the DSIMM from the socket (FIGURE 10-22).**

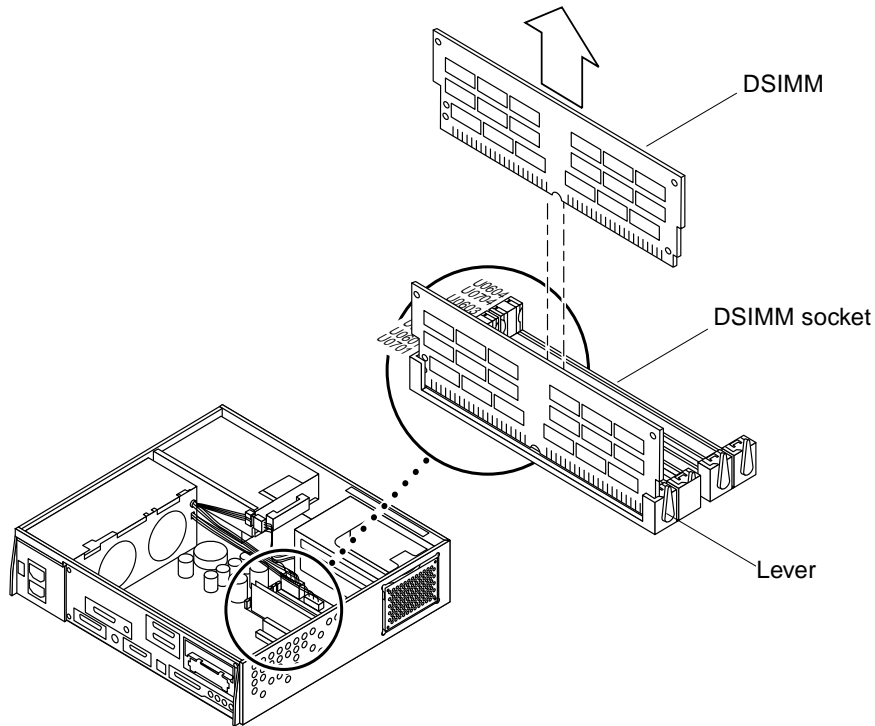


FIGURE 10-22 Removing a DSIMM

## 10.5.2 Replacing a DSIMM



---

**Caution** – DSIMMs are made of electronic components that are extremely sensitive to static electricity. Ordinary amounts of static electricity from clothing or work environment can destroy the DSIMM.

---



---

**Caution** – Do not remove any DSIMM from the anti-static container until ready to install it on the system board. Handle DSIMMs only by their edges. Do not touch DSIMM components or metal parts. Always wear a grounding strap when handling DSIMMs.

---





**Caution** – Each DSIMM bank must contain two DSIMMs of equal density (for example: two 16-Mbyte DSIMMs) to function properly. Do not mix DSIMM density in any bank.

---



**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

**1. Locate and select an available pair of DSIMM slots on the system board.**

---

**Note** – Use only DSIMMs that are specifically designed for system and server units.

---



---

**Caution** – Hold DSIMMs by edges only.

---

**2. Remove the DSIMM from the antistatic container.**

**3. Install the DSIMM as follows (FIGURE 10-23):**

- a. Position the DSIMM in the socket, ensure that the notch is on the same side as the lever.**
- b. Use thumbs to press firmly on the DSIMM top until the DSIMM is properly seated.**

---

**Note** – Proper DSIMM seating is verified by a clicking sound.

---

**c. Push the lever toward the DSIMM.**

**4. Detach the wrist strap.**

**5. Replace the unit cover.**

See Section 7.3 “Replacing the Cover” on page 7-3.

**6. Power-on the system.**

See Section 6.1 “Powering On the System” on page 6-1.

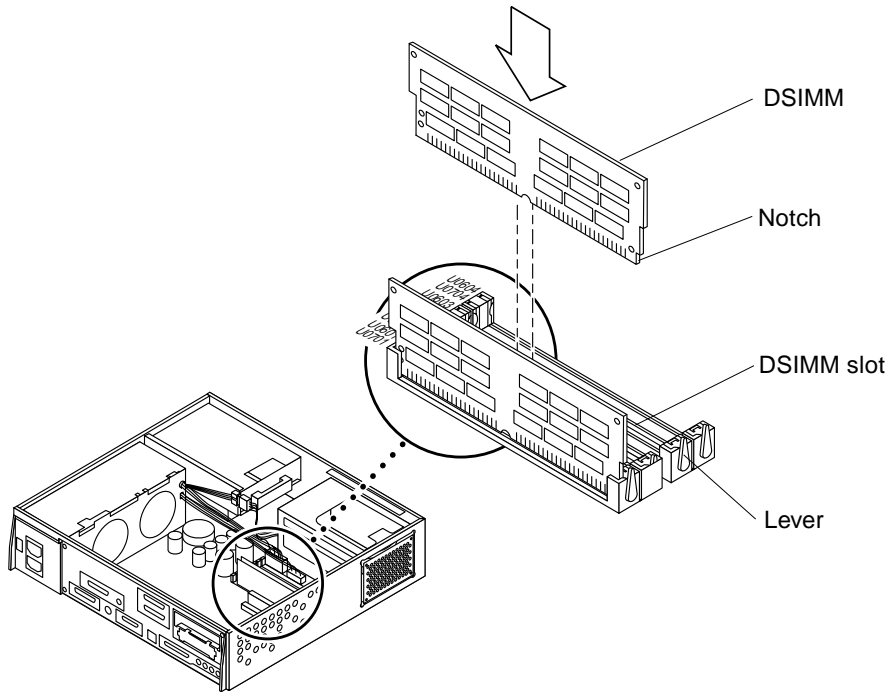


FIGURE 10-23 Installing a DSIMM

---

## 10.6 System Board Fan

To remove and replace the system board fan, proceed as follows.

### 10.6.1 Removing the System Board Fan

**1. Power-off the system.**

See Section 6.2 “Powering Off the System” on page 6-2.

**2. Remove the unit cover.**

See Section 7.1 “Removing the Cover” on page 7-1.



---

**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

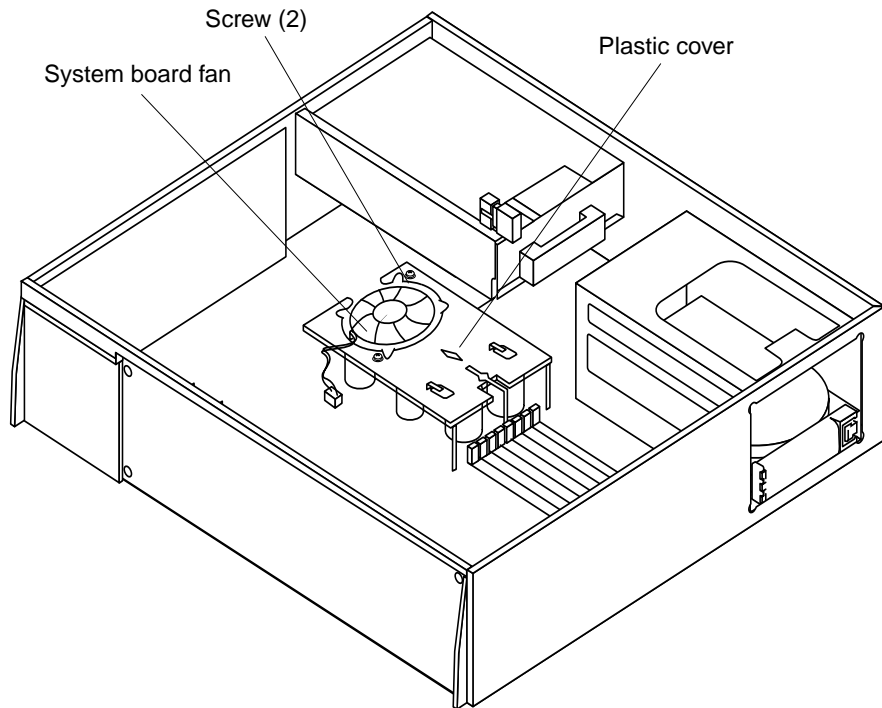
---

**3. Attach the wrist strap.**

See Section 7.2 “Attaching the Wrist Strap” on page 7-2.

**4. Remove the two screws securing the system board fan and heatsink cover to the system board (FIGURE 10-24).**

**5. Lift the plastic cover and pull the plastic cover up to remove it from the system board.**



**FIGURE 10-24** System Board Fan Plastic Cover

**6. Disconnect the board fan connector from the system board at J0101 (FIGURE 10-25).**

**7. Remove the system board fan from the system board.**

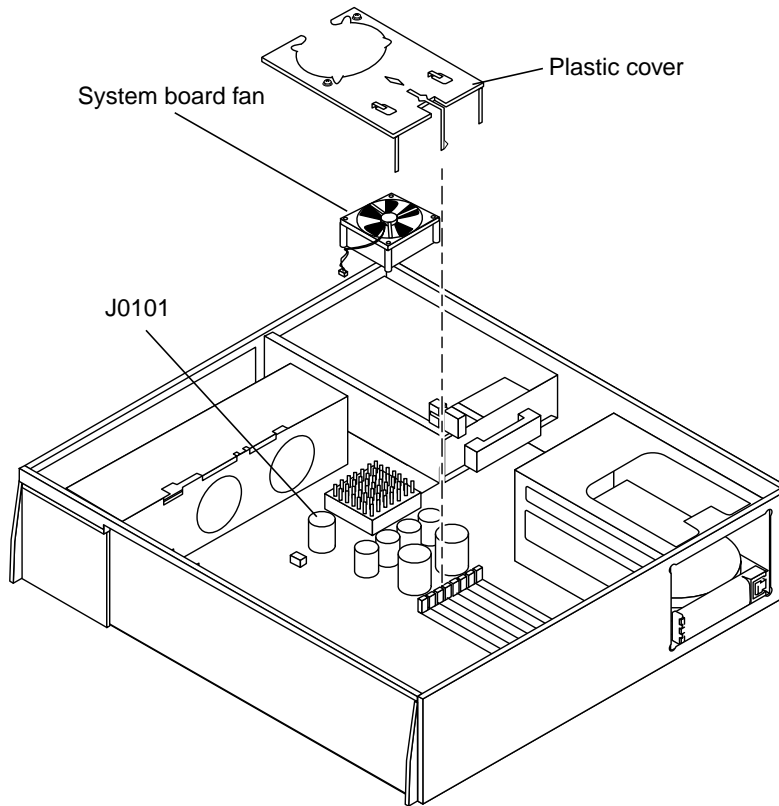


FIGURE 10-25 System Board Fan

## 10.6.2 Replacing the Board Fan



**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. Position the replacement system board fan on the system board (FIGURE 10-25).
2. Connect the system board fan connector to the system board at J0101.
3. Position the plastic cover on top of the system board fan.
4. Replace the two screws securing the plastic cover and system board fan to the system board (FIGURE 10-24)

**5. Detach the wrist strap.**

**6. Replace the unit cover.**

See Section 7.3 “Replacing the Cover” on page 7-3.

