

Sun™ Ultra™ 5/10 Service Manual



THE NETWORK IS THE COMPUTER™

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Part No.: 805-0423-11
November 1998, Revision A

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Adobe PostScript

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Preface

The *Sun Ultra 5/10 Service Manual* provides detailed procedures that describe the removal and replacement of replaceable parts in the Sun™ Ultra™ 5 and the Ultra 10 computers (system units). The service manual also includes information about the use and maintenance of the system units. This book is written for technicians, system administrators, authorized service providers (ASPs), and advanced computer system end users who have experience troubleshooting and replacing hardware.

Note – Removal and replacement of selected system unit components are also illustrated with photographs and audio/visual instructions on the *Sun Ultra 5 ShowMe How Multimedia Documentation*, part number 704-5753 and the *Sun Ultra 10 ShowMe How Multimedia Documentation*, part number 704-5983.

How This Book Is Organized

This document is organized into chapters and appendixes as listed in the following table. A glossary is also included.

TABLE P-1 Document Organization

Chapter	Content Description
Chapter 1, "Product Description"	Describes the major components of the system units.
Chapter 2, "SunVTS Overview"	Describes the execution of individual tests for verifying hardware configuration and functionality.
Chapter 3, "Power-On Self-Test"	Describes the execution of POST and provides examples of POST output patterns.
Chapter 4, "Troubleshooting Procedures"	Provides troubleshooting advice and suggested corrective actions for hardware problems.
Chapter 5, "Safety and Tool Requirements"	Explains how to work safely when servicing the system units.
Chapter 6, "Power On and Off"	Provides step-by-step procedures to power on and power off the system units.
Chapter 7, "Internal Access"	Provides step-by-step procedures to remove the 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.
Chapter 10, "Motherboard and Component Replacement"	Provides step-by-step procedures to remove and replace the motherboard and various components associated with motherboard operation.
Chapter 11, "Illustrated Parts List"	Lists replaceable parts for the system units.
Appendix A, "Product Specifications"	Provides product specifications, system requirements about power and environment, system unit dimensions, weight, memory mapping, and peripheral component interconnect (PCI) card slot specifications.

TABLE P-1 Document Organization (*Continued*)

Chapter	Content Description
Appendix B, “Signal Descriptions”	Provides signal descriptions, instructions for connecting the system unit to a 10BASE-T/100BASE-T twisted-pair Ethernet (TPE) local area network (LAN), and modem settings for system units used in specific network telecommunication applications.
Appendix C, “Functional Description”	Provides functional descriptions for the system units.
Appendix D, “Regulatory Compliance Statements”	Provides regulatory compliance statements.
Appendix E, “Safety Agency Compliance Statements”	Provides safety agency compliance statements.
Appendix F, “Software Notes”	Identifies software issues.

Using UNIX Commands

This document may not contain information on basic UNIX commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- *Solaris Handbook for Sun Peripherals*
- AnswerBook online documentation for the Solaris software environment
- Other software documentation that you received with your system

Typographic Conventions

Typographic conventions used in this service manual are listed in the following table.

TABLE P-2 Typographic Conventions

Typeface or Symbol	Meaning	Examples
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. % You have mail.
AaBbCc123	What you type, when contrasted with on-screen computer output.	% su Password:
<i>AaBbCc123</i>	Book titles, new words or terms, words to be emphasized. Command-line variable; replace with a real name or value.	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. You <i>must</i> be <code>root</code> to do this. To delete a file, type <code>rm filename</code> .

Shell Prompts

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

TABLE P-3 Shell Prompts

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

Related Documents

Additional information for servicing the system unit are listed in the following table. These documents are also available online on the *Sun Ultra 5/10 Hardware AnswerBook* or on the *Solaris on Sun Hardware AnswerBook*.

TABLE P-4 Related Documents

Application	Title	Part Number
Configuration	<i>Solaris Handbook for Sun Peripherals</i>	805-4440
Configuration	<i>Solaris Handbook for Sun Frame Buffers</i>	805-4441
Diagnostics	<i>SunVTS 2.0 User's Guide</i>	802-5331
Diagnostics	<i>SunVTS 2.0 Test Reference Manual</i>	802-5330
Diagnostics	<i>SunVTS 2.0 Quick Reference Card</i>	802-5329
Installation	<i>Creator Installation Guide</i>	802-7731
Installation	<i>Sun Ultra 5/10 CD-ROM Drive and Hard Disk Drive Installation Guide</i>	805-7115
Software notes	<i>Sun Ultra 5/10 Preinstalled Software Notes</i>	805-4971 805-6962 805-6963 805-5590
Specification	<i>17-Inch Entry, 17-Inch Premium, and 20-Inch Premium Color Monitors Specifications</i>	802-6178
Specification	<i>4.2-Gbyte 7200-RPM Disk Drive Specifications</i>	802-7744
Specification	<i>Diskette Drive Specification</i>	802-6285
User	<i>SunVTS 2.0 User's Guide</i>	802-5331

Ordering Sun Documents

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Please include the part number of your document in the subject line of your email.

Product Description

The Ultra 5 and Ultra 10 workstations are uniprocessor devices that use the family of UltraSPARC™ processors. They support high-performance CPU module (UltraSPARC-III) processing and high-performance graphics (Ultra 10 only). FIGURE 1-1 illustrates the Ultra 5 desktop workstation and FIGURE 1-2 illustrates the Ultra 10 minitower workstation.

This chapter contains the following topics:

- Section 1.1 “Common Features” on page 1-3
- Section 1.2 “Ultra 5 Features” on page 1-4
- Section 1.3 “Ultra 10 Features” on page 1-4
- Section 1.4 “I/O Devices” on page 1-5
- Section 1.5 “System Unit Features” on page 1-6
- Section 1.6 “System Unit Components” on page 1-8

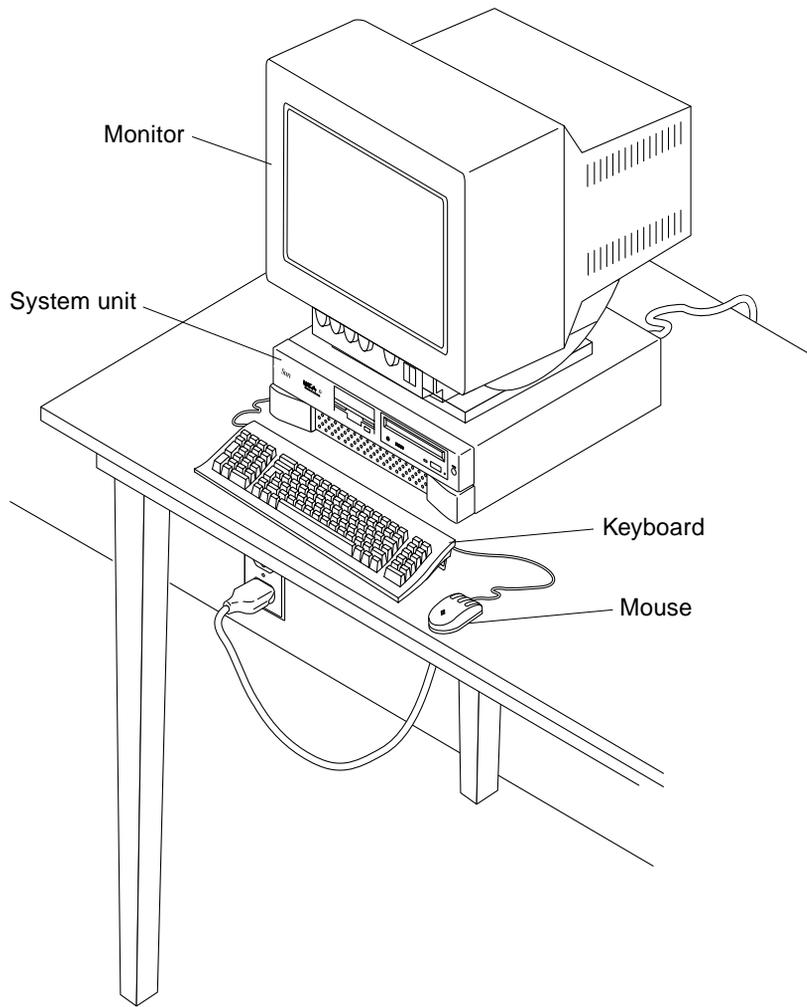


FIGURE 1-1 Ultra 5 Desktop Workstation

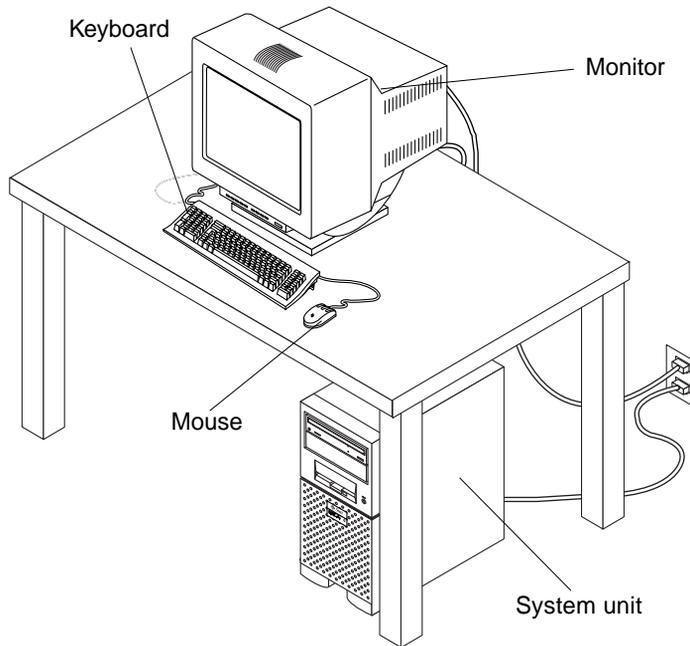


FIGURE 1-2 Ultra 10 Minitower Workstation

1.1 Common Features

The Ultra 5 and Ultra 10 workstations provide the following common features:

- UltraSPARC-IIi processor module (CPU module)/advanced PCI bridge (APB) application-specific integrated circuit (ASIC)
- 33-megahertz (MHz), 32-bit peripheral component interconnect (PCI)
- Enhanced integrated drive electronic (IDE) hard drive
- CD-ROM drive
- PGX on-board graphics
- PGX24 PCI on-board graphics
- Two serial ports
- One parallel port
- 10-/100-megabit per second Ethernet
- CD quality audio

- 1.44-megabyte (Mbyte) manual eject diskette drive
- Front access Personal Computer Memory Card International Association (PCMCIA) bay (two Type II or one Type III slot(s))

Note – Systems with PGX24 graphics have "PGX24" printed on the serial number label that is affixed to the system cover.

1.2 Ultra 5 Features

The Ultra 5 workstation provides the following unique features:

- 333-MHz, 2-Mbyte cache CPU module or 270-MHz, 256-kilobyte (Kbyte) cache CPU module
- Three PCI slots (riser card expansion with two long PCI cards and one short PCI card)
- One hard drive bay
- One front-access 5.25-inch bay
- Desktop enclosure
- 200-watt power supply

1.3 Ultra 10 Features

The Ultra 10 workstation provides the following unique features:

- 360-MHz, 2-Mbyte cache CPU module; or 333-MHz, 2-Mbyte cache CPU module; or 300-MHz, 512-Kbyte cache CPU module
- 1-gigabyte (Gbyte) memory (maximum)
- Four PCI slots (riser card expansion with four long PCI cards)
- One UltraSPARC port architecture (UPA) graphics slot
- One internal hard drive bay
- One dedicated front-access 5.25-inch bay
- One optional front-access 5.25-inch bay
- Minitower enclosure
- 250-watt power supply

1.4 I/O Devices

The Ultra 5 and Ultra 10 workstations use the I/O devices listed in TABLE 1-1.

TABLE 1-1 Supported I/O Devices

I/O Device	Description
17-inch (43-cm) color monitor	1280 x 1024 resolution, 76- or 66-Hz refresh rate, 110 dots per inch (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, 70 dpi
24-inch (61-cm) color monitor	1920 x 1200 resolution, 70-Hz refresh rate, 103 dpi
	1600 x 1000 resolution, 76- or 66-Hz refresh rate, 86 dpi
	1400 x 900 resolution, 76-Hz refresh rate, 77 dpi
	1280 x 800 resolution, 76-Hz refresh rate, 69 dpi
Microphone	SunMicrophone™ II (optional)
Keyboard	Sun Type-5; AT 101 or UNIX layout available
Mouse	Sun Type-5; optomechanical, 3-button

1.5 System Unit Features

System unit components are housed in either a desktop enclosure (Ultra 5), or a minitower enclosure (Ultra 10). Overall chassis dimensions for the Ultra 5 and Ultra 10 are listed in the following table.

TABLE 1-2 Ultra 5 and Ultra 10 Physical Dimensions

Unit	Width	Height	Depth
Ultra 5 Desktop Enclosure	17.17 inches (43.60 cm)	4.31 inches (10.95 cm)	16.69 inches (42.40 cm)
Ultra 10 Minitower Enclosure	6.93 inches (17.60 cm)	15.75 inches (40.00 cm)	16.54 inches (42.00 cm)

System unit electronics are contained on a single printed circuit board (motherboard). The motherboard contains the CPU module, memory, system control ASICs, and I/O ASICs.

The following figures illustrate the Ultra 5 and Ultra 10 system unit front and rear views.

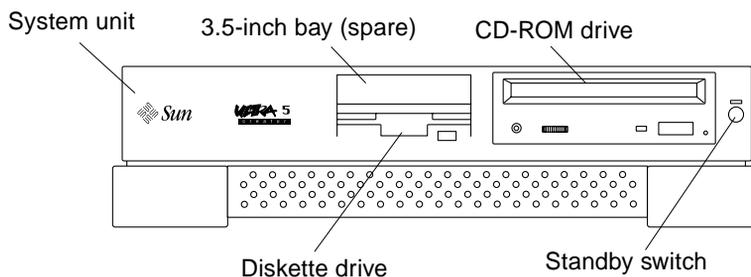


FIGURE 1-3 Ultra 5 System Unit Front View

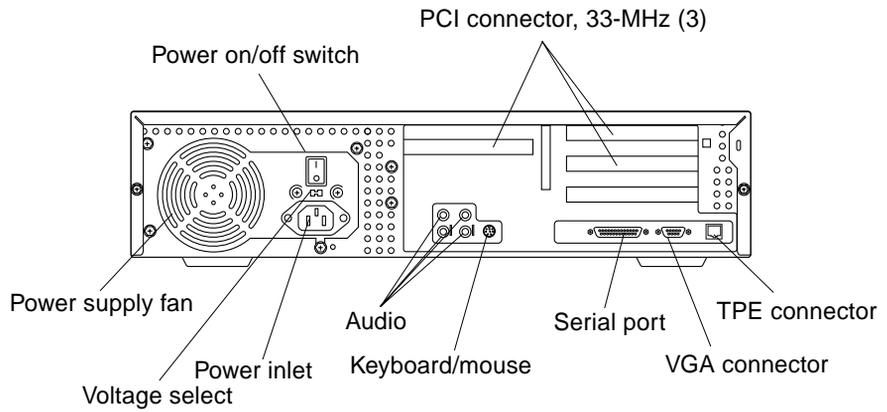


FIGURE 1-4 Ultra 5 System Unit Rear View

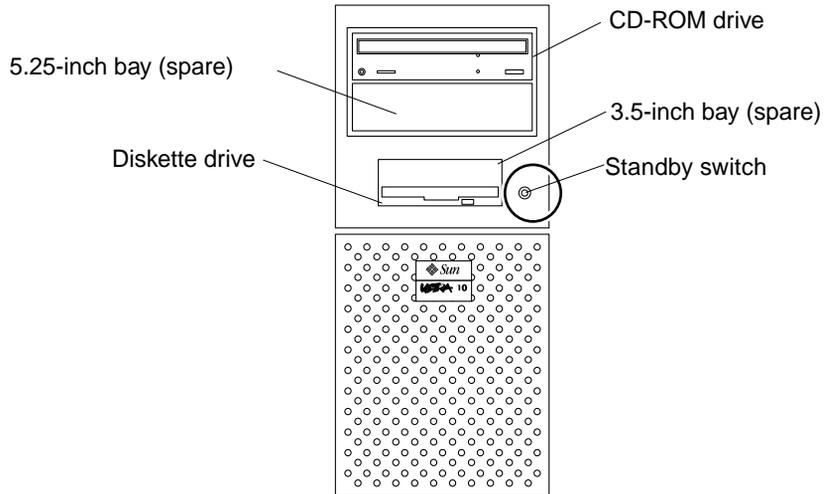


FIGURE 1-5 Ultra 10 System Unit Front View

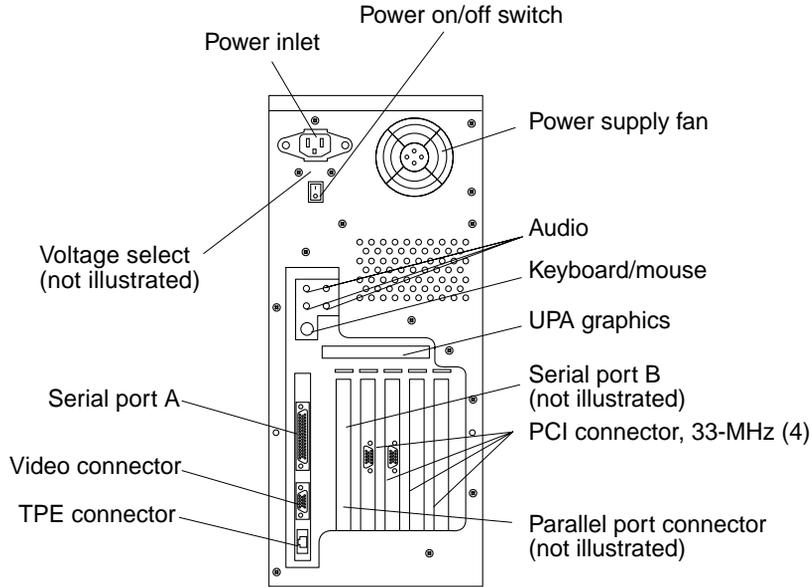


FIGURE 1-6 Ultra 10 System Unit Rear View

1.6 System Unit Components

The following table lists the Ultra 5 and Ultra 10 system unit replaceable components. A brief description of each listed component is also provided.

Note – Consult your authorized Sun sales representative or service provider prior to ordering a replacement part.

TABLE 1-3 Ultra 5 and Ultra 10 System Unit Replaceable Components

Component	Ultra 5	Ultra 10	Description
Manual eject floppy	Yes	Yes	Diskette drive
Speaker assembly		Yes	Speaker assembly
Fan assembly	Yes		CPU fan, 80-mm

TABLE 1-3 Ultra 5 and Ultra 10 System Unit Replaceable Components *(Continued)*

Component	Ultra 5	Ultra 10	Description
Fan assembly		Yes	CPU fan, 92-mm
CD-ROM drive	Yes	Yes	CD-ROM drive
16-Mbyte DIMM	Yes	Yes	60-ns, 16-Mbyte DIMM
32-Mbyte DIMM	Yes	Yes	60-ns, 32-Mbyte DIMM
64-Mbyte DIMM	Yes	Yes	60-ns, 64-Mbyte DIMM
128-Mbyte DIMM	Yes	Yes	60-ns, 128-Mbyte DIMM
256-Mbyte DIMM	Yes	Yes	60-ns, 256-Mbyte DIMM
Service kit	Yes	Yes	Includes diskette drive cable assembly, hard drive cable assembly, serial/parallel cable assembly, and CD-ROM drive cable assembly
CPU module	Yes		270-MHz, 256-kilobyte (Kbyte) external cache
CPU module		Yes	360-MHz, 2-Mbyte external cache
CPU module	Yes	Yes	333-MHz, 2-Mbyte external cache
CPU module		Yes	300-MHz, 512-Kbyte external cache
Motherboard	Yes	Yes	System board
NVRAM/TOD	Yes	Yes	Time of day, 48T59, with carrier
PCI card	Yes	Yes	Generic
Riser board	Yes		3-slot riser board
Riser board		Yes	4-slot riser board
Hard drive	Yes		Disk drive, 4.3-Gbyte, 5400 RPM
Hard drive	Yes	Yes	Disk drive, 9.1-Gbyte, 7200 RPM
Power supply	Yes		Power supply, 200 watts
Power supply		Yes	Power supply, 250 watts
Graphics card		Yes	Vertical, double buffer plus Z (DBZ) UPA graphics card

TABLE 1-3 Ultra 5 and Ultra 10 System Unit Replaceable Components *(Continued)*

Component	Ultra 5	Ultra 10	Description
Graphics card		Yes	Vertical, single buffer UPA graphics card
Graphics card		Yes	Elite3D m3 UPA graphics card
Front bezel	Yes	Yes	System unit front bezel
Drive bracket	No	Yes	9.1-Gbyte rear drive bracket
Audio cable assembly	Yes	Yes	

Note – The Ultra 5/10 diskette drive cable assembly, hard drive cable assembly, serial/parallel cable assembly, and CD-ROM drive cable assembly cannot be ordered separately.

SunVTS Overview

This chapter contains an overview of the SunVTS™ diagnostic tool.

This chapter contains the following topics:

- Section 2.1 “SunVTS Description” on page 2-1
- Section 2.2 “SunVTS Operation” on page 2-2

2.1 SunVTS Description

The SunVTS software executes multiple diagnostic hardware tests from a single user interface. SunVTS verifies the configuration, functionality, and reliability of most hardware controllers and devices.

The SunVTS software can be used in both the Common Desktop Environment (CDE) and the OPEN LOOK graphical user interface (GUI) environments, or from a TTY interface.

Within the CDE and OPEN LOOK GUI environments, test parameters can be set quickly and easily by pointing and clicking a mouse button.

With a TTY interface, the SunVTS software can be used from a terminal or modem attached to a serial port. Data is input through the keyboard, rather than with a mouse, and only one screen of information is displayed at a time.

2.2 SunVTS Operation

The following table lists the documentation for the SunVTS software. These documents are available on the *Solaris on Sun Hardware Collection*.

TABLE 2-1 SunVTS Documentation

Title	Part Number	Description
<i>SunVTS User's Guide</i>	802-7299	Describes the SunVTS environment; starting and controlling various user interfaces; feature descriptions
<i>SunVTS Test Reference Manual</i>	802-7300	Describes each SunVTS test; provides various test options and command line arguments
<i>SunVTS Quick Reference Card</i>	802-7301	Provides overview of vtstui interface features

Power-On Self-Test

This chapter describes how to initiate power-on self-test (POST) diagnostics.

This chapter contains the following topics:

- Section 3.1 “POST Overview” on page 3-1
- Section 3.2 “Pre-POST Preparation” on page 3-2
- Section 3.3 “Initializing POST” on page 3-5
- Section 3.4 “Maximum and Minimum Levels of POST” on page 3-6
- Section 3.5 “Bypassing POST” on page 3-23
- Section 3.6 “Additional Keyboard Control Commands” on page 3-23
- Section 3.7 “System and Keyboard LEDs” on page 3-24
- Section 3.8 “Initializing Motherboard POST” on page 3-24

3.1 POST Overview

POST is useful in determining if a portion of the system unit has failed and should be replaced. POST detects approximately 95 percent of system unit faults and is located in the system board OpenBoot™ PROM (OBP). The setting of two NVRAM variables, the `diag-switch?` and the `diag-level` flag, determine if POST is executed (see Section 3.3 “Initializing POST” on page 3-5).. The following table lists the `diag-switch?` and `diag-level` flag settings for disabling POST (off), enabling POST maximum (max), or enabling POST minimum (min).

TABLE 3-1 Diag-Level Switch Settings

Diag-Level Setting	POST Initialization	Serial Port A I/O	Serial Port A Error Output	Diag-Switch? Setting
Off	No	N/A	N/A	N/A
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 3.7 “System and Keyboard LEDs” on page 3-24.

3.2.1 Setting Up a Tip Connection

A tip connection enables 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 tested system unit is used to establish the tip connection between the system unit 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, refer to the following figure and proceed as follows:

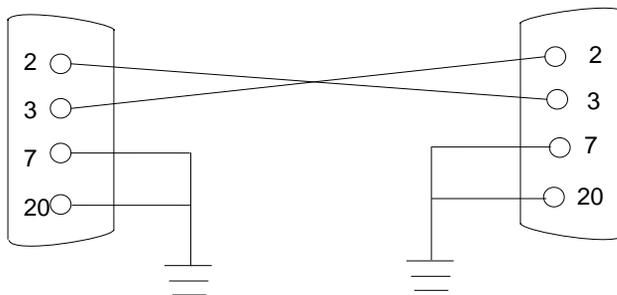


FIGURE 3-1 Setting Up a TIP Connection

1. Connect serial port A of the system being tested to serial port B of another Sun workstation 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 by changing to the `/etc` directory and then editing the `remote` file:

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

Note – The example shows connection to serial port B.

3. To use serial port A:
 - a. Copy and paste the serial port B `remote` file.
 - b. Modify the serial port B `remote` file as follows:

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

4. In a shell window on the Sun workstation, type `tip hardware`.

```
% tip hardware
connected
```

Note – The shell window is now a `tip` window directed to the serial port of the system unit being tested. When power is applied to the system unit 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 window.
 - b. Type `ps -a` to view the active `tip` line and process ID (PID) number.
 - c. Type the following to kill the `tip` hardware process.

```
% kill -9 PID#
```

3.2.2 Verifying the Baud Rate

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

1. Open a shell window.
2. Type `eeeprom`.
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 settings are consistent with TTY-type terminal or workstation monitor settings.

3.3 Initializing POST

POST is initialized in two ways:

- By setting the `diag-switch?` to `true` and the `diag-level` to `max` or `min`, followed by power cycling the system unit
- By simultaneously pressing the keyboard Stop and D keys while power is applied to the system unit.

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

1. At the system prompt, type:

```
ok% setenv diag-switch? true
```

2. At the keyboard, power cycle the system unit by simultaneously pressing the Shift key and the Standby key. After a few seconds, press the Standby key again. See the following figure

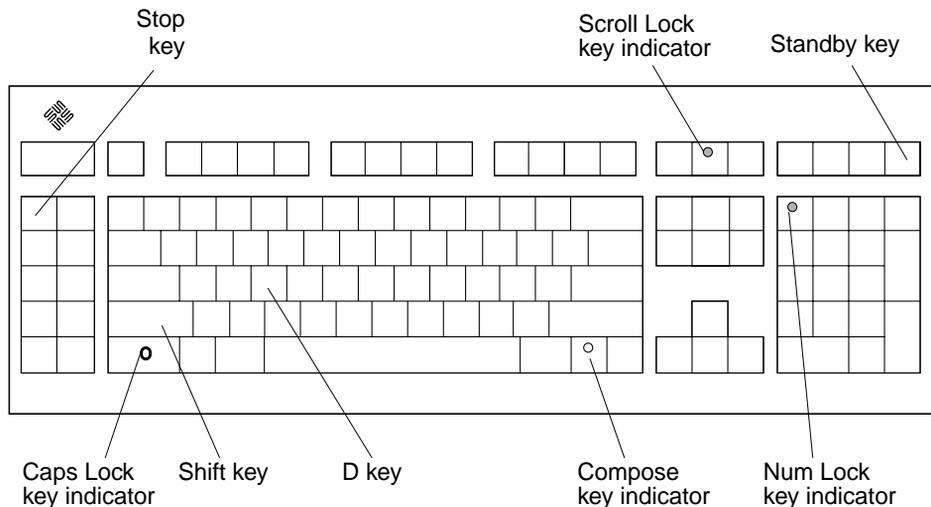


FIGURE 3-2 Sun Type-5 Keyboard

3. Verify the following:

- The display prompt is no longer displayed.
- The monitor power-on indicator flashes on and off.
- The keyboard Caps Lock key indicator flashes on and off.

4. When the POST is complete, type the following at the system prompt:

```
ok% setenv diag-switch? false
```

3.4 Maximum and Minimum Levels of POST

Two levels of POST are available: maximum (max) level and minimum (min) 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 Variable Set to max” An example of a min level POST output on serial port A is provided in Section 3.4.2 “diag-level Variable Set to min” on page 3-15.

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

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

To return to the default setting:

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

3.4.1 `diag-level` Variable Set to max

When the `diag-level` variable is set to max, POST enables an extended set of diagnostic-level tests. This mode requires approximately 2 minutes to complete (with 128 Mbytes of DIMM installed). The following code example identifies a typical serial port A POST output with the `diag-level` variable set to max.

Note – Video output is disabled while POST is initialized.

CODE EXAMPLE 3-1 diag-level Variable Set to max

```
Power On Selftest Completed
Software Power ON0.0000.0000.0000 ffff.ffff.f00b.4100
0002.3333.0200.001b

@(#) Sun Ultra 5/10 UPA/PCI 3.9 P2.1 Version 9 created 1997/08/
05 16:24
Clearing E$ Tags Done
Clearing I/D TLBs Done
Probing Memory Done
MEM BASE = 0000.0000.0000.0000
MEM SIZE = 0000.0000.1000.0000
11-Column Mode Enabled
MMUs ON
Copy Done
PC = 0000.01ff.f000.20ec
PC = 0000.0000.0000.2130
Decompressing into Memory Done
Size = 0000.0000.0007.5300
ttya initialized
Reset Control: BXIR:0 BPOR:0 SXIR:0 SPOR:1 POR:0
UltraSPARC-IIIi 2-2 module
Probing Memory Bank #0 128 + 128 : 256 Megabytes
Probing Memory Bank #2 0 + 0 : 0 Megabytes
Probing Floppy: drive detected on ID0
Probing EBUS SUNW,CS4231
Probing UPA Slot at 1e,0 SUNW,ffb
Probing /pci@1f,0/pci@1,1 at Device 2 SUNW,m64B
Probing /pci@1f,0/pci@1,1 at Device 3 ide disk cdrom
Probing /pci@1f,0/pci@1 at Device 1 Nothing there
Probing /pci@1f,0/pci@1 at Device 2 Nothing there
Probing /pci@1f,0/pci@1 at Device 3 Nothing there
Probing /pci@1f,0/pci@1 at Device 4 Nothing there
Reset Control: BXIR:0 BPOR:0 SXIR:0 SPOR:1 POR:0
UltraSPARC-IIIi 2-2 module
Probing Memory Bank #0 128 + 128 : 256 Megabytes
Probing Memory Bank #2 0 + 0 : 0 Megabytes
Probing Floppy: drive detected on ID0
Probing EBUS SUNW,CS4231
Probing UPA Slot at 1e,0 SUNW,ffb
Probing /pci@1f,0/pci@1,1 at Device 2 SUNW,m64B
Probing /pci@1f,0/pci@1,1 at Device 3 ide disk cdrom
Probing /pci@1f,0/pci@1 at Device 1 Nothing there
Probing /pci@1f,0/pci@1 at Device 2 Nothing there
```

CODE EXAMPLE 3-1 diag-level Variable Set to max (Continued)

```
Power On Selftest Completed
Probing /pci@1f,0/pci@1 at Device 3  Nothing there
Probing /pci@1f,0/pci@1 at Device 4  Nothing there

Sun Ultra 5/10 UPA/PCI (UltraSPARC-IIi 300MHz), No Keyboard
OpenBoot 3.9 P2.1 , 256 MB memory installed, Serial #9337477.
Ethernet address 8:0:20:8e:7a:85, Host ID: 808e7a85.

ok Hardware Power ON

@(#) Sun Ultra 5/10 UPA/PCI  3.9 P2.1  Version 9 created 1997/08/
05 16:24
Probing keyboard Done
%o0 = 0000.0000.0000.4001

Executing Power On SelfTest

@(#) Sun Ultra 5/10 (Darwin) POST 2.1.1 (Build No. 293) 08/21/97:
15:59

CPU: UltraSPARC-LC (MHz: 301 Ecache Size:  512KB)

Init POST BSS
  Init System BSS
NVRAM
  NVRAM Battery Detect Test
  NVRAM Scratch Addr Test
  NVRAM Scratch Data Test
DMMU TLB Tags
  DMMU TLB Tag Access Test
DMMU TLB RAM
  DMMU TLB RAM Access Test
Probe Ecache
  Probe Ecache
Ecache Tests
  Ecache RAM Addr Test
  Ecache Tag Addr Test
  Ecache RAM Test
  Ecache Tag Test
All CPU Basic Tests
  V9 Instruction Test
  CPU Tick and Tick Compare Reg Test
  CPU Soft Trap Test
```

CODE EXAMPLE 3-1 diag-level Variable Set to max (*Continued*)

```
Power On Selftest Completed
  CPU Softint Reg and Int Test
All Basic MMU Tests
  DMMU Primary Context Reg Test
  DMMU Secondary Context Reg Test
  DMMU TSB Reg Test
  DMMU Tag Access Reg Test
  DMMU VA Watchpoint Reg Test
  DMMU PA Watchpoint Reg Test
  IMMU TSB Reg Test
  IMMU Tag Access Reg Test
All Basic Cache Tests
  Dcache RAM Test
  Dcache Tag Test
  Icache RAM Test
  Icache Tag Test
  Icache Next Test
  Icache Predecode Test
Sabre MCU Control & Status Regs Init and Tests
  Init Sabre MCU Control & Status Regs
  Initializing SC registers in SabreIO
Memory Probe and Init
  Probe Memory
  INFO:    256MB Bank 0
  bank 2:  OMB
frequency = 301, refvalue = 146, no_of_banks = 1
INFO: MCO = 0x00000000.80001192, MC1 = 0x00000000.0c4aab14
  Malloc Post Memory
  Memory Addr w/ Ecache
  Load Post In Memory
  Run POST from MEM
  .....
loaded POST in memory
  Map PROM/STACK/NVRAM in DMMU
  Update Master Stack/Frame Pointers
All FPU Basic Tests
  FPU Regs Test
  FPU Move Regs Test
  FPU State Reg Test
  FPU Functional Test
  FPU Trap Test
UPA Data Bus Line Test
Memory Tests
  Init Memory
  INFO:    256MB at bank 0 stack 0 (2 dimms per bank)
```

CODE EXAMPLE 3-1 diag-level Variable Set to max (Continued)

```
Power On Selftest Completed
.....
.....
.....
INFO:      0MB at bank 0 stack 1
INFO:      0MB at bank 2 stack 0
INFO:      0MB at bank 2 stack 1
Memory Addr w/ Ecache Test
INFO:      256MB at bank 0 stack 0 (2 dimms per bank)
INFO:      0MB at bank 0 stack 1
INFO:      0MB at bank 2 stack 0
INFO:      0MB at bank 2 stack 1
ECC Memory Addr Test
INFO:      256MB at bank 0 stack 0 (2 dimms per bank)
INFO:      0MB at bank 0 stack 1
INFO:      0MB at bank 2 stack 0
INFO:      0MB at bank 2 stack 1
Block Memory Addr Test
INFO:      256MB at bank 0 stack 0 (2 dimms per bank)
INFO:      0MB at bank 0 stack 1
INFO:      0MB at bank 2 stack 0
INFO:      0MB at bank 2 stack 1
Block Memory Test
INFO:      256MB at bank 0 stack 0 (2 dimms per bank)
Write 0x33333333.33333333
.....
.....
.....
Read
.....
.....
.....
Write 0x55555555.55555555
.....
.....
.....
Read
.....
.....
.....
```