**7. Connect the video cable to the 13W3 video connector.**

**8. Power-on the system.**

See Section 6.1 “Powering On the System” on page 6-1.



## Replacement Parts

---

This chapter lists the authorized replaceable parts for the Ultra 1 Creator series system unit and the Ultra Enterprise 1 server. TABLE 11-1 lists replaceable parts by nomenclature and part number. A brief description is also provided.

---

**Note** – Part numbers listed in TABLE 11-1 are correct as of the service manual publication date but are subject to change without notice. Consult your authorized Sun sales representative or service provider to confirm a part number prior to ordering a replacement part.

---

TABLE 11-1 List of Replacement Parts

---

Replacement Parts	Part Number	Description
CPU	501-2486	Ultra 1 Creator Series system board (167-MHz)
CPU	501-4134	Ultra 1 Creator Series system board (200-MHz)
TOD/NVRAM	525-1430	TOD/NVRAM
DSIMM	501-2479	DSIMM, 16-Mbyte
DSIMM	501-2622	DSIMM, 32-Mbyte
DSIMM	501-2480	DSIMM, 64-Mbyte
DSIMM	501-3136	DSIMM, 128-Mbyte
Graphics card	501-2633	FFB board, double buffer, 67-MHz (desktop workstation only)
Graphics card	501-2634	FFB board, single buffer, 67-MHz (desktop workstation only)

---

**TABLE 11-1** List of Replacement Parts *(Continued)*

<b>Replacement Parts</b>	<b>Part Number</b>	<b>Description</b>
Graphics card	501-4126	FFB board, double buffer, 67-MHz (desktop workstation only)
Graphics card	501-4127	FFB board, single buffer, 67-MHz (desktop workstation only)
Drive	540-2729	1.05-Gbyte disk drive
Drive	540-2730	2.1-Gbyte disk drive
Drive	370-2102	CD-ROM drive 1.6-inch
Drive	370-2151	Diskette drive
Power supply	300-1308	180 W power supply
Fan assembly	540-2761	System board fan
Fan assembly	540-2666	Disk fan (80 mm)
Speaker	370-1579	Speaker
Cable assembly	530-1871	TPE cable type 5
Cable assembly	530-2153	SCSI cable/backplane assy
Cable assembly	530-2175	Cable, speaker/LED
Cable assembly	530-2176	Cable, peripheral power
Cable assembly	530-2187	Cable, diskette



# Product Specifications

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This appendix provides product specifications for the Ultra 1 Creator series system (system unit) and the Ultra Enterprise 1 server (server) and is divided into three parts:

- Physical specifications
- Electrical specifications
- Environmental specifications

---

## A.1 Physical Specifications

TABLE A-1 lists physical specifications for the system unit and server. TABLE A-2 lists physical specifications for the 17-inch color monitor. TABLE A-3 lists physical specifications for the 20-inch color monitor.

**TABLE A-1** System Unit/Server Physical Specifications

Specification	U.S.A.	Metric
Height	4.07 inches	10.35 cm
Width	16.44 inches	41.75 cm
Depth	17.44 inches	44.30 cm
Weight range	21.0 to 27.5 lbs	9.55 to 12.50 kg

**TABLE A-2** 17-Inch Monitor Physical Specifications

Specification	Value
Height	16.40 in. (41.40 cm)
Width	16.00 in. (40.60 cm))
Depth	17.70 in. (45.00 cm)
Weight (approx)	57.00 lb. (25.90 kg)

**TABLE A-3** 20-Inch Monitor Physical Specifications

Specification	Value
Height	18.50 in. (47.10 cm)
Width	18.70 in. (47.50 cm))
Depth	19.50 in. (49.50 cm)
Weight (approx)	80.30 lb. (36.50 kg)

---

## A.2 Electrical Specifications

TABLE A-4 lists electrical specifications for the system unit and server.

**TABLE A-4** Electrical Specifications

Parameter	Description	Value
Input	Voltage range	100 to 240 VAC
	Current, maximum	3.1 to 1.5A
	Current frequency range	47 to 63 Hz
Output	1	+5V, 18A
Output	2	+3.3V, 12 A
Output	3	+2.5 to 3.6 V, 12 to 8.3 A
Output	4	+12V, 5.1 A

**TABLE A-4** Electrical Specifications

Parameter	Description	Value
Output	5	-12V, 0.3 A
Input Power rating		260 W
Volt-Ampere rating		260 VA
Power factor		>0.98

## A.3 Environmental Requirements

TABLE A-5 lists environmental requirements for the Ultra 1 Creator Series system.

**TABLE A-5** Environmental Requirements

Environmental	Operating	Non-operating
Temperature	41 to 104° F (5 to 40° C)	-40 to 140° F (-40 to 60° C)
Humidity	20 to 80% noncondensing at 104° F (40° C)	95% noncondensing at 104° F (40° C)
Altitude	10,000 ft (3 km)	40,000 ft (12 km)
Max Dwells at Extremes	16 hr	16 hr



## Signal Descriptions

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This appendix provides signal descriptions for the Ultra 1 Creator series desktop workstation and the Ultra Enterprise 1 server back panel connectors. Tables B-1 through B-9 list connector pin assignments and signal descriptions. An illustration of each connector is also provided.

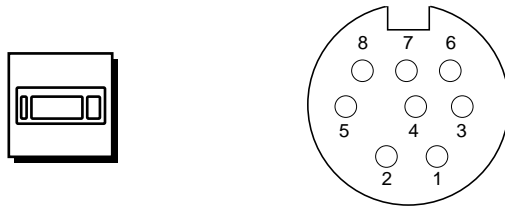
- “Keyboard/Mouse and Serial Ports A and B” on page 1
- “Serial Ports A and B (RS-423/RS-232) Connector” on page 2
- “TPE (Twisted Pair Ethernet) Connector” on page 4
- “Fast Wide SCSI (Small Computer System Interface) Connector” on page 5
- “Audio Connectors” on page 9
- “Parallel Port Connector” on page 10
- “MII (Media Independent Interface) Connector” on page 12
- “UPA Connector” on page 15
- “Graphics Card 13W3 Video Connector” on page 20

---

### B.1 Keyboard/Mouse and Serial Ports A and B

#### B.1.1 Keyboard/Mouse Connector

The keyboard/mouse connector is a DIN-8 type connector located on the system back panel. FIGURE B-1 illustrates the keyboard/mouse connector configuration. TABLE B-1 lists the keyboard/mouse connector pin assignments.



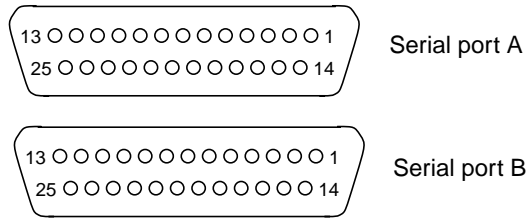
**FIGURE B-1** Keyboard/Mouse Connector Pin Configuration

**TABLE B-1** Keyboard/Mouse Connector Pin Assignments

Pin	Signal Name	Description
1	Gnd	Ground
2	Gnd	Ground
3	+5 Vdc	+5 Vdc
4	Mse-rxd	Mouse receive data
5	Kbd-txd	Keyboard out
6	Kbd-rxd	Keyboard in
7	Kbd-pwk	Keyboard power in
8	+5 Vdc	+5 Vdc

## B.1.2 Serial Ports A and B (RS-423/RS-232) Connector

The serial ports A and B connector are DB-25 type connectors located on the system board back panel. FIGURE B-2 illustrates the serial port A and serial port B connector configuration. TABLE B-2 lists the serial A and B port connector pin assignments.



**FIGURE B-2** Serial Ports A and B Connector Configuration

**TABLE B-2** Serial A and B Port Connector Pin Assignments

Pin	Signal Name	Description
1	Not connected	None
2	Transmit Data	TxD
3	Receive Data	RxD
4	Ready To Send	RTS
5	Clear To Send	CTS
6	Data Set Ready	DSR
7	Signal Ground	Gnd
8	DCD	Data Carrier Detect
9	NC	Not connected
10	NC	Not connected
11	NC	Not connected
12	NC	Not connected
13	NC	Not connected
14	Not connected	None
15	Transmit Clock	TRxC
16	Not connected	None

**TABLE B-2** Serial A and B Port Connector Pin Assignments (*Continued*)

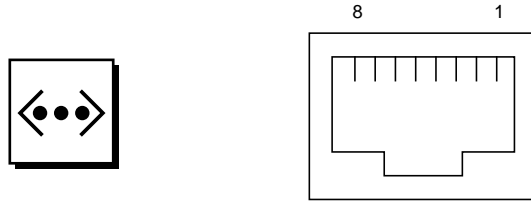
Pin	Signal Name	Description
17	Receive Clock	RTxC
18	Not connected	None
19	Not connected	None
20	Data Terminal Ready	DTR
21	NC	Not connected
22	NC	Not connected
23	NC	Not connected
24	TxC	Transmit Clock
25	NC	Not connected

---

## B.2 TPE (Twisted Pair Ethernet) Connector

The TPE connector is a RJ-45 type connector located on the system board back panel. FIGURE B-3 illustrates the TPE connector configuration. TABLE B-3 lists the TPE connector pin assignments.





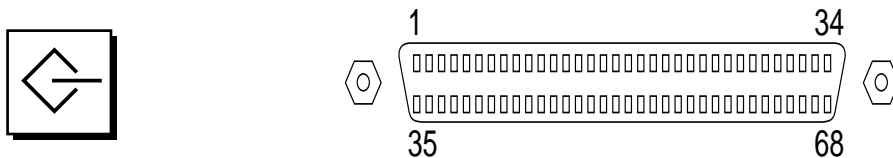
**FIGURE B-3** TPE Connector Configuration

**TABLE B-3** TPE Connector Pin Assignments

Pin	Signal Name	Description
1	tpe0	Transmit data +
2	tpe1	Transmit data -
3	tpe2	Receive data +
4	Common mode termination	Termination
5	Common mode termination	Termination
6	tpe3	Receive data -
7	Common mode termination	Termination
8	Common mode termination	Termination

## B.3 Fast Wide SCSI (Small Computer System Interface) Connector

The fast wide SCSI connector is located on the system board back panel. FIGURE B-4 illustrates the fast wide SCSI connector configuration. TABLE B-4 lists the fast wide SCSI connector pin assignments.



**FIGURE B-4** Fast Wide SCSI Connector Configuration

**TABLE B-4** Fast Wide SCSI Connector Pin Assignments

Pin	Signal Name	Description
1	Gnd	Ground
2	Gnd	Ground
3	Gnd	Ground
4	Gnd	Ground
5	Gnd	Ground
6	Gnd	Ground
7	Gnd	Ground
8	Gnd	Ground
9	Gnd	Ground
10	Gnd	Ground
11	Gnd	Ground
12	Gnd	Ground
13	Gnd	Ground
14	Gnd	Ground
15	Gnd	Ground
16	Gnd	Ground

**TABLE B-4** Fast Wide SCSI Connector Pin Assignments *(Continued)*

<b>Pin</b>	<b>Signal Name</b>	<b>Description</b>
17	Termpower	Termpower
18	Termpower	Termpower
19	Not used	Undefined
20	Gnd	Ground
21	Gnd	Ground
22	Gnd	Ground
23	Gnd	Ground
24	Gnd	Ground
25	Gnd	Ground
26	Gnd	Ground
27	Gnd	Ground
28	Gnd	Ground
29	Gnd	Ground
30	Gnd	Ground
31	Gnd	Ground
32	Gnd	Ground
33	Gnd	Ground
34	Gnd	Ground
35	Dat<12>_	Data 12
36	Dat<13>_	Data 13
37	Dat<14>_	Data 14
38	Dat<15>_	Data 15
39	Par1 l_	Parity 1

**TABLE B-4** Fast Wide SCSI Connector Pin Assignments *(Continued)*

<b>Pin</b>	<b>Signal Name</b>	<b>Description</b>
40	Dat<0>_	Data 0
41	Dat<1>_	Data 1
42	Dat<2>_	Data 2
43	Dat<3>_	Data 3
44	Dat<4>_	Data 4
45	Dat<5>_	Data 5
46	Dat<6>_	Data 6
47	Dat<7>_	Data 7
48	Par0 l_	Parity 0
49	Gnd	Ground
50	Term_dis_	Term disable
51	Termpower	Termpower
52	Termpower	Termpower
53	Not used	Undefined
54	Gnd	Ground
55	Atn_	Attention
56	Gnd	Ground
57	Bsy_	Busy
58	Ack_	Acknowledge
59	Rst_	Reset
60	Msg_	Message
61	Sel_	Select
62	Cd_	Command

**TABLE B-4** Fast Wide SCSI Connector Pin Assignments (*Continued*)

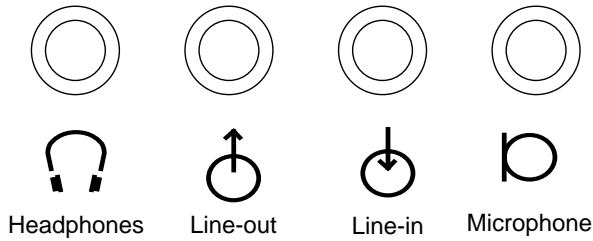
Pin	Signal Name	Description
63	Req_	Request
64	IO_	In/Out
65	Dat<8>_	Data 8
66	Dat<9>_	Data 9
67	Dat<10>_	Data 10
68	Dat<11>_	Data 11

**Note** – \_ (underscore) signifies active low

---

## B.4 Audio Connectors

The audio connectors are located on the system board back panel. These connectors use EIA standard 3.5-mm/0.125-inch jacks. FIGURE B-5 illustrates each audio connector configuration. TABLE B-5 lists each audio connector line assignment.



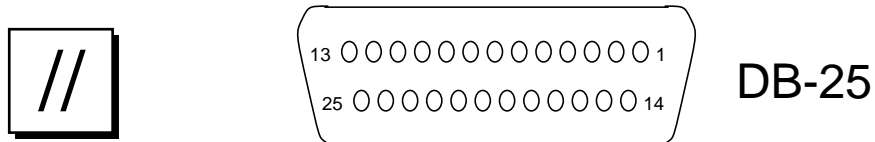
**FIGURE B-5** Audio Connector Configuration

**TABLE B-5** Audio Connector Line Assignment

	Headphones	Line Out	Line In	Microphone
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.5 Parallel Port Connector

The parallel port connector is a DB-25 type connector located on the system board back panel. FIGURE B-6 illustrates the parallel port connector configuration. TABLE B-6 lists the parallel port connector pin assignments.



**FIGURE B-6** Parallel Port Connector Pin Configuration

**TABLE B-6** Parallel Port Connector Pin Assignments

Pin	Signal Name	Description
1	nStrobe	Strobe
2	Data[0]	Data bit 0
3	Data[1]	Data bit 1
4	Data[2]	Data bit 2
5	Data[3]	Data bit 3
6	Data[4]	Data bit 4
7	Data[5]	Data bit 5
8	Data[6]	Data bit 6
9	Data[7]	Data bit 7
10	nAck	Acknowledge
11	Busy	Busy
12	PError	Parity error
13	Select	Select
14	nAuto Fd	Auto feed
15	nFault	Fault
16	nInit	Initiate
17	nSelectIn	Input select

**TABLE B-6** Parallel Port Connector Pin Assignments (*Continued*)

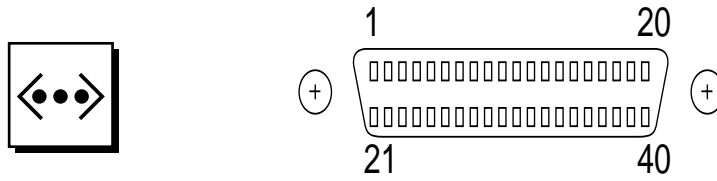
<b>Pin</b>	<b>Signal Name</b>	<b>Description</b>
18	Signal ground	Signal ground
19	Signal ground	Signal ground
20	Signal ground	Signal ground
21	Signal ground	Signal ground
22	Signal ground	Signal ground
23	Signal ground	Signal ground
24	Signal ground	Signal ground
25	Signal ground	Signal ground

---

## B.6 MII (Media Independent Interface) Connector

The MII connector is located on the system board. FIGURE B-7 illustrates the MII connector configuration. TABLE B-7 lists the MII connector pin assignment.





**FIGURE B-7** MII Connector Configuration

**TABLE B-7** MII Connector Pin Assignments

Pin	Signal Name	Description
1	Pwr	Power
2	Mdio	Management data I/O
3	Mdc	Management data clock
4	Rxd3	Receive data 3
5	Rxd2	Receive data 2
6	Rxd1	Receive data 1
7	Rxd0	Receive data 0
8	Rx dv	Receive data valid
9	Rx clk	Receive clock
10	Rx er	Receive error
11	Tx er	Transmit error
12	Tx clk	Transmit clock
13	Tx en	Transmit data enable
14	Txd0	Transmit data 0
15	Txd1	Transmit data 1
16	Txd2	Transmit data 2
17	Txd3	Transmit data 3

**TABLE B-7** MII Connector Pin Assignments *(Continued)*

<b>Pin</b>	<b>Signal Name</b>	<b>Description</b>
18	Col	Collision detected
19	Crs	Carrier sense
20	Pwr	Power
21	Pwr	Power
22	Gnd	Ground
23	Gnd	Ground
24	Gnd	Ground
25	Gnd	Ground
26	Gnd	Ground
27	Gnd	Ground
28	Gnd	Ground
29	Gnd	Ground
30	Gnd	Ground
31	Gnd	Ground
32	Gnd	Ground
33	Gnd	Ground
34	Gnd	Ground
35	Gnd	Ground
36	Gnd	Ground
37	Gnd	Ground
38	Gnd	Ground
39	Gnd	Ground
40	Pwr	Power

## B.7 UPA Connector

The UPA connector is located on the system board. FIGURE B-8 illustrates the UPA connector configuration. TABLE B-8 lists the UPA connector pin assignment.