CODE EXAMPLE 3-1 diag-level Variable Set to max (Continued)

```
Power On Selftest Completed
Write 0xcccccccc.cccccccc
.....
.....
.....
.....
Read
.....
.....
.....
.....
Write 0xaaaaaaaa.aaaaaaaa
.....
.....
.....
.....
Read
.....
.....
.....
.....

INFO:      0MB at bank 0 stack 1
INFO:      0MB at bank 2 stack 0
INFO:      0MB at bank 2 stack 1
ECC Blk Memory Test
INFO:      256MB at bank 0 stack 0 (2 dimms per bank)
Write 0xa5a5a5a5.a5a5a5a5
.....
.....
.....
.....
Read
.....
.....
.....
.....
Write 0x96969696.96969696
.....
.....
.....
.....
```

CODE EXAMPLE 3-1 diag-level Variable Set to max (Continued)

```
Power On Selftest Completed
Read
.....
.....
.....
.....
Write 0xbbbbbbbb.bbbbbbbb
.....
.....
.....
.....
Read
.....
.....
.....
.....
Write 0xdddddddd.dddddddd
.....
.....
.....
.....
Read
.....
.....
.....
.....

INFO:      OMB at bank 0 stack 1
INFO:      OMB at bank 2 stack 0
INFO:      OMB at bank 2 stack 1
All Basic Sabre MMU Tests
Init Sabre
PIO Decoder and BCT Test
PCI Byte Enable Test
Interrupt Map (short) Reg Test
Interrupt Set/Clr Reg Test
Sabre IOMMU Regs Test
Sabre IOMMU RAM Address Test
Sabre IOMMU CAM Address Test
IOMMU TLB Compare Test
IOMMU TLB Flush Test
PBMA PCI Config Space Regs Test
PBMA Control/Status Reg Test
PBMA Diag Reg Test
Sabre IO Regs Test
All Advanced CPU Tests
```

CODE EXAMPLE 3-1 diag-level Variable Set to max (Continued)

```
Power On Selftest Completed
  DMMU Hit/Miss Test
  IMMU Hit/Miss Test
  DMMU Little Endian Test
  IU ASI Access Test
  FPU ASI Access Test
  Ecache Thrash Test
All CPU Error Reporting Tests
  CPU Data Access Trap Test
  CPU Addr Align Trap Test
  DMMU Access Priv Page Test
  DMMU Write Protected Page Test
All Advanced Sabre IOMMU Tests
  Init Sabre
  Consist DMA Rd, IOMMU miss Ebus Test
  Consist DMA Rd, IOMMU hit Ebus Test
  Consist DMA Wr, IOMMU miss Ebus Test
  Consist DMA Wr, IOMMU hit Ebus Test
  Pass-Thru DMA Rd, Ebus device Test
  Pass-Thru DMA Wr, Ebus device Test
  Consist DMA Rd, IOMMU LRU Lock Ebus Test
  Consist DMA Wr, IOMMU LRU Locked Ebus Test
All Basic Cheerio Tests
  Cheerio Ebus PCI Config Space Test
  Cheerio Ethernet PCI Config Space Test
  Cheerio Init
All Sabre IOMMU Error Reporting Tests
  Init Sabre
  PIO Read, Master Abort Test
  PIO Read, Target Abort Test

Status of this POST run:PASS
manufacturing mode=OFF
Time Stamp [hour:min:sec] 00:02:01 [month/date year] 08/22 1997

Power On Selftest Completed
Software Power ON0.0000.0000.0000 ffff.ffff.f00b.4100
0002.3333.0200.001b

@(#) Sun Ultra 5/10 UPA/PCI 3.9 P2.1 Version 9 created 1997/08/
05 16:24
Clearing E$ Tags Done
Clearing I/D TLBs Done
```

CODE EXAMPLE 3-1 diag-level Variable Set to max (Continued)

```
Power On Selftest Completed
Probing Memory Done
MEM BASE = 0000.0000.0000.0000
MEM SIZE = 0000.0000.1000.0000
11-Column Mode Enabled
MMUs ON
Copy Done
PC = 0000.01ff.f000.20ec
PC = 0000.0000.0000.2130
Decompressing into Memory Done
Size = 0000.0000.0007.5300
ttya initialized
Reset Control: BXIR:0 BPOR:0 SXIR:0 SPOR:1 POR:0
UltraSPARC-III 2-2 module
Probing Memory Bank #0 128 + 128 : 256 Megabytes
Probing Memory Bank #2 0 + 0 : 0 Megabytes
Probing Floppy: drive detected on ID0
Probing EBUS SUNW,CS4231
Probing UPA Slot at 1e,0 SUNW,ffb
Probing /pci@1f,0/pci@1,1 at Device 2 SUNW,m64B
Probing /pci@1f,0/pci@1,1 at Device 3 ide disk cdrom
Probing /pci@1f,0/pci@1 at Device 1 Nothing there
Probing /pci@1f,0/pci@1 at Device 2 Nothing there
Probing /pci@1f,0/pci@1 at Device 3 Nothing there
Probing /pci@1f,0/pci@1 at Device 4 Nothing there
Reset Control: BXIR:0 BPOR:0 SXIR:0 SPOR:1 POR:0
UltraSPARC-III 2-2 module
Probing Memory Bank #0 128 + 128 : 256 Megabytes
Probing Memory Bank #2 0 + 0 : 0 Megabytes
Probing Floppy: drive detected on ID0
Probing EBUS SUNW,CS4231
Probing UPA Slot at 1e,0 SUNW,ffb
Probing /pci@1f,0/pci@1,1 at Device 2 SUNW,m64B
Probing /pci@1f,0/pci@1,1 at Device 3 ide disk cdrom
Probing /pci@1f,0/pci@1 at Device 1 Nothing there
Probing /pci@1f,0/pci@1 at Device 2 Nothing there
Probing /pci@1f,0/pci@1 at Device 3 Nothing there
Probing /pci@1f,0/pci@1 at Device 4 Nothing there

Sun Ultra 5/10 UPA/PCI (UltraSPARC-III 300MHz), No Keyboard
OpenBoot 3.9 P2.1 , 256 MB memory installed, Serial #9337477.
Ethernet address 8:0:20:8e:7a:85, Host ID: 808e7a85.
```

CODE EXAMPLE 3-1 diag-level Variable Set to max (Continued)

```
Power On Selftest Completed  
  
ok
```

3.4.2 diag-level Variable Set to min

When the `diag-level` variable is set to `min`, POST enables an abbreviated set of diagnostic-level tests. This mode requires approximately 1 minute to complete (with 128 Mbytes of DIMM installed). The following code example identifies a serial port A POST output with the `diag-level` NVRAM variable set to `min`.

Note – Video output is disabled while POST is initialized.

CODE EXAMPLE 3-2 diag-level Variable Set to min

```
@(#) Sun Ultra 5/10 UPA/PCI 3.9 P2.1 Version 9 created 1997/08/  
05 16:24  
Probing keyboard Done  
%o0 = 0000.0000.0000.2001  
  
Executing Power On SelfTest  
  
@(#) Sun Ultra 5/10 (Darwin) POST 2.1.1 (Build No. 293) 08/21/97:  
15:59  
  
CPU: UltraSPARC-LC (MHz: 301 Ecache Size: 512KB)  
  
Init POST BSS  
  Init System BSS  
NVRAM  
  NVRAM Battery Detect Test  
  NVRAM Scratch Addr Test  
  NVRAM Scratch Data Test  
DMMU TLB Tags  
  DMMU TLB Tag Access Test  
DMMU TLB RAM  
  DMMU TLB RAM Access Test  
Probe Ecache  
  Probe Ecache  
Ecache Tests  
  Ecache RAM Addr Test
```

CODE EXAMPLE 3-2 diag-level Variable Set to min (Continued)

```
@(#) Sun Ultra 5/10 UPA/PCI 3.9 P2.1 Version 9 created 1997/08/
05 16:24
  Ecache Tag Addr Test
All CPU Basic Tests
  V9 Instruction Test
  CPU Soft Trap Test
  CPU Softint Reg and Int Test
All Basic MMU Tests
  DMMU Primary Context Reg Test
  DMMU Secondary Context Reg Test
  DMMU TSB Reg Test
  DMMU Tag Access Reg Test
  IMMU TSB Reg Test
  IMMU Tag Access Reg Test
All Basic Cache Tests
  Dcache RAM Test
  Icache RAM Test
Sabre MCU Control & Status Regs Init and Tests
  Init Sabre MCU Control & Status Regs
  Initializing SC registers in SabreIO
Memory Probe and Init
  Probe Memory
  INFO:    256MB Bank 0
  bank 2:  0MB
frequency = 301, refvalue = 146, no_of_banks = 1
INFO: MC0 = 0x00000000.80001192, MC1 = 0x00000000.0c4aab14
  Malloc Post Memory
  Memory Addr w/ Ecache
  Load Post In Memory
  Run POST from MEM
  .....
loaded POST in memory
  Map PROM/STACK/NVRAM in DMMU
  Update Master Stack/Frame Pointers
All FPU Basic Tests
  FPU Regs Test
  FPU Move Regs Test
UPA Data Bus Line Test
Memory Tests
  Init Memory
  INFO:    256MB at bank 0 stack 0 (2 dimms per bank)
  .....
  .....
  .....
  INFO:    0MB at bank 0 stack 1
  INFO:    0MB at bank 2 stack 0
```

CODE EXAMPLE 3-2 diag-level Variable Set to min (Continued)

```
@(#) Sun Ultra 5/10 UPA/PCI 3.9 P2.1 Version 9 created 1997/08/
05 16:24
INFO:      OMB at bank 2 stack 1
ECC Memory Addr Test
INFO:      256MB at bank 0 stack 0 (2 dimms per bank)
INFO:      OMB at bank 0 stack 1
INFO:      OMB at bank 2 stack 0
INFO:      OMB at bank 2 stack 1
All Basic Sabre MMU Tests
Init Sabre
Interrupt Map (short) Reg Test
Interrupt Set/Clr Reg Test
Sabre IOMMU Regs Test
Sabre IOMMU RAM Address Test
Sabre IOMMU CAM Address Test
PBMA PCI Config Space Regs Test
PBMA Control/Status Reg Test
PBMA Diag Reg Test
Sabre IO Regs Test
All Advanced CPU Tests
IU ASI Access Test
FPU ASI Access Test
All CPU Error Reporting Tests
CPU Data Access Trap Test
CPU Addr Align Trap Test
DMMU Access Priv Page Test
DMMU Write Protected Page Test
All Advanced Sabre IOMMU Tests
Init Sabre
Consist DMA Rd, IOMMU miss Ebus Test
All Basic Cheerio Tests
Cheerio Ebus PCI Config Space Test
Cheerio Ethernet PCI Config Space Test
Cheerio Init
All Sabre IOMMU Error Reporting Tests
Init Sabre
PIO Read, Master Abort Test
PIO Read, Target Abort Test

Status of this POST run:PASS
manufacturing mode=OFF
Time Stamp [hour:min:sec] 00:10:33 [month/date year] 08/22 1997
```

CODE EXAMPLE 3-2 diag-level Variable Set to min (Continued)

```
@(#) Sun Ultra 5/10 UPA/PCI 3.9 P2.1 Version 9 created 1997/08/
05 16:24
Power On Selftest Completed
Software Power ON0.0000.0000.0000 ffff.ffff.f00b.4100
0002.3333.0200.001b

@(#) Sun Ultra 5/10 UPA/PCI 3.9 P2.1 Version 9 created 1997/08/
05 16:24
Clearing E$ Tags Done
Clearing I/D TLBs Done
Probing Memory Done
MEM BASE = 0000.0000.0000.0000
MEM SIZE = 0000.0000.1000.0000
11-Column Mode Enabled
MMUs ON
Copy Done
PC = 0000.01ff.f000.20ec
PC = 0000.0000.0000.2130
Decompressing into Memory Done
Size = 0000.0000.0007.5300
ttya initialized
Reset Control: BXIR:0 BPOR:0 SXIR:0 SPOR:1 POR:0
UltraSPARC-IIIi 2-2 module
Probing Memory Bank #0 128 + 128 : 256 Megabytes
Probing Memory Bank #2 0 + 0 : 0 Megabytes
Probing Floppy: drive detected on ID0
Probing EBUS SUNW,CS4231
Probing UPA Slot at 1e,0 SUNW,ffb
Probing /pci@1f,0/pci@1,1 at Device 2 SUNW,m64B
Probing /pci@1f,0/pci@1,1 at Device 3 ide disk cdrom
Probing /pci@1f,0/pci@1 at Device 1 Nothing there
Probing /pci@1f,0/pci@1 at Device 2 Nothing there
Probing /pci@1f,0/pci@1 at Device 3 Nothing there
Probing /pci@1f,0/pci@1 at Device 4 Nothing there
Reset Control: BXIR:0 BPOR:0 SXIR:0 SPOR:1 POR:0
UltraSPARC-IIIi 2-2 module
Probing Memory Bank #0 128 + 128 : 256 Megabytes
Probing Memory Bank #2 0 + 0 : 0 Megabytes
Probing Floppy: drive detected on ID0
Probing EBUS SUNW,CS4231
Probing UPA Slot at 1e,0 SUNW,ffb
Probing /pci@1f,0/pci@1,1 at Device 2 SUNW,m64B
Probing /pci@1f,0/pci@1,1 at Device 3 ide disk cdrom
Probing /pci@1f,0/pci@1 at Device 1 Nothing there
Probing /pci@1f,0/pci@1 at Device 2 Nothing there
Probing /pci@1f,0/pci@1 at Device 3 Nothing there
Probing /pci@1f,0/pci@1 at Device 4 Nothing there
```

CODE EXAMPLE 3-2 diag-level Variable Set to min (Continued)

```
@(#) Sun Ultra 5/10 UPA/PCI 3.9 P2.1 Version 9 created 1997/08/
05 16:24

Sun Ultra 5/10 UPA/PCI (UltraSPARC-IIIi 300MHz), No Keyboard
OpenBoot 3.9 P2.1 , 256 MB memory installed, Serial #9337477.
Ethernet address 8:0:20:8e:7a:85, Host ID: 808e7a85.

ok
```

3.4.3 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. The following code example identifies the typical appearance of an error message. If a keyboard error code is displayed, determine the meaning of the error code by using TABLE 3-2 on page 21.

Note – The system does not automatically boot if a POST error occurs; it halts at the ok prompt to indicate a failure.

CODE EXAMPLE 3-3 Typical Error Code Failure Message

```
@(#) Sun Ultra 5/10 UPA/PCI 3.9 P2.1 Version 9 created 1997/08/
05 16:24
Probing keyboard Done
%o0 = 0000.0000.0000.2001
```

CODE EXAMPLE 3-3 Typical Error Code Failure Message (Continued)

```
@(#) Sun Ultra 5/10 UPA/PCI 3.9 P2.1 Version 9 created 1997/08/
05 16:24
Executing Power On SelfTest

@(#) Sun Ultra 5/10 (Darwin) POST 2.1.1 (Build No. 293) 08/21/97:
15:59

CPU: UltraSPARC-LC (MHz: 301 Ecache Size: 512KB)

Init POST BSS
    Init System BSS
NVRAM
    NVRAM Battery Detect Test
    NVRAM Scratch Addr Test
    NVRAM Scratch Data Test
DMMU TLB Tags
    DMMU TLB Tag Access Test
DMMU TLB RAM
    DMMU TLB RAM Access Test
Probe Ecache
    Probe Ecache
Ecache Tests
    Ecache RAM Addr Test
    Ecache Tag Addr Test
All CPU Basic Tests
    V9 Instruction Test
    CPU Soft Trap Test
    CPU Softint Reg and Int Test
All Basic MMU Tests
    DMMU Primary Context Reg Test
    DMMU Secondary Context Reg Test
    DMMU TSB Reg Test
    DMMU Tag Access Reg Test
    IMMU TSB Reg Test
    IMMU Tag Access Reg Test
All Basic Cache Tests
    Dcache RAM Test
    Icache RAM Test
Sabre MCU Control & Status Regs Init and Tests
    Init Sabre MCU Control & Status Regs
    Initializing SC registers in SabreIO
Memory Probe and Init
    Probe Memory
    INFO: All the memory banks in 10 bit column mode
    INFO:      32MB Bank 0
frequency = 301, refvalue = 73, no_of_banks = 2
```

CODE EXAMPLE 3-3 Typical Error Code Failure Message (Continued)

```
@(#) Sun Ultra 5/10 UPA/PCI 3.9 P2.1 Version 9 created 1997/08/
05 16:24
INFO: MCO = 0x00000000.80000549, MC1 = 0x00000000.0c4aab14
    Malloc Post Memory
    Memory Addr w/ Ecache
    Load Post In Memory
    Run POST from MEM
    .....
loaded POST in memory
    Map PROM/STACK/NVRAM in DMMU
    Update Master Stack/Frame Pointers
All FPU Basic Tests
    FPU Regs Test
    FPU Move Regs Test
UPA Data Bus Line Test
Memory Tests
    Init Memory
    INFO:      32MB at bank 0 stack 0 (2 dimms per bank)
    .....
    INFO:      0MB at bank 0 stack 1
    ERROR:    DIMM Undetected on some sockets on the board!
    ERROR:    DIMM Undetected on some sockets on the board!
    ECC Memory Addr Test
    INFO:      32MB at bank 0 stack 0 (2 dimms per bank)
    INFO:      0MB at bank 0 stack 1
    ERROR:    DIMM Undetected on some sockets on the board!
    ERROR:    DIMM Undetected on some sockets on the board!
```

TABLE 3-2 Keyboard LED Patterns

Caps Lock	Compose	Scroll Lock	Num Lock	Bit Value	Meaning of Pattern
Blink	Off	Off	Off	x000(2)	POST in progress
Off	Off	Off	Off	0000(2)	POST successfully completed
On	Off	Off	On	1001(2)	System board failed
On	Off	On	Off	1010(2)	No memory found
On	Off	On	On	1011(2)	Reserved
On	On	Off	Off	1100(2)	Reserved

TABLE 3-2 Keyboard LED Patterns *(Continued)*

Caps Lock	Compose	Scroll Lock	Num Lock	Bit Value	Meaning of Pattern
On	On	Off	On	1101(2)	Reserved
On	On	On	Off	1110(2)	Bad CPU
On	On	On	On	1111(2)	Reserved

3.5 Bypassing POST

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

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

3.6 Additional Keyboard Control Commands

Stop Key

If the `diag-level` is set to either `max` or `min` and the `diag-level 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.

Note – Press and hold the Stop key for approximately 5 seconds.

Stop and N Keys

To set the system NVRAM parameters 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 displays on the monitor.

3.7 System and Keyboard LEDs

The power light-emitting diode (LED), located at the chassis front, remains lighted when the system is operating normally. FIGURE 1-3 or FIGURE 1-5 shows the location of the power LED.

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 off and the system will return to the OpenBoot PROM (OBP). TABLE 3-2 on page 21 defines the keyboard LED patterns. FIGURE 3-2 on page 5 shows the location of the LED keys on the keyboard.

3.8 Initializing Motherboard POST

To initialize the motherboard POST:

1. **Power off the system unit.**
2. **At the keyboard, simultaneously press and hold the Stop and D keys and press the Standby key.**

Note – Video output is disabled while POST is initialized.

Note – To view the POST output results, a tip connection must be set up. See Section 3.2.1 “Setting Up a Tip Connection” on page 3-2.

3. **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 POST.**
4. **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 3.7 “System and Keyboard LEDs” on page 3-24.
5. **If the Caps Lock key LED fails to flash after the Stop and D keys are pressed, POST has failed.**
See Section 3.7 “System and Keyboard LEDs” on page 3-24.

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

- 6. Before replacing the motherboard, remove any optional components, such as PCI cards and memory, and repeat the POST.**

Note – Non-optional components such as DIMMs, the motherboard, 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.

- 7. 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 hardware problems and includes suggested corrective actions.

This chapter contains the following topics:

- Section 4.1 “Power-On Failure” on page 4-1
- Section 4.2 “Video Output Failure” on page 4-2
- Section 4.3 “Hard Drive or CD-ROM Drive Failure” on page 4-3
- Section 4.4 “Power Supply Test” on page 4-4
- Section 4.5 “DIMM Failure” on page 4-7
- Section 4.6 “OpenBoot PROM On-Board Diagnostics” on page 4-7
- Section 4.7 “OpenBoot Diagnostics” on page 4-12

4.1 Power-On Failure

This section provides examples of power-on failure symptoms and suggested actions.

Symptom

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

Action

Check the keyboard connection. Ensure that the keyboard is properly connected to the system unit. 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

power on/off switch is set to on. Verify that the wall receptacle is supplying AC power to the system unit. Check the voltage select switch. Verify that the voltage select switch is set properly.

Press the front panel standby switch. If the system unit 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 standby key again. If the system unit powers on, no further action is required. If the system unit does not power on, the CPU module may not be properly seated. Inspect the CPU module for proper seating. 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 standby key.

If the wall receptacle AC power has been verified, the CPU module is properly seated, and a spare Sun Type-5 keyboard has been connected to the system unit and the standby key has been pressed but 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 on but does not boot or initialize the monitor.

Action

Press the keyboard standby key and watch the keyboard. The keyboard LEDs should light briefly and a tone from the keyboard should be heard. If a tone is not heard 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 a keyboard tone is heard and the keyboard LEDs light briefly but the system unit still fails to initialize, see Section 3.8 "Initializing Motherboard POST" on page 3-24.

4.2 Video Output Failure

This section provides video output failure symptoms and suggested action.

Symptom

The video does not display 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 UPA graphics card output port (Ultra 10 only) or the video

output connector at the rear of the system unit. Check that the CPU module is properly seated. If the AC connection to the monitor is correct, the video cable is correctly connected, and the CPU module is properly seated, the system monitor, UPA graphics card, or motherboard video chip may be defective.

4.3 Hard Drive or CD-ROM Drive Failure

This section provides hard drive and CD-ROM drive failure symptoms and suggested actions.

Symptom

A hard 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 application.

Action

Replace the drive indicated by the failure message. The operating system identifies the internal drives as identified in the following table.

TABLE 4-1 Internal Drives Identification

Operating System Address	Drive Physical Location and Target
c0t0d0s#	Hard drive (Ultra 5) or rear hard drive (Ultra 10), target 0
c0t1d0s#	Front hard disk (Ultra 10), target 1
c0t6d0s#	CD-ROM drive, target 6 (optional)

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

Symptom

Hard drive or CD-ROM drive fails to respond to commands.

Action

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

Note – To bypass POST, type `setenv diag-switch? false` at the `ok` prompt.

At the system `ok` prompt:

```
ok% reset-all
ok% probe-ide
```

If the hard drive responds correctly to `probe-ide` command, the message identified in CODE EXAMPLE 4-4 is displayed. If the drive responds and a message is displayed, the system EIDE controller has successfully probed the device. This is an indication that the motherboard is operating correctly. If an optional hard drive is installed (Ultra 10 only) and one drive does not respond to the EIDE controller probe but the other does, replace the unresponsive drive. If the `probe-ide` test fails to show the device in the message, replace the drive (see Section 9.1 “Diskette Drive” on page 9-1). If replacing the hard drive does not correct the problem, replace the motherboard.

4.4 Power Supply Test

The section describes how to test the power supply. FIGURE 4-1 and TABLE 4-2 identify power supply connector J17. FIGURE 4-2 and TABLE 4-3 identify power supply connector J20.

1. Power off the system unit.

See Section 6.2 “Powering Off the System Unit” on page 6-4.

2. Remove the top cover.

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

3. Remove the PCI card from riser board connector 2 (adjacent to power supply), if necessary. Disconnect the ribbon cables from motherboard to expose connectors J17 and J20 (J20 is used in Ultra 10 only).

4. Power on the system unit.

5. Using a digital voltage meter (DVM), check the power supply output voltages as follows:

Note – Power supply connectors J17 and J20 must remain connected to the motherboard.

- a. With the negative probe of the DVM placed on a connector ground (Gnd) pin, position the positive probe on each power pin.
 - b. Verify voltage and signal availability as listed in TABLE 4-2 and TABLE 4-3.
6. If any power pin signal is not present with the power supply active and properly connected to the motherboard, replace the power supply.

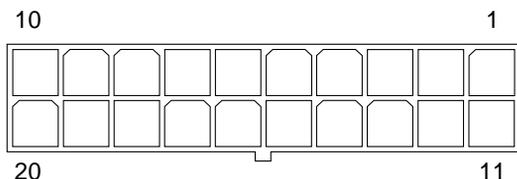


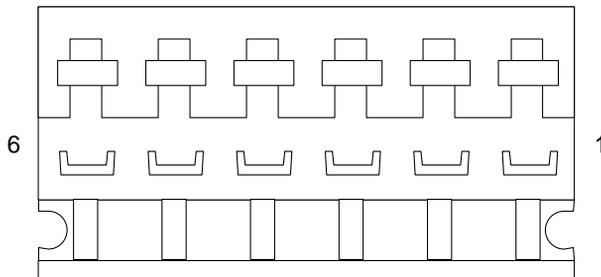
FIGURE 4-1 Power Supply Connector J17 Pin Configuration

TABLE 4-2 Power Supply Connector J17 Pin Assignments

Pin	Signal	Description
1	+3.3V	+3.3 VDC
2	+3.3V	+3.3 VDC
3	Gnd	Chassis ground
4	+5V	+5 VDC
5	Gnd	Chassis ground
6	+5V	+5 VDC
7	Gnd	Chassis ground
8	PWR_OK	Power okay
9	5VSB	
10	+12V	+12 VDC
11	+3.3V	+3.3 VDC
12	-12V	-12 VDC
13	Gnd	Chassis ground
14	PS_ON	Power supply on

TABLE 4-2 Power Supply Connector J17 Pin Assignments (*Continued*)

Pin	Signal	Description
15	Gnd	Chassis ground
16	Gnd	Chassis ground
17	Gnd	Chassis ground
18	-5V	-5 VDC
19	+5V	+5 VDC
20	+5V	+5 VDC

**FIGURE 4-2** Power Supply Connector J20 Pin Configuration (Ultra 10 only)**TABLE 4-3** Power Supply Connector J20 Pin Assignments

Pin	Signal	Description
1	Gnd	Chassis ground
2	Gnd	Chassis ground
3	SEN_COM	Sense common
4	SEN_+3.3V	Sense 3.3 VDC
5	+3.3V	+3.3 VDC
6	+3.3V	+3.3 VDC

4.5 DIMM Failure

At times, the operating system, diagnostic program, or POST may not display a DIMM 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). The following table lists physical memory addresses to locate a defective DIMM.

TABLE 4-4 DIMM Physical Memory Address

DIMM Slot	DIMM Pair (non-interleave)
DIMM0 DIMM1	00000000 - 0ffffff
DIMM2 DIMM3	10000000 - 1ffffff

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:

- Section 4.6.1 “Watch-Clock Diagnostic” on page 4-7
- Section 4.6.2 “Watch-Net and Watch-Net-All Diagnostics” on page 4-8
- Section 4.6.3 “Probe-IDE Diagnostic” on page 4-9
- Section 4.6.4 “Test alias name, device path, -All Diagnostic” on page 4-10
- Section 4.6.5 “UPA Graphics Card (Ultra 10 Only)” on page 4-11

4.6.1 Watch-Clock Diagnostic

The watch-clock diagnostic 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. The watch-clock diagnostic is initialized by typing the `watch-clock` command at the `ok` prompt. The following code example identifies the watch-clock diagnostic output message.

CODE EXAMPLE 4-1 Watch-Clock Diagnostic Output Message

```
ok watch-clock
Watching the 'seconds' register of the real time clock chip.
It should be 'ticking' once a second.
Type any key to stop.
49
ok
```

4.6.2 Watch-Net and Watch-Net-All Diagnostics

The watch-net and watch-net-all diagnostics monitor Ethernet packets on the Ethernet interfaces 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. The watch-net diagnostic is initialized by typing the `watch-net` command at the `ok` prompt and the watch-net-all diagnostic is initialized by typing the `watch-net-all` command at the `ok` prompt. The following code example identifies the watch-net diagnostic output message. CODE EXAMPLE 4-3 identifies the watch-net-all diagnostic output message.

CODE EXAMPLE 4-2 Watch-Net Diagnostic Output Message

```
ok watch-net
Hme register test --- succeeded.
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.
.....
.....
.....
.....
.....
ok
```


4.6.4 Test *alias name*, *device path*, -All Diagnostic

The test diagnostic, when combined with a device alias or device path, enables a device self-test diagnostic 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, type the `test` command followed by the device alias or device path name.

The following code example identifies the test diagnostic output message. Test diagnostics are initialized by typing the `test alias name` or `test device path` command at the `ok` prompt. TABLE 4-5 lists the types of tests that can be used, a brief description of each test, and preparation.

Note – The diskette drive (floppy) is selected as the test alias name example.

CODE EXAMPLE 4-5 Test Diagnostic Output Message

```
ok test floppy

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

ok
```

TABLE 4-5 Selected OBP On-Board Diagnostic Tests

Type of Test	Description	Preparation
<code>test screen</code>	Tests system video graphics hardware and monitor	<code>Diag-switch?</code> NVRAM parameter must be true for the test to execute.
<code>test floppy</code>	Tests diskette drive response to commands	A formatted diskette must be inserted into the diskette drive.
<code>test net</code>	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.

TABLE 4-5 Selected OBP On-Board Diagnostic Tests (Continued)

Type of Test	Description	Preparation
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 UPA Graphics Card (Ultra 10 Only)

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

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

To initialize the UPA graphics card diagnostic:

1. At the `ok` prompt, type:

```
ok% setenv diag-switch? true
diag-switch? = true
ok% setenv diag-switch? true
```

2. At the `ok` prompt, type:

```
ok% test screen
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
FFB Frame Buffer functional test passed
ok%
```

3. When the UPA graphics card on-board diagnostics are completed, type:

```
ok% setenv diag-switch? false
diag-switch? = false
```

4.7 OpenBoot Diagnostics

The OpenBoot diagnostic (OBDiag) is a menu-driven diagnostic tool that verifies:

- Internal I/O system
- Ethernet
- Keyboard
- Mouse
- Diskette drive (floppy)
- Parallel port
- Serial ports
- NVRAM
- Audio
- EIDE
- Video

OBDiag performs root-cause failure analysis on the referenced devices by testing internal registers, confirming subsystem integrity, and verifying device functionality.

Note – The OBDiag test result data captured in the following code examples represent the test result data that is output when the system being tested is connected to a remote shell window through a `tip` connection. When the system being tested is tested in a stand-alone configuration, the test result data may differ.

4.7.1 Starting the OBDiag Menu

1. At the `ok` prompt, type:

```
ok% setenv mfg-mode on
mfg-mode = on
```

2. At the ok prompt, type:

```
ok% setenv diag-switch? true
diag-switch? = true
```

3. At the ok prompt, type:

```
ok% setenv auto-boot? false
auto-boot? = false
```

4. At the ok prompt, type:

```
ok% reset-all
```

5. Verify that the platform resets (CODE EXAMPLE 4-6).

CODE EXAMPLE 4-6 Reset Verification

```
ok setenv mfg-mode on
mfg-mode = on
ok setenv diag-switch? true
diag-switch? = true
ok setenv auto-boot? false
auto-boot? = false
ok reset-all
Resetting...

Software Power ON

@(#) Sun Ultra 5/10 UPA/PCI 3.11 Version 9 created 1998/03/06
10:31
Clearing E$ Tags Done
Clearing I/D TLBs Done
Probing Memory Done
MEM BASE = 0000.0000.2000.0000
MEM SIZE = 0000.0000.1000.0000
11-Column Mode Enabled
MMUs ON
Copy Done
PC = 0000.01ff.f000.1ffc
PC = 0000.0000.0000.2040
Decompressing into Memory Done
Size = 0000.0000.0006.e160
```

CODE EXAMPLE 4-6 Reset Verification (Continued)

```
ttya initialized
Reset Control: BXIR:0 BPOR:0 SXIR:0 SPOR:1 POR:0
UltraSPARC-III 2-2 module
Probing Memory Bank #0 256 + 256: 512 Megabytes
Probing Memory Bank #2  0 +  0:  0 Megabytes
Probing UPA Slot at 1e,0 SUNW,ffb

Probing /pci@1f,0/pci@1,1 at Device 1 pci108e,1000 network
Probing /pci@1f,0/pci@1,1 at Device 2 SUNW,m64B
Probing /pci@1f,0/pci@1,1 at Device 3 ide disk cdrom
Probing /pci@1f,0/pci@1 at Device 1 pci
Probing /pci@1f,0/pci@1/pci@1 at Device 0 pci108e,1000 SUNW,hme
Probing /pci@1f,0/pci@1/pci@1 at Device 1 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device 2 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device 3 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device 4 SUNW,isptwo sd st
Probing /pci@1f,0/pci@1/pci@1 at Device 5 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device 6 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device 7 Nothing there

Probing /pci@1f,0/pci@1/pci@1 at Device 8 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device 9 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device a Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device b Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device c Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device d Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device e Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device f Nothing there

Probing /pci@1f,0/pci@1 at Device 2 Nothing there
Probing /pci@1f,0/pci@1 at Device 3 Nothing there
Probing /pci@1f,0/pci@1 at Device 4 Nothing there
Reset Control: BXIR:0 BPOR:0 SXIR:0 SPOR:1 POR:0
UltraSPARC-III 2-2 module
Probing Memory Bank #0 256 + 256: 512 Megabytes
Probing Memory Bank #2  0 +  0:  0 Megabytes
Probing UPA Slot at 1e,0 SUNW,ffb
Probing /pci@1f,0/pci@1,1 at Device 1 pci108e,1000 network
Probing /pci@1f,0/pci@1,1 at Device 2 SUNW,m64B
Probing /pci@1f,0/pci@1,1 at Device 3 ide disk cdrom
Probing /pci@1f,0/pci@1 at Device 1 pci
Probing /pci@1f,0/pci@1/pci@1 at Device 0 pci108e,1000 SUNW,hme
Probing /pci@1f,0/pci@1/pci@1 at Device 1 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device 2 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device 3 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device 4 SUNW,isptwo sd st
Probing /pci@1f,0/pci@1/pci@1 at Device 5 Nothing there
```

CODE EXAMPLE 4-6 Reset Verification (Continued)

```
Probing /pci@1f,0/pci@1/pci@1 at Device 6 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device 7 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device 8 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device 9 Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device a Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device b Nothing there

Probing /pci@1f,0/pci@1/pci@1 at Device c Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device d Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device e Nothing there
Probing /pci@1f,0/pci@1/pci@1 at Device f Nothing there

Probing /pci@1f,0/pci@1 at Device 2 Nothing there
Probing /pci@1f,0/pci@1 at Device 3 Nothing there
Probing /pci@1f,0/pci@1 at Device 4 Nothing there

Sun Ultra 5/10 UPA/PCI (UltraSPARC-IIIi 300MHz), No Keyboard
OpenBoot 3.11, 512 MB memory installed, Serial #9337777.
Ethernet address 8:0:20:8e:7b:b1, Host ID: 808e7bb1.

ok
```

6. At the **ok** prompt, type **obdiag**. Verify that the **OBDiag** menu is displayed (CODE EXAMPLE 4-7).
7. At the **OBDiag** menu prompt, type **16** to enable toggle script-debug messages.

Note – Enabling the toggle script-debug messages allow verbose test message displays.

8. At the **OBDiag** menu prompt, type **18** to disable external loopback test.

CODE EXAMPLE 4-7 OBDiag Menu

```
ok obdiag
stdin: fffe2008
stdout: fffe2010
loading code into: /pci@1f,0/pci@1,1/ebus@1
loading code into: /pci@1f,0/pci@1,1/ebus@1/eprom@14,0
loading code into: /pci@1f,0/pci@1,1/ebus@1/ecpp@14,3043bc
loading code into: /pci@1f,0/pci@1,1/ebus@1/su@14,3062f8
loading code into: /pci@1f,0/pci@1,1/ebus@1/se@14,400000
loading code into: /pci@1f,0/pci@1,1/network@1,1
loading code into: /pci@1f,0/pci@1,1/ebus@1/fdthree@14,3023f0
```

CODE EXAMPLE 4-7 OBDiag Menu (Continued)

```
loading code into: /pci@1f,0/pci@1,1/ibus@1/
SUNW,CS4231@14,200000
loading code into: /pci@1f,0/pci@1,1/ide@3
loading code into: /pci@1f,0/pci@1,1/ide@3/disk
loading code into: /pci@1f,0/pci@1,1/ide@3/cdrom
loading code into: /pci@1f,0/pci@1,1/SUNW,m64B@2
Debugging enabled
```

OBDiag Menu

```
0..... PCI/Cheerio
1..... EBUS DMA/TCR Registers
2..... Ethernet
3..... Keyboard
4..... Mouse
5..... Floppy
6..... Parallel Port
7..... Serial Port A
8..... Serial Port B
9..... NVRAM
10..... Audio
11..... EIDE
12..... Video
13..... All Above
14..... Quit
15..... Display this Menu
16..... Toggle script-debug
17..... Enable External Loopback Tests
18..... Disable External Loopback Tests

Enter (0-13 tests, 14 -Quit, 15 -Menu) ==>
```

4.7.2 OBDiags

The OBDiags are described in the following sections:

- Section 4.7.2.1 “PCI/PCIO” on page 4-17
- Section 4.7.2.2 “EBus DMA/TCR Registers” on page 4-19
- Section 4.7.2.3 “Ethernet” on page 4-19
- Section 4.7.2.4 “Keyboard” on page 4-20
- Section 4.7.2.5 “Mouse” on page 4-21
- Section 4.7.2.6 “Floppy” on page 4-21
- Section 4.7.2.7 “Parallel Port” on page 4-22
- Section 4.7.2.8 “Serial Port A” on page 4-22
- Section 4.7.2.9 “Serial Port B” on page 4-24

- Section 4.7.2.10 “NVRAM” on page 4-25
- Section 4.7.2.11 “Audio” on page 4-25
- Section 4.7.2.12 “EIDE” on page 4-26
- Section 4.7.2.13 “Video” on page 4-26
- Section 4.7.2.14 “All Above” on page 4-27

4.7.2.1 PCI/PCIO

The PCI/PCIO diagnostic performs the following:

1. `vendor_id_test` – Verifies the PCIO ASIC vendor ID is 108e.
2. `device_id_test` – Verifies the PCIO ASIC device ID is 1000.
3. `mixmode_read` – Verifies the PCI configuration space is accessible as half-word bytes by reading the EBus2 vendor ID address.
4. `e2_class_test` – Verifies the address class code. Address class codes include bridge device (0 x B, 0 x 6), other bridge device (0 x A and 0 x 80), and programmable interface (0 x 9 and 0 x 0).
5. `status_reg_walk1` – Performs walk-one test on status register with mask 0 x 280 (PCIO ASIC is accepting fast back-to-back transactions, DEVSEL timing is 0 x 1).
6. `line_size_walk1` – Performs tests a through e. `latency_walk1` – Performs walk one test on latency timer.
7. `line_walk1` – Performs walk one test on interrupt line.
8. `pin_test` – Verifies interrupt pin is logic-level high (1) after reset.

The following code example identifies the PCI/PCIO output message.

CODE EXAMPLE 4-8 PCI/PCIO Output Message

```

Enter (0-12 tests, 13 -Quit, 14 -Menu) ==> 0

TEST='all_pci/PCIO_test'
SUBTEST='vendor_id_test'
SUBTEST='device_id_test'
SUBTEST='mixmode_read'
SUBTEST='e2_class_test'
SUBTEST='status_reg_walk1'
SUBTEST='line_size_walk1'
SUBTEST='latency_walk1'
SUBTEST='line_walk1'

```

CODE EXAMPLE 4-8 PCI/PCIO Output Message *(Continued)*

```
SUBTEST='pin_test'  
Enter (0-12 tests, 13 -Quit, 14 -Menu) ===>
```

4.7.2.2 EBus DMA/TCR Registers

The EBus DMA/TCR registers diagnostic performs the following:

1. `dma_reg_test` - Performs a walking ones bit test for control status register, address register, and byte count register of each channel. Verifies that the control status register is set properly.
2. `dma_func_test` - Validates the DMA capabilities and FIFOs. Test is executed in a DMA diagnostic loopback mode. Initializes the data of transmitting memory with its address, performs a DMA read and write, and verifies that the data received is correct. Repeats for four channels.

The following code example identifies the EBus DMA/TCR registers output message.

CODE EXAMPLE 4-9 EBus DMA/TCR Registers Output Message

```
Enter (0-12 tests, 13 -Quit, 14 -Menu) ===> 1

TEST='all_dma/ebus_test'
SUBTEST='dma_reg_test'
SUBTEST='dma_func_test'
Enter (0-12 tests, 13 -Quit, 14 -Menu) ===>
```

4.7.2.3 Ethernet

The Ethernet diagnostic performs the following:

1. `my_channel_reset` - Resets the Ethernet channel.
2. `hme_reg_test` - Performs Walk1 on the following registers set: global register 1, global register 2, bmac xif register, bmac tx register, and the mif register.
3. `MAC_internal_loopback_test` - Performs Ethernet channel engine internal loopback.
4. `10_mb_xcvr_loopback_test` - Enables the 10Base-T data present at the transmit MII data inputs to be routed back to the receive MII data outputs.
5. `100_mb_phy_loopback_test` - Enables MII transmit data to be routed to the MII receive data path.
6. `100_mb_twister_loopback_test` - Forces the twisted-pair transceiver into loopback mode.

The following code example identifies the Ethernet output message.

CODE EXAMPLE 4-10 Ethernet Output Message

```
Enter (0-13 tests, 14 -Quit, 15 -Menu) ==> 2

TEST='ethernet_test'
Using Onboard Transceiver - Link Up.
SUBTEST='my_channel_reset'
SUBTEST='hme_reg_test'
SUBTEST='global_reg1_test'
SUBTEST='global_reg2_test'
SUBTEST='bmac_xif_reg_test'
SUBTEST='bmac_tx_reg_test'
SUBTEST='mif_reg_test'
SUBTEST='mac_internal_loopback_test'
SUBTEST='10mb_xcvr_loopback_test'
SUBTEST='100mb_phy_loopback_test'
SUBTEST='100mb_twister_loopback_test'
Enter (0-13 tests, 14 -Quit, 15 -Menu) ==>
```

4.7.2.4 Keyboard

The keyboard diagnostic consists of an external and internal loopback. The external loopback requires a passive loopback connector. The internal loopback verifies the keyboard port by transmitting and receiving 128 characters.

The following code example identifies the keyboard output message.

CODE EXAMPLE 4-11 Keyboard Output Message

```
setenv Enter (0-13 tests, 14 -Quit, 15 -Menu) ==> 3

TEST='keyboard_test'
SUBTEST='internal_loopback'
Enter (0-13 tests, 14 -Quit, 15 -Menu) ==>
```

4.7.2.5 Mouse

The mouse diagnostic performs a keyboard-to-mouse loopback.

The following code example identifies the mouse output message.

CODE EXAMPLE 4-12 Mouse Output Message

```
Enter (0-12 tests, 13 -Quit, 14 -Menu) ===> 4

TEST='mouse_test'
SUBTEST='mouse_loopback'

###OBDIAG_MFG_START###
TEST='mouse_test'
STATUS='FAILED'
SUBTEST='mouse_loopback'
ERRORS='1 '
TTF='1656 '
SPEED='295.99 MHz'
PASSES='1 '
MESSAGE='Error: Timeout receiving a character'
Enter (0-12 tests, 13 -Quit, 14 -Menu) ===>
```

4.7.2.6 Floppy

The floppy diagnostic verifies the diskette drive controller initialization. It also validates the status of a selected disk drive and reads the diskette drive header.

The following code example identifies the floppy output message.

CODE EXAMPLE 4-13 Floppy Output Message

```
Enter (0-12 tests, 13 -Quit, 14 -Menu) ===> 5

TEST='floppy_test'
SUBTEST='floppy_id0_read_test'
Enter (0-12 tests, 13 -Quit, 14 -Menu) ===>
```

4.7.2.7 Parallel Port

The parallel port diagnostic performs the following:

1. `sio-passive-lb` - Sets up the SuperIO configuration register to enable extended/compatible parallel port select, then does a write 0, walk one, write 0 x ff to the data register. It verifies the results by reading the status register.
2. `dma_read` - Enables ECP mode and ECP DMA configuration, and FIFO test mode. Transfers 16 bytes of data from memory to the parallel port device and then verifies the data is in TFIFO.

The following code example identifies the parallel port output message.

CODE EXAMPLE 4-14 Parallel Port Output Message

```
Enter (0-12 tests, 13 -Quit, 14 -Menu) ==> 6

TEST='parallel_port_test'
SUBTEST='dma_read'
Enter (0-12 tests, 13 -Quit, 14 -Menu) ==>
```

4.7.2.8 Serial Port A

The serial port A diagnostic invokes the `uart_loopback` test. This test transmits and receives 128 characters and checks serial port A transaction validity.

The following code example identifies the serial port A output message.

CODE EXAMPLE 4-15 Serial Port A Output Message

```
Enter (0-12 tests, 13 -Quit, 14 -Menu) ==> 7

TEST='uarta_test'
BAUDRATE='1200'
SUBTEST='internal_loopback'
BAUDRATE='1800'
SUBTEST='internal_loopback'
BAUDRATE='2400'
SUBTEST='internal_loopback'
BAUDRATE='4800'
SUBTEST='internal_loopback'
BAUDRATE='9600'
SUBTEST='internal_loopback'
```

CODE EXAMPLE 4-15 Serial Port A Output Message (*Continued*)

```
BAUDRATE='19200'  
SUBTEST='internal_loopback'  
BAUDRATE='38400'  
SUBTEST='internal_loopback'  
BAUDRATE='57600'  
SUBTEST='internal_loopback'  
BAUDRATE='76800'  
SUBTEST='internal_loopback'  
BAUDRATE='115200'  
SUBTEST='internal_loopback'  
BAUDRATE='153600'  
SUBTEST='internal_loopback'  
BAUDRATE='230400'  
SUBTEST='internal_loopback'  
BAUDRATE='307200'  
SUBTEST='internal_loopback'  
BAUDRATE='460800'  
SUBTEST='internal_loopback'  
Enter (0-12 tests, 13 -Quit, 14 -Menu) ==>
```

Note – The serial port A diagnostic will stall if the TIP line is installed on serial port A. The following code example identifies the serial port A output message when the TIP line is installed on serial port A.

CODE EXAMPLE 4-16 Serial Port A Output Message With TIP Line Installed

```
Enter (0-12 tests, 13 -Quit, 14 -Menu) ==> 7  
  
TEST='uarta_test'  
'UART A in use as console - Test not run.'  
Enter (0-12 tests, 13 -Quit, 14 -Menu) ==>
```

4.7.2.9

Serial Port B

The serial port B diagnostic is identical to the serial port A diagnostic.

The following code example identifies the serial port B output message.

Note – The serial port B diagnostic will stall if the TIP line is installed on serial port B.

CODE EXAMPLE 4-17 Serial Port B Output Message

```
Enter (0-12 tests, 13 -Quit, 14 -Menu) ==> 8

TEST='uartb_test'
BAUDRATE='1200'
SUBTEST='internal_loopback'
BAUDRATE='1800'
SUBTEST='internal_loopback'
BAUDRATE='2400'
SUBTEST='internal_loopback'
BAUDRATE='4800'
SUBTEST='internal_loopback'
BAUDRATE='9600'
SUBTEST='internal_loopback'
BAUDRATE='19200'
SUBTEST='internal_loopback'
BAUDRATE='38400'

SUBTEST='internal_loopback'
BAUDRATE='57600'
SUBTEST='internal_loopback'
BAUDRATE='76800'
SUBTEST='internal_loopback'
BAUDRATE='115200'
SUBTEST='internal_loopback'
BAUDRATE='153600'
SUBTEST='internal_loopback'
BAUDRATE='230400'
SUBTEST='internal_loopback'
BAUDRATE='307200'
SUBTEST='internal_loopback'
BAUDRATE='460800'
SUBTEST='internal_loopback'
Enter (0-12 tests, 13 -Quit, 14 -Menu) ==>
```

4.7.2.10 NVRAM

The NVRAM diagnostic verifies the NVRAM operation by performing a write and read to the NVRAM.

The following code example identifies the NVRAM output message.

CODE EXAMPLE 4-18 NVRAM Output Message

```
Enter (0-12 tests, 13 -Quit, 14 -Menu) ===> 9

TEST='nvram_test'
SUBTEST='write/read_patterns'
SUBTEST='write/read_inverted_patterns'
Enter (0-12 tests, 13 -Quit, 14 -Menu) ===>
```

4.7.2.11 Audio

The audio diagnostic performs the following:

1. cs4231_test – Verifies the cs4231 internal registers.
2. Line-in to line-out external loopback.
3. Microphone to headphone external loopback.

The following code example identifies the audio output message.

CODE EXAMPLE 4-19 Audio Output Message

```
Enter (0-13 tests, 14 -Quit, 15 -Menu) ===> 10

TEST='audio_test'
SUBTEST='cs4231_test'
Codec_ID='8a'
Version_ID='a0'
SUBTEST='external_lpbk'

###OBDIAG_MFG_START###
TEST='audio_test'
STATUS='FAILED'
SUBTEST='external_lpbk'
ERRORS='1 '
TTF='505 '
SPEED='299.80 MHz'
```

CODE EXAMPLE 4-19 Audio Output Message (*Continued*)

```
PASSES='1 `
MESSAGE='Error: External Audio Test not run: Please set the mfg-
mode to sys-ext.'
Enter (0-13 tests, 14 -Quit, 15 -Menu) ==>
```

4.7.2.12 EIDE

The EIDE diagnostic validates both the EIDE chip and the IDE bus subsystem.

The following code example identifies the EIDE output message.

CODE EXAMPLE 4-20 EIDE Output Message

```
Enter (0-13 tests, 14 -Quit, 15 -Menu) ==> 11

TEST='ide_test'
SUBTEST='probe-cmd-device'
SUBTEST='hd-and-cd-check'
Enter (0-13 tests, 14 -Quit, 15 -Menu) ==>
```

4.7.2.13 Video

The video diagnostic validates the UPA graphics.

The following code example identifies the video output message.

CODE EXAMPLE 4-21 Video Output Message

```
Enter (0-13 tests, 14 -Quit, 15 -Menu) ==> 12

TEST='video_test'
Please connect the monitor and use ttya/ttyb when running this test
if you are using the screen it may be become unreadable
SUBTEST='mach64-chip-id-vendor-id-check'
SUBTEST='video-frame-buffer-test'
SUBTEST='mach64-walk-one-test'
SUBTEST='mach64-walk-zero-test'
Enter (0-13 tests, 14 -Quit, 15 -Menu) ==>
```

4.7.2.14 All Above

The all above diagnostic validates the system unit.

The following code example identifies the all above output message.

Note – The all above diagnostic will stall if the TIP line is installed on serial port A or serial port B.

CODE EXAMPLE 4-22 All Above Output Message

```
Enter (0-13 tests, 14 -Quit, 15 -Menu) ===> 13

TEST='all_pci/cheerio_test'
SUBTEST='vendor_id_test'
SUBTEST='device_id_test'
SUBTEST='mixmode_read'
SUBTEST='e2_class_test'
SUBTEST='status_reg_walk1'
SUBTEST='line_size_walk1'
SUBTEST='latency_walk1'
SUBTEST='line_walk1'
SUBTEST='pin_test'

TEST='all_dma/ebus_test'
SUBTEST='dma_reg_test'
SUBTEST='dma_func_test'

TEST='ethernet_test'
Using Onboard Transceiver - Link Up.
SUBTEST='my_channel_reset'
SUBTEST='hme_reg_test'
SUBTEST='global_reg1_test'
SUBTEST='global_reg2_test'
SUBTEST='bmac_xif_reg_test'
SUBTEST='bmac_tx_reg_test'
SUBTEST='mif_reg_test'
SUBTEST='mac_internal_loopback_test'
SUBTEST='10mb_xcvr_loopback_test'
SUBTEST='100mb_phy_loopback_test'
SUBTEST='100mb_twister_loopback_test'

TEST='keyboard_test'
SUBTEST='internal_loopback'

TEST='mouse_test'
```

CODE EXAMPLE 4-22 All Above Output Message (Continued)

```
SUBTEST='mouse_loopback'

###OBDIAG_MFG_START###
TEST='mouse_test'
STATUS='FAILED'
SUBTEST='mouse_loopback'
ERRORS='1 \'
TTF='1011 \'
SPEED='299.80 MHz'
PASSES='1 \'
MESSAGE='Error: Timeout receiving a character'

TEST='floppy_test'
SUBTEST='floppy_id0_read_test'

TEST='parallel_port_test'
SUBTEST='dma_read'

TEST='uarta_test'
'UART A in use as console - Test not run.'

TEST='uartb_test'
BAUDRATE='1200'
SUBTEST='internal_loopback'
BAUDRATE='1800'
SUBTEST='internal_loopback'
BAUDRATE='2400'
SUBTEST='internal_loopback'
BAUDRATE='4800'
SUBTEST='internal_loopback'
BAUDRATE='9600'
SUBTEST='internal_loopback'
BAUDRATE='19200'
SUBTEST='internal_loopback'
BAUDRATE='38400'
SUBTEST='internal_loopback'
BAUDRATE='57600'
SUBTEST='internal_loopback'
BAUDRATE='76800'
SUBTEST='internal_loopback'
BAUDRATE='115200'
SUBTEST='internal_loopback'
BAUDRATE='153600'
SUBTEST='internal_loopback'
BAUDRATE='230400'
SUBTEST='internal_loopback'
```

CODE EXAMPLE 4-22 All Above Output Message (Continued)

```
BAUDRATE='307200'
SUBTEST='internal_loopback'
BAUDRATE='460800'
SUBTEST='internal_loopback'

TEST='nvram_test'
SUBTEST='write/read_patterns'
SUBTEST='write/read_inverted_patterns'

TEST='audio_test'
SUBTEST='cs4231_test'
Codec_ID='8a'
Version_ID='a0'
SUBTEST='external_lpbk'

###OBDIAG_MFG_START###
TEST='audio_test'
STATUS='FAILED'
SUBTEST='external_lpbk'
ERRORS='1 '
TTF='1030 '
SPEED='299.80 MHz'
PASSES='1 '
MESSAGE='Error: External Audio Test not run: Please set the mfg-
mode to sys-ext.'
```

4.7.3 Ending the OBDiag Menu

1. At the `ok` prompt, type:

```
ok% setenv mfg-mode off  
mfg-mode = off
```

2. At the `ok` prompt, type:

```
ok% setenv diag-switch? false  
diag-switch? = false
```

3. At the `ok` prompt, type:

```
ok% setenv auto-boot? true  
auto-boot? = true
```

4. At the `ok` prompt, type:

```
ok% reset-all
```

Safety and Tool Requirements

This chapter describes the safety requirements, symbols, safety precautions, and tools required.

This chapter contains the following topics:

- Section 5.1 “Safety Requirements” on page 5-1
- Section 5.2 “Symbols” on page 5-2
- Section 5.3 “Safety Precautions” on page 5-2
- Section 5.4 “Tools Required” on page 5-4

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

Follow all safety precautions.

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, ensure equipment openings are not blocked or covered. Never place a Sun product near a radiator or hot air register.

5.3.3 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 a Sun product.



Caution – The power switch on 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.



Caution – The power supply of this product is not an autoranging power supply. You must set the power supply voltage setting to either 115V or 230V on the voltage select switch. Failure to correctly set this switch may result in damage to the equipment.

5.3.4 Electrostatic Discharge



Caution – The boards and hard disk drives contain electronic components that are extremely sensitive to static electricity. Ordinary amounts of static electricity from clothing or the 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.



Caution – Wear an antistatic wrist strap and use an ESD-protected mat when handling components. When servicing or removing system unit components, attach an ESD strap to your wrist, then to a metal area on the chassis, and then disconnect the power cord from the system unit and the wall receptacle. Following this caution equalizes all electrical potentials with the system unit.

5.3.5 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.

5.4 Tools Required

The following tools are required to service the Ultra 5 and Ultra 10 computers.

- Number 2 Phillips screwdriver (magnetized tip suggested)
- Needle-nose pliers
- Grounding wrist strap
- Digital voltage meter (DVM)
- Antistatic mat

Place ESD-sensitive components such as the motherboard, circuit cards, hard drives, and NVRAM/TOD on an antistatic mat. The following items can be used as an antistatic mat:

- 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 number 250-1088 (available through your Sun sales representative)
- Disposable ESD mat; shipped with replacement parts or optional system features

Power On and Off

This chapter describes how to power on and power off the Ultra 5 and Ultra 10. This chapter also explains how to externally control standby operation.

This chapter contains the following topics:

- Section 6.1 “Powering On the System Unit” on page 6-1
- Section 6.2 “Powering Off the System Unit” on page 6-4

Note – Power on and power off procedures are also illustrated with photographs and audio/visual instructions on the *Sun Ultra 5 ShowMe How Multimedia Documentation*, part number 704-5753 and the *Sun Ultra 10 ShowMe How Multimedia Documentation*, part number 704-5983.

6.1 Powering On the System Unit

To power on the system unit:

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.



Caution – Plugging a 115V power cord into a 230V connector will severely damage the system.

2. **Verify that the voltage selector switch is set to the appropriate setting: 115V or 230V.**

3. Connect the AC power cord.
4. If necessary, set the power on/off switch to the on position (FIGURE 6-1).
5. Press the standby switch (FIGURE 6-2) or press the Sun Type-5 keyboard standby key (FIGURE 6-3).
6. Verify the following:
 - a. The front panel LED is on.
 - b. The system fans are spinning.

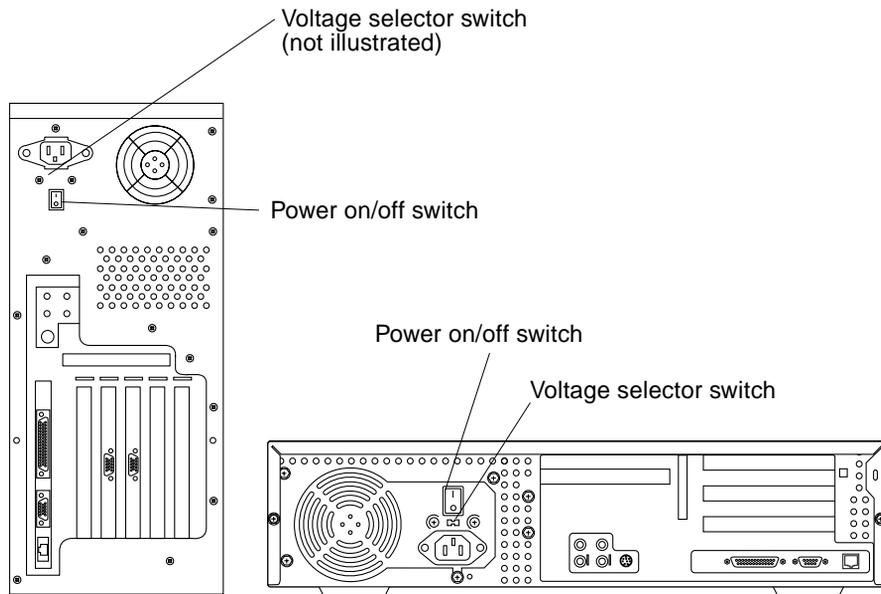


FIGURE 6-1 System Unit Power On/Off Switch

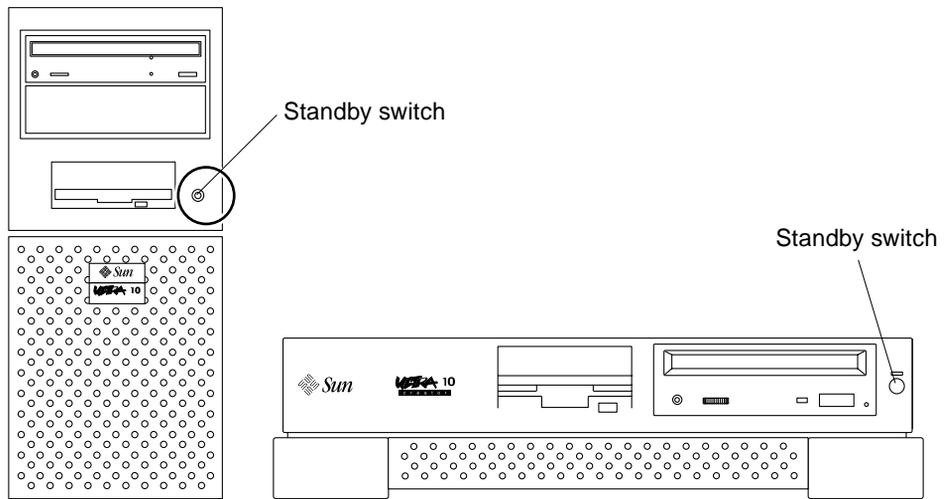


FIGURE 6-2 System Unit Standby Switch

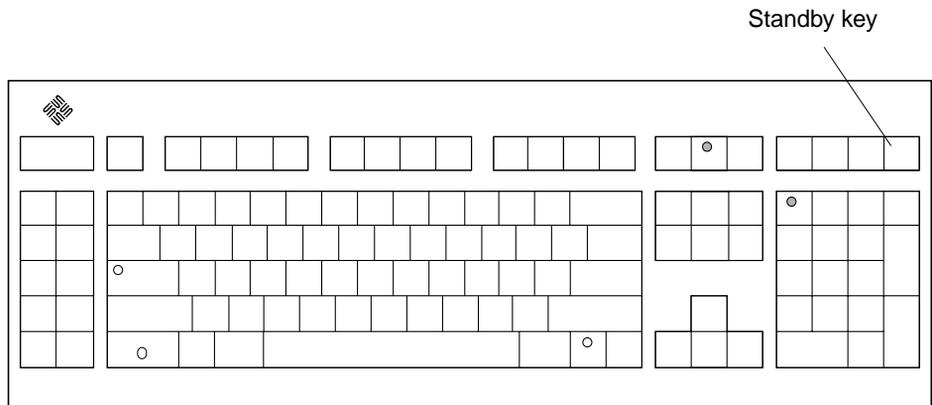


FIGURE 6-3 Sun Type-5 Keyboard

6.2 Powering Off the System Unit



Caution – Exit from the operating system before turning off system unit power. Failure to do so may result in data loss.



Caution – Wear an antistatic wrist strap and use an ESD-protected mat when handling components. When servicing or removing system unit components, attach an ESD strap to your wrist, then to a metal area on the chassis, and then disconnect the power cord from the system unit and the wall receptacle. Following this caution equalizes all electrical potentials with the system unit.

To power off the system unit:

1. Back up system files as necessary.

See *Solaris Handbook for SMCC Peripherals*, part number 802-7675.

Note – For a typical system unit shutdown, it is not necessary to set the power on/off switch to the off position.



Caution – Pressing the standby switch or pressing the Sun Type-5 keyboard standby key does not remove all power from the system unit; a trickle voltage remains in the power supply. To remove all power from the system unit, set the power on/off switch to the off position.

2. Press the system unit standby switch (FIGURE 6-2) or press the Sun Type-5 keyboard standby key (FIGURE 6-3).

Note – For the system unit to gracefully shut down by the standby switch or the Sun Type-5 keyboard standby key, UNIX must be operating. If the system unit is in POST, the standby switch or the standby key are inoperative.

3. Set the system unit power on/off switch to the off position (FIGURE 6-1).

4. Verify the following:

- a. The front panel LED is off.
- b. The system fans are not spinning.



Caution – Disconnect the AC power cord prior to servicing system unit components.

5. **Turn off the power to the monitor and any peripheral equipment.**
6. **Disconnect cables to any peripheral equipment.**

Internal Access

This chapter describes how to access the Ultra 5 and Ultra 10 computers for service.

This chapter contains the following topics:

- Section 7.1 “Removing the Top Cover” on page 7-1
- Section 7.2 “Attaching the Wrist Strap” on page 7-4
- Section 7.3 “Removing the Metal Filler Panel (Ultra 10)” on page 7-5
- Section 7.4 “Replacing the Top Cover” on page 7-7

Note – Removal and replacement of selected system unit components are also illustrated with photographs and audio/visual instructions on the *Sun Ultra 5 ShowMe How Multimedia Documentation*, part number 704-5753 and the *Sun Ultra 10 ShowMe How Multimedia Documentation*, part number 704-5983.

7.1 Removing the Top Cover

1. Power off the system unit.

See Section 6.2 “Powering Off the System Unit” on page 6-4

2. Remove the top cover.

- Ultra 5—go to Step 3
- Ultra 10—go to Step 4

3. Remove the Ultra 5 top cover as follows (FIGURE 7-1):

- a. Using a number 2 Phillips screwdriver, remove the two screws securing the top cover to the chassis.
- b. Grasp the center front edge of the top cover. Slide the top cover toward the rear of the system unit until the top cover tabs release.

- c. Lift the top cover straight up. Set it aside in a safe place.
4. Remove the Ultra 10 top cover as follows (FIGURE 7-2):
 - a. Position the system unit upside down on its top.
 - b. Using a number 2 Phillips screwdriver, remove the four screws securing the top cover to the chassis.
 - c. Disengage the top cover from the top cover tabs.
 - d. Lift the top cover straight up. Set it aside in a safe place.

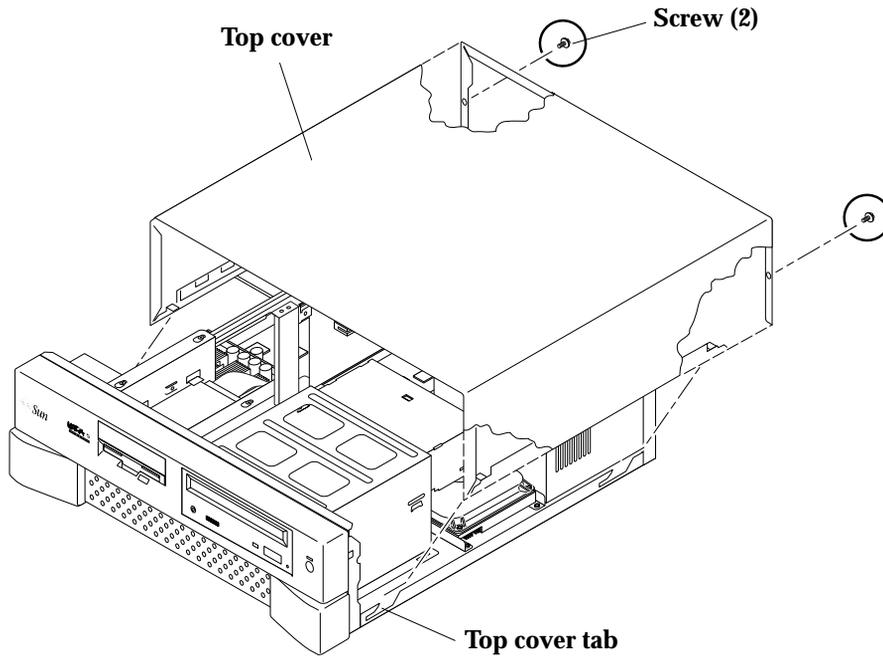


FIGURE 7-1 Removing and Replacing the Top Cover (Ultra 5)

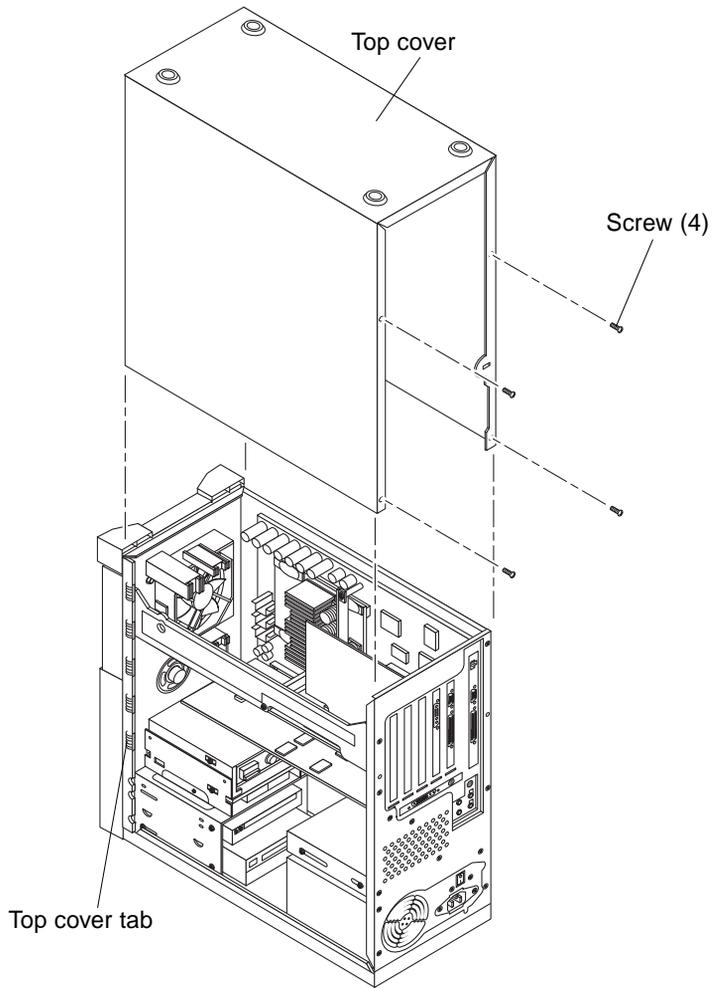


FIGURE 7-2 Removing and Replacing the Top Cover (Ultra 10)

7.2 Attaching the Wrist Strap



Caution – Wear an antistatic wrist strap and use an ESD-protected mat when handling components. When servicing or removing system unit components, attach an ESD strap to your wrist, then to a metal area on the chassis, and then disconnect the power cord from the system unit and the wall receptacle. Following this caution equalizes all electrical potentials with the system unit.