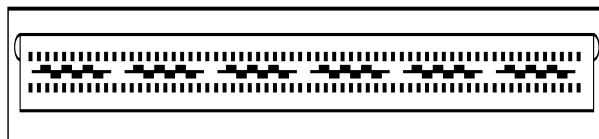


FIGURE B-8 UPA Connector Pin Configuration

TABLE B-8 UPA Connector Pin Assignments

Pin	Signal Name	Description
1	Adrbus1<00>	Address bus bit 0
2	Adrbus1<01>	Address bus bit 1
3	Adrbus1<02>	Address bus bit 2
4	Adrbus1<03>	Address bus bit 3
5	Adrbus1<04>	Address bus bit 4
6	Adrbus1<05>	Address bus bit 5
7	Adrbus1<06>	Address bus bit 6
8	Adrbus1<07>	Address bus bit 7
9	Adrbus1<08>	Address bus bit 8
10	Adrbus1<09>	Address bus bit 9
11	Adrbus1<10>	Address bus bit 10
12	Adrbus1<11>	Address bus bit 11
13	Adrbus1<12>	Address bus bit 12

**TABLE B-8** UPA Connector Pin Assignments (*Continued*)

<b>Pin</b>	<b>Signal Name</b>	<b>Description</b>
14	Adrbus1<13>	Address bus bit 13
15	Adrbus1<14>	Address bus bit 14
16	Adrbus1<15>	Address bus bit 15
17	Adrbus1<16>	Address bus bit 16
18	Adrbus1<17>	Address bus bit 17
19	Adrbus1<18>	Address bus bit 18
20	Adrbus1<19>	Address bus bit 19
21	Adrbus1<20>	Address bus bit 20
22	Adrbus1<21>	Address bus bit 21
23	Adrbus1<22>	Address bus bit 22
24	Adrbus1<23>	Address bus bit 23
25	Adrbus1<24>	Address bus bit 24
26	Adrbus1<25>	Address bus bit 25
27	Adrbus1<26>	Address bus bit 26
28	Adrbus1<27>	Address bus bit 27
29	Adrbus1<28>	Address bus bit 28
30	GND	Ground
31	GND	Ground
32	+12 V	+12 volts DC
33	Graphic1 int 1	Interrupt
34	+12 V	+12 volts DC
35	Mod tdi	JTAG TDI
36	Adr bus1 val	UPA address bus 1 value

**TABLE B-8** UPA Connector Pin Assignments (*Continued*)

Pin	Signal Name	Description
37	Mod1 tms	JTAG TMS
38	Tclk2	JTAG clock
39	Trst 1	JTAG reset
40	Mod1 tdo	JTAG tdo
41	S reply3<0>	UPA s reply 3<0>
42	S reply3<1>	UPA s reply 3<1>
43	S reply3<2>	UPA s reply 3<2>
44	GND	Ground
45	VCC	VCC
46	Clk pos<4>	Clock
47	VCC	VCC
48	GND	Ground
49	VCC	VCC
50	Clk neg<4>	Clock
51	-12V	-12 volts DC
52	GND	Ground
53	P reply3<0>	UPA p reply 3<0>
54	P reply3<1>	UPA s reply 3<1>
55	Reset1 1	Reset 1
56	GND	Ground
57	Databus1<00>	Data bus bit 0
58	Databus1<01>	Data bus bit 1
59	Databus1<02>	Data bus bit 2

**TABLE B-8** UPA Connector Pin Assignments (*Continued*)

<b>Pin</b>	<b>Signal Name</b>	<b>Description</b>
60	Databus1<03>	Data bus bit 3
61	Databus1<04>	Data bus bit 4
62	Databus1<05>	Data bus bit 5
63	Databus1<06>	Data bus bit 6
64	Databus1<07>	Data bus bit 7
65	Databus1<08>	Data bus bit 8
66	Databus1<09>	Data bus bit 9
67	Databus1<10>	Data bus bit 10
68	Databus1<11>	Data bus bit 11
69	Databus1<12>	Data bus bit 12
70	Databus1<13>	Data bus bit 13
71	Databus1<14>	Data bus bit 14
72	Databus1<15>	Data bus bit 15
73	Databus1<16>	Data bus bit 16
74	Databus1<17>	Data bus bit 17
75	Databus1<18>	Data bus bit 18
76	Databus1<19>	Data bus bit 19
77	Databus1<20>	Data bus bit 20
78	Databus1<21>	Data bus bit 21
79	Databus1<22>	Data bus bit 22
80	Databus1<23>	Data bus bit 23
81	Databus1<24>	Data bus bit 24
82	Databus1<25>	Data bus bit 25

**TABLE B-8** UPA Connector Pin Assignments (*Continued*)

<b>Pin</b>	<b>Signal Name</b>	<b>Description</b>
83	Databus1<26>	Data bus bit 26
84	Databus1<27>	Data bus bit 27
85	Databus1<28>	Data bus bit 28
86	Databus1<29>	Data bus bit 29
87	Databus1<30>	Data bus bit 30
88	Databus1<31>	Data bus bit 31
89	Databus1<32>	Data bus bit 32
90	Databus1<33>	Data bus bit 33
91	Databus1<34>	Data bus bit 34
92	Databus1<35>	Data bus bit 35
93	Databus1<36>	Data bus bit 36
94	Databus1<37>	Data bus bit 37
95	Databus1<38>	Data bus bit 38
96	Databus1<39>	Data bus bit 39
97	Databus1<40>	Data bus bit 40
98	Databus1<41>	Data bus bit 41
99	Databus1<42>	Data bus bit 42
100	Databus1<43>	Data bus bit 43
101	Databus1<44>	Data bus bit 44
102	Databus1<45>	Data bus bit 45
103	Databus1<46>	Data bus bit 46
104	Databus1<47>	Data bus bit 47
105	Databus1<48>	Data bus bit 48

**TABLE B-8** UPA Connector Pin Assignments (*Continued*)

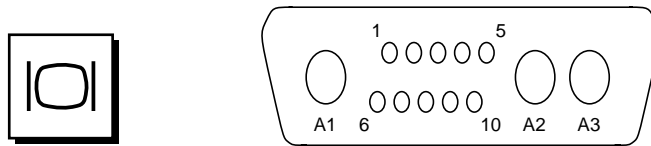
Pin	Signal Name	Description
106	Databus1<49>	Data bus bit 49
107	Databus1<50>	Data bus bit 50
108	Databus1<51>	Data bus bit 51
109	Databus1<52>	Data bus bit 52
110	Databus1<53>	Data bus bit 53
111	Databus1<54>	Data bus bit 54
112	Databus1<55>	Data bus bit 55
113	Databus1<56>	Data bus bit 56
114	Databus1<57>	Data bus bit 57
115	Databus1<58>	Data bus bit 58
116	Databus1<59>	Data bus bit 59
117	Databus1<60>	Data bus bit 60
118	Databus1<61>	Data bus bit 61
119	Databus1<62>	Data bus bit 62
120	Databus1<63>	Data bus bit 63

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## B.8 Graphics Card 13W3 Video Connector

The graphics card 13W3 video connector is located on the system board back panel. FIGURE B-9 illustrates the graphics card 13W3 video connector configuration. TABLE B-9 lists the graphics card 13W3 video connector pin assignment.





**FIGURE B-9** Graphics Card 13W3 Video Con

**TABLE B-9** Graphics Card 13W3 Video Connector Pin Assignments

Pin	Signal Name	Description
A1	R	Red
A2	G	Green
A3	B	Blue
1	Serial Read	Serial Read
2	Vert Sync	Vertical Sync
3	Sense <0>	Sense <0>
4	Gnd	Ground
5	Comp Sync	Composite Sync
6	Horiz Sync	Horizontal Sync
7	Serial Write	Serial Write
8	Sense <1>	Sense <1>
9	Sense <2>	Sense <2>
10	Gnd	Ground



# Functional Description

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This section provides a functional description for the Ultra 1 Creator Series system.