1. Unwrap the first two folds of the wrist strap; wrap the adhesive side firmly against the wrist.
2. Peel the liner from the copper foil at the opposite end of the wrist strap.
3. Attach the copper end of the wrist strap to the chassis (FIGURE 7-3 or FIGURE 7-4).
4. Disconnect the AC power cord from the system unit.

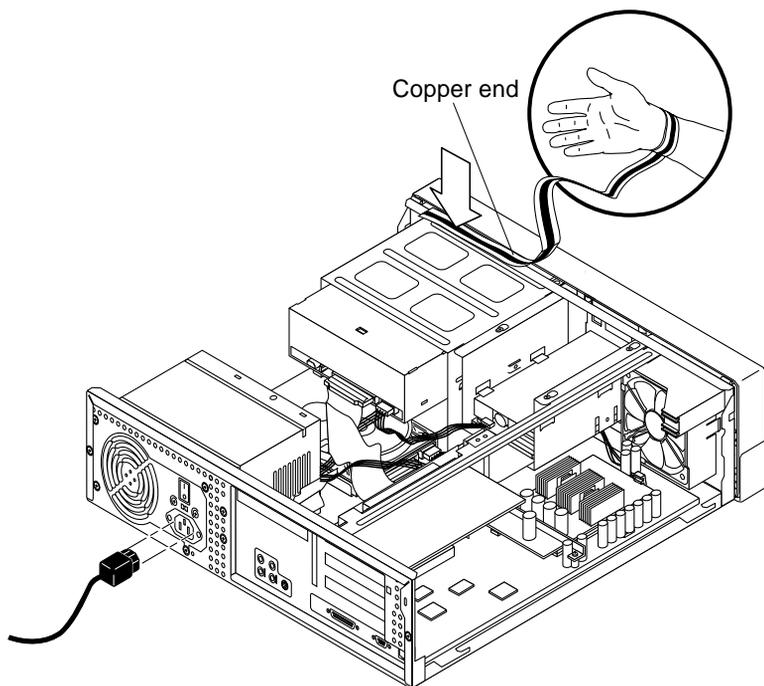


FIGURE 7-3 Attaching the Wrist Strap to the Chassis (Ultra 5)

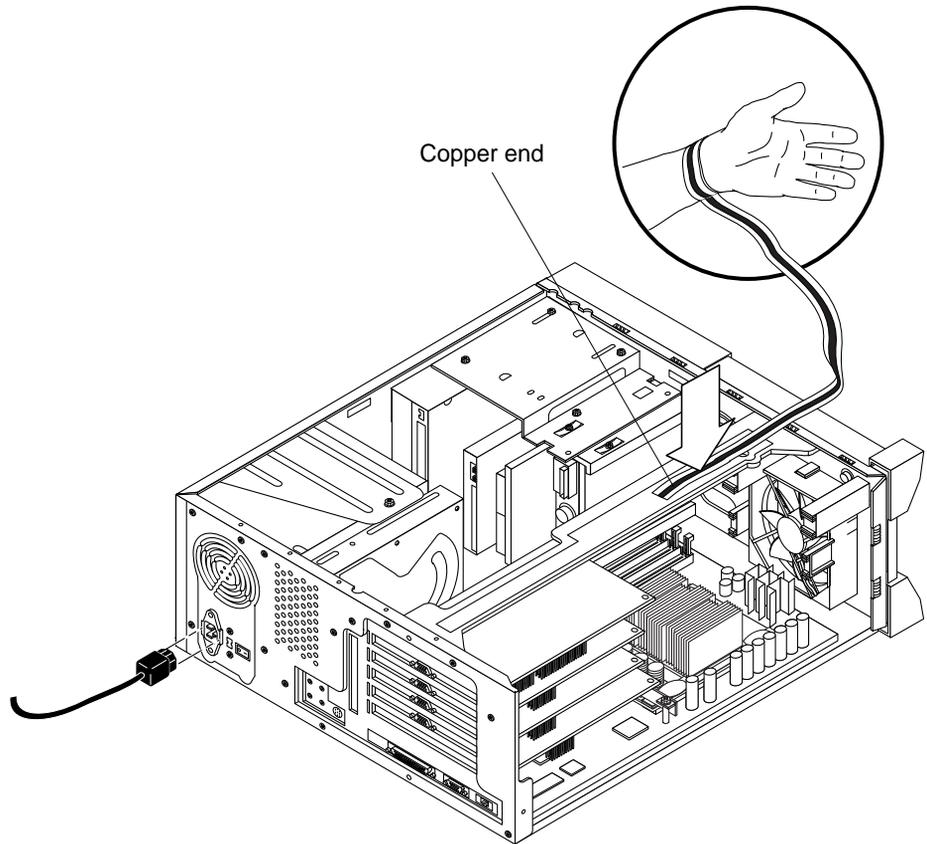


FIGURE 7-4 Attaching the Wrist Strap to the Chassis (Ultra 10)

7.3 Removing the Metal Filler Panel (Ultra 10)

1. Remove the top cover.

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

2. Remove the CD-ROM drive.

See Section 9.3.1 “Removing a CD-ROM Drive” on page 9-14.

3. Remove a filler panel as follows (FIGURE 7-5 and FIGURE 7-6):
 - a. Using a number 2 Phillips screwdriver, remove the two screws (located at the unit base) securing the bottom bezel to the chassis.
 - b. Remove the bottom bezel from the system unit.
 - c. Locate the two tabs securing the upper bezel to the chassis. Remove the upper bezel from the chassis by pressing the tabs outward while lifting the bottom of the bezel upward and out.
 - d. Remove the plastic filler panel.
 - e. Using a screwdriver, break the metal filler panel from the chassis.

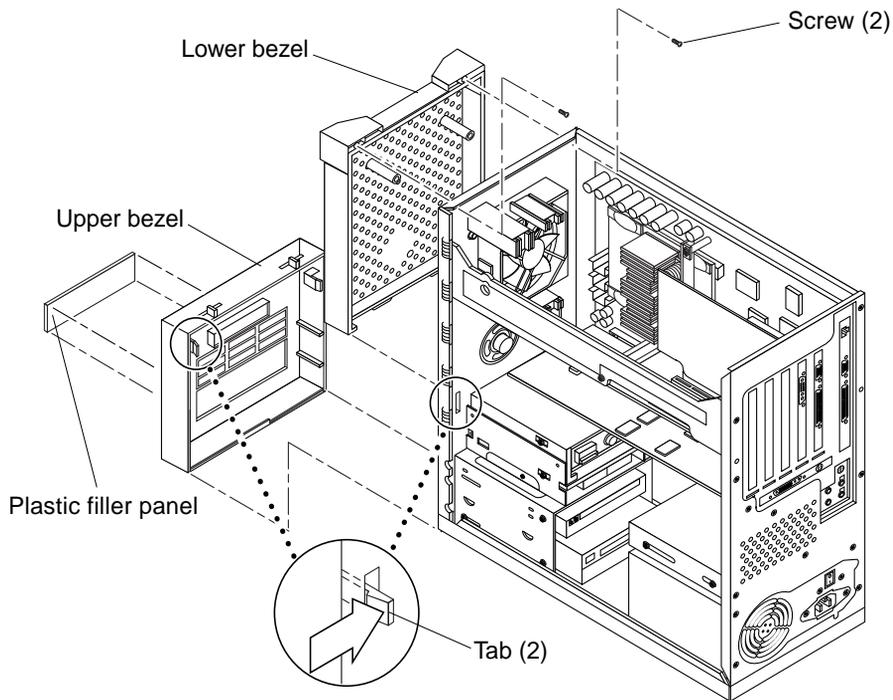


FIGURE 7-5 Removing and Replacing the Plastic Filler Panel (Ultra 10)

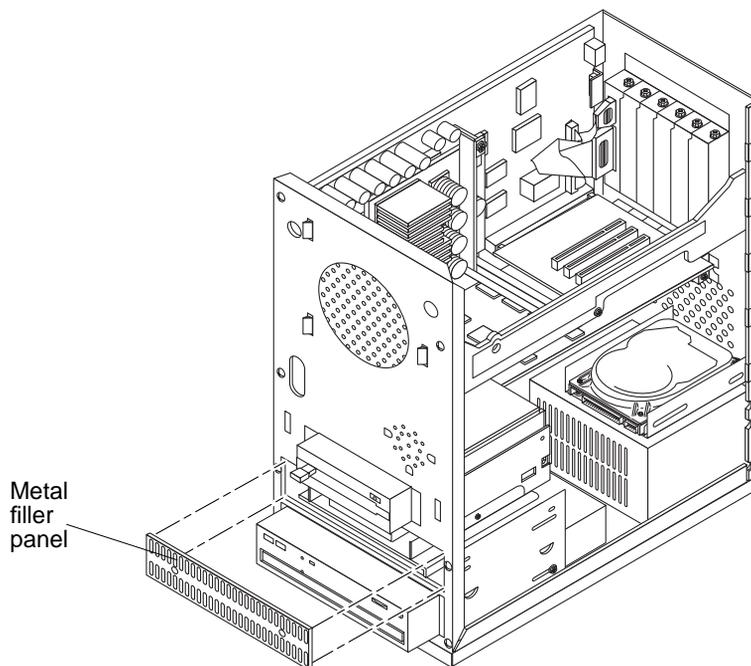


FIGURE 7-6 Removing the Metal Filler Panel (Ultra 10)

7.4 Replacing the Top Cover

1. **Replace the top cover assembly.**
 - Ultra 5—go to Step 2
 - Ultra 10—go to Step 3
2. **Replace the Ultra 5 top cover as follows: (FIGURE 7-1):**
 - a. **Position the top cover onto the system unit chassis. Slide the top cover toward the front of the system unit until the top cover tabs lock.**
 - b. **Using a number 2 Phillips screwdriver, replace the two screws securing the top cover to the chassis.**
3. **Replace the Ultra 10 top cover as follows: (FIGURE 7-2):**
 - a. **Position the system unit upside down on its top.**

- b. Position the top cover onto the system unit chassis. Press the top cover onto the chassis until the top cover tabs lock.**
 - c. Using a number 2 Phillips screwdriver, replace the four screws securing the top cover to the chassis.**
 - d. Position the system unit upright.**
- 4. Replace the CD-ROM drive.**
See Section 9.3.2 “Replacing a CD-ROM Drive” on page 9-16.
- 5. Power on the system unit.**
See Section 6.1 “Powering On the System Unit” on page 6-1.

Major Subassemblies

This chapter describes how to remove and replace the major subassemblies.

This chapter contains the following topics:

- Section 8.1 “Power Supply” on page 8-1
- Section 8.2 “Cable Assemblies” on page 8-6
- Section 8.3 “Speaker Assembly” on page 8-18
- Section 8.4 “CPU Fan Assembly” on page 8-21
- Section 8.5 “Front Bezel” on page 8-25
- Section 8.6 “Rear Drive Bracket (Ultra 10 Only)” on page 8-28

Note – Removal and replacement of selected system unit components are also illustrated with photographs and audio/visual instructions on the *Sun Ultra 5 ShowMe How Multimedia Documentation*, part number 704-5753 and the *Sun Ultra 10 ShowMe How Multimedia Documentation*, part number 704-5983.

8.1 Power Supply

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

8.1.1 Removing the Power Supply

1. Power off the system unit.

See Section 6.2 “Powering Off the System Unit” on page 6-4.

2. Remove the top cover.

See Section 7.1 “Removing the Top 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 them on any surface.



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

3. Attach the wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

4. Remove the power supply.

- Ultra 5—go to Step 5
- Ultra 10—go to Step 6

5. Remove the power supply from the Ultra 5 as follows (FIGURE 8-1):

a. Disconnect the peripheral power cable connectors from the following (not illustrated):

- CD-ROM drive
- Diskette drive
- Hard drive
- Motherboard (J12)

b. Using a number 2 Phillips screwdriver, remove the four screws securing the power supply to the back panel.

c. Push the power supply toward the chassis front to disengage the power supply from the chassis floor mounting hooks.

d. Lift the power supply from the chassis.

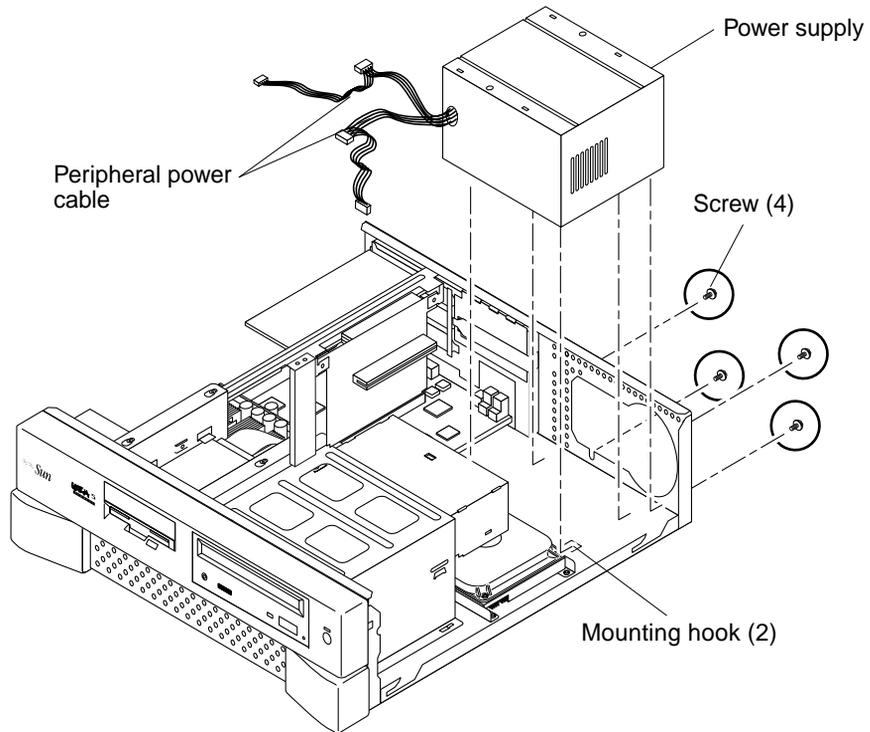


FIGURE 8-1 Removing and Replacing the Power Supply (Ultra 5)

6. Remove the power supply from the Ultra 10 as follows (FIGURE 8-2):

- a. Disconnect the peripheral power cable connectors from the following (not illustrated):**
 - CD-ROM drive
 - Diskette drive
 - Hard drive(s)
 - Motherboard (J12 and J13)
- b. Set the system unit on its side.**
- c. Using a number 2 Phillips screwdriver, remove the four screws securing the power supply to the chassis.**
- d. Push the power supply forward to disengage the mounting hooks and lift from chassis.**

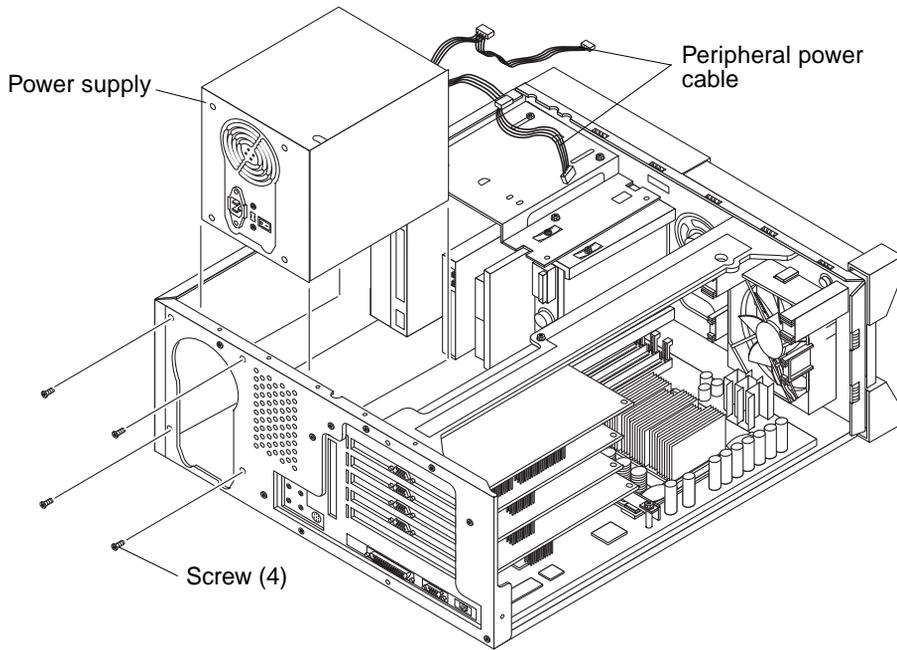


FIGURE 8-2 Removing and Replacing the Power Supply (Ultra 10)

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 them on any surface.

1. **Replace the power supply.**
 - Ultra 5—go to Step 2
 - Ultra 10—go to Step 3
2. **Replace the power supply into the Ultra 5 as follows (FIGURE 8-1):**
 - a. **Tilt the power supply slightly toward the motherboard; position the power supply into the chassis.**
 - b. **Push the power supply toward the chassis rear to engage the mounting hooks.**
 - c. **Using a number 2 Phillips screwdriver, replace the four screws securing the power supply to the chassis.**

8.2 Cable Assemblies

To remove and replace the diskette drive cable assembly, the hard drive cable assembly, the serial/parallel cable assembly, and the audio cable assembly, proceed as follows.

Note – The Ultra 5/10 diskette drive cable assembly (370-3164), hard drive cable assembly (370-3163), serial/parallel cable assembly (370-3165), and CD-ROM drive cable assembly (370-3276) are part of service kit 370-3266 and cannot be ordered separately.

8.2.1 Removing the Diskette Drive Cable Assembly

1. Power off the system unit.

See Section 6.2 “Powering Off the System Unit” on page 6-4.

2. Remove the top cover.

See Section 7.1 “Removing the Top 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 them on any surface.

3. Attach the wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

4. Remove the diskette drive cable assembly connectors from the following (FIGURE 8-3 or FIGURE 8-4):

- Diskette drive
- Motherboard (J16) (not illustrated)

5. Remove the diskette drive cable assembly.

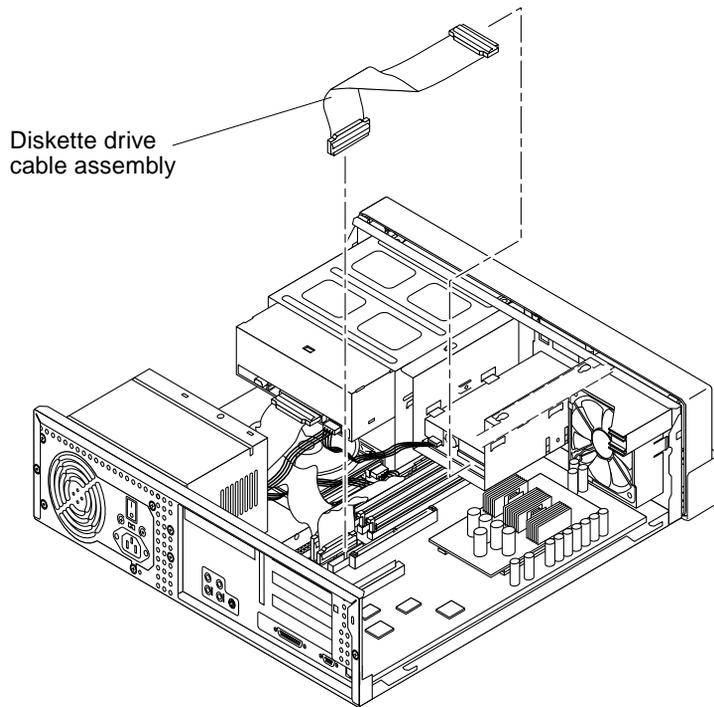


FIGURE 8-3 Removing and Replacing the Diskette Drive Cable (Ultra 5)

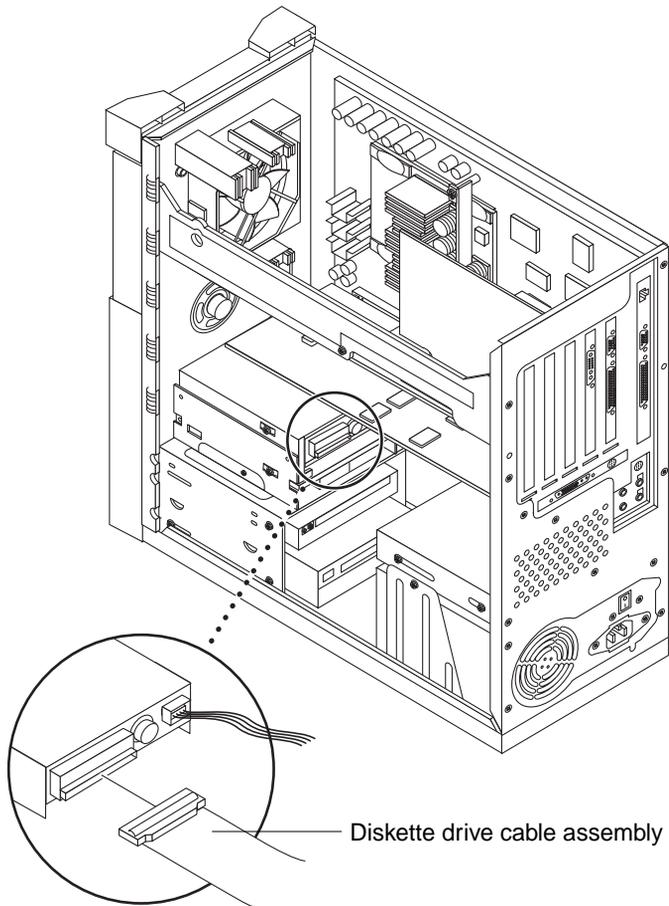


FIGURE 8-4 Removing and Replacing the Diskette Drive Cable (Ultra 10)

8.2.2 Replacing the Diskette Drive Cable 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 them on any surface.



Caution – The diskette drive cable assembly connector labeled “A” connects to the diskette drive only.

Note – Diskette drive cable assembly should be oriented properly by aligning keys.

1. **Replace the diskette drive cable assembly as follows (FIGURE 8-3 or FIGURE 8-4):**
 - a. **Position the diskette drive cable assembly into the chassis.**
 - b. **Connect the diskette drive cable assembly connectors to the following:**
 - Motherboard (J16)
 - Diskette drive (“A” connector only)
2. **Connect the AC power cord to the system unit.**
3. **Detach the wrist strap.**
4. **Replace the top cover.**

See Section 7.4 “Replacing the Top Cover” on page 7-7.
5. **Power on the system unit.**

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

8.2.3 Removing the Hard Drive Cable Assembly

1. **Power off the system unit.**

See Section 6.2 “Powering Off the System Unit” on page 6-4.
2. **Remove the top cover.**

See Section 7.1 “Removing the Top 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 them on any surface.

3. Attach the wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

4. Disconnect the hard drive cable assembly connectors from the following (FIGURE 8-5 or FIGURE 8-6):

- Hard drive(s)
- Motherboard (J15, not illustrated)

5. Remove the hard drive cable assembly.

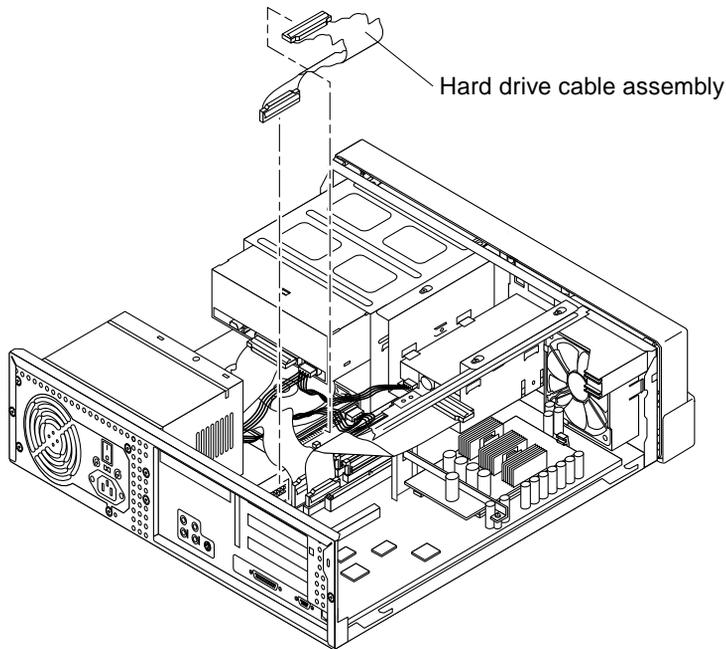


FIGURE 8-5 Removing and Replacing the Hard Drive Cable (Ultra 5)

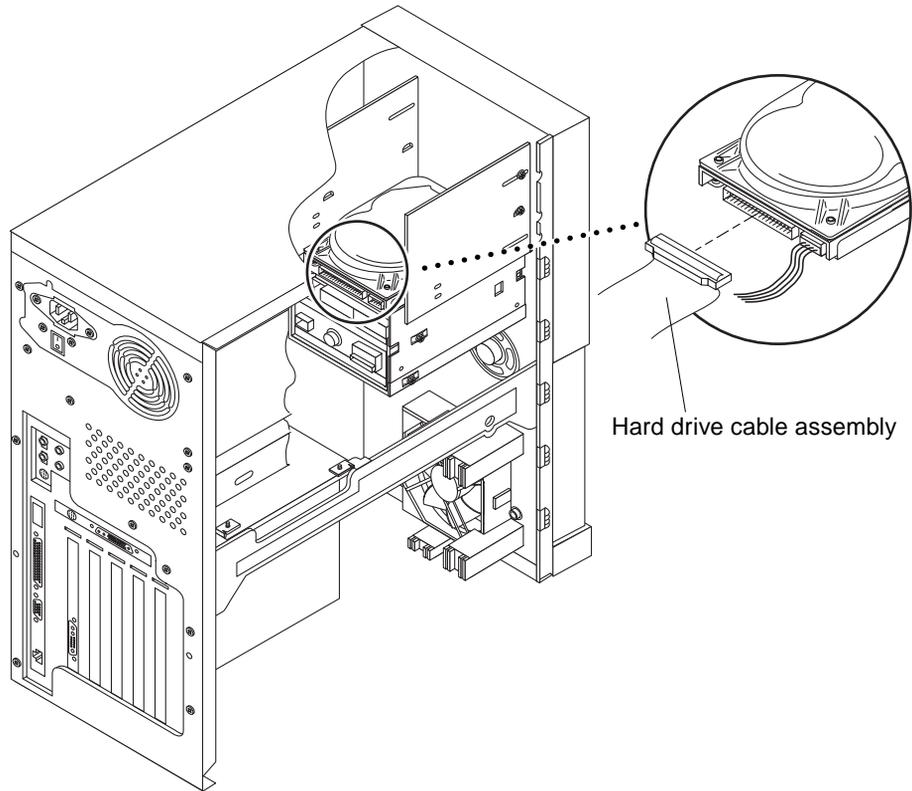


FIGURE 8-6 Removing and Replacing the Hard Drive Cable (Ultra 10)

8.2.4

Replacing the Hard Drive Cable 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 them on any surface.

Note – Hard drive cable assembly should be oriented properly by aligning keys.

1. **Replace the hard drive cable assembly as follows (FIGURE 8-5 or FIGURE 8-6):**
 - a. **Position the hard drive cable assembly into the chassis.**



Caution – Hard drive will not operate if hard drive cable assembly is connected to the wrong motherboard connector.

b. Connect the hard drive cable assembly connectors to the following:

- Hard drive(s)
- Motherboard (J15)

2. Connect the AC power cord to the system unit.

3. Detach the wrist strap.

4. Replace the top cover.

See Section 7.4 “Replacing the Top Cover” on page 7-7.

5. Power on the system unit.

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

8.2.5 Removing the Serial/Parallel Cable Assembly

1. Power off the system unit.

See Section 6.2 “Powering Off the System Unit” on page 6-4.

2. Remove the top cover.

See Section 7.1 “Removing the Top 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 them on any surface.

3. Attach the wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

4. Remove the serial/parallel cable assembly as follows (FIGURE 8-7 or FIGURE 8-8):

a. Disconnect the serial/parallel cable assembly connector from the motherboard (J7/J8).

b. Using a number two Phillips screwdriver, remove the screw securing the serial/parallel cable assembly connector panel to the chassis. Remove the connector assembly from the chassis cutout.

c. Remove the serial/parallel cable assembly.

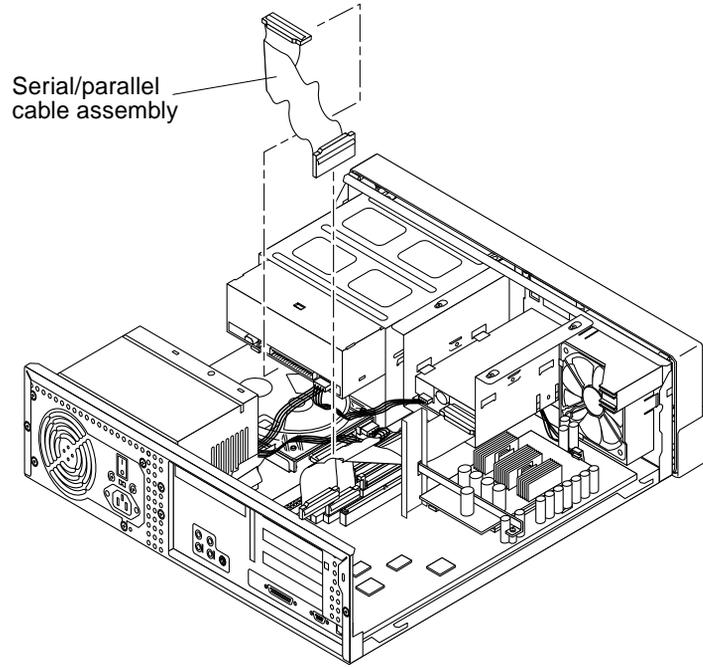


FIGURE 8-7 Removing and Replacing the Serial/Parallel Cable (Ultra 5)

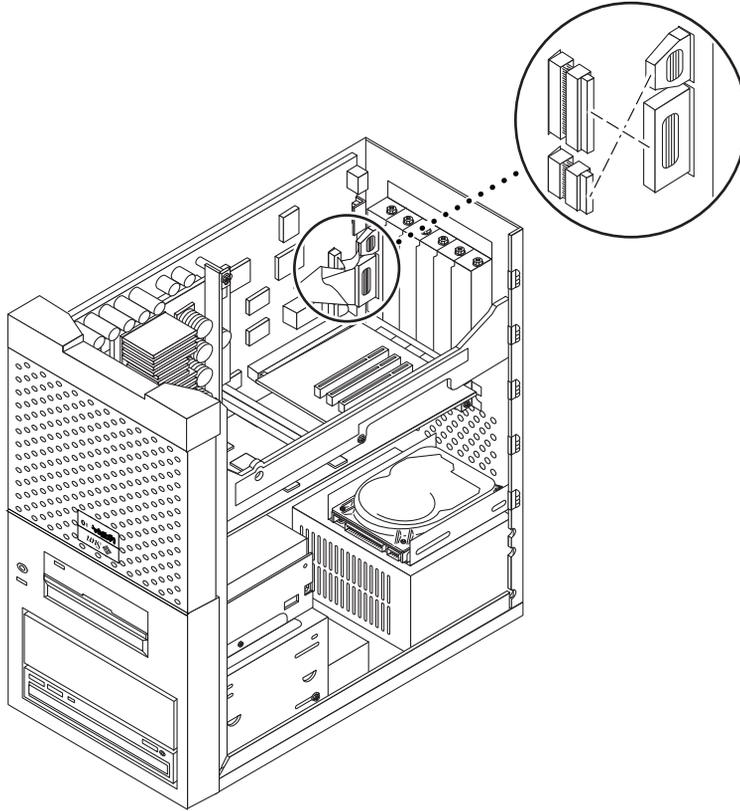


FIGURE 8-8 Removing and Replacing the Serial/Parallel Cable (Ultra 10)

8.2.6

Replacing the Serial/Parallel Cable 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 them on any surface.

1. **Replace the serial/parallel cable assembly as follows (FIGURE 8-7 or FIGURE 8-8):**
 - a. **Position the serial/parallel cable assembly into the chassis.**
 - b. **Position the connector assembly into the chassis cutout. Using a number two Phillips screwdriver, replace the screw securing the serial/parallel cable assembly connector panel to the chassis.**

- c. **Connect the serial/parallel cable assembly connector to the motherboard (J7/J8).**
- 2. Connect the AC power cord to the system unit.**
- 3. Detach the wrist strap.**
- 4. Replace the top cover.**
See Section 7.4 “Replacing the Top Cover” on page 7-7.
- 5. Power on the system unit.**
See Section 6.1 “Powering On the System Unit” on page 6-1.

8.2.7 Removing the Audio Cable Assembly

- 1. Power off the system unit.**
See Section 6.2 “Powering Off the System Unit” on page 6-4.
- 2. Remove the top cover.**
See Section 7.1 “Removing the Top 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 them on any surface.