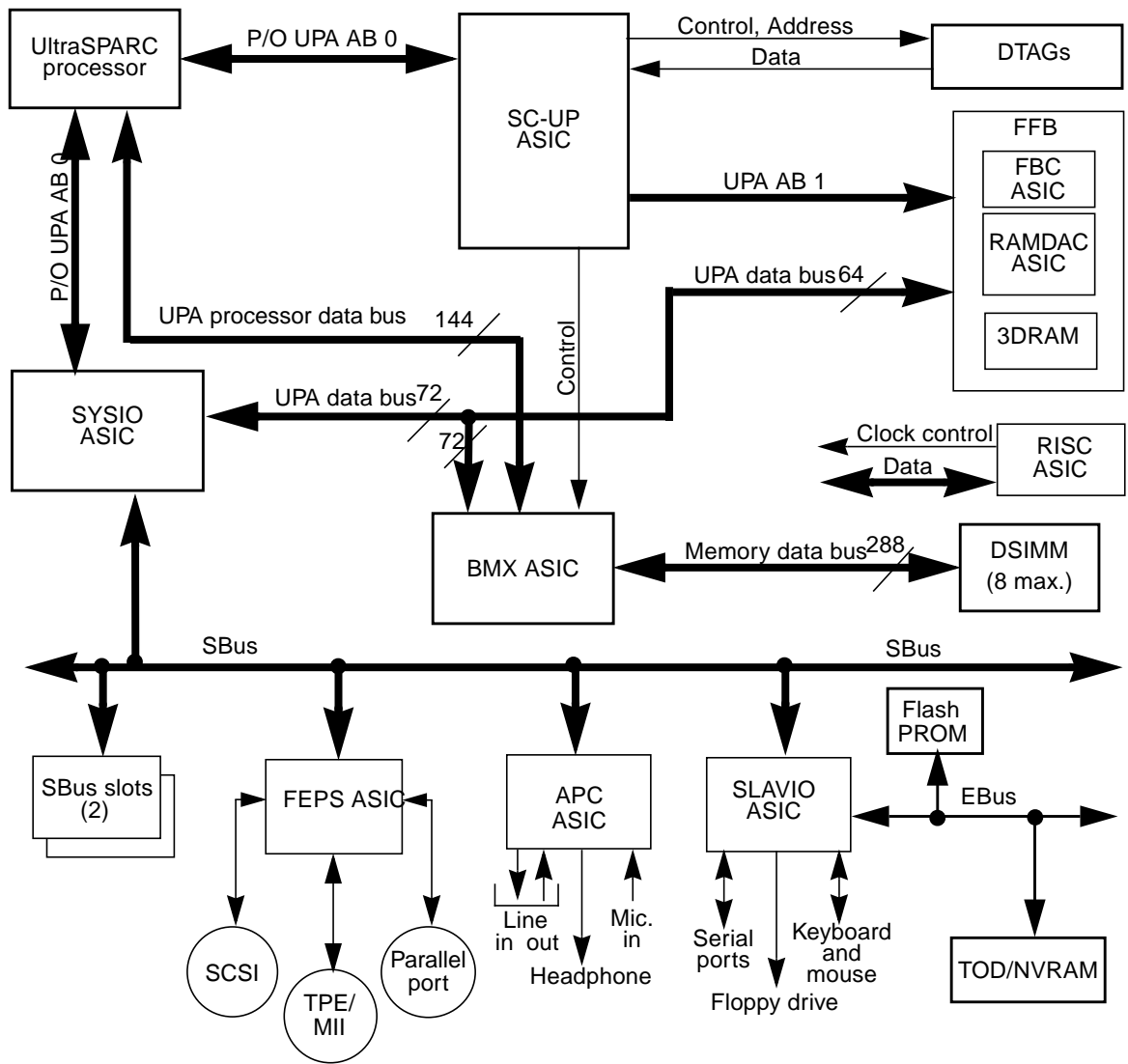
- “System Unit/Server Overview” on page 1
- “ASICS” on page 11
- “Power Supply” on page 15
- “System Board” on page 16
- “Jumper Descriptions” on page 17
- “Enclosure” on page 20
- “Environmental Compliance” on page 21
- “Agency Compliance” on page 21

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## C.1 System Unit/Server Overview

Refer to FIGURE C-1. The processor-to-memory interconnection is provided by the UPA mechanism. The output of the UltraSPARC processor and the output of the system I/O controller (SYSIO) ASIC reside on the UPA. A slave UPA port is provided for graphic device communications between the fast frame buffer (FFB), the buffered memory crossbar (BMX) ASIC, and the SYSIO ASIC. All UPA interactions are orchestrated by the system controller uniprocessor (SC-UP) ASIC.

The I/O sub-system connects to the processor-to-memory sub-system through the SYSIO ASIC. The SYSIO ASIC provides connectivity to two SBus slots, the fast Ethernet parallel port SCSI (FEPS) ASIC, the audio processor controller (APC) ASIC, and the slave I/O (Slavio) ASIC.



**FIGURE C-1** System Unit or Server Functional Block Diagram

## C.1.1 UPA

The UPA is a cache-coherent processor-to-memory interconnect. A key advantage of the UPA processor-to-memory interconnect is a scalable bandwidth through support of multiple bussed interconnects for both data and address. Other advantages include more bandwidth, high-performance graphics support with two-cycle, single-word writes on the 64-bit UPA data bus, and centralized coherence and memory controller functions. The UPA consists of the following, as implemented on the system board:

- Eighteen BMX ASICs
  - The BMX ASICs connect the 144-bit UPA processor data bus to a 288-bit memory data bus and a 72-bit UPA data bus for graphics and I/O devices
  - The memory path is 64 bits
- The processor shares a UPA address bus (UPA address bus 0) with the SYSIO ASIC; a second address bus (UPA address bus 1) supports slave UPA connection to the expansion slot for graphics capability
- Low voltage transistor-transistor logic (TTL) voltage levels for signal input
- Up to 100 MHz operation (10-nanosecond system cycle time). A 6-nanosecond UltraSPARC operation results in a 12-nanosecond UPA operation. A 5-nanosecond UltraSPARC results in a 10-nanosecond UPA operation

## C.1.2 SBus

The system unit or server uses the IEEE 1496 SBus specification. This includes:

- 16.6-MHz to 25-MHz operation. Default frequency is 25 MHz; independent of processor and UPA operating frequencies
- Extended transfer mode (64-bit data path)
- Transfer sizes to 64 bytes (maximum)
- Parity
- Dedicated interrupts per SBus slot.

The system unit or server supports two SBus slots. The slots are configured in a stacked configuration.

## C.1.3 UltraSPARC Processor

The UltraSPARC processor is mounted on a module that is plugged into the system board. The UltraSPARC processor has the following features:

- SPARC V9 compatibility

- Specifies a 64-bit instruction set architecture
- Provides for 64-bit data and addressing as well as other features to enhance operating system and application performance
- Implements 44-bit virtual address bits and 41-bit physical address bits
- Implements the visual instruction set (VIS) used by the FFB graphics device to provide optimal graphics performance (this also includes instructions to help with imaging performance)
- 16-Kbyte direct mapped data cache with 32-bit line size and 16-bit sub-blocks. 16-Kbyte two-way set associate to a 32-bit line size
- 512-Kbyte external cache with 64-bit line size. Four synchronous SRAMs are used for data and one SRAM is used for dual tags (DTAGs). Datapath to Ecache is 128 bits wide and parity protected.
- System interface is provided through two instances of a Spitfire data buffer (SDB) ASIC. System interface is 128 bits wide and is parity protected.
- Features:
  - 5-nanosecond or 6-nanosecond UltraSPARC processor.
  - Separate core and I/O power rails.
  - Air cooled using an impingement fan (SDB ASIC and SRAMs are cooled by heatsink).
  - Two temperature levels: warning and shutdown.

## C.1.4 Memory

Memory uses conventional 5-VDC DRAM SIMMs (DSIMMs) with a 60-nanosecond access time. The system unit or server memory configuration allows for 8 DSIMMs. Supported DSIMM sizes include 16-Mbyte, 32-Mbyte, 64-Mbyte, and 128-Mbyte. Memory capacities are as follows: 16-Mbyte DSIMMs, 128 Mbytes; 32-Mbyte DSIMMs, 256 Mbytes; 64-Mbyte DSIMMs, 512 Mbytes; 128-Mbyte DSIMM, 1 Gbyte.

Memory configuration allows either one, two, three, or four DSIMM pairs to be installed. DSIMM capacities must be identical in a DSIMM pair, however, DSIMM pairs can be of different capacities, in which case the lower capacity DSIMM pair will determine the capacity of the DSIMM pair.

## C.1.5 Graphics and Imaging (Workstation Only)

The system unit takes advantage of UPA features to provide high performance graphics through the fast frame buffer (FFB). The FFB consists of the frame buffer controller (FBC), the 3D RAM (3DRAM), the RAM digital-to-analog converter (RAMDAC), and associated circuitry. The FFB connects to the system unit through the UPA64S expansion connector.

The 3DRAM is a standard DRAM that includes a multi-level cache in front of it and a separate graphics port. The FBC ASIC provides acceleration for 2D and 3D imaging primitives that permits a write-mostly interface. This, combined with the 3DRAM cache and support for graphics operations, allows a high performance frame buffer.

FFB supports the VESA standard for monitor control. FFB also supports stereo video.

## C.1.6 Peripherals

The following peripherals are supported by the system unit or server: CD-ROM drive, floppy drive, and disk drive. A small computer system interface (SCSI) and optional tape drive components; 2.5-Gbyte, 4-mm, and 8-mm are also supported.

### C.1.6.1 CD-ROM Drive

The CD-ROM drive is a standard device with multimedia features. This includes multi-session capability and fast access (quadra-speed) for image and video data. The CD-ROM drive dimensions are 5.94 inch x 7.78 inch x 1.71 inch (149.5 mm x 196 mm x 43 mm) and the drive slot is a standard 1.6-in. (40.64 mm) bay that uses industry standard bezels. Headphone access, eject, pin eject, and volume control is available on the front panel. Audio from the CD is available through either the front panel headphone connection, the line-out connector at the system unit or server rear (accessible by cabling from front to rear), or the internal speaker.

The CD-ROM drive supports an approximate 600-KByte-per-second data transfer rate and an access time of 350 ms (maximum). The *SunCD 4 Drive Specifications*, document part number 802-4157, provides cleaning, jumper setting, and operation instructions for the CD-ROM drive.

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**Note** – Both multifunction and quadra-speed CD-ROM drives are supported as long as they conform to the 5.94-inch x 7.78-inch x 1.71-inch dimensions.

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## C.1.6.2 Diskette Drive

The system unit or server uses a standard 1.44-Mbyte diskette drive that is 1 inch (25.40 mm) high. The system unit- to-diskette drive or server-to-diskette drive interface is an 82077 style interface. The *Diskette Drive Specification*, document part number 802-5283, provides cleaning, jumper setting, and diskette instructions for the diskette drive.

## C.1.6.3 Disk Drives

The system unit or server supports two 1.05-Gbyte or two 2.1-Gbyte SCSI disk drives. Each drive is of the 3.5-inch form factor with a single connector configuration. A drive bracket is used to mount the drive to the system unit or server. TABLE C-1 lists the supported disk drives. The *1.05 Gbyte Disk Drive Specifications*, document part number 802-4057, provides installation instructions, power requirements, and performance data for the 1.05-Gbyte disk drive. The *2.1 Gbyte Disk Drive Specifications*, document part number 802-4058, provides installation instructions, power requirements, and performance data for the 2.1-Gbyte disk drive.