- 3. Attach the wrist strap.**
See Section 7.2 “Attaching the Wrist Strap” on page 7-4.
- 4. Remove the audio cable assembly as follows:**
 - a. Remove the audio cable assembly connectors from the following (FIGURE 8-9 or FIGURE 8-10):**
 - CD-ROM drive
 - Motherboard (J5)
 - b. Remove the audio cable assembly.**

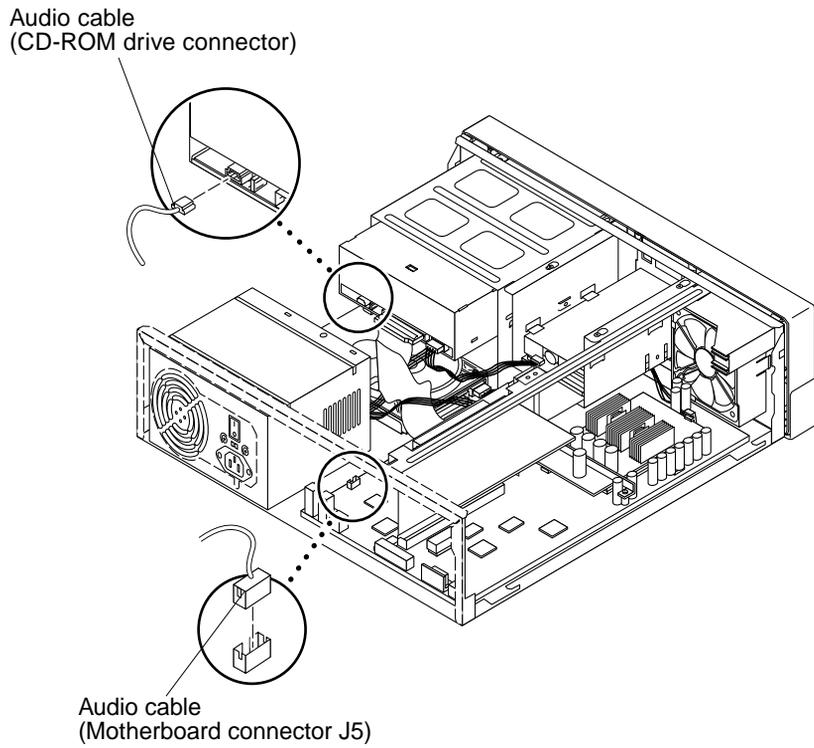


FIGURE 8-9 Removing and Replacing the Audio Cable (Ultra 5)

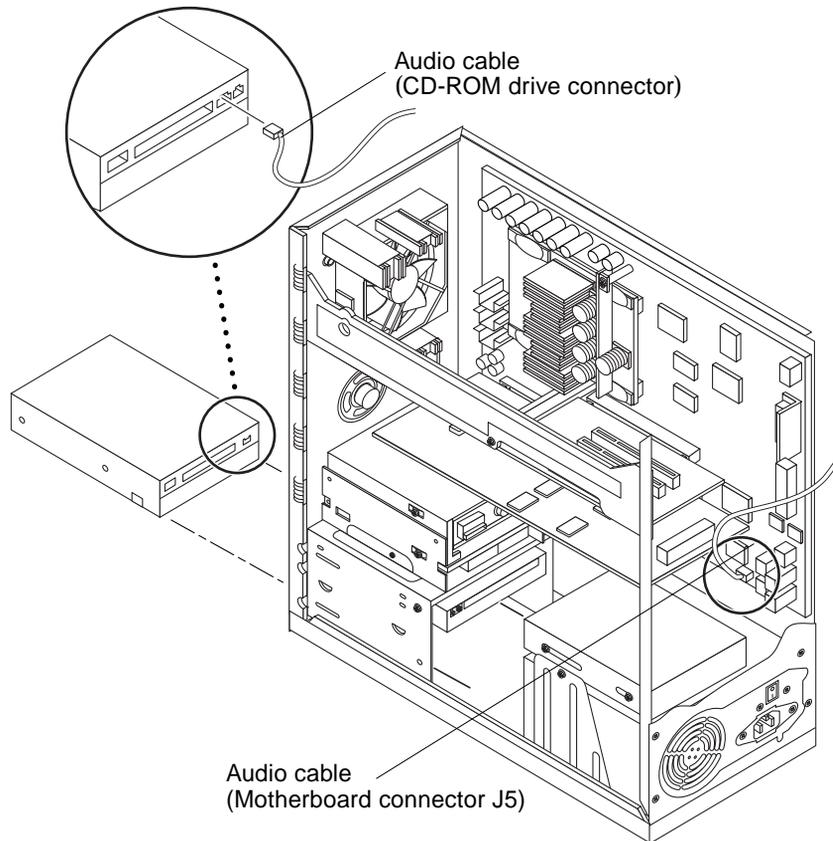


FIGURE 8-10 Removing and Replacing the Audio Cable (Ultra 10)

8.2.8

Replacing the Audio Cable 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 them on any surface.

1. **Replace the audio cable assembly as follows (FIGURE 8-9 or FIGURE 8-10):**
 - a. **Position the audio cable assembly into the chassis.**
 - b. **Connect the audio cable assembly connectors to the following:**
 - Motherboard (J5)
 - CD-ROM drive

2. **Connect the AC power cord to the system unit.**
3. **Detach the wrist strap.**
4. **Replace the top cover.**
See Section 7.4 “Replacing the Top Cover” on page 7-7.
5. **Power on the system unit.**
See Section 6.1 “Powering On the System Unit” on page 6-1.

8.3 Speaker Assembly

To remove and replace the speaker assembly, proceed as follows.

8.3.1 Removing the Speaker Assembly

1. **Power off the system unit.**
See Section 6.2 “Powering Off the System Unit” on page 6-4.
2. **Remove the top cover.**
See Section 7.1 “Removing the Top 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 them on any surface.

3. **Attach the wrist strap.**
See Section 7.2 “Attaching the Wrist Strap” on page 7-4.
4. **Remove the speaker assembly.**
 - Ultra 5—go to Step 5
 - Ultra 10—go to Step 6
5. **Remove the speaker assembly from the Ultra 5 as follows (FIGURE 8-11):**
 - a. **Disconnect the speaker cable from the motherboard (J18).**
 - b. **Remove the diskette drive assembly.**
See Section 9.1.1 “Removing the Diskette Drive” on page 9-1.

- c. Grasp the magnet and firmly pull the speaker away from the chassis while moving it downward.
- d. Remove the speaker assembly.

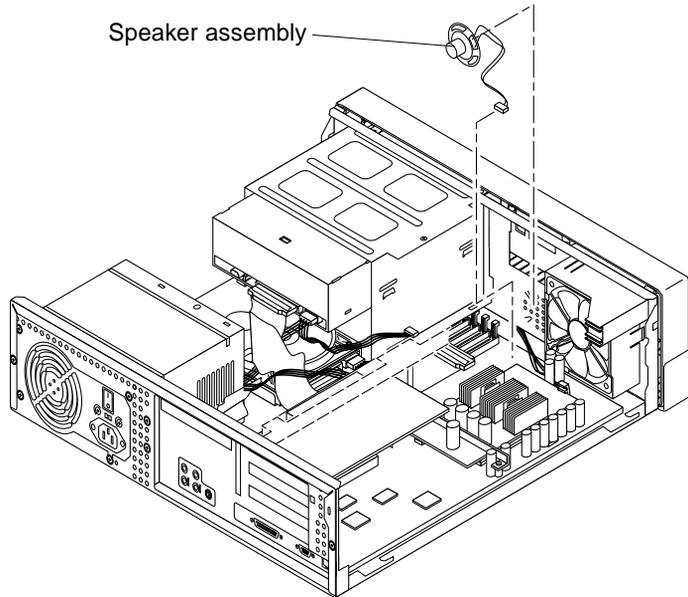


FIGURE 8-11 Removing and Replacing the Speaker Assembly (Ultra 5)

6. Remove the speaker assembly from the Ultra 10 as follows (FIGURE 8-12):
 - a. Disconnect the speaker cable from the motherboard (J18).
 - b. Grasp the magnet and firmly pull the speaker away from the chassis while moving it downward.
 - c. Remove the speaker assembly.

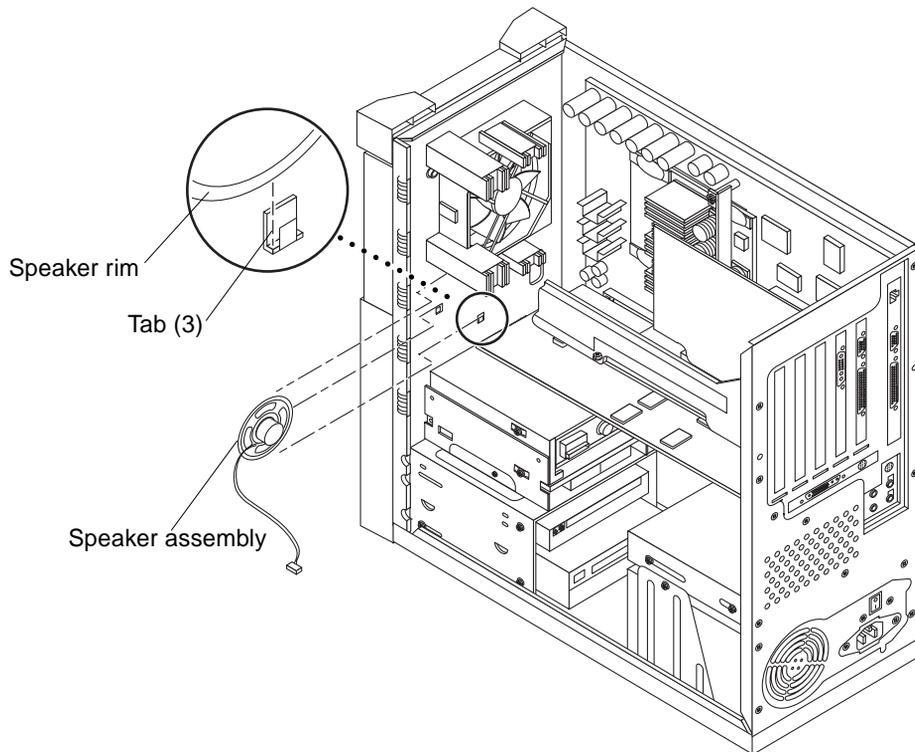


FIGURE 8-12 Removing and Replacing the Speaker Assembly (Ultra 10)

8.3.2 Replacing the Speaker 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 them on any surface.

1. **Replace the speaker assembly.**
 - Ultra 5—go to Step 2
 - Ultra 10—go to Step 3
2. **Replace the speaker assembly into the Ultra 5 as follows (FIGURE 8-11):**
 - a. **Position the speaker assembly.**
 - b. **Grasp the magnet and slide the speaker upwards under the three metal chassis speaker tabs until the lower tab engages the outer rim of the speaker.**

- c. **Replace the diskette drive assembly.**
See Section 9.1.2 “Replacing the Diskette Drive” on page 9-5.
 - d. **Connect the speaker cable to the motherboard (J18).**
3. **Replace the speaker assembly into the Ultra 10 as follows (FIGURE 8-12):**
 - a. **Position the speaker assembly.**
 - b. **Grasp the magnet and slide the speaker upwards under the three metal chassis speaker tabs until the lower tab engages the outer rim of the speaker.**
 - c. **Connect the speaker cable to the motherboard (J18).**
4. **Connect the AC power cord to the system unit.**
5. **Detach the wrist strap.**
6. **Replace the top cover.**
See Section 7.4 “Replacing the Top Cover” on page 7-7.
7. **Power on the system unit.**
See Section 6.1 “Powering On the System Unit” on page 6-1.

8.4 CPU Fan Assembly

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

8.4.1 Removing the CPU Fan Assembly

1. **Power off the system unit.**
See Section 6.2 “Powering Off the System Unit” on page 6-4.
2. **Remove the top cover.**
See Section 7.1 “Removing the Top 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 them on any surface.

3. Attach the wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

4. Remove the CPU fan assembly.

- Ultra 5—go to Step 5
- Ultra 10—go to Step 6

5. Remove the CPU fan assembly from the Ultra 5 as follows (FIGURE 8-13):

a. Remove the PCI cards from riser board connectors 1 and 3.

See Section 10.3.1 “Removing a PCI Card” on page 10-8.

b. Disconnect the CPU fan assembly power cable connector from the motherboard (J19).

c. Press the retaining clip and separate the CPU fan assembly from the chassis.

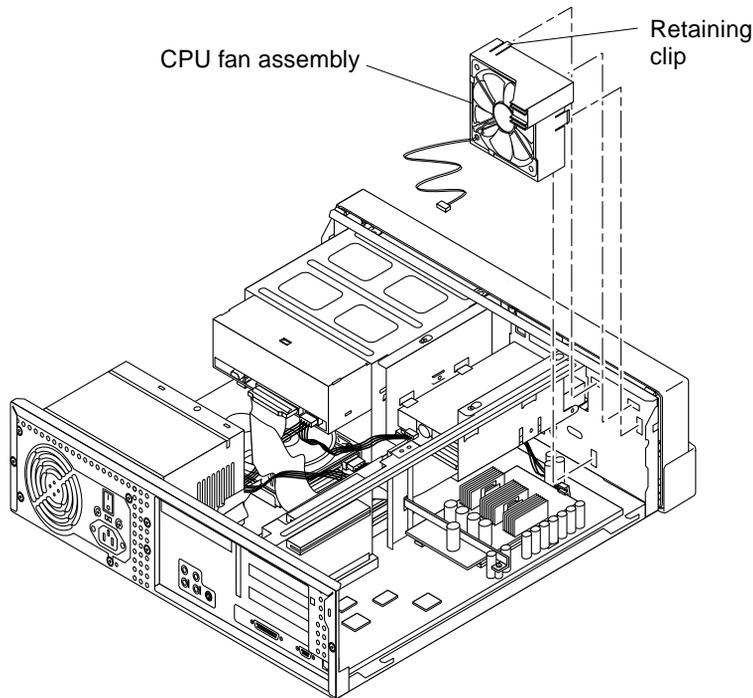


FIGURE 8-13 Removing and Replacing the CPU Fan Assembly (Ultra 5)

6. Remove the CPU fan assembly from the Ultra 10 as follows (FIGURE 8-14):

a. Remove all PCI cards.

See Section 10.3.1 “Removing a PCI Card” on page 10-8.

b. Remove the UPA graphics card.

See Section 10.4.1 “Removing a UPA Graphics Card” on page 10-14.

c. Disconnect the CPU fan assembly power cable connector from the motherboard (J19).

d. Press the retaining clip and separate the CPU fan assembly from the chassis.

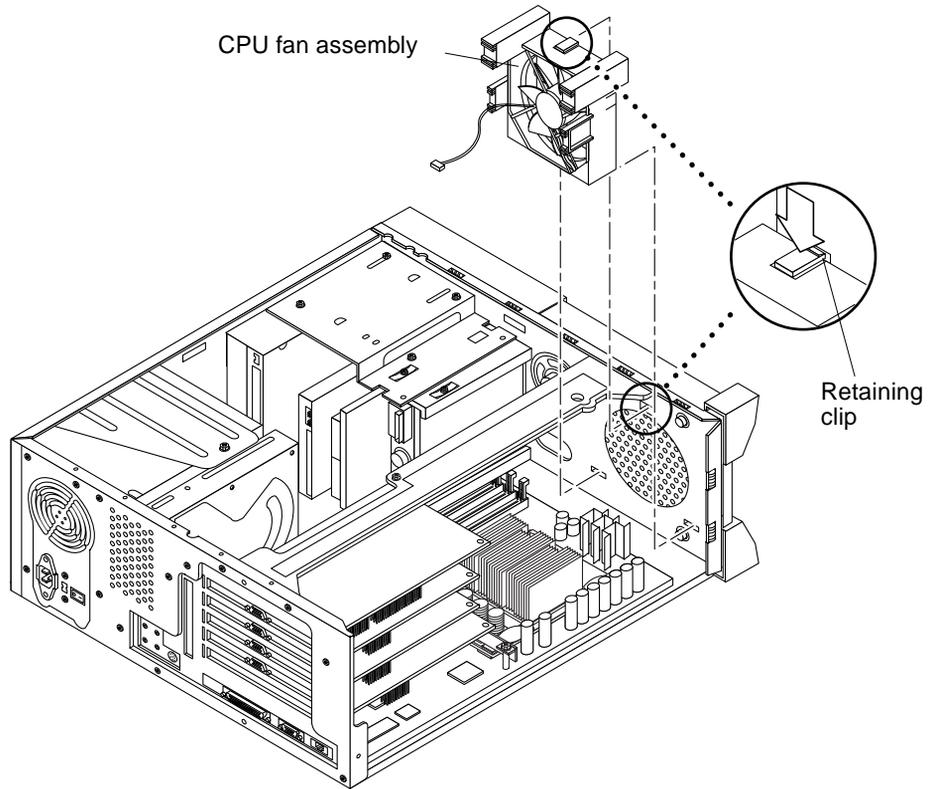


FIGURE 8-14 Removing and Replacing the CPU Fan Assembly (Ultra 10)

8.4.2 Replacing the CPU Fan 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 them on any surface.

1. Join the CPU fan assembly to the motherboard.

- 2. Replace the CPU fan assembly.**
 - Ultra 5—go to Step 3
 - Ultra 10—go to Step 4
- 3. Replace the CPU fan assembly into the Ultra 5 as follows (FIGURE 8-13):**
 - a. Position the CPU fan assembly, ensuring that the CPU fan assembly retaining clip is aligned with the chassis retaining clip hole.**
 - b. Secure the CPU fan assembly retaining clip to the chassis.**
 - c. Connect the CPU fan assembly power cable connector to the motherboard (J19).**
 - d. Replace the PCI card(s) to the riser board connectors 1 and 3.**

See Section 10.3.2 “Replacing a PCI Card” on page 10-12.
- 4. Replace the CPU fan assembly into the Ultra 10 as follows (FIGURE 8-14):**
 - a. Position the CPU fan assembly, ensuring that the CPU fan assembly retaining clip is aligned with the chassis retaining clip hole.**
 - b. Secure the CPU fan assembly retaining clip to the chassis.**
 - c. Connect the CPU fan assembly power cable connector to the motherboard (J19).**
 - d. Replace the UPA graphics card.**

See Section 10.4.2 “Replacing a UPA Graphics Card” on page 10-16.
 - e. Replace all PCI cards.**

See Section 10.3.2 “Replacing a PCI Card” on page 10-12.
- 5. Connect the AC power cord to the system unit.**
- 6. Detach the wrist strap.**
- 7. Replace the top cover.**

See Section 7.4 “Replacing the Top Cover” on page 7-7.
- 8. Power on the system unit.**

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

8.5 Front Bezel

To remove and replace the front bezel, proceed as follows.

8.5.1 Removing the Front Bezel

1. Power off the system unit.

See Section 6.2 “Powering Off the System Unit” on page 6-4.

2. Remove the top cover.

See Section 7.1 “Removing the Top 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 them on any surface.

3. Attach the wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

4. Remove the front bezel.

- Ultra 5—go to Step 5
- Ultra 10—go to Step 6

5. Remove the front bezel from the Ultra 5 as follows (FIGURE 8-15):

a. Remove the diskette drive bracket.

See Section 9.1.1 “Removing the Diskette Drive” on page 9-1.

b. Remove the CD-ROM drive.

See Section 9.3.1 “Removing a CD-ROM Drive” on page 9-14.

c. Disconnect the standby switch connector from the motherboard.

d. Using a number two Phillips screwdriver, remove the two screws securing the front bezel to the chassis.

e. Using thumbs, press down on the front bezel retaining clips, detach the front bezel from the chassis.

f. Remove the front bezel from the Ultra 5.

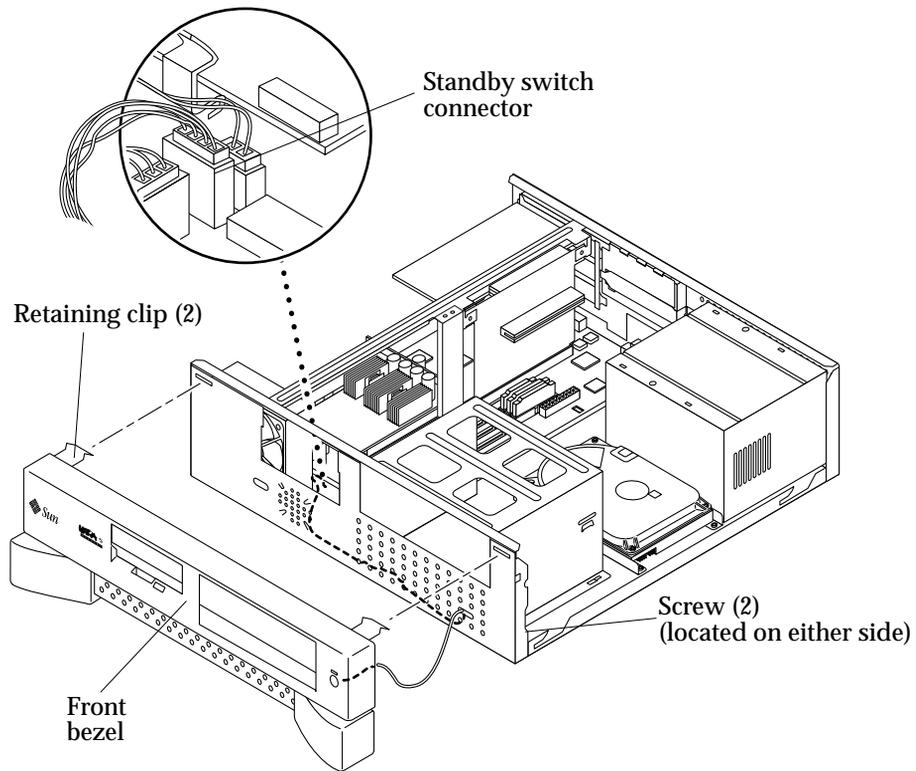


FIGURE 8-15 Removing and Replacing the Front Bezel (Ultra 5)

6. Remove the front bezel from the Ultra 10 as follows (FIGURE 8-16):
 - a. Disconnect the standby switch connector from the motherboard.
 - b. Remove the lower front bezel and detach the upper front bezel from the chassis as described in Section 7.3 “Removing the Metal Filler Panel (Ultra 10)” on page 7-5.
 - c. Remove the front upper bezel from the Ultra 10.

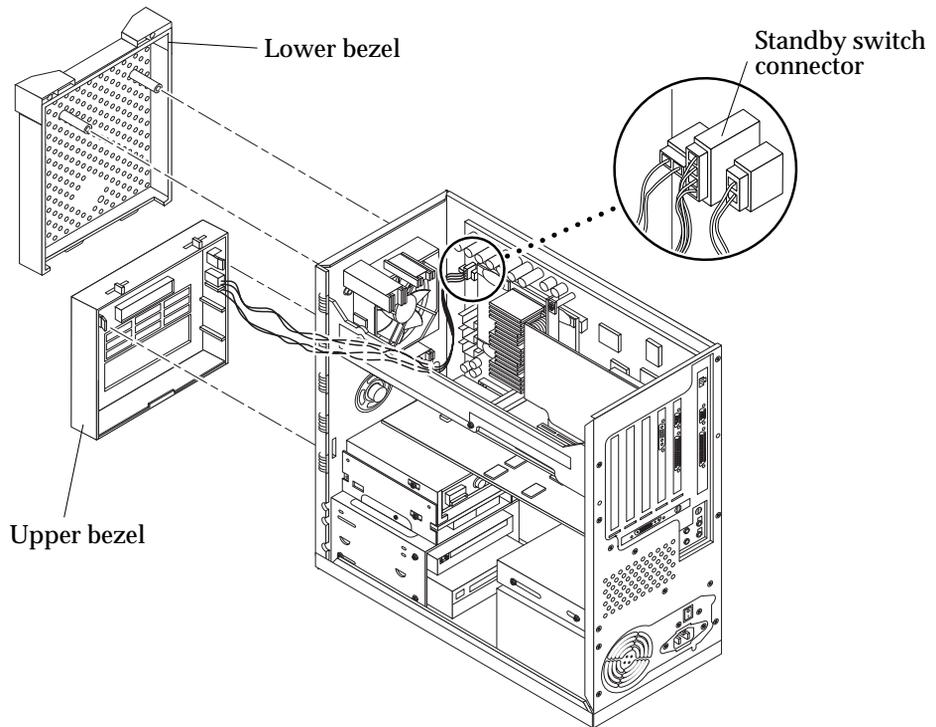


FIGURE 8-16 Removing and Replacing the Front Bezel (Ultra 10)

8.5.2 Replacing the Front Bezel



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 them on any surface.

1. **Replace the front bezel.**
 - Ultra 5—go to Step 2
 - Ultra 10—go to Step 3
2. **Replace the Ultra 5 front bezel as follows (FIGURE 8-15):**
 - a. **Position the front bezel on the chassis.**
 - b. **Using thumbs, press up on the front bezel retaining clips, attach the front bezel to the chassis.**

- c. **Using a number two Phillips screwdriver, replace the two screws securing the front bezel to the chassis.**
 - d. **Thread the standby switch connector and wires through the chassis access hole and connect the standby switch connector to the motherboard.**
 - e. **Replace the CD-ROM drive.**
See Section 9.3.2 “Replacing a CD-ROM Drive” on page 9-16.
 - f. **Replace the diskette drive bracket.**
See Section 9.1.2 “Replacing the Diskette Drive” on page 9-5.
- 3. Replace the Ultra 10 front bezel as follows (FIGURE 8-16):**
- a. **Replace the lower front bezel and attach the upper front bezel to the chassis.**
 - b. **Using a number 2 Phillips screwdriver, replace the two screws (located at the unit base) securing the lower front bezel to the chassis.**
 - c. **Thread the standby switch connector and wires through the chassis access hole and connect the standby switch connector to the motherboard.**
 - d. **Attach the upper front bezel to the chassis by pressing the upper bezel tabs in while lifting the bottom of the bezel down and in.**
 - e. **Replace the lower front bezel.**
- 4. Detach the wrist strap.**
- 5. Replace the top cover.**
See Section 7.4 “Replacing the Top Cover” on page 7-7.
- 6. Power On the system unit.**
See Section 6.1 “Powering On the System Unit” on page 6-1.

8.6 Rear Drive Bracket (Ultra 10 Only)

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

8.6.1 Removing the Drive Bracket

- 1. Power off the system unit.**
See Section 6.2 “Powering Off the System Unit” on page 6-4.

2. Remove the top cover.

See Section 7.1 “Removing the Top 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 them on any surface.

3. Attach the wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

4. Remove the rear hard drive.

See Section 9.2.1 “Removing a Hard Drive” on page 9-7.

5. Remove the rear drive bracket from the Ultra 10 as follows (FIGURE 8-17):

- a. Using a number 2 Phillips screwdriver, remove the two screws securing the rear drive bracket to the chassis.**
- b. While placing hand under rear drive bracket for support, use a number 2 Phillips screwdriver to remove the screw securing the rear drive bracket to the chassis bracket support.**
- c. Remove the rear drive bracket.**

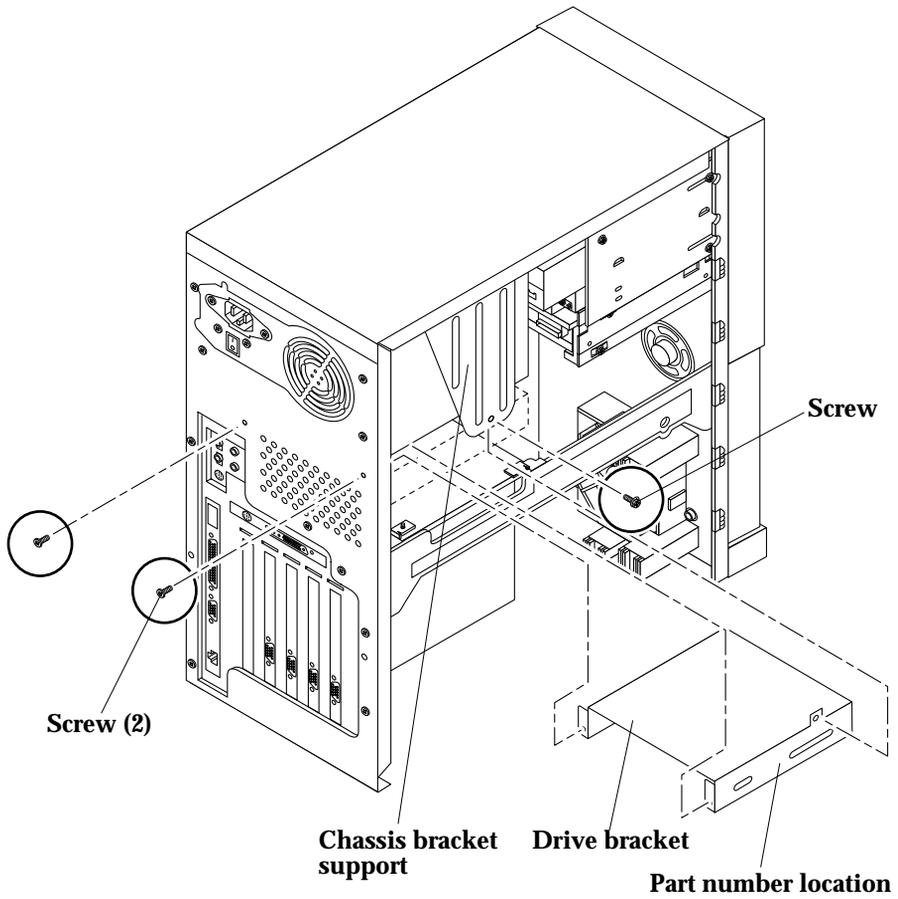


FIGURE 8-17 Removing and Replacing the Rear Drive Bracket

8.6.2 Replacing the Drive Bracket



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 them on any surface.

Note – If you are installing a 9.1-GByte or larger capacity replacement or upgrade hard drive in the rear position, a special bracket is required to ensure cooling. This bracket is already installed in new Ultra 10 systems and can be identified by the manufacturing part number, F370-3721, stamped on the side of the bracket.

1. **Replace the rear drive bracket into the Ultra 10 as follows (FIGURE 8-17):**
 - a. **Position the rear drive bracket.**
 - b. **While placing hand under rear drive bracket for support, use a number 2 Phillips screwdriver to replace the screw securing the rear drive bracket to the chassis bracket support.**
 - c. **Using a number 2 Phillips screwdriver, replace the two screws securing the rear drive bracket to the chassis.**
2. **Connect the AC power cord to the system unit.**
3. **Detach the wrist strap.**
4. **Replace the top cover.**

See Section 7.4 “Replacing the Top Cover” on page 7-7.
5. **Power on the system unit.**

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

Storage Devices

This chapter describes how to remove and replace the Ultra 5 and Ultra 10 storage devices.

This chapter contains the following topics:

- Section 9.1 “Diskette Drive” on page 9-1
- Section 9.2 “Hard Drive” on page 9-7
- Section 9.3 “CD-ROM Drive” on page 9-14

Note – Removal and replacement of selected system unit components are also illustrated with photographs and audio/visual instructions on the *Sun Ultra 5 ShowMe How Multimedia Documentation*, part number 704-5753 and the *Sun Ultra 10 ShowMe How Multimedia Documentation*, part number 704-5983.

9.1 Diskette Drive

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

9.1.1 Removing the Diskette Drive

1. Power off the system unit.

See Section 6.2 “Powering Off the System Unit” on page 6-4.

2. Remove the top cover.

See Section 7.1 “Removing the Top 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 them on any surface.

3. Attach the wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

4. Remove the diskette drive.

- Ultra 5—go to Step 5
- Ultra 10—go to Step 6

5. Remove the diskette drive from the Ultra 5 as follows (FIGURE 9-1 and FIGURE 9-2):

a. Disconnect the following:

- Diskette drive cable assembly from the diskette drive.
- Peripheral power cable connector from the diskette drive.
- Cables connected to other 3.5-inch (8.89-cm) form-factor device (if installed).

b. Using a number 2 Phillips screwdriver, loosen the three screws securing the diskette drive bracket to the chassis.

Note – Do not remove the three screws securing the diskette drive bracket to the chassis.

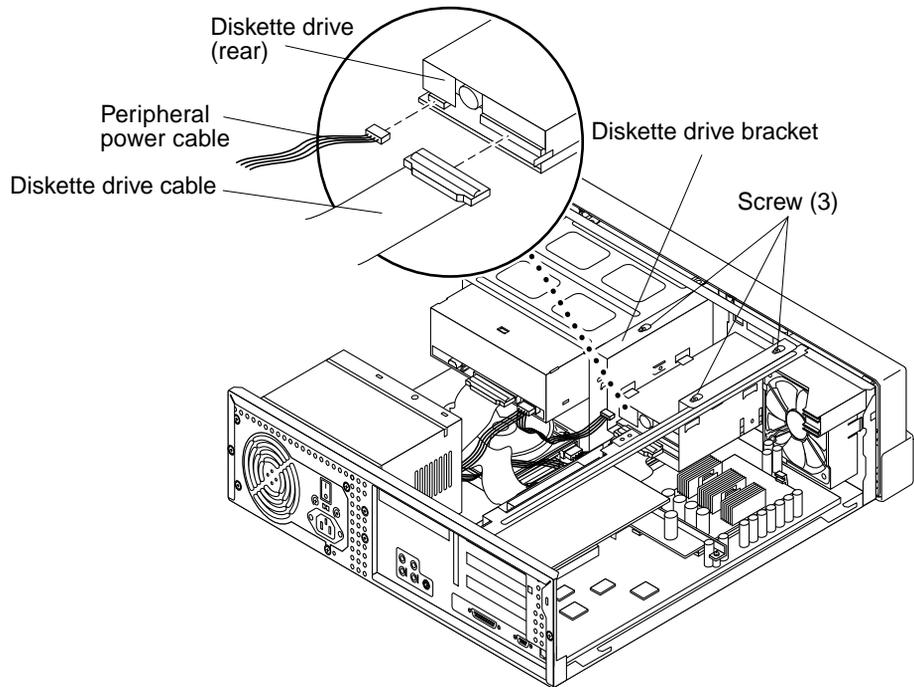


FIGURE 9-1 Removing and Replacing the Diskette Drive Part 1 (Ultra 5)

- c. Remove the diskette drive bracket from the chassis by sliding back and lifting.
- d. Using a number 2 Phillips screwdriver, remove the four screws securing the diskette drive to the diskette drive bracket.
- e. Remove the diskette drive from the diskette drive bracket.

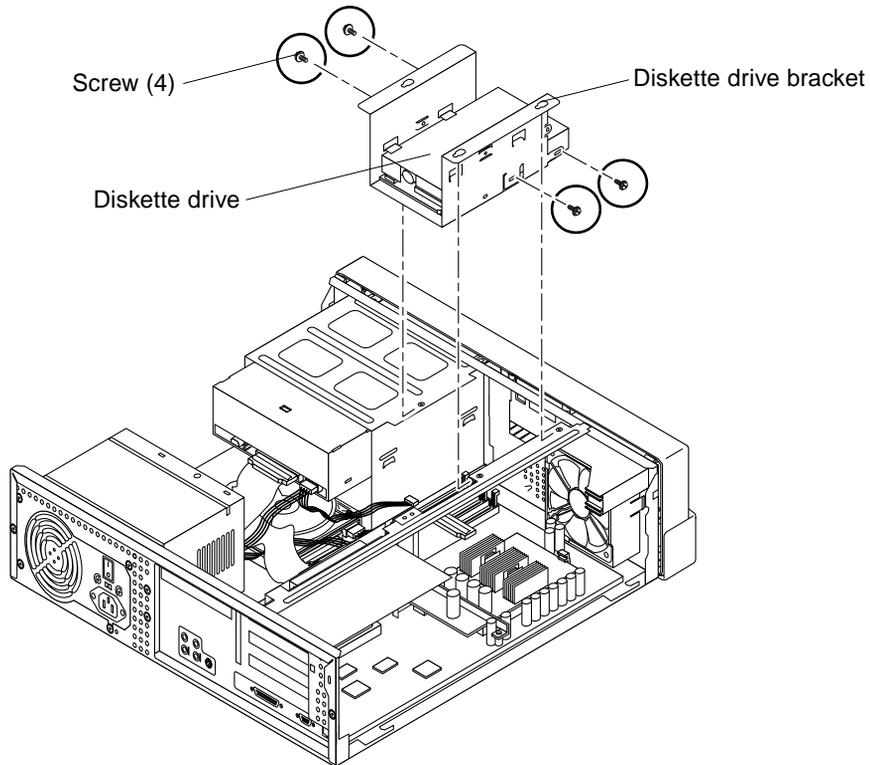


FIGURE 9-2 Removing and Replacing the Diskette Drive Part 2 (Ultra 5)

6. Remove the diskette drive from the Ultra 10 as follows (FIGURE 9-3):

a. Disconnect the following:

- Diskette drive cable assembly from the diskette drive.
- Peripheral power cable from the diskette drive.
- Cables connected to other 3.5-inch (8.89-cm) form-factor device (if installed).

b. Using a number 2 Phillips screwdriver, remove the screw securing the diskette drive to the diskette drive bracket.

c. Remove the diskette drive through the chassis rear.