TABLE C-1 Supported Disk Drives

Form Factor Dimension	Disk Drive Capacity	Fast Wide	RPM	Access Time
1 inch	1.05 Gbytes	No	5400	10.5 ms
1 inch	1.05 Gbyte	Yes	5400	11.0 ms
1 inch	2.1 Gbytes	Yes	7200	7.8 ms

## C.1.6.4 SCSI Interface

The system unit or server provides a 20-Mbyte per second SCSI interface that is supported by the FEPS ASIC. A 16-bit single-ended operation provides a 20-Mbyte per second throughput at 10 MHz. Both internal and external peripherals are connected to the same daisy chain. External connection is provided through a 68-pin SCSI connector.

Configuration rules for SCSI interface are as follows:

- System configuration requires devices to be connected in a daisy chain configuration.



- A maximum of 15 devices (3 internal and 12 external) may be daisy-chained through a maximum cable length of 19.69 feet (6 meters). An internal cable length of approximately 35 inches (90 centimeters) must be accounted for in the total cable length.
- A maximum of five CD-ROM drives in DSP enclosures or a maximum of four CD-ROM drives in Togo enclosures are allowed. The number is reduced by one if there is an internal CD-ROM drive.
- A maximum of two tape drives are allowed if disk drives or CD-ROM drives reside on the same bus. If there are no disk drives or CD-ROM drives, an additional tape drive is allowed.
- SCSI target address 7 is reserved for the onboard SCSI host adapter (FEPS).
- SCSI target address 0 and target address 1 are automatically assigned to the internal SCSI disk drives when installed and SCSI target address 6 is recommended for the internal CD-ROM drive. SCSI target address 4 or 5 is recommended for the internal tape drive.
- The end of the daisy chain must be terminated with an active terminator.

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**Note** – Certain devices, such as devices mounted within desktop storage enclosures, provide automatic termination.

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- If both 50-pin and 68-pin external devices are connected externally, the 68-pin device must be connected earlier in the daisy chain. A special terminator/adaptor, which terminates the extra signals and converts the extra signals into a 50-pin configuration, is available for the last 68-pin device. The last 50-pin device must be terminated.

### C.1.6.5 Optional 2.5-Gbyte, 4-mm, and 8-mm Tape Drives

The system unit or server supports the optional 2.5-Gbyte, 4-mm, and 8-mm tape drives. Either the 2.5-Gbyte tape drive, 4-mm tape drive, or 8-mm tape drive may be installed in the system/server unit in lieu of the CD-ROM drive.

#### *2.5-Gbyte Tape Drive*

The 2.5-Gbyte tape drive is a 1/4-inch tape drive that is equipped with an intelligent controller and an embedded SCSI-type interface. The *2.5-Gbyte QIC Tape Drive Specifications*, document part number 802-3615, provides cleaning, jumper setting, and tape cartridge instructions for the 2.5-Gbyte tape drive.

### *4-mm Tape Drive*

The 4-mm tape drive is equipped with a single-ended SCSI controller and a 1-MByte on-drive buffer. The *4-mm Tape Drive Specifications*, document part number 802-5324, provides cleaning, jumper setting, and tape cartridge instructions for the 4-mm tape drive.

### *8-mm Tape Drive*

The 8-mm tape drive is an enhanced 8-mm digital helical-scan cartridge tape subsystem. It is packaged in the industry standard 5.25-inch half-height form factor. The *8-mm Tape Drive Specifications*, document part number 802-5775, provides cleaning, jumper setting, and tape cartridge instructions for the 8-mm tape drive.

## C.1.7 Networking

The system unit or server supports 10-Mbit per second and 100-Mbit per second local area Ethernet IEEE standard 802.3u (also known as 100BASE-T) through the FEPS ASIC. The FastEthernet standard is backwards-compatible with the standard 10-Mbit per second Ethernet standard. The speed is auto-sensed.

Category 5-type twisted-pair Ethernet support is provided through a RJ45 connector. In addition, a media independent interface (MII) connection provides support to any other form of Ethernet (AUI/TP/ThinNet/Fiber). The MII connection is provided through a 40-pin MII connector. MII converters include MII-to-AUI and MII-to-fiber optic.

## C.1.8 Terminal, Modem, Keyboard, and Mouse Connectivity

Terminal, modem, keyboard, and mouse connectivity is traditional Sunness connectivity. Two serial ports provide synchronous and asynchronous communication. The synchronous port supports data throughput rates up to 64 Kbaud. The asynchronous port supports data throughput rates up to 76.8 Kbaud.

Both RS-232 and RS-423 interface standards are supported. RS-232 or RS-423 interface selection is provided through a jumper setting. Default configuration is RS-423. Two DB25 connectors are provided for the two serial ports.

Keyboard and mouse functionality is provided through a DIN8 connector. Sun type-5 keyboards and a new mechanical mouse are supported.

## C.1.9 Printer connectivity

Parallel printer port connectivity is provided with a DB25 connector. This interface supports up to a 2-Mbyte per second data throughput and is Centronics-compatible. All SPARC printers are supported.

## C.1.10 Audio

Audio includes interface, built-in speaker, and microphone.

### C.1.10.1 Interface

The system unit or server includes the Codec for audio functionality. Four external connectors are supplied: line input, line output, a headphone, and stereo microphone. All connectors are 0.125-inch (3.18-mm) mini-stereo connectors. Line-in and line-out support 16-bit CD quality stereo. TABLE C-2 lists each audio port function. TABLE C-3 identifies the audio specifications.

**TABLE C-2** Audio Port Functions

Port	Function
Headphones	Connects stereophonic headphones for private listening of audio output
Line Out	Connects the system audio output to an external stereophonic amplifier and loudspeakers
Line In	Connects external stereophonic audio sources such as a compact disc player or cassette tape player to the system
Microphone	Connects the SunMicrophone™ II (or other suitable microphone <sup>1</sup> ) to the system

1. The Ultra 1 Creator Series microphone port accepts stereophonic input; however, the Sun Microphone II is a monophonic device. Note also that the older SunMicrophone is not compatible with the Ultra 1 Creator Series system.

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**Note** – Specifications listed in TABLE C-2 assume that the Audio Tool format setting, “CD-ROM or DAT” is selected.

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**TABLE C-3** Audio Specifications

<b>Stereo I/Os</b>	<b>Specifications</b>
Line In	2V typical, 4V max.; 5-50W impedance
Frequency Response	20 Hz-17 kHz +/- 0.5 dB
Internal CD Input	
Input Level	0.1 Vrms typical at 10 kW; 2Vpp max.
Distortion	0.01%, typical at 1 kHz
S/N Ratio	84 dB, typical IEC 179 A-weighted
Frequency Response	20 Hz-17 kHz +/- 0.5 dB
Microphone Input	15 mV typical, 0.6-1.0 kW impedance; +5 VDC input bias via a 2.2kW resistor
Headphone Output	1V typical, 2.4V max.; 16W-1kW impedance
Line Out	1V typical, 2.4V max.; 5-50 kW impedance

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### C.1.10.2 Built-In Speaker

The system unit or server contains a cost-effective speaker. The speaker provides audio functionality in the absence of external speakers. Audio from all sources is available. TABLE C-4 lists the built-in speaker specifications.

**TABLE C-4** Built-In Speaker Specifications

<b>Speaker</b>	<b>Specifications</b>
Power Output	1.5W average, 3W peak
Distortion	0.02%, typical at 1 kHz
Impedance	16Ω +/- 20%
Frequency Response	150 Hz-17 kHz +/- 0.5 dB

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### C.1.10.3 Microphone

A SunMicrophone II mono microphone is included with each system unit.

## C.1.11 Standard System Facilities

In addition to the previously listed features, the system unit or server provides the following:

- TOD/NVRAM for clock and identification functions
- Flash PROM for operating system initialization. The flash PROM is re-programmable through UNIX and OBP utilities.
- Single LED for status. If LED is lighted, the system unit has power and some functional intelligence through OBP.

## C.1.12 Frequency Operation

The system unit or server provides three frequencies of interest: processor frequency, system frequency, and SBus frequency. Processor frequency, system frequency, and SBus frequency are:

- Processor frequency, 167 MHz or 200 MHz
- System frequency, 83.5 MHz or 100 MHz
- SBus frequency, 25 MHz

---

## C.2 ASICS

The system unit or server achieves a high level of integration through application-specific integrated circuits (ASICs). All ASICs are 1149.1 (JTAG) compliant. The following ASICs are highlighted and are described in the following paragraphs:

- System controller uniprocessor (SC-UP)
- System I/O controller (SYSIO)
- Buffered memory crossbar (BMX)
- Reset, interrupt, scan, and clock controller (RISC)
- Frame buffer controller (FBC)
- RAM digital-to-analog controller (RAMDAC)
- Fast Ethernet parallel interface (FEPS)
- Slave I/O (SLAVIO)
- Audio processor controller (APC)

## C.2.1 System Controller Uniprocessor

The system controller uniprocessor (SC-UP) ASIC is the key element for controlling the UPA and main memory. The SC-UP ASIC controls accesses from UPA master device to UPA slave device, and UPA accesses to memory. SC-UP includes a complete coherency controller which controls system dual tags (DTAGs).