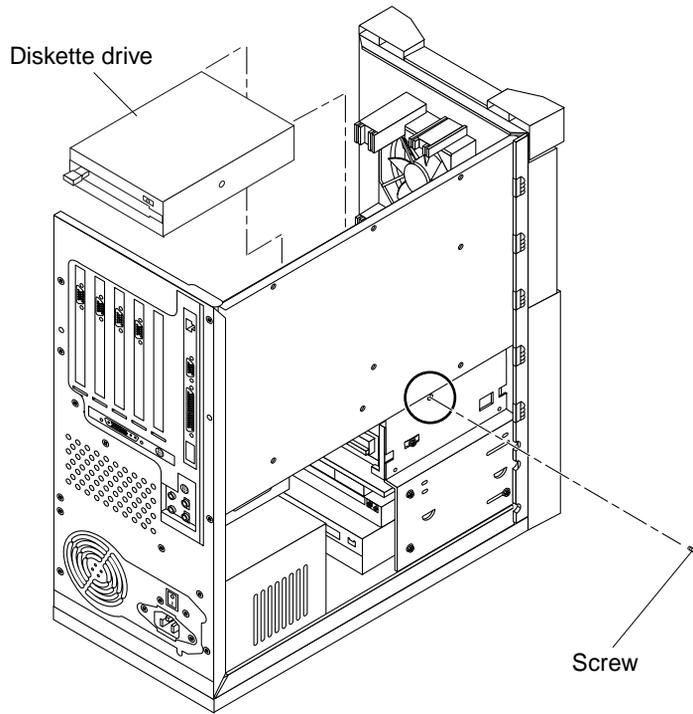


FIGURE 9-3 Removing and Replacing the Diskette Drive (Ultra 10)

9.1.2 Replacing the 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 them on any surface.

Note – Read the diskette drive product guide for information about jumpers, switch settings, or other installation tasks.

1. **Replace the diskette drive assembly.**
 - Ultra 5—go to Step 2
 - Ultra 10—go to Step 3
2. **Replace the diskette drive into the Ultra 5 as follows (FIGURE 9-1 and FIGURE 9-2):**

- a. **Position the diskette drive into the diskette drive bracket.**
 - b. **Using a number 2 Phillips screwdriver, replace the four screws securing the diskette drive to the diskette drive bracket.**
 - c. **Position the diskette drive bracket into the chassis.**
 - d. **Using a number 2 Phillips screwdriver, tighten the three screws securing the diskette drive bracket to the chassis.**
 - e. **Connect the following:**
 - Diskette drive cable assembly to the diskette drive.
 - Peripheral power cable to the diskette drive.
 - Cables connected to other 3.5-inch (8.89-cm) form-factor device (if installed).
- 3. Replace the diskette drive into the Ultra 10 as follows (FIGURE 9-3):**
- a. **Position the diskette drive into the diskette drive bracket.**
 - b. **Using your fingers, push the diskette drive toward the chassis front.**
 - c. **Using a number 2 Phillips screwdriver, replace the screw securing the diskette drive to the diskette drive bracket.**
 - d. **Connect the following:**
 - Diskette drive cable assembly to the diskette drive.
 - Peripheral power cable to the diskette drive.
 - Cables connected to other 3.5-inch (8.89-cm) form-factor device (if installed).
- 4. Connect the AC power cord to the system unit.**
- 5. Detach the wrist strap.**
- 6. Replace the top cover.**
See Section 7.4 “Replacing the Top Cover” on page 7-7.
- 7. Power on the system unit.**
See Section 6.1 “Powering On the System Unit” on page 6-1.

9.2 Hard Drive

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

Note – If the existing Ultra 10 rear hard drive is being replaced with a 9.1-Gbyte or larger capacity hard drive, ensure that the existing rear drive bracket is removed and the replacement drive bracket (part number 370-3721) is installed. This bracket is already installed in new Ultra 10 system units and can be identified by the manufacturing part number, F370-3721, stamped on the side of the bracket. See Section 8.6 “Rear Drive Bracket (Ultra 10 Only)” on page 8-28.

9.2.1 Removing a Hard Drive

1. Power off the system unit.

See Section 6.2 “Powering Off the System Unit” on page 6-4.

2. Remove the top cover.

See Section 7.1 “Removing the Top 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 them on any surface.

3. Attach the wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

4. Remove the hard drive.

- Ultra 5—go to Step 5
- Ultra 10 chassis rear—go to Step 6
- Ultra 10 chassis front—go to Step 7

5. Remove the hard drive from the Ultra 5 as follows (FIGURE 9-4 and FIGURE 9-5):

- a. **Disconnect the peripheral power cable connector and the CD-ROM drive cable connector from the rear of the CD-ROM drive. Move the peripheral power and CD-ROM drive cables out of the way.**
- b. **Disconnect the hard drive cable connector and the peripheral power cable connector from the hard drive. Move the hard drive and peripheral power cables out of the way.**

- c. Using a number 2 Phillips screwdriver, remove the two screws securing the hard drive bracket to the chassis. Lift the hard drive and hard drive bracket from the chassis.
- d. Using a number 2 Phillips screwdriver, remove the four screws securing the hard drive to the hard drive bracket. Remove the hard drive.
- e. Place the hard drive on an antistatic mat.

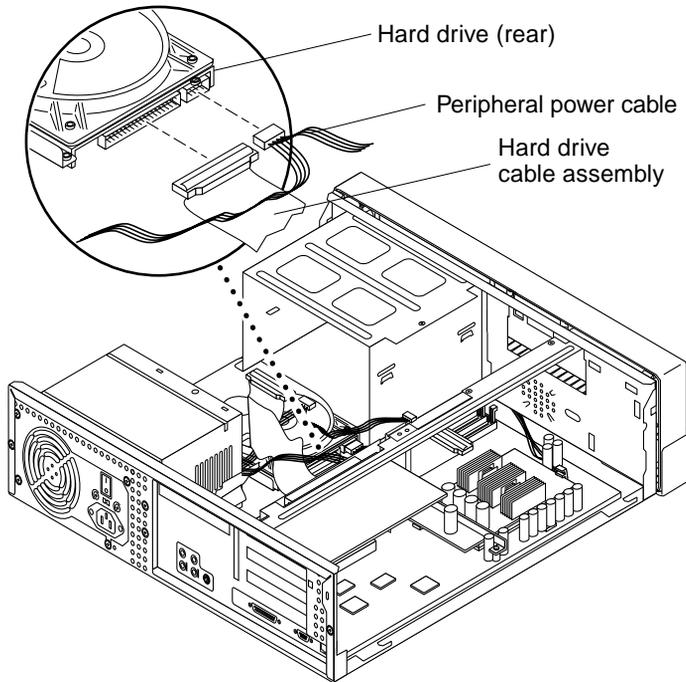


FIGURE 9-4 Removing and Replacing a Hard Drive (Ultra 5)

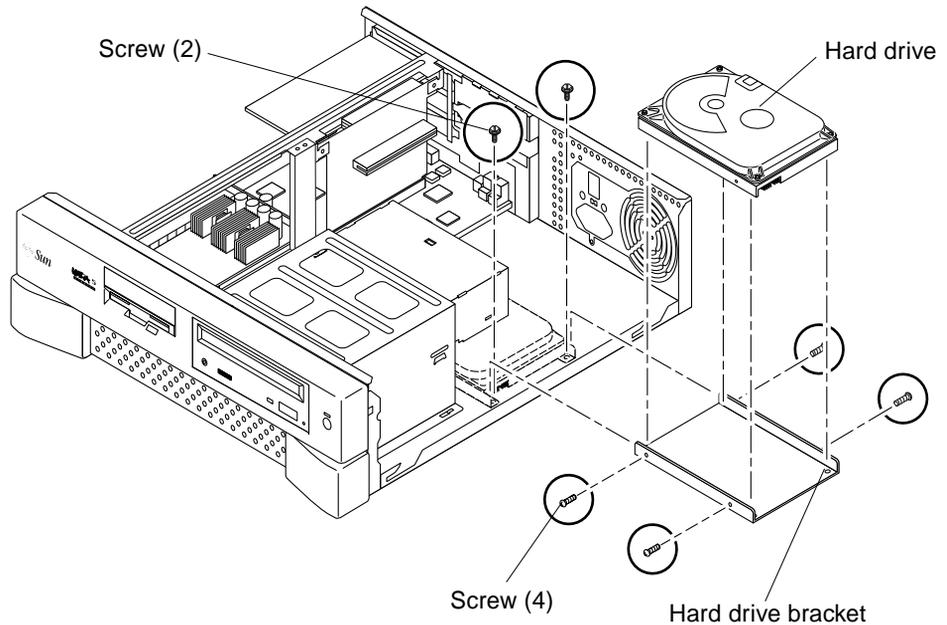


FIGURE 9-5 Removing and Replacing a Hard Drive (Ultra 5)

- 6. Remove the hard drive from the Ultra 10 chassis rear as follows (FIGURE 9-6):**
 - a. Disconnect the peripheral power cable connector and the hard drive cable connector from the hard drive. Move the peripheral power and hard drive cables out of the way.**
 - b. Using a number 2 Phillips screwdriver, remove the two screws securing the hard drive to the chassis.**
 - c. Using a number 2 Phillips screwdriver, remove the four screws securing the hard drive to the hard drive bracket.**
 - d. Remove the hard drive from the hard drive bracket.**
 - e. Place the hard drive on an antistatic mat.**

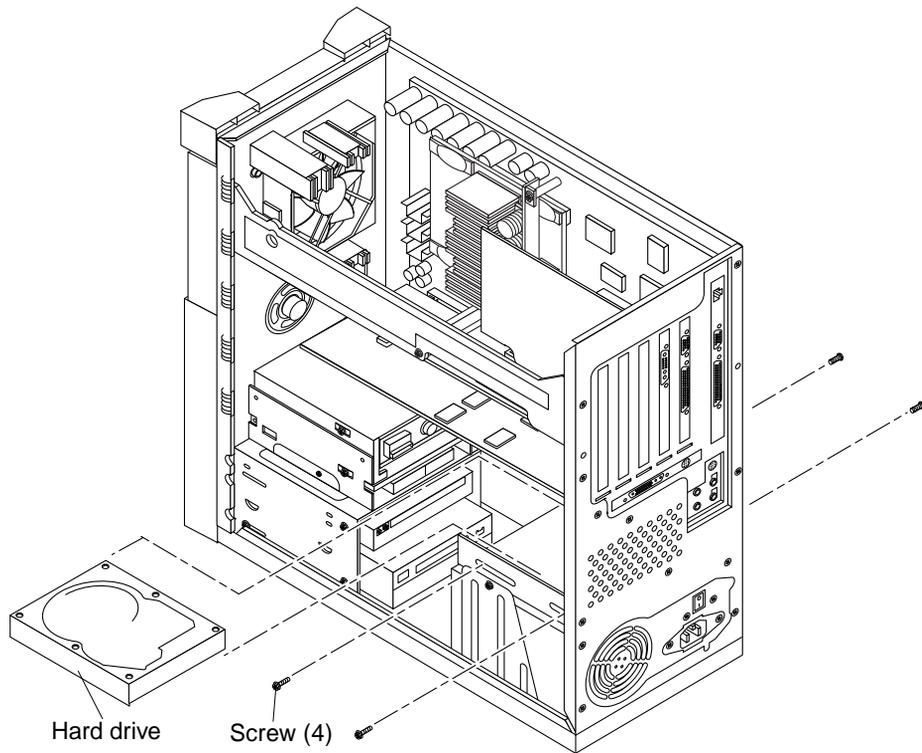


FIGURE 9-6 Removing and Replacing a Hard Drive (Ultra 10 Chassis Rear)

7. Remove the hard drive from the Ultra 10 chassis front as follows (FIGURE 9-7):
 - a. Disconnect the peripheral power cable connector and the hard drive cable connector from the hard drive. Move the peripheral power and hard drive cables out of the way.
 - b. Using a number 2 Phillips screwdriver, remove the two screws securing the hard drive bracket to the chassis.
 - c. Slide the hard drive and the hard drive bracket toward the chassis rear until it clears the chassis.
 - d. Remove the hard drive and hard drive bracket.
 - e. Using a number 2 Phillips screwdriver, remove the four screws securing the hard drive to the hard drive bracket. Remove the hard drive.

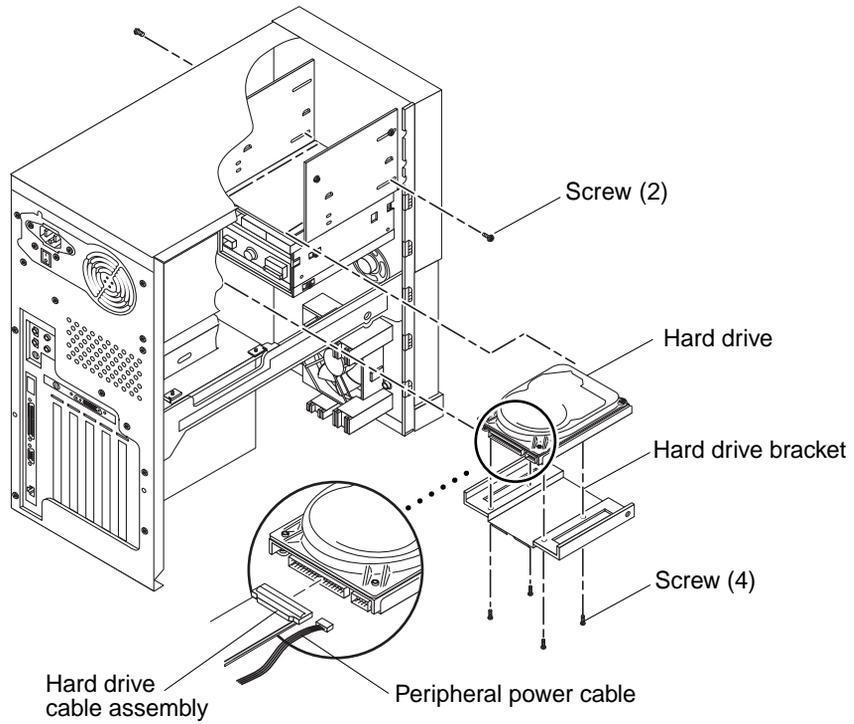


FIGURE 9-7 Removing and Replacing a Hard Drive (Ultra 10 Chassis Front)

9.2.2 Replacing a Hard 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 them on any surface.

Note – Read the hard drive product guide for information about jumpers, switch settings, or other installation tasks.

Note – Prior to replacing a hard drive, verify that the back panel mode select jumper is set to CS.

1. **Replace the hard drive.**
 - Ultra 5—go to Step 2
 - Ultra 10 chassis rear—go to Step 3
 - Ultra 10 chassis front—go to Step 4
2. **Replace the hard drive into the Ultra 5 as follows (FIGURE 9-4 and FIGURE 9-5):**
 - a. **Position the hard drive into the hard drive bracket.**
 - b. **Using a number 2 Phillips screwdriver, replace the four screws securing the hard drive to the hard drive bracket.**
 - c. **Position the hard drive and hard drive bracket into the chassis.**
 - d. **Using a number 2 Phillips screwdriver, replace the two screws securing the hard drive bracket to the chassis.**
 - e. **Connect the hard drive cable connector and the peripheral power cable connector to the hard drive. Dress cables.**
 - f. **Connect the peripheral power cable connector and the CD-ROM drive cable connector to the rear of the CD-ROM drive. Dress cables.**

3. Replace the hard drive into the Ultra 10 chassis rear as follows (FIGURE 9-6):

Note – If the existing rear hard drive is being replaced with a 9.1-Gbyte or larger capacity hard drive, ensure that the existing rear drive bracket is removed and the replacement drive bracket (part number 370-3721) is installed. See Section 8.6 “Rear Drive Bracket (Ultra 10 Only)” on page 8-28.

a. Position the hard drive into the hard drive bracket.

Note – Ensure the correct hard drive orientation.

b. Using a number 2 Phillips screwdriver, replace the four screws securing the hard drive to the hard drive bracket.

c. Position the peripheral power cable and the hard drive cable.

d. Connect the peripheral power cable connector and the hard drive cable connector to the hard drive. Dress cables.

4. Replace the hard drive into the Ultra 10 chassis front as follows (FIGURE 9-7):

a. Position the hard drive into the hard drive bracket.

b. Using a number 2 Phillips screwdriver, replace the four screws securing the hard drive to the hard drive bracket.

c. Position the hard drive and hard drive bracket into the chassis.

d. Slide the hard drive and hard drive bracket toward the chassis front.

e. Using a number 2 Phillips screwdriver, replace the two screws securing the hard drive bracket to the chassis.

f. Connect the peripheral power and hard drive cable connectors to the hard drive. Dress cables

5. Connect the AC power cord to the system unit.

6. Detach the wrist strap.

7. Replace the top cover.

See Section 7.4 “Replacing the Top Cover” on page 7-7.

8. Power-on the system unit.

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

9.3 CD-ROM Drive

To remove and replace a CD-ROM drive, proceed as follows.

9.3.1 Removing a CD-ROM Drive

1. Power off the system unit.

See Section 6.2 “Powering Off the System Unit” on page 6-4.

2. Remove the top cover.

See Section 7.1 “Removing the Top 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 them on any surface.

3. Attach the wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

4. Remove the CD-ROM drive.

- Ultra 5—go to Step 5
- Ultra 10—go to Step 6

5. Remove the CD-ROM drive from the Ultra 5 as follows (FIGURE 9-8):

a. Remove the diskette drive.

See Section 9.1.1 “Removing the Diskette Drive” on page 9-1.

b. Remove the CPU fan assembly

See Section 8.4.1 “Removing the CPU Fan Assembly” on page 8-21.

Note – The CPU fan assembly removal is optional. Remove the CPU fan assembly only if the screws securing the CD-ROM drive to the CD-ROM drive bracket can not be reached.

c. Remove the following from the rear of the CD-ROM drive:

- CD-ROM drive cable connector
- Peripheral power cable connector
- Audio cable connector

- d. Using a number 2 Phillips screwdriver, remove the four screws securing the CD-ROM drive to the CD-ROM drive bracket.
- e. Place your fingers on the rear of the CD-ROM drive. Push the CD-ROM drive toward the chassis front and remove.
- f. Place the CD-ROM drive on an antistatic mat.

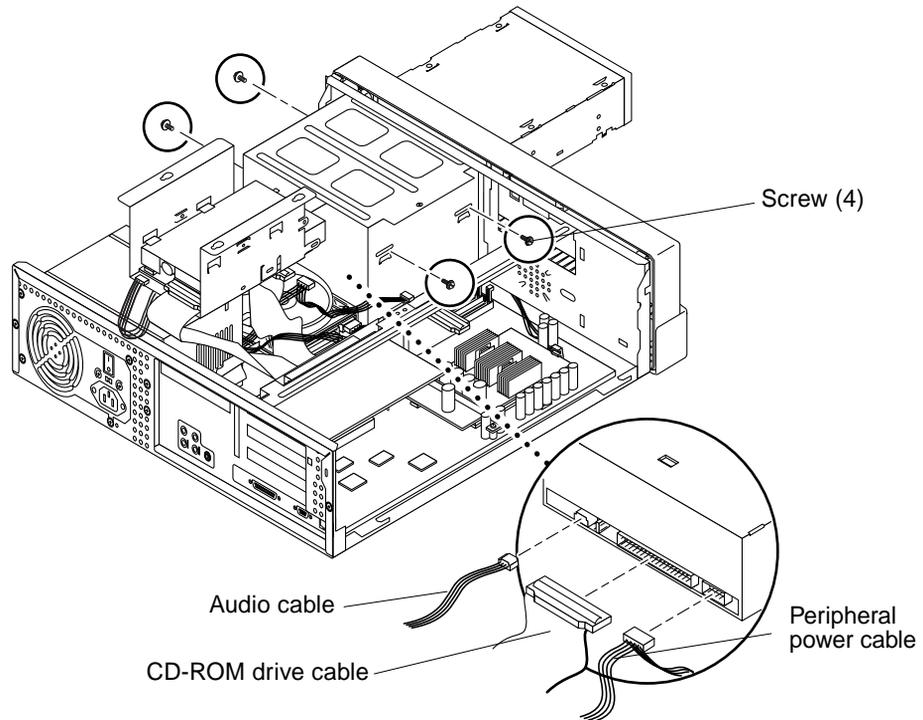


FIGURE 9-8 Removing and Replacing a CD-ROM Drive (Ultra 5)

6. Remove the CD-ROM drive from the Ultra 10 as follows (FIGURE 9-9):
 - a. Remove the following from the rear of the CD-ROM drive (not illustrated):
 - CD-ROM drive cable connector
 - Peripheral power cable connector
 - Audio cable connector
 - b. Using a number 2 Phillips screwdriver, remove the four screws securing the CD-ROM drive to the CD-ROM drive bracket.
 - c. Place your fingers on the rear of the CD-ROM drive. Push the CD-ROM drive toward the chassis front and remove.

d. Place the CD-ROM drive on an antistatic mat.

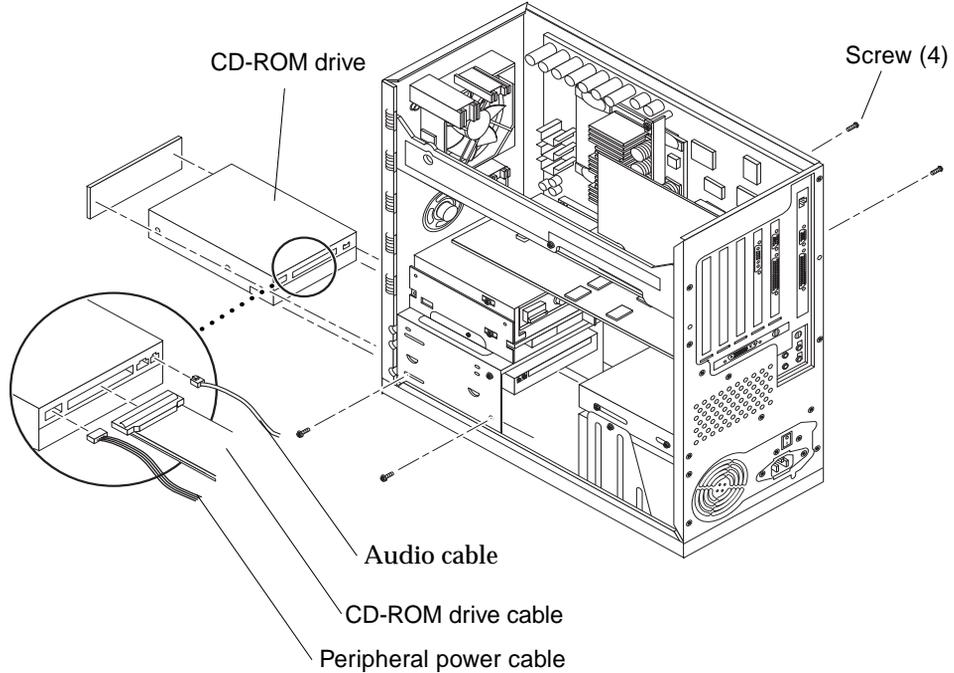


FIGURE 9-9 Removing and Replacing a CD-ROM Drive (Ultra 10)

9.3.2

Replacing a CD-ROM 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 them on any surface.

Note – Prior to replacing the CD-ROM drive, verify that the CD-ROM drive back panel mode select jumper is set to MA.

1. Replace the CD-ROM drive.

- Ultra 5—go to Step 2
- Ultra 10—go to Step 3

- 2. Replace the CD-ROM drive into the Ultra 5 as follows (FIGURE 9-8):**
 - a. Position the CD-ROM drive into the CD-ROM drive bracket. Push the CD-ROM drive toward the chassis rear.**
 - b. Using a number 2 Phillips screwdriver, replace the four screws securing the CD-ROM drive to the bracket.**
 - c. Replace the CPU fan assembly.**

See Section 8.4.2 “Replacing the CPU Fan Assembly” on page 8-23.
 - d. Replace the diskette drive.**

See Section 9.1.2 “Replacing the Diskette Drive” on page 9-5.
 - e. Connect the following to the rear of the CD-ROM drive:**
 - CD-ROM drive cable connector
 - Peripheral power cable connector
 - Audio cable connector
- 3. Replace the CD-ROM drive into the Ultra 10 as follows (FIGURE 9-9):**
 - a. Position the CD-ROM drive into the CD-ROM drive bracket. Push the CD-ROM drive toward the chassis rear.**
 - b. Using a number 2 Phillips screwdriver, replace the four screws securing the CD-ROM drive to the bracket.**
 - c. Connect the following to the rear of the CD-ROM drive (not illustrated):**
 - CD-ROM drive cable connector
 - Peripheral power cable connector
 - Audio cable connector
- 4. Connect the AC power cord to the system unit.**
- 5. Detach the wrist strap.**
- 6. Replace the top cover.**

See Section 7.4 “Replacing the Top Cover” on page 7-7.
- 7. Power-on the system unit.**

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

Motherboard and Component Replacement

This chapter describes how to remove and replace the Ultra 5 and Ultra 10 motherboard and motherboard components.

This chapter contains the following topics:

- Section 10.1 “CPU Module” on page 10-2
- Section 10.2 “NVRAM/TOD” on page 10-5
- Section 10.3 “PCI Card” on page 10-8
- Section 10.4 “UPA Graphics Card (Ultra 10)” on page 10-14
- Section 10.5 “DIMM” on page 10-18
- Section 10.6 “Riser Board” on page 10-22
- Section 10.7 “Motherboard” on page 10-25

Note – Removal and replacement of selected system unit components are also illustrated with photographs and audio/visual instructions on the *Sun Ultra 5 ShowMe How Multimedia Documentation*, part number 704-5753, and the *Sun Ultra 10 ShowMe How Multimedia Documentation*, part number 704-5983.

10.1 CPU Module

To remove and replace the CPU module, proceed as follows.

10.1.1 Removing the CPU Module

1. Power off the system unit.

See Section 6.2 “Powering Off the System Unit” on page 6-4.

2. Remove the top cover.

See Section 7.1 “Removing the Top 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 them on any surface.

3. Attach a wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.



Caution – The static random access memory (SRAM) heatsinks are extremely fragile. Do not touch the SRAM heatsinks.

4. Remove the CPU module as follows (FIGURE 10-1 or FIGURE 10-2):

- a. Using a number 2 Phillips screwdriver, remove the screw securing the hold-down brace to the riser. Remove the hold-down brace.
- b. Using a number 2 Phillips screwdriver, remove the screw securing the CPU module hold-down clip to the motherboard. Remove the CPU module hold-down clip.
- c. Using your fingers, gently lift the front edges of the CPU module, wiggling as necessary, to loosen it from the motherboard CPU connectors MJ1 and MJ2.
- d. Lift the CPU module upward from the motherboard CPU connectors until it clears the system unit chassis.
- e. Place the CPU module on an antistatic mat.

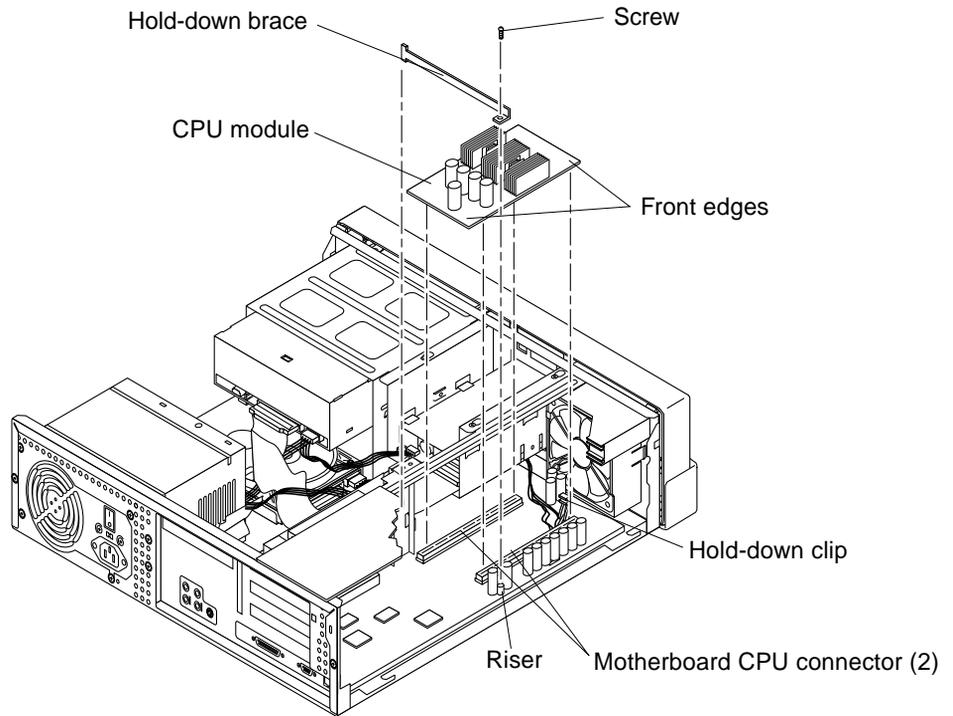


FIGURE 10-1 Removing and Replacing the CPU Module (Ultra 5)

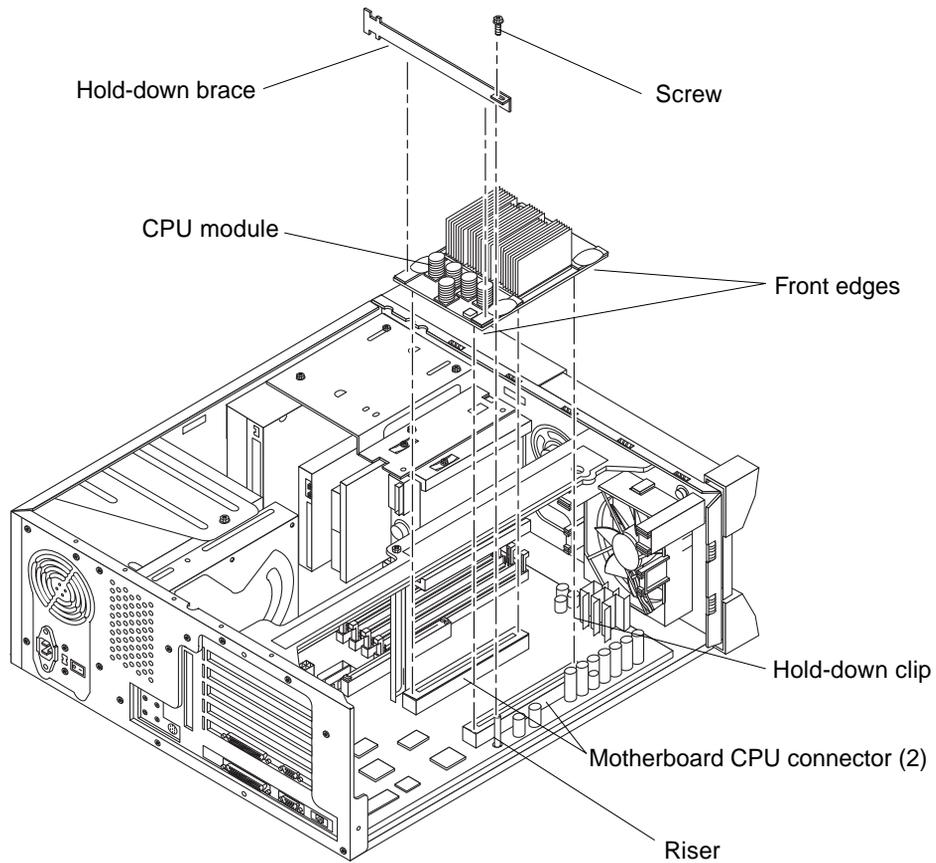


FIGURE 10-2 Removing and Replacing the CPU Module (Ultra 10)

10.1.2 Replacing the CPU Module



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 them on any surface.

1. **Replace the CPU module as follows (FIGURE 10-1 or FIGURE 10-2):**
 - a. **Position the CPU module onto the motherboard CPU connectors.**
 - b. **Grasping the CPU module, gently press on the CPU module rear edges and then the front edges until the CPU module begins to seat.**

- c. Using both hands, press the CPU module downward until the CPU module is properly seated to the motherboard CPU connectors.
 - d. Push the hold-down clip forward over the edge of the CPU module.
 - e. Replace the hold-down clip. Using a number two Phillips screwdriver, replace the screw securing the CPU module hold-down clip to the motherboard.
 - f. Replace the hold-down brace. Using a number 2 Phillips screwdriver, replace the screw securing the hold-down brace to the riser.
2. Connect the AC power cord to the system unit.
 3. Detach the wrist strap.
 4. Replace the top cover.
See Section 7.4 “Replacing the Top Cover” on page 7-7.
 5. Power on the system unit.
See Section 6.1 “Powering On the System Unit” on page 6-1.

10.2 NVRAM/TOD

To remove and replace the NVRAM/TOD, proceed as follows.

10.2.1 Removing the NVRAM/TOD

1. **Power off the system unit.**
See Section 6.2 “Powering Off the System Unit” on page 6-4.
2. **Remove the top cover.**
See Section 7.1 “Removing the Top 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 them on any surface.

3. **Attach a wrist strap.**
See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

4. Remove the NVRAM/TOD as follows (FIGURE 10-3 or FIGURE 10-4):
 - a. With exception to a PCI card that may be installed into PCI connector number 2 (the PCI connector closest to the power supply), remove the PCI card(s).
See Section 10.3.1 “Removing a PCI Card” on page 10-8.
 - b. Locate the NVRAM/TOD and carrier on the motherboard.
 - c. Grasp the NVRAM/TOD carrier at each end and pull it straight up gently wiggling it as necessary.

Note – Gently wiggle the NVRAM/TOD as necessary.

5. Place the NVRAM/TOD and carrier on an antistatic mat.

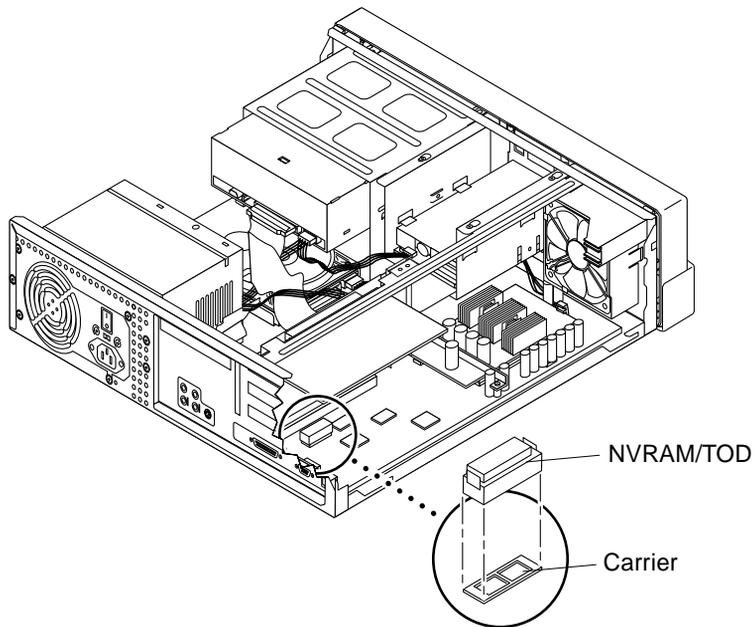


FIGURE 10-3 Removing and Replacing the NVRAM/TOD (Ultra 5)

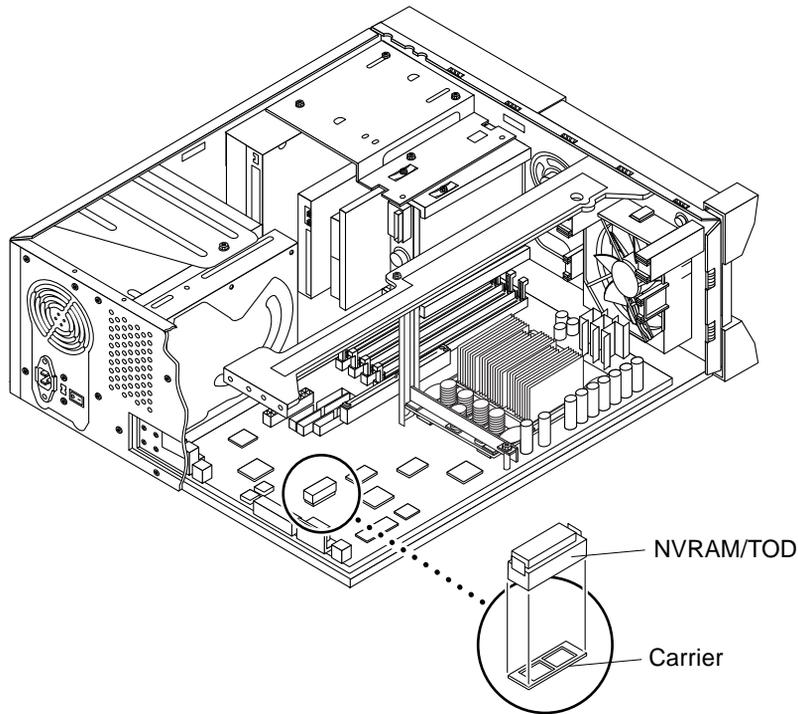


FIGURE 10-4 Removing and Replacing the NVRAM/TOD (Ultra 10)

10.2.2 Replacing the 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 them on any surface.

1. Replace the NVRAM/TOD as follows (FIGURE 10-3 or FIGURE 10-4):
 - a. Position the NVRAM/TOD and carrier on the motherboard.
 - b. 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.

- c. Push the NVRAM/TOD into the carrier until properly seated.

2. **Replace the PCI card(s).**
See Section 10.3.2 “Replacing a PCI Card” on page 10-12.
3. **Connect the AC power cord to the system unit.**
4. **Detach the wrist strap.**
5. **Replace the top cover.**
See Section 7.4 “Replacing the Top Cover” on page 7-7.
6. **Power on the system unit.**
See Section 6.1 “Powering On the System Unit” on page 6-1.

10.3 PCI Card

To remove and replace a PCI card, proceed as follows.

10.3.1 Removing a PCI Card

1. **Power off the system unit.**
See Section 6.2 “Powering Off the System Unit” on page 6-4.
2. **Disconnect all cables from the PCI 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 them on any surface.

3. **Remove the top cover.**
See Section 7.1 “Removing the Top Cover” on page 7-1.
4. **Attach the wrist strap.**
See Section 7.2 “Attaching the Wrist Strap” on page 7-4.
5. **Remove the PCI card.**
 - Ultra 5—go to Step 6 (slots 1 or 3) or Step 7 (slot 2)
 - Ultra 10—go to Step 8

6. Remove the PCI card from PCI slots 1 or 3 as follows (FIGURE 10-5):

- a. Using a number 2 Phillips screwdriver, remove the screw securing the PCI card bracket tab to the system unit chassis.**



Caution – Avoid damaging the connector by not applying force to one end or one side of the board.

- b. Grasp the two corners of the PCI card and pull the card straight out from the connector.**

Note – Use a number 2 Phillips screwdriver to remove the bracket tab adapter from the PCI card prior to placing the PCI card on an antistatic mat.

- c. Place the PCI card on an antistatic mat.**

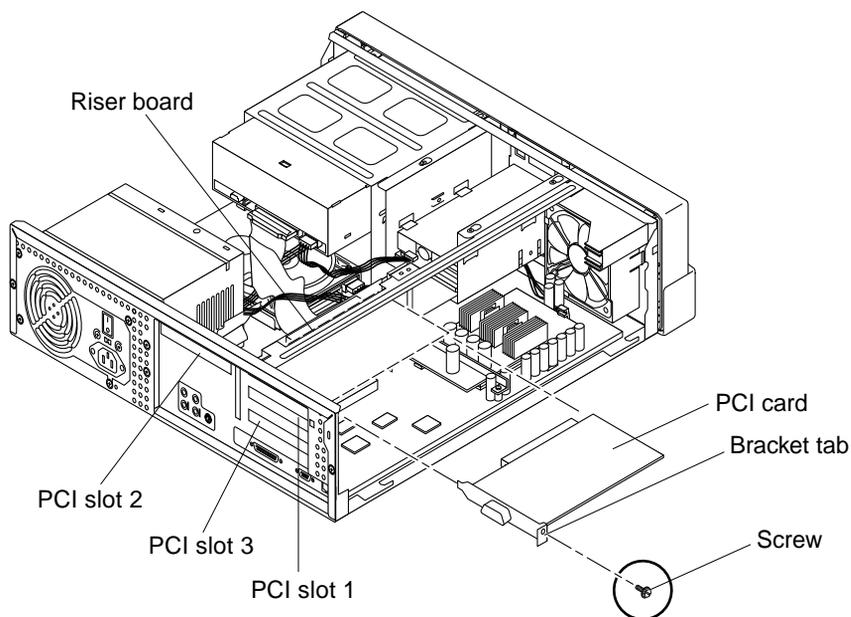


FIGURE 10-5 Removing and Replacing a PCI Card From PCI Slot 1 and/or 3 (Ultra 5)

7. Remove the PCI card from slot 2 as follows (FIGURE 10-6):

- a. Using a number 2 Phillips screwdriver, remove the screw securing the bracket tab adapter to the chassis.**

- b. Remove the bracket tab adapter.
- c. At the two corners of the card, pull the card from the riser board connector.
- d. Move the PCI card so that the card backplate clears the chassis back panel slot.
- e. Remove the PCI card.
- f. Place the PCI card on an antistatic mat.

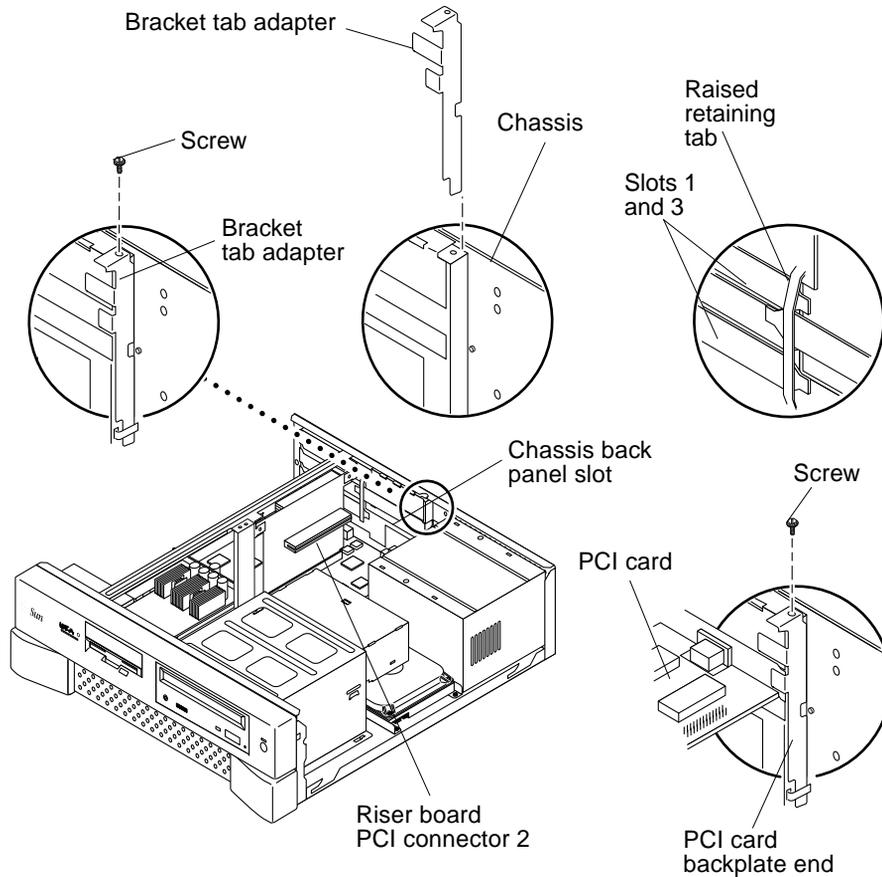


FIGURE 10-6 Removing and Replacing the PCI Card From PCI Slot 2 (Ultra 5)

8. Remove the PCI card from the Ultra 10 as follows (FIGURE 10-7):

- a. Using a number 2 Phillips screwdriver, remove the screw securing the PCI card bracket tab to the system unit chassis.



Caution – Avoid damaging the connector by not applying force to one end or one side of the board.

b. Grasp the two corners of the PCI card and pull the card straight out from the connector.

Note – Use a number 2 Phillips screwdriver to remove the bracket tab adapter from the PCI card prior to placing the PCI card on an antistatic mat.

c. Place the PCI card on an antistatic mat.

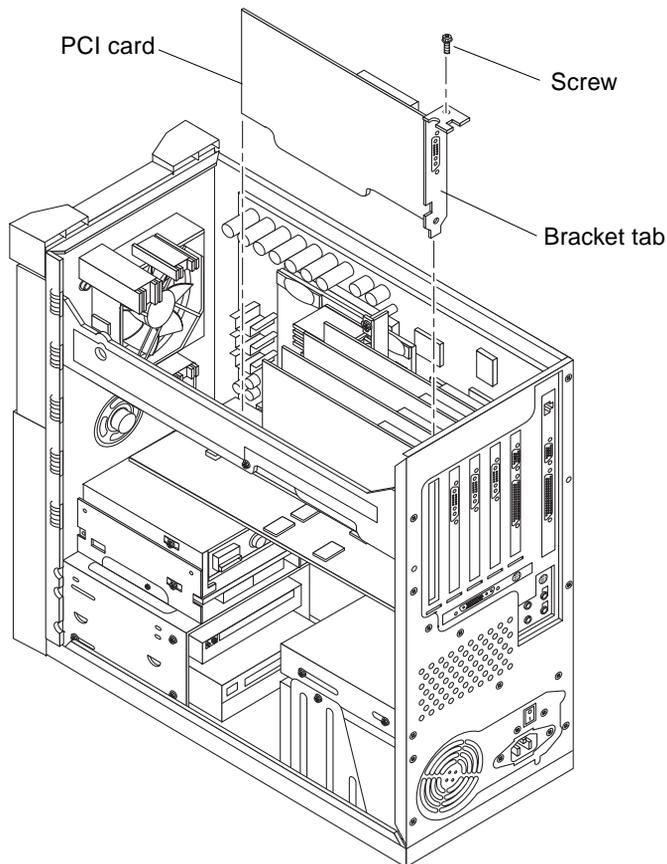


FIGURE 10-7 Removing and Replacing the PCI Card (Ultra 10)

10.3.2 Replacing a PCI 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 them on any surface.

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

1. Replace the PCI card.

- Ultra 5—go to Step 2 (slots 1 or 3) or Step 3 (slot 2)
- Ultra 10—go to Step 4

2. Replace the PCI card into PCI slot 1 or 3, proceed as follows (FIGURE 10-5):

a. Position the PCI card into the chassis.



Caution – The PCI card backplate end *must* be inserted between the back panel in slot 2 (opposite side of riser board) and the back of the system chassis.

b. Insert the PCI card connector so that it touches the associated riser board PCI connector.



Caution – Support the riser card with the fingers of one hand, to insure full insertion of the PCI card into the riser board.

c. Guide the PCI card back panel into the chassis back panel slot.



Caution – Insure the backplate does not snag the shielding fingers on the system back panel.

d. At the two corners of the card, push the card into the riser board connector until the card is fully seated.

e. Using a number 2 Phillips screwdriver, replace the screw securing the PCI card bracket tab to the system unit chassis.

3. Replace the PCI card into PCI slot 2, proceed as follows (FIGURE 10-6):

a. Position the PCI card into the chassis.



Caution – The PCI card backplate end *must* be inserted *between* the back panels in slots 1 and 3 (opposite side of riser card) and the raised retaining tab on the back of the system chassis.

b. Insert the PCI card connector so that it touches the associated riser board PCI connector.



Caution – Insure the backplate does not snag the shielding fingers on the system back panel.

c. Guide the PCI card backplate into the chassis back panel slot.



Caution – Support the riser card with the fingers of one hand, to insure full insertion of the PCI card into the riser board.

d. At the two corners of the card, push the card into the riser board connector until the card is fully seated.

e. Position the PCI card bracket tab.

f. Using a number 2 Phillips screwdriver, replace the screw securing the PCI card bracket tab to the system unit chassis.

4. Replace the PCI card into the Ultra 10, proceed as follows (FIGURE 10-7):

a. Position the PCI card into the chassis.

b. Insert the PCI card connector so that it touches the associated riser board PCI connector.



Caution – Support the riser card with the fingers of one hand to insure full insertion of the PCI card into the riser board.

c. Guide the PCI card backplate into the chassis back panel slot.



Caution – Insure the backplate does not snag the shielding fingers on the system back panel.

d. At the two corners of the card, push the card into the riser board connector until the card is fully seated.

e. Using a number 2 Phillips screwdriver, replace the screw securing the PCI card bracket tab to the system unit chassis.

5. **Connect the AC power cord to the system unit.**
6. **Detach the wrist strap.**
7. **Replace the top cover.**
See Section 7.4 “Replacing the Top Cover” on page 7-7.
8. **Connect all cables to the PCI card.**
9. **Power on the system unit.**
See Section 6.1 “Powering On the System Unit” on page 6-1.

10.4 UPA Graphics Card (Ultra 10)

To remove and replace a UPA graphics card, and to install UPA graphics card patch software, proceed as follows.

10.4.1 Removing a UPA Graphics Card

1. **Power off the system unit.**
See Section 6.2 “Powering Off the System Unit” on page 6-4.
2. **Disconnect the video cable from the graphics card video connector.**
3. **Remove the top cover.**
See Section 7.1 “Removing the Top 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 them on any surface.

4. **Attach the wrist strap.**
See Section 7.2 “Attaching the Wrist Strap” on page 7-4.
5. **Remove a UPA graphics card as follows (FIGURE 10-8):**
 - a. **Using a Phillips screwdriver, remove the screw securing the graphics card bracket tab to the system unit chassis.**



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

- b. At the two nearest corners of the graphics card, pull the card straight away from the connector (UPA1).**
- 6. Place the UPA graphics card on an antistatic mat.**

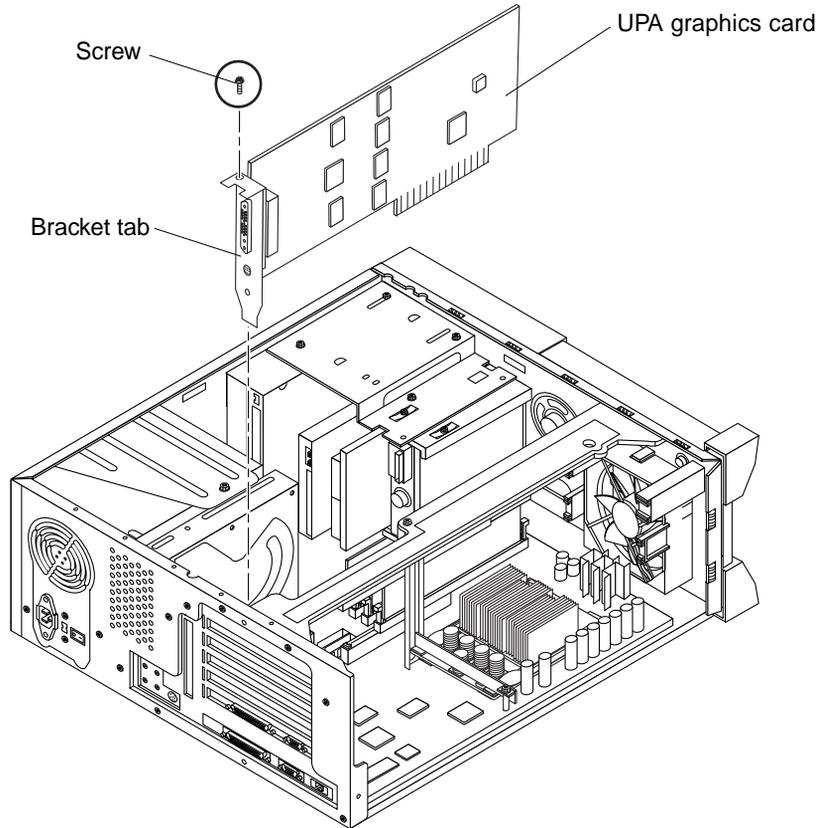


FIGURE 10-8 Removing and Replacing the UPA Graphics Card (Ultra 10)

10.4.2 Replacing a UPA Graphics Card

Note – If you are installing are using the Solaris 2.5.1 HW:11/97 or the Solaris 2.6 5/98 operating environments, and you are installing an Elite3D UPA graphics card, see Section 10.4.3 “Elite3D m3 UPA Graphics Card Patch Information” on page 10-17.



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 them on any surface.

1. **Replace the UPA graphics card as follows (FIGURE 10-8):**
 - a. **Position the UPA graphics card into the chassis.**
 - b. **Guide the UPA graphics card back panel into the chassis back panel.**
 - c. **Push the UPA graphics card connector so that it touches its associated UPA card connector on the motherboard.**



Caution – Avoid damaging the connector by not applying force to one end or one side of the board.

Note – The UPA graphics card connector is a double-row connector that requires two levels of insertion. When installing the graphics card, ensure that the connector is fully seated into the slot.

- d. **At the two nearest corners of the card, push the card straight into the connector until the card is fully seated.**
 - e. **Using a Phillips screwdriver, replace the screw securing the card bracket tab to the system unit chassis.**
2. **Replace the top cover.**
See Section 7.4 “Replacing the Top Cover” on page 7-7.
3. **Connect the video cable to the graphics card video connector.**
4. **Connect the AC power cord to the system unit.**
5. **Detach the wrist strap.**

6. Power on the system unit.

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

10.4.3 Elite3D m3 UPA Graphics Card Patch Information

If you are installing or using the Solaris 2.5.1 HW:11/97 or the Solaris 2.6 5/98 operating environment, and you are also installing an Elite3D UPA graphics card, you must install the respective software patch(es):

- Solaris 2.5.1 HW:11/97 - Patch 105789-01 is automatically installed when the Elite3D UPA graphics card software is installed. It is recommend that software patch 105791-05 (or a more curret version of the patch, if available) also be installed.
- Solaris 2.6 5/98 - After installing the Elite 3D UPA graphics card, software patch 105363-06 (or a more curret version of the patch, if available) should be installed.

These patches are available through the *Sun Ultra 5/10 Software Note* CD (see table), or through the SunSolve Online website at <http://www.sun.com/service/online/index.html>, or by contacting *Enterprise Service*.

TABLE 10-1 Sun Ultra 5/10 Software Note CD Selection

CD Part Number	Audience
805-4971	Northern Europe
805-6962	Southern Europe
805-6963	Asia
805-5590	Japan

10.5 DIMM

To remove and replace a DIMM, proceed as follows.



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



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



Caution – Each DIMM group must contain two DIMMs of equal density (for example: two 32-Mbyte DIMMs) to function properly. Do not mix DIMM capacities in any group.

Note – The system unit *must* have two identical DIMMs installed in a DIMM group. For best system performance, install four identical DIMMs in the two groups. The following table identifies DIMM installation locations.

TABLE 10-2 DIMM Group and Slot Pairs

Group	Pairs
0	DIMM1 and DIMM2
1	DIMM3 and DIMM4

10.5.1 Removing a DIMM



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

1. Power off the system unit.

See Section 6.2 “Powering Off the System Unit” on page 6-4.

2. Remove the top cover.

See Section 7.1 “Removing the Top 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 them on any surface.

3. Attach the wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

4. Remove the diskette drive (Ultra 5 only).

See Section 9.1.1 “Removing the Diskette Drive” on page 9-1

5. Locate the DIMM to be removed.

6. Push the ejection levers away from the DIMM (FIGURE 10-9 or FIGURE 10-10).

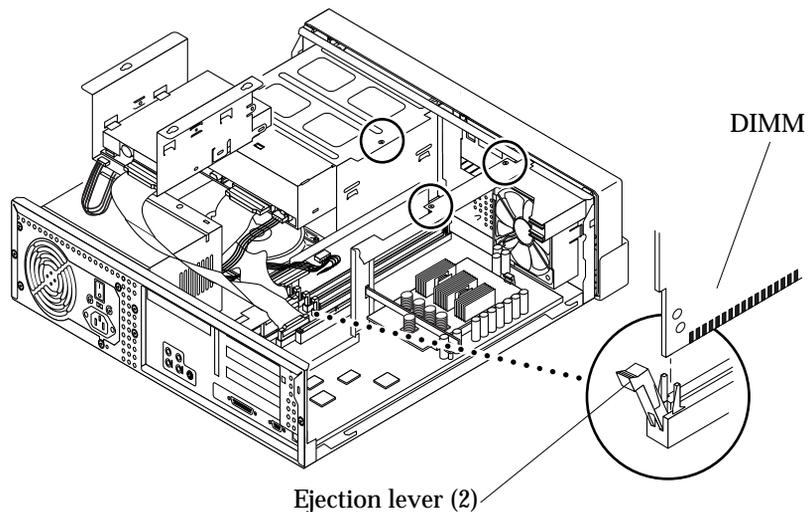


FIGURE 10-9 Removing and Replacing a DIMM (Ultra 5)

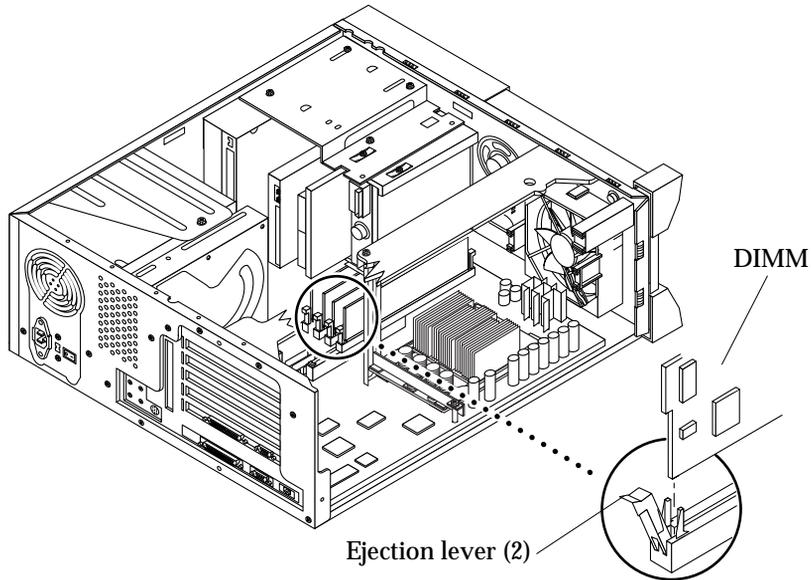


FIGURE 10-10 Removing and Replacing a DIMM (Ultra 10)

7. Remove the DIMM from the connector.
8. Place the DIMM on an antistatic mat.

10.5.2 Replacing a DIMM



Caution – DIMMs 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 DIMM.



Caution – Do not remove any DIMM from the antistatic container until you are ready to install it on the motherboard. Handle DIMMs only by their edges. Do not touch DIMM components or metal parts. Always wear a grounding strap when handling DIMMs.



Caution – A DIMM group must contain two DIMMs of equal density (for example, two 32-Mbyte DIMMs) to function properly. Do not mix DIMM density in any group.



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 them on any surface.



Caution – Hold DIMMs only by the edges.



Caution – If the system unit memory is configured with 16-Mbyte DIMMs and the system unit memory is being upgraded with anything other than 16-Mbyte DIMMs, then it is necessary to remove the 16-Mbyte DIMMs and replace them with the memory upgrade.



Caution – If the DIMM is not seated into its slot evenly, it can cause shorts that will damage the system. Ensure that all contacts engage at the same time by pressing evenly on the top corners of the DIMM--do *not* rock the DIMM into place. A clicking sound will be heard when the DIMM is properly seated.



Caution – The system unit *must* have two identical DIMMs installed a group. For best system performance, install four identical DIMMs in the two groups. TABLE 10-2 identifies DIMM installation locations.

1. Remove the DIMM from the antistatic container.
2. Install the DIMM as follows: (FIGURE 10-9 or FIGURE 10-10)
 - a. Position the DIMM in the connector, ensuring that the notches on the bottom of the DIMM are aligned with the connector alignment bumps.

Note – Bottom DIMM notches and connector alignment bumps are keyed to ensure proper DIMM orientation.

- b. Press firmly on the DIMM top until the DIMM is properly seated.

Note – Proper DIMM seating is verified by a clicking sound. Ensure proper seating occurs.

3. **Verify the ejection levers are positioned toward the DIMM.**
4. **Connect the AC power cord to the system unit.**
5. **Detach the wrist strap.**
6. **Replace the top cover.**
See Section 7.4 “Replacing the Top Cover” on page 7-7.
7. **Power on the system unit.**
See Section 6.1 “Powering On the System Unit” on page 6-1.

10.6 Riser Board

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

10.6.1 Removing the Riser Board

1. **Power off the system unit.**
See Section 6.2 “Powering Off the System Unit” on page 6-4.
2. **Remove the top cover.**
See Section 7.1 “Removing the Top 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 them on any surface.

3. **Attach a wrist strap.**
See Section 7.2 “Attaching the Wrist Strap” on page 7-4.
4. **Remove the PCI card(s).**
See Section 10.3.1 “Removing a PCI Card” on page 10-8.
5. **Remove the riser board as follows (FIGURE 10-11 or FIGURE 10-12):**

- a. Using a Phillips screwdriver, remove the two screws securing the riser board to the system unit chassis.



Caution – Avoid damaging the connector by not applying force to one end or one side of the board.

- b. At the two upper corners of the riser board, pull the board straight upward from the connector.
- c. Remove the riser board.

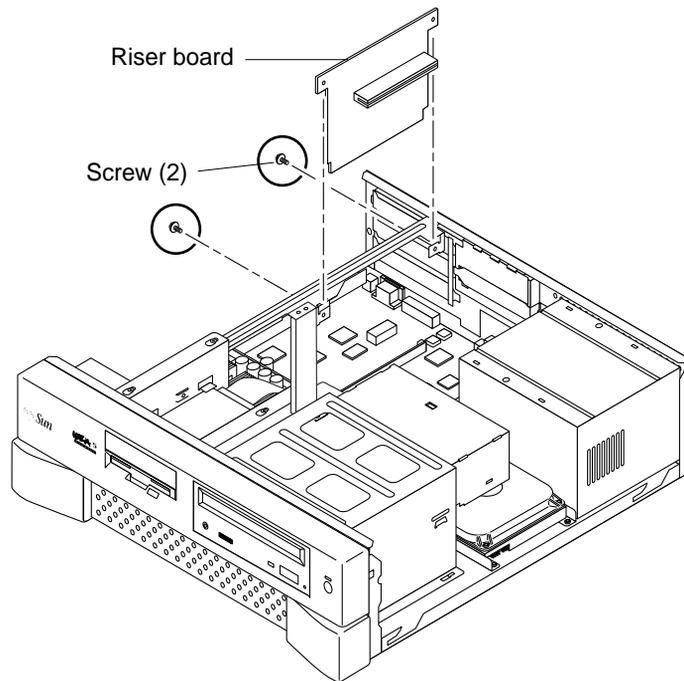


FIGURE 10-11 Removing and Replacing the Riser Board (Ultra 5)

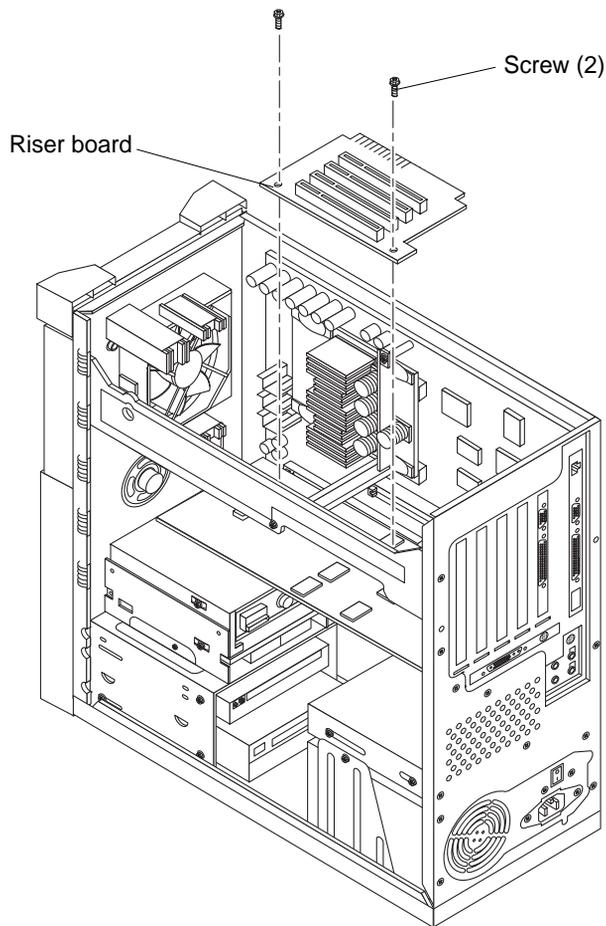


FIGURE 10-12 Removing and Replacing the Riser Board (Ultra 10)

10.6.2 Replacing the Riser 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 them on any surface.

1. **Replace the riser board as follows (FIGURE 10-11 or FIGURE 10-12):**
 - a. **Position the riser board into the chassis.**

- b. Lower the riser board connector so that it touches its associated card connector on the motherboard.
 - c. At the two upper corners of the board, push the board straight downward into the connector until the card is fully seated.
 - d. Using a Phillips screwdriver, replace the two screw securing the riser card to the system unit chassis.
2. **Replace the PCI card(s).**
See Section 10.3.2 “Replacing a PCI Card” on page 10-12.
 3. **Connect the AC power cord to the system unit.**
 4. **Detach the wrist strap.**
 5. **Replace the top cover.**
See Section 7.4 “Replacing the Top Cover” on page 7-7.
 6. **Power on the system unit.**
See Section 6.1 “Powering On the System Unit” on page 6-1.

10.7 Motherboard

To remove and replace a motherboard, proceed as follows.



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

Note – If the motherboard is being replaced, remove all DIMMs, UPA graphics card, PCI card(s), and the CPU module prior to removing the motherboard. Note the chassis connector location for each DIMM, UPA graphics card, and PCI card prior to removal.

Note – The NVRAM/TOD contains the system host identification (ID) and Ethernet address. If the same ID and Ethernet address are to be used on the replacement motherboard, remove the NVRAM/TOD from the motherboard and install the removed NVRAM/TOD on the replacement motherboard after motherboard installation.

10.7.1 Removing the Motherboard

1. Power off the system unit.

See Section 6.2 “Powering Off the System Unit” on page 6-4.

2. Remove the top cover.

See Section 7.1 “Removing the Top 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 them on any surface.

3. Attach a wrist strap.

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

4. Remove the motherboard.

- Ultra 5—go to Step 5
- Ultra 10—go to Step 6

5. Remove the motherboard from the Ultra 5 as follows (FIGURE 10-13 and FIGURE 10-14):

a. Remove the power supply.

See Section 8.1.1 “Removing the Power Supply” on page 8-1.

b. Remove the diskette drive.

See Section 9.1.1 “Removing the Diskette Drive” on page 9-1.

c. Disconnect the following from the motherboard:

- Speaker cable connector (J18)
- CPU fan cable connector (J19)
- Power-on LED/software power on cable connector (J17)
- Diskette drive cable assembly (J16)
- CD-ROM drive cable connector (J14)
- Hard drive cable connector (J15)
- Audio cable assembly (J9)
- Serial/parallel cable assembly (J7/J8)

d. Remove the following:

i. CPU module

See Section 10.1.1 “Removing the CPU Module” on page 10-2.

ii. CPU fan assembly

See Section 8.4.1 “Removing the CPU Fan Assembly” on page 8-21.

iii. PCI card(s)

See Section 10.3.1 “Removing a PCI Card” on page 10-8.

iv. Riser board

See Section 10.6.1 “Removing the Riser Board” on page 10-22.

v. Riser board support

vi. NVRAM/TOD with carrier

See Section 10.2.1 “Removing the NVRAM/TOD” on page 10-5.

vii. DIMMs

See Section 10.5.1 “Removing a DIMM” on page 10-18.

e. Remove the motherboard as follows:

i. Disconnect the external cables.

ii. Using a number 2 Phillips screwdriver, remove the seven screws securing the motherboard to the chassis standoffs.



Caution – Handle the motherboard by the back panel or by the edges only.

iii. Lift the motherboard from the chassis.

iv. Place the motherboard on an antistatic mat.

Note – It may be necessary to slide the motherboard toward the chassis front before lifting from chassis.