A highlight of the SC-UP ASIC features follow:

- Integrates memory controller functionality
- Supports four banks of memory, each with two SIMMs
- Supports DSIMMs with 4-Mbyte, 16-Mbyte, 64-Mbyte, 60-nanosecond DRAM
- Maximum memory configurations of 1 Gbytes with eight 128-Mbyte DSIMMs
- Supports two UPA masters and one UPA slave with independent address busses (independent busses are required for graphics streaming)
- Controls the BMX ASIC which connects the UPA data bus and memory
- 83-MHz or 100-MHz operation
- 225-pin BGA package
- 3.3-VDC and 5-VDC power supply voltage

## C.2.2 System I/O Controller

The system I/O controller (SYSIO) ASIC provides bridging between the UPA and the SBUS.

A highlight of the SYSIO ASIC features follow:

- Contains the IOMMU
- Integrates streaming buffer to enhance sequential I/O performance
- Provides logic for dispatching interrupt vectors to processors
- Provides ECC generation and checking logic
- Provides 372-pin BGA packaging
- Provides 3.3-VDC and 5-VDC (for SBus) supply voltages

## C.2.3 Buffered Memory Crossbar

The buffered memory crossbar (BMX) ASIC is a three-port crossbar connecting a 144-bit UPA data bus, a 288-bit-wide DRAM memory bus, and a 72-bit UPA data bus. To maintain a manageable pin count, the devices are sliced so that 18 BMX ASICs are needed to form the complete switch function.

A highlight of the BMX ASIC features follow:

- 8 bits of UPA 128, 4 bits of UPA 72, and 16 bits of DRAM bus per ASIC
- 3.3-VDC and 5-VDC power supply voltage
- Switch connections controlled by SC
- 48-pin TSSOP package

## C.2.4 Reset, Interrupt, Scan, and Clock Controller

The reset, interrupt, scan, and clock (RISC) ASIC implements four functions: reset, interrupt, scan, and clock. Generation and stretching of the reset pulse is performed in this ASIC. Interrupt logic concentrates 42 different interrupt sources into a 6-bit code which communicates with the SYSIO ASIC. It also integrates a JTAG controller.

A highlight of the RISC ASIC features follow:

- Determines system clock frequency
- Controls reset generation
- Provides JTAG
- Performs SBus and miscellaneous interrupt concentration for SYSIO
- Controls flash PROM programming, frequency margining, and lab console operation
- 25-MHz operation
- 160-pin MQFP package
- 3.3-VDC and 5-VDC supply voltage

## C.2.5 Frame Buffer Controller

The frame buffer controller (FBC) ASIC is the graphics draw ASIC that provides interface between the UPA and the 3DRAM. The FBC ASIC provides 2D and 3D graphics draw acceleration.

A highlight of the FBC ASIC features follow:

- UPA slave device with write-mostly philosophy
- Supports single buffered and double buffered with Z buffer configurations
- Interfaces with 3DRAM to achieve accelerated graphics performance
- Supports frame buffer to frame buffer copy
- Supports viewport clipping, picking, and pixel processing
- Supports byte, plane masks, raster operations, blend operations, and conditional writes in 3DRAM
- 83/400-MHz UPA operation and 75-MHz 3DRAM operation

- 313-pin BGA package
- 3.3-VDC and 5-VDC (for RAMDAC ASIC) supply voltage

## C.2.6 RAM Digital-to-Analog Controller

The RAM digital-to-analog controller (RAMDAC) ASIC is listed for reference. It is being designed in conjunction with an outside vendor.

A highlight of the RAMDAC ASIC features follow:

- Built in VTG
- Direct interface to 3DRAM
- Onboard phase-lock loop (PLL) and clock generator circuitry for the pixel clock
- 64 X 64 cursor LUT
- Direct support for X visual types
- 208-pin PQFP package
- 5-VDC supply voltage

## C.2.7 Fast Ethernet Parallel Port SCSI

The fast Ethernet parallel port SCSI (FEPS) ASIC provides throughput for I/O devices connected to the Ethernet, SCSI, and parallel ports.

A highlight of the FEPS ASIC features follow:

- Integrates 20 Mbytes-per-second SCSI interface core with low system overhead
- Integrates 10 Mbits-per-second and 100 Mbit-per-second Ethernet
- Complies with IEEE 1496 SBus specification. Also provides for 64-bit SBUS transfers
- Supports SBus extended transfer and 64-byte burst transfer
- 25-MHz SBus operation
- 5-VDC supply voltage

## C.2.8 Slave I/O

The slave I/O (SLAVIO) ASIC integrates serial ports and Ebus control.

A highlight of the SLAVIO ASIC features follow:

- Connects Sunness I/O devices through the Ebus



- Integrated keyboard/mouse interface, two serial port controllers (asynchronous only)
- Provides two synchronous/asynchronous port controllers
- Complies with IEEE 1496 SBus specification
- 25-MHz SBus operation
- 5-VDC supply voltage

## C.2.9 Audio Processor Controller

The audio processor controller (APC) ASIC provides audio functionality.

A highlight of the APC ASIC features follow:

- Connects to CODEC crystal semiconductor
- Audio direct memory access (DMA) controller
- Power management
- Complies with IEEE 1496 SBus specification
- 5-VDC supply voltage

---

## C.3 Power Supply

FIGURE C-1 lists power budgets for the Ultra 1 Creator series desktop workstation and the Ultra Enterprise 1 server power supply.

A highlight of the power supply features follow:

- Remote sensing for UltraSPARC processor core voltage; 2.5 VDC to 3.5 VDC
- Three cable required for power distribution: one to the peripherals and two to the system board
- An unswitched outlet (IEC type 320 rated at 4 A) is provided for optional monitor connection (optional cable is required)

**Note** – Power values listed in FIGURE C-1 translate to worse-case current requirements. Peak current requirements are greater. Note that the amount of power dissipated as heat is not listed. Also, the maximum delivered power is not the same as the sum of the output powers because of configuration restrictions and peripheral power-dissipation limits that are smaller than peak current requirements. All component power supply budget values are measured as a function of wattage.

**TABLE C-5** Ultra 1 Creator Series Desktop Workstation and Ultra Enterprise 1 Server Power Supply Budget

Component	3.3V	Programmable	5V	+12V	-12V	Power Delivered (max)
UltraSPARC processor	15.0	30.0	0.0	0.0	0.0	45.0
Memory	0.0	0.0	14.6	0.0	0.0	14.6
Graphics	13.2	0.0	1.5	0.5	0.0	14.7
System board	10.0	0.0	6.6	8.8	0.5	25.9
SBus/+	0.0	0.0	30.0	12.0	2.4	44.4
Disks	0.0	0.0	<12.0	<29.0	0.0	30.0
CDROM	0.0	0.0	<4.0	<12.0	0.0	12.0
Diskette drive	0.0	0.0	1.5	0.0	0.0	1.5
Keyboard/mouse	0.0	0.0	1.6	0.0	0.0	1.6
Output rated at	40 0	30.0	<8 0 0	<6 1 0	< 5 0	
Total						180.0

## C.4 System Board

FIGURE C-2 illustrates a block diagram of the system unit or server system board.

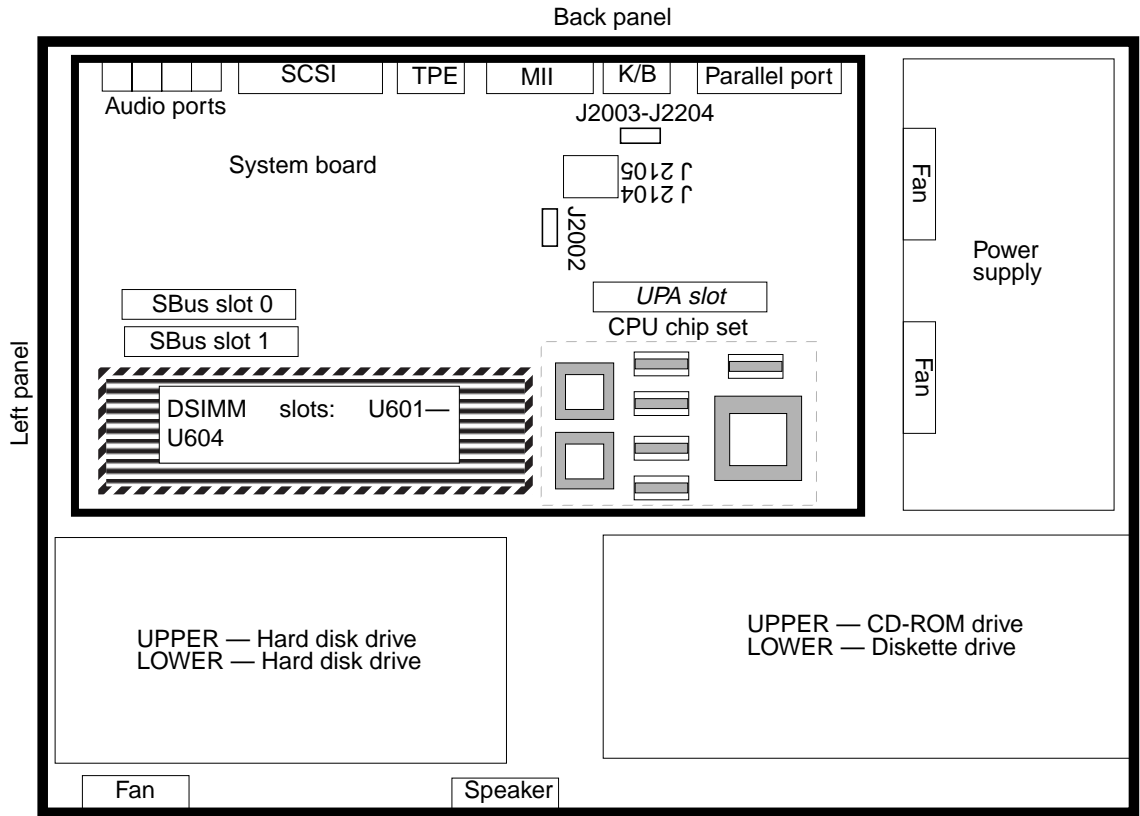


FIGURE C-2 Ultra 1 Creator Series System Board Block Diagram

## C.5 Jumper Descriptions

Jumper descriptions include brief overviews of serial port jumpers, flash PROM jumpers, and additional system board jumper and connector blocks.

Jumpers are identified on the system board by J designations. Jumper pins are located immediately adjacent to the J designator. Pin 1 is marked with an asterisk in any of the positions shown (FIGURE C-3). Ensure that the serial port jumpers are set correctly.

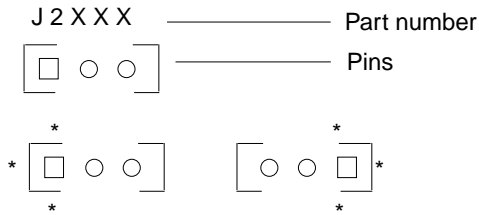


FIGURE C-3 Identifying Jumper Pins

## C.5.1 Serial Port Jumpers

Serial port jumpers J2104 and J2105 can be set to either RS-423 or RS-232 serial interface. The jumpers are preset for RS-423. RS-232 is required for digital telecommunication within the European Community. TABLE C-6 identifies serial port jumper settings. If the system is being connected to a public X.25 network, the serial port mode jumper setting may need to change from RS-423 to RS-232 mode.

To change the serial port mode jumper setting:

1. **Power-off the system**
2. **Remove the unit cover**



**Caution** – Use proper ESD grounding techniques when handling components. Wear an antistatic wriststrap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

3. **Attach the wrist strap.**
4. **Locate the jumpers on the system board and change the selection of jumpers J2104 and J2105 to position B.**
5. **Detach the wrist strap.**
6. **Replace the unit cover.**
7. **Power-on the system.**

TABLE C-6 Serial Port Jumper Settings

Jumper	Pins 1 + 2 Select	Pins 2 + 3 Select	Default Jumper on Pins
J2104	RS-232	RS-423	2 + 3
J2105	RS-232	RS-423	2 + 3

## C.5.2 Flash PROM Jumpers

Flash PROM jumpers J2002, J2003, and J2004 permit the reprogramming of specific code blocks. TABLE C-7 identifies the flash PROM jumper settings. The default setting of J2002 through J2004 is on pins 1 and 2. TABLE C-7 identifies the signals controlled by the non-default settings of jumpers J2003 and J2004.

TABLE C-7 Flash PROM Jumper Settings

Jumper	Pins 1 + 2 Select	Pins 2 +3 Select	Default Jumper on Pins	Signal Controlled
J2002	Flash PROM	Not to be used	1 + 2	FLASH PROM SEL
J2003	Write protect	Write Enable	1 + 2	FLASH PROM PROG ENABLE
J2004	High half booting	Normal Booting	2 + 3	XOR LOGIC SET

## C.5.3 Additional System Board Jumper Blocks

Additional system board jumper blocks are identified in TABLE C-8 and are listed for informational purposes only.

**Note** – Do not attempt to add jumpers to jumper blocks identified in TABLE C-8.

TABLE C-8 Additional System Board Jumper Blocks

Jumper Block ID	Description
J2103	Enable Test Edge Serial Ports Enable (manufacturing only)
J2201	External Reset (jumper pin 1 to 2 forces XIR reset; jumper pin 2 to 3 forces POR reset)
J2202	Manufacturing ROMBO/JSSC scan test connector
J2203	Manufacturing JTAG/Scan test connector
J3602	Manufacturing JTAG/Scan test Connector
J3603	Enable Test Edge Ethernet Port (manufacturing only)

---

## C.6 Enclosure

The Sun Ultra 1 Creator series uses an enclosure that reflects style, ergonomics, serviceability, functionality, versatility, and quality. Physical orientation allows for a rack-mount or desktop installation. The enclosure design complies with all necessary environmental and regulatory specifications.

### C.6.1 Enclosure Basics

Overall dimensions of the enclosure are (width x depth x height) 16.44 inches x 17.44 inches x 4.07 inches (41.75 cm x 44.30 cm x 10.35 cm). The enclosure houses:

- One 3.5-inch (8.89cm) diskette drive
- One 1.6-inch (4.06cm) CD-ROM drive in a industry standard 5.25-inch (13.33cm) bay

---

**Note** – The CD-ROM drive slot may be used for either a CD-ROM drive or an optional 4-mm or 8-mm tape drive.

---

- One 1.6-inch-high (4.06cm) or two 1-inch-high (2.54cm) single-connector 3.5-inch (8.89cm) disk drives
- One 9.6-inch x 11.0-inch (24.38cm x 27.94cm) system board
- Eight DSIMMs
- Two SBus modules
- One UPA64S module

### C.6.2 Enclosure Features

Enclosure features include:

- Good service access for internal upgrades and field replaceable units (FRUs)
- Optimized system board layout
- Graphics expansion module (UPA64S connector)
- UltraSPARC processor integration on to system board
- All standard connectors and no splitter cables on rear panel

---

## C.7 Environmental Compliance

The Ultra 1 Creator series meets or exceeds the specifications defined by the “Controlled Office” classification of the 990-1146-03, Rev A document.

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## C.8 Agency Compliance

The Ultra 1 Creator series complies with international and domestic regulatory requirements for safety, ergonomics, EMI, immunity, electrical, and telecommunication.





# Glossary

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- address** A unique location within a computer memory or a peripheral. Reference is usually made to an address for retrieving or storing data.
- APC** Audio processor controller. An ASIC responsible for audio processing control.
- ASIC** Application specific integrated circuit.
- BMX** Buffered memory crossbar. An ASIC responsible for connecting a 144-bit UPA data bus, a 288-bit-wide DRAM memory bus, and a 72-bit UPA data bus.
- boot** A term used to identify the process of reading in initial software to the computer.
- boot PROM** In Sun Workstations, contains the PROM monitor program, a command interpreter used for booting, resetting, low-level configuration, and simple test procedures.
- default** A preset value that is assumed to be correct unless changed by the user.
- DMA** Direct memory access.
- DPI** Dots per inch.
- DPS** Data path scheduler. Controls all data flow coordinating the activity of the BMX chips.
- DRAM** Dynamic random-access memory. A read/write dynamic memory in which the data can be read or written in approximately the same amount of time for any memory location.
- DSIMM** DRAM Single In-line Memory Module. A small printed circuit card that contains dynamic random access memory (DRAM) chips.
- DTAG** Dual tag or data tag.
- EMI** Electrostatic magnetic interference. Electrical phenomena that directly or indirectly, contributes to a degradation in performance of an electronic system.

- Ethernet** A type of network hardware that permits communication between systems connected directly together by transceiver taps, transceiver cables, and various cable types; coaxial or twisted-pair, fiberoptic.
- FBC** Frame buffer controller. An ASIC responsible for the interface between the UPA and the 3DRAM. Also controls graphic draw acceleration.
- FFB** Fast frame buffer. Circuit card consisting of the FBC, FBRAM, RAMDAC, and associated circuitry.
- FEPS** Fast Ethernet parallel port SCSI. An ASIC responsible for implementing three master devices on the SBus: the Ethernet, SCSI, and parallel port.
- FRU** Field replaceable unit.
- I/O** Input/output.
- LED** Light-emitting diode.
- Mbps** Megabits-per-second.
- MHz** Megahertz.
- ns** Nanosecond.
- NVRAM** Non-volatile random access memory. Stores system variables used by the boot PROM. Contains the system `hostIDnumber` and Ethernet address.
- OBP** OpenBoot  
™  
 PROM. A routine that allows testing of control registers, network controller, diskette drive system, memory, cache, system clock, and network monitoring.
- PID** Process ID.
- POST** Power-on self-test. Initialized at system turn-on or when the system is rebooted. A series of tests that verify system board components are operating properly.
- RAMDAC** RAM digital-to-analog converter. An ASIC responsible for direct interface to 3DRAM. Also provides onboard phase-lock loop (PLL) and clock generator circuitry for the pixel clock
- RISC** Reset, interrupt, scan, and clock. An ASIC responsible for reset, interrupt, scan, and clock.
- SCSI** Small computer system interface.
- SC-UP** System controller uniprocessor. An ASIC responsible for UPA and memory control.
- SDB** Spitfire data buffer.

- SIMM** Single in-line memory module.
- Slavio** Slave I/O. An ASIC responsible for implementing three slave interfaces on the SBus: serial, keyboard/mouse, and diskette drive.
- SunVTS** Sun validation and test suite. A diagnostic application designed to test hardware.
- SYSIO** System I/O. An ASIC responsible for bridging data transfers between the UPA and the SBus. Acts as an I/O hub, providing IOMMU and streaming buffers to accelerate sequential I/O access.
- TPE** Twisted-pair Ethernet.
- TOD** Time of day. A timekeeping IC.
- TTL** Transistor-transistor logic.
- UPA** UltraSPARC port architecture. Provides processor-to-memory interconnection.
- UPA AB 0** UPA address bus 0. Provides data interface between the UltraSPARC processor and the SYSIO ASIC.
- UPA AB 1** UPA address bus 1. Supports slave UPA connection to the expansion slot for graphics capability.
- VIS** Visual instruction set.
- vtsk** VTS kernel. A SunVTS diagnostic tool that control all testing; operates in OpenWindows.
- vt sui** VTS user interface. A SunVTS diagnostic tool that provides `vt sk` control, various user options, tests, and read-log files.
- vtstty** VTS teletype. A SunVTS diagnostic tool that controls the `vt sk` from either a command shell or a terminal attached to a serial port.



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