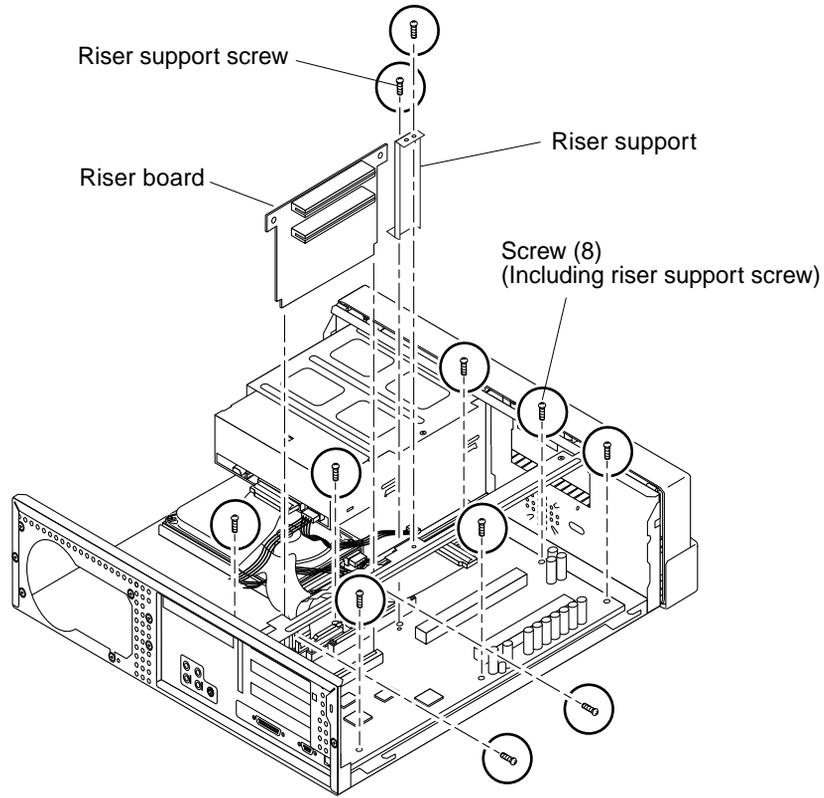


FIGURE 10-13 Removing and Replacing the Motherboard (Ultra 5)

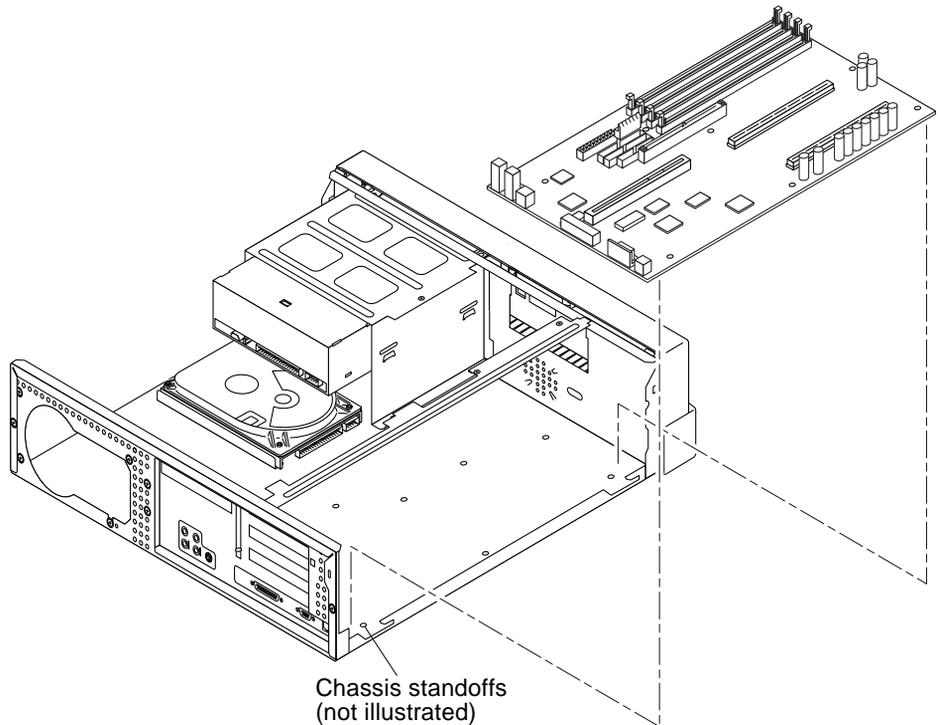


FIGURE 10-14 Removing and Replacing the Motherboard (Ultra 5)

6. Remove the motherboard from the Ultra 10 as follows (FIGURE 10-15):

a. Place the system unit on its side.

b. Disconnect the following from the motherboard:

- Speaker cable connector (J18)
- CPU fan cable connector (J19)
- Power-on LED/software power on cable connector (J17)
- Diskette drive cable assembly (J16)
- CD-ROM drive cable connector (J14)
- Hard drive cable connector (J15)
- Audio cable assembly (J9)
- Serial/parallel cable assembly (J7/J8)

c. Remove the following:

i. CPU module

See Section 10.1.1 “Removing the CPU Module” on page 10-2.

ii. CPU fan assembly

See Section 8.4.1 “Removing the CPU Fan Assembly” on page 8-21.

iii. PCI card(s)

See Section 10.3.1 “Removing a PCI Card” on page 10-8.

iv. Riser board

See Section 10.6.1 “Removing the Riser Board” on page 10-22.

v. UPA graphics card(s)

See Section 10.4.1 “Removing a UPA Graphics Card” on page 10-14.

vi. NVRAM/TOD with carrier

See Section 10.2.1 “Removing the NVRAM/TOD” on page 10-5.

vii. DIMMs

See Section 10.5.1 “Removing a DIMM” on page 10-18.

d. Remove the motherboard as follows:

- Disconnect the external cables.
- Using a number 2 Phillips screwdriver, remove the eight screws securing the motherboard to the chassis standoffs.



Caution – Handle the motherboard by the back panel or by the edges only.

- Lift the motherboard from the chassis.

Note – It may be necessary to slide the motherboard toward the chassis front before lifting from chassis.

- Place the motherboard on an antistatic mat.

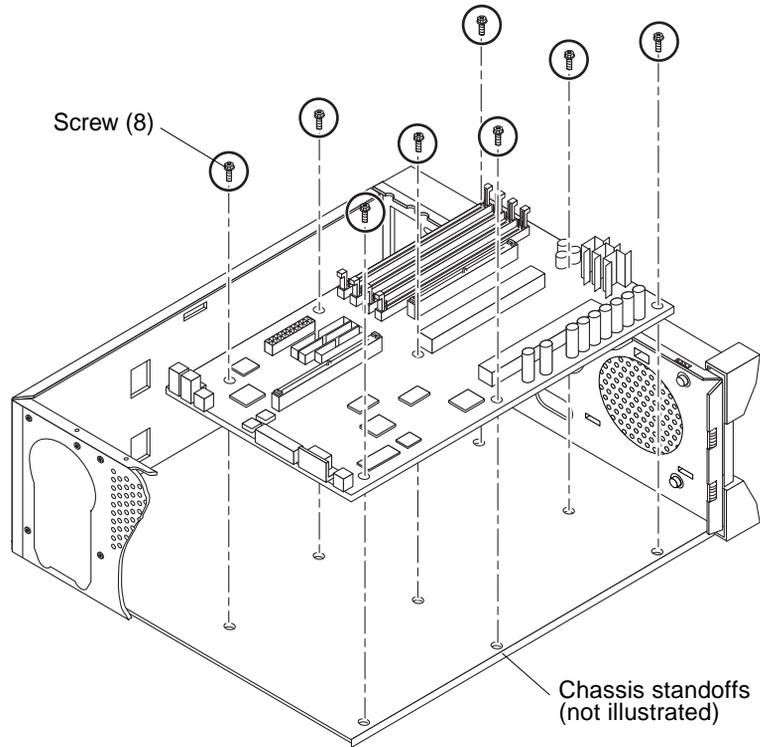


FIGURE 10-15 Removing and Replacing the Motherboard (Ultra 10)

10.7.2 Replacing the Motherboard



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 them on any surface.

Note – Jumpers JP3 and JP4 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.

- Using long-nose pliers, set the motherboard serial port jumpers JP3 and JP4 (refer to the following table).

TABLE 10-3 Serial Port Jumper Settings

Jumper	Pins 1 + 2 Select	Pins 2 + 3 Select	Default Shunt on Pins
JP3	RS-232	RS-423	2-3
JP4	RS-232	RS-423	2-3

Note – Motherboard jumpers are identified as JP. Jumper pins are located immediately adjacent to the part number. Pin 1 is marked with an asterisk in any of the positions shown in the following illustration. Ensure that the serial port jumpers are set correctly.

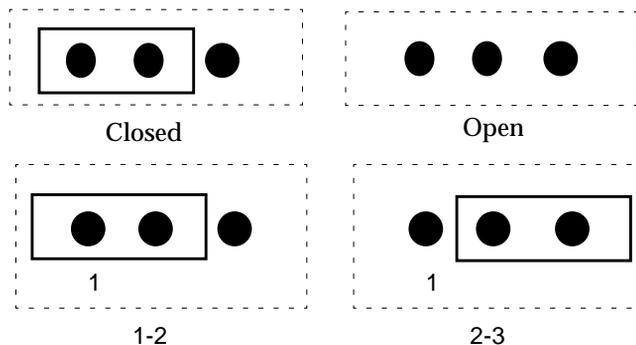


FIGURE 10-16 Identifying Jumper Pins

- Replace the motherboard.
 - Ultra 5—go to Step 3
 - Ultra 10—go to Step 4
- Replace the motherboard into the Ultra 5 as follows (FIGURE 10-13 and FIGURE 10-14):
 - Replace the motherboard as follows:



Caution – Handle the motherboard by the back panel or the edges only.

- Position the motherboard into the chassis.
- Using a number 2 Phillips screwdriver, replace the seven screws securing the motherboard to the chassis.

- Connect the external cables.
- b. Replace the following:**
- i. Riser board and support**
See Section 10.6.2 “Replacing the Riser Board” on page 10-24.
 - ii. DIMMs**
See Section 10.5.2 “Replacing a DIMM” on page 10-20.
 - iii. NVRAM/TOD with carrier**
See Section 10.2.2 “Replacing the NVRAM/TOD” on page 10-7.
 - iv. PCI card(s)**
See Section 10.3.2 “Replacing a PCI Card” on page 10-12.
 - v. CPU fan assembly**
See Section 8.4.2 “Replacing the CPU Fan Assembly” on page 8-23.
 - vi. CPU module**
See Section 10.1.2 “Replacing the CPU Module” on page 10-4.
- c. Connect the following to the motherboard:**
- Speaker cable connector (J18)
 - CPU fan cable connector (J19)
 - Power-on LED/software power on cable connector (J17)
 - Diskette drive cable assembly (J16)
 - CD-ROM drive cable connector (J14)
 - Hard drive cable connector (J15)
 - Audio cable assembly (J9)
 - Serial/parallel cable assembly (J7/J8)

4. Replace the motherboard into the Ultra 10 as follows (FIGURE 10-15):

a. Replace the motherboard as follows:



Caution – Handle the motherboard by the back panel or by the edges only.

- Position the motherboard into the chassis.
- Using a number 2 Phillips screwdriver, replace the eight screws securing the motherboard to the chassis.
- Connect the external cables.

b. Replace the following:

i. DIMMs

See Section 10.5.2 “Replacing a DIMM” on page 10-20.

ii. NVRAM/TOD with carrier

See Section 10.2.2 “Replacing the NVRAM/TOD” on page 10-7.

iii. UPA graphics card(s)

See Section 10.4.2 “Replacing a UPA Graphics Card” on page 10-16.

iv. Riser board

See Section 10.6.2 “Replacing the Riser Board” on page 10-24.

v. PCI card(s)

See Section 10.3.2 “Replacing a PCI Card” on page 10-12.

vi. CPU fan assembly

See Section 8.4.2 “Replacing the CPU Fan Assembly” on page 8-23.

vii. CPU module

See Section 10.1.2 “Replacing the CPU Module” on page 10-4.

c. Connect the following to the motherboard:

- Speaker cable connector (J18)
- CPU fan cable connector (J19)
- Power-on LED/software power on cable connector (J17)
- Diskette drive cable assembly (J16)
- CD-ROM drive cable connector (J14)
- Hard drive cable connector (J15)
- Audio cable assembly (J9)
- Serial/parallel cable assembly (J7/J8)

5. Connect the AC power cord to the system unit.

6. Detach the wrist strap.

7. Replace the top cover.

See Section 7.4 “Replacing the Top Cover” on page 7-7.

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

a. Set the system unit power to on.

See Section 6.1 “Powering On the System Unit” 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 unit 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.

Illustrated Parts List

This chapter lists the authorized replaceable parts for the Ultra 5 and Ultra 10 computers. FIGURE 11-1 illustrates an exploded view of the Ultra 5 computer and TABLE 11-2 illustrates an exploded view of the Ultra 10 computer. TABLE 11-1 and TABLE 11-2 list the replaceable components, respectively.

Note – Removal and replacement of selected system unit components are also illustrated with photographs and audio/visual instructions on the *Sun Ultra 5 ShowMe How Multimedia Documentation*, part number 704-5753, and the *Sun Ultra 10 ShowMe How Multimedia Documentation*, part number 704-5983.

Numerical references illustrated in Figure 11-1 and Figure 11-2 correlate to the numerical references listed in Table 11-1 and Table 11-2, respectively. Consult your authorized Sun sales representative or service provider to confirm a part number prior to ordering a replacement part.

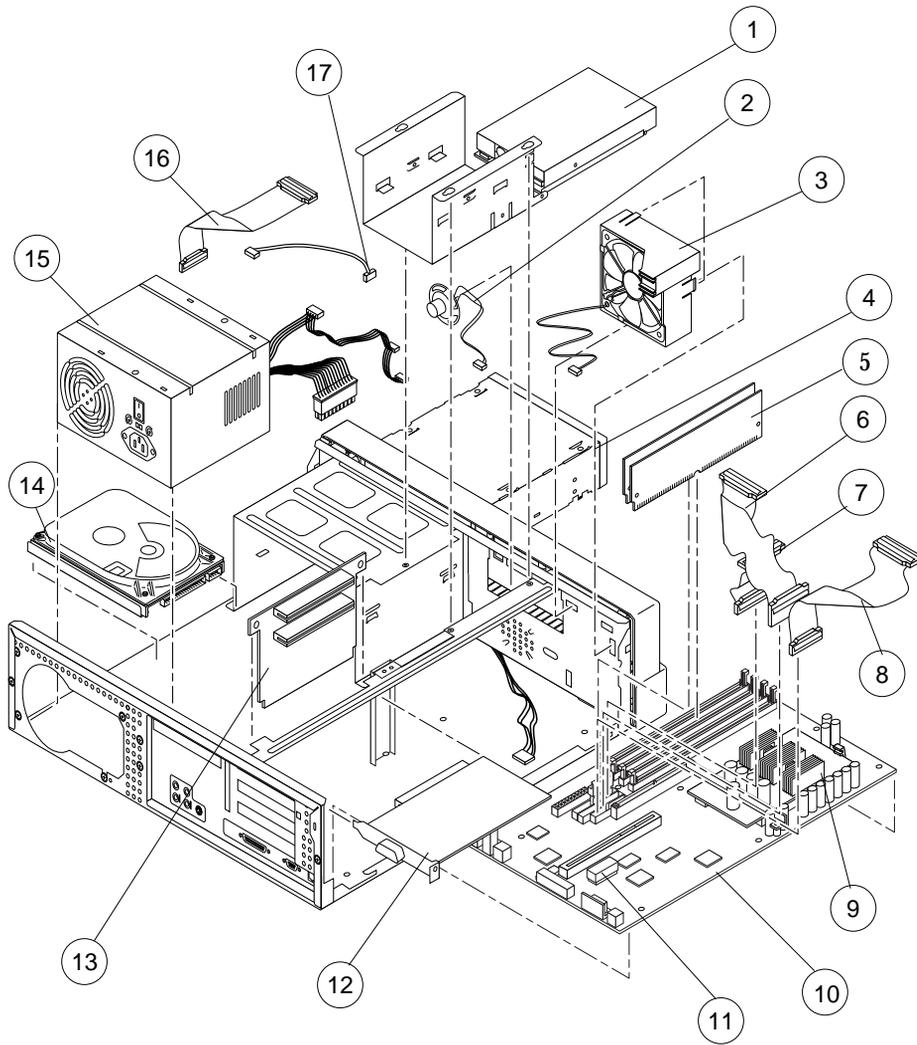


FIGURE 11-1 Ultra 5 Computer System Unit Exploded View

TABLE 11-1 Ultra 5 System Unit Replaceable Components

Numerical Reference	Component	Description
1	Manual eject floppy	Diskette drive
2	Speaker assembly	Speaker assembly
3	CPU fan assembly	CPU fan
4	CD-ROM drive	CD-ROM drive
5	16-Mbyte DIMM	60-ns, 16-Mbyte DSIMM
5	32-Mbyte DIMM	60-ns, 32-Mbyte DSIMM
5	64-Mbyte DIMM	60-ns, 64-Mbyte DSIMM
5	128-Mbyte DIMM	60-ns, 128-Mbyte DSIMM
6	Diskette drive cable assembly	Diskette drive cable. Part of service kit 370-3266
7	Hard drive cable assembly	Hard drive cable. Part of service kit 370-3266
8	Serial/parallel cable assembly	Serial/parallel cable. Part of service kit 370-3266
9	CPU module	270-MHz, 256-Kbyte external cache
9	CPU module	333-MHz, 2-Mbyte external cache
10	Motherboard	Motherboard
11	NVRAM/TOD	Time of day, 48T59, with carrier
12	PCI card	Generic
13	Riser board	Riser board
14	Hard drive	Disk drive, 4.3-Gbyte, 5400 RPM
14	Hard drive	Disk drive, 9.1-Gbyte, 7200 RPM
15	Power supply	Power supply, 200 watts
16	CD-ROM drive cable assembly	CD-ROM drive cable. Part of service kit 370-3266
17	Audio cable assembly	Audio cable
N/A	Front bezel	System unit front bezel

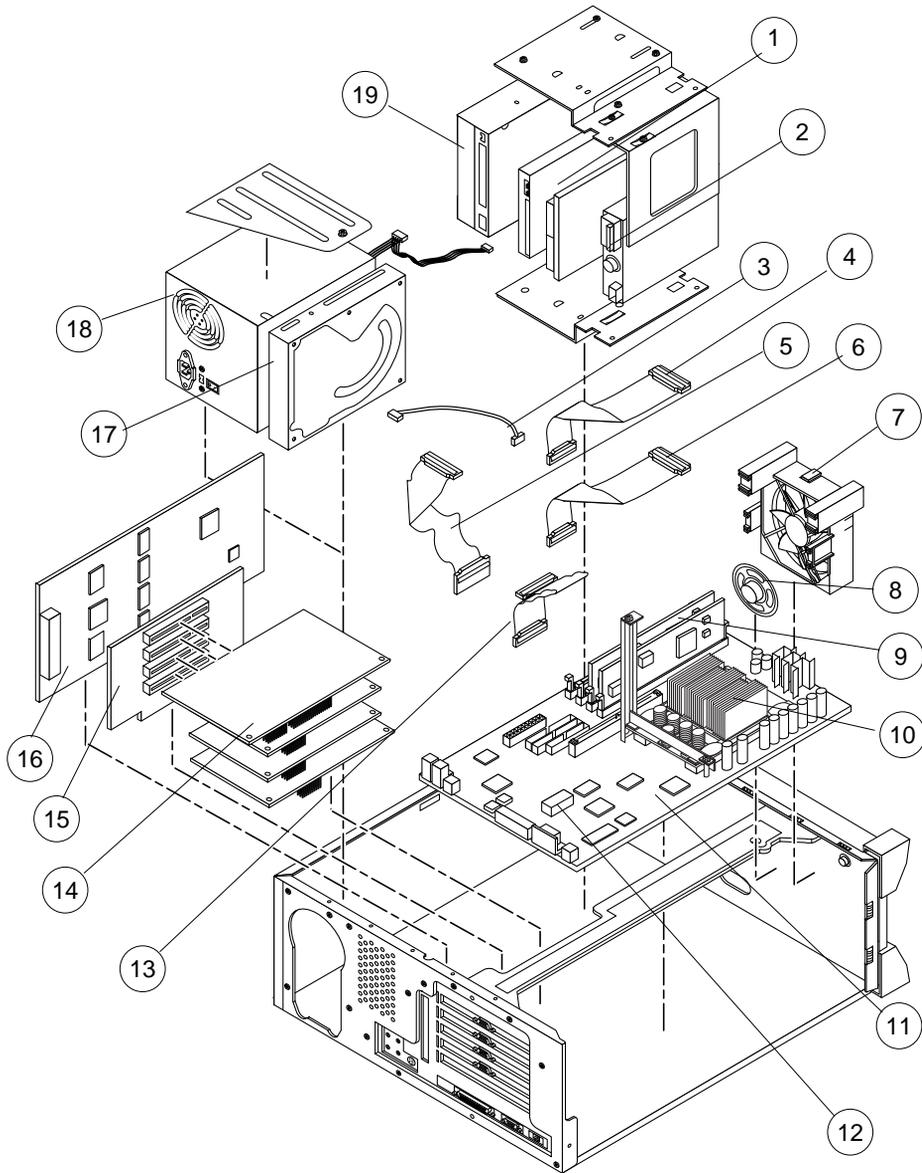


FIGURE 11-2 Ultra 10 Computer System Unit Exploded View

TABLE 11-2 Ultra 10 Computer Replaceable Components

Numerical Reference	Component	Description
1	Manual eject floppy	Manual eject floppy
2	Audio cable assembly	Audio cable.
3	Diskette drive cable assembly	Diskette drive cable. Part of service kit 370-3267
4	Serial/parallel cable assembly	Serial/parallel cable. Part of service kit 370-3267
5	CD-ROM drive cable assembly	CD-ROM drive cable. Part of service kit 370-3267
6	Fan assembly	CPU fan, 92-mm
7	Speaker assembly	Speaker
8	16-Mbyte DIMM	60-ns, 16-Mbyte DIMM
8	32-Mbyte DIMM	60-ns, 32-Mbyte DIMM
8	64-Mbyte DIMM	60-ns, 64-Mbyte DSIMM
8	128-Mbyte DIMM	60-ns, 128-Mbyte DSIMM
8	256-Mbyte DIMM	60-ns, 256-Mbyte DSIMM
9	CPU module	300-MHz, 512-Kbyte external cache
9	CPU module	333-MHz, 2-Mbyte external cache
9	CPU module	360-MHz, 2-Mbyte external cache
10	Motherboard	Motherboard
11	NVRAM/TOD	Time of day, 48T59, with carrier
12	Hard drive cable assembly	Hard drive cable. Part of service kit 370-3267
13	PCI card	Generic
14	Riser board	Riser board
15	Graphics card	Vertical, double buffer plus Z (DBZ) UPA graphics card
15	Graphics card	Vertical, single buffer UPA graphics card
15	Graphics card	Elite3D UPA graphics card

TABLE 11-2 Ultra 10 Computer Replaceable Components *(Continued)*

Numerical Reference	Component	Description
16	Hard drive	Disk drive, 9.1-Gbyte, 7200 RPM
17	Power supply	Power supply, 250 watts
18	CD-ROM drive	CD-ROM drive
N/A	Front bezel	System unit front bezel
N/A	Drive bracket	9.1-Gbyte rear drive bracket (rear position only)

Product Specifications

This appendix provides product specifications for the Ultra 5 and Ultra 10 computers.

- Section A.1 “Physical Specifications” on page A-1
- Section A.2 “Electrical Specifications” on page A-2
- Section A.3 “Modem Setup Specifications” on page A-4
- Section A.4 “Environmental Requirements” on page A-6
- Section A.5 “Reference Information” on page A-7

A.1 Physical Specifications

- Section A.1.1 “Ultra 5 Physical Specifications” on page A-2
- Section A.1.2 “Ultra 10 Physical Specifications” on page A-2

A.1.1 Ultra 5 Physical Specifications

The following table list the Ultra 5 physical specifications.

TABLE A-1 Ultra 5 Physical Specifications

Specification	U.S.A.	Metric
Height	4.31 in.	10.95 cm
Width	17.17 in.	43.60 cm
Depth	16.69 in.	42.40 cm
Weight (approximate)	39.70 lb.	18.00 kg

A.1.2 Ultra 10 Physical Specifications

The following table lists the Ultra 10 physical specifications.

TABLE A-2 Ultra 10 Physical Specifications

Specification	U.S.A.	Metric
Height	15.75 in.	40.00 cm
Width	6.93 in.	16.60 cm
Depth	16.54 in.	42.00 cm
Weight (approximate)	44.00 lb.	20.00 kg

A.2 Electrical Specifications

- Section A.2.1 “Ultra 5 Electrical Specifications” on page A-3
- Section A.2.2 “Ultra 10 Electrical Specifications” on page A-3

A.2.1 Ultra 5 Electrical Specifications

The following table lists the Ultra 5 electrical specifications.

TABLE A-3 Ultra 5 Electrical Specifications

Parameter	Value
AC input	47 to 63 Hz, 90 to 132 Vac or 180 to 264 Vac, switch selectable
DC output	200W (maximum)
Output 1	+3.3 VDC, 14.0A
Output 2	+5.0 VDC, 22.0A
Output 3	+12.0 VDC, 6.0A
Output 4	-5.0 VDC, 0.5A
Output 5	-12.0 VDC, 0.8A
Output 6 (Standby)	+5.0 VDC, 0.2A

A.2.2 Ultra 10 Electrical Specifications

The following table lists the Ultra 10 electrical specifications.

TABLE A-4 Ultra 10 Electrical Specifications

Parameter	Value
AC input	47 to 63 Hz, 90 to 132 Vac or 180 to 264 Vac, switch selectable
DC output	250W (maximum)
Output 1	+3.3 VDC, 21A
Output 2	+5.0 VDC, 22A
Output 3	+12.0 VDC, 5.0A

TABLE A-4 Ultra 10 Electrical Specifications *(Continued)*

Parameter	Value
Output 4	-12.0 VDC, 0.3A
Output 5	-12.0 VDC, 0.3A
Output 6 (Standby)	+5.0 VDC, 0.2A

A.3 Modem Setup Specifications

- Section A.3.1 “Setting Up the Modem” on page A-4
- Section A.3.2 “Serial Port Speed Change” on page A-5
- Section A.3.3 “Recommendations” on page A-5

A.3.1 Setting Up the Modem

Any modem that is compatible with CCITT V.24 can be connected to the system unit serial port. Modems can be set up to function in one of three ways:

- Dial out only
- Dial in only
- Bidirectional

To set up a modem:

1. **Become superuser and type `admintool`.**

```
% su
Password: #
admintool
```

2. **Click Serial Port Manager.**
3. **Select Port a or Port b for your modem connection.**
4. **Click Edit.**
The Serial Port Manager: Modify Service window is displayed.
5. **Choose the Expert level of detail.**

6. From the Use Template menu, choose one of the following:

- Modem - Dial-out only
- Modem - Dial-in only
- Modem - Bidirectional

7. Click Apply.

8. Set your modem auto-answer switch to one of the following:

- Off - Dial-out only
- On - dial-in only
- On - Bidirectional

A.3.2 Serial Port Speed Change

To change the speed of a serial port, edit the `/etc/remote` file as follows:

1. Become superuser, and type `cd /etc`.

```
% su
Password:#
cd /etc
```

2. Type `vi remote`.

3. Type `tip speed device-name`.

Typical speeds are 9600, 19200 to 38400 bps.

The device name is the serial port name — for example,

`/dev/tty[a,b]` or `/dev/term/[a,b]`.

4. Press Esc and type `:wq` to save your file change(s) and to exit from the `vi` text editor.

A.3.3 Recommendations

A.3.3.1 Cable

For a modem-to-host (system unit) connection, use an RS-423/RS-232 straight-through cable with DB-25 male connectors at both ends.

A.3.3.2 Modem Switch Settings (AT Commands)

- Enable transmit flow control (AT&H1) [suggested setting]
(Required for sending binary/8-bit data.)
- Set link rate to fixed
(Will not track modem data rate, AT&Bn; n = menu choice in modem manual.)
- Set display result codes (ATQ0)
- Set verbal result codes (ATV1)
- Set result code subset (ATXn; n = option choice)
- Save settings in NVRAM (AT&W)

Note – The above settings are meant as helpful guidelines only. These guidelines may change depending on site requirements and the chosen modem.

For additional information about modem switch settings, see the manual that came with the modem.

A.4 Environmental Requirements

The following table lists environmental requirements for the Ultra 5 and Ultra 10 system units.

TABLE A-5 Environmental Requirements

Environmental	Operating	Non-operating
Temperature	4 to 95 degrees F (5 to 35 degrees C)	-4 to 140 degrees F (-20 to 60 degrees C)
Humidity	80% (max) noncondensing at 95 degrees F (35 degrees C)	95% noncondensing at 140 degrees F (60 degrees C)
Altitude	10,000 ft (3 km)	40,000 ft (12 km)

A.5 Reference Information

This section contains the following reference information:

- Section A.5.1 “CD-ROM Drive Cabling Configuration” on page A-7
- Section A.5.2 “Ultra 5 Hard Drive Cabling Configuration” on page A-8
- Section A.5.3 “Ultra 10 Hard Drive Cabling Configuration” on page A-8
- Section A.5.4 “Jumper Settings” on page A-9
- Section A.5.5 “CD Handling and Use” on page A-9

A.5.1 CD-ROM Drive Cabling Configuration

The CD-ROM drive cabling is the same for both the Ultra 5 and the Ultra 10 system units. The following block diagram shows the cabling for the CD-ROM drive.

- CD-ROM data cable: connects to motherboard connector J14
- CD-ROM audio cable: connects to motherboard connector J9

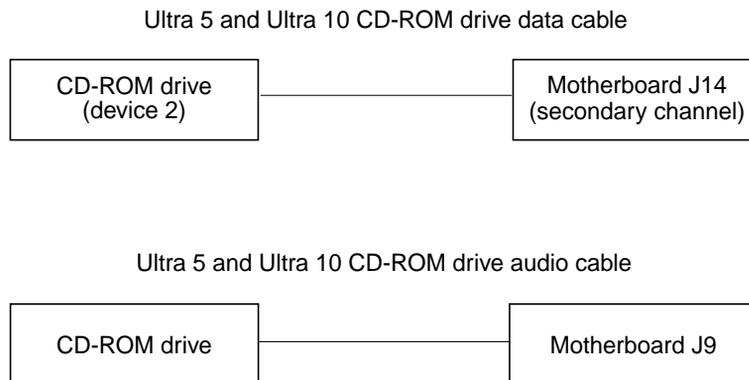


FIGURE A-1 CD-ROM Drive Cabling Configuration

A.5.2 Ultra 5 Hard Drive Cabling Configuration

The Ultra 5 hard drive cabling connects to motherboard connector J15. The following block diagram shows the cabling for CD-ROM drives.

Ultra 5 hard drive cable



FIGURE A-2 Ultra 5 Hard Drive Cabling Configuration

A.5.3 Ultra 10 Hard Drive Cabling Configuration

The Ultra 10 hard drive cabling differs, depending on whether there are one or two hard hard drives configured. Hard drive cable:

- Hard drive cable: connects to motherboard connector J15
- If two hard drives are installed, the cable assembly connection is as shown in the following block diagram

Ultra 10 Hard Drive cable

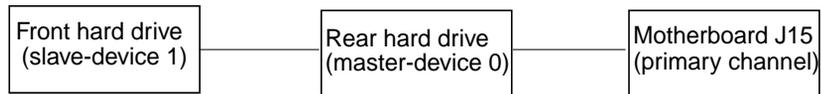


FIGURE A-3 Ultra 10 Hard Drive Cabling Configuration

A.5.4 Jumper Settings

Prior to installing a CD-ROM or hard disk drive in an Ultra 5 or Ultra 10, verify that the drive's back panel mode-select jumper is set as follows:

- Set the CD-ROM drive jumper (located on the CD-ROM drive back panel) to MA
- Set a hard drive jumper to CS

A.5.5 CD Handling and Use

The following sections are discussed.

- Inserting a CD into the CD-Rom drive
- Ejecting a CD from the CD-ROM drive
- Cleaning the CD-ROM drive
- Handling and storing CDs

A.5.5.1 Inserting a CD into the CD-ROM Drive

- 1. After the system is powered on, push the eject button to open the drive tray.**

It may be necessary to unmount the CD before manually ejecting it. The CD can also be ejected by using software commands. Refer to the peripherals handbook that corresponds with your operating system.

- 2. Place the CD (label side up) into the tray.**

Ensure that the CD is properly set into the recessed area of the tray.

- 3. If the drive is being installed in a vertical position, slide the two bottom tabs on the tray toward each other to hold the CD.**

A.5.5.2 Ejecting a CD From the CD-ROM Drive

To eject a CD, press the eject button on the front of the CD-ROM drive.

If the motorized eject mechanism does not operate, insert a thin, stiff wire (such as a paper clip) into the hole next to the eject button to eject the CD.

A.5.5.3 Cleaning the CD-ROM Drive

If the CD-ROM drive cannot read a CD, the cause may be a dirty CD. Follow these guidelines to clean a CD:



Caution – Do not use solvents such as benzene, paint thinner, antistatic aerosol spray, or abrasive cleaners to clean CDs.

- Use a soft, clean, lint-free, dry cloth
- Clean the *non-labeled* side of the CD
- Wipe the CD *radially* from the center to the outside
- Use professional cleaning kits

A.5.5.4 Handling and Storing CDs

Follow these guidelines when handling and storing CDs:

- Handle CDs only by their edges; avoid touching CD surfaces.
- Do not write on CDs with permanent marking pens.
- Do not use CDs in high-dust environments.
- Keep CDs out of direct sunlight, extreme sources of heat or cold, and away from dust and moisture.
- Make sure CDs are at room temperature before using them.
- Store CDs in storage boxes so that they remain clean and free of dust.

Signal Descriptions

This appendix describes the Ultra 5 and Ultra 10 motherboard connector signals and pin assignments.

- Section B.1 “Power Supply Connectors” on page B-1
- Section B.2 “Keyboard/Mouse Connector” on page B-3
- Section B.3 “Twisted-Pair Ethernet Connector” on page B-4
- Section B.4 “Serial Port A Connector” on page B-6
- Section B.5 “Serial Port B Connector” on page B-7
- Section B.6 “Parallel Port Connector” on page B-8
- Section B.7 “Audio Connectors” on page B-10
- Section B.8 “UPA Graphics Card Connector (Ultra 10 Only)” on page B-11
- Section B.9 “Video Connector” on page B-12

B.1 Power Supply Connectors

There are two power supply connectors on the motherboard. The Ultra 5 motherboard uses a standard ATX style connector (J12). The Ultra 10 motherboard use connectors J12 and J13 to connect to the power supply. The following figure illustrates the J12 connector configuration and the following table lists the pin assignments. FIGURE B-2 illustrates the J13 connector configuration and TABLE B-2 lists the pin assignments.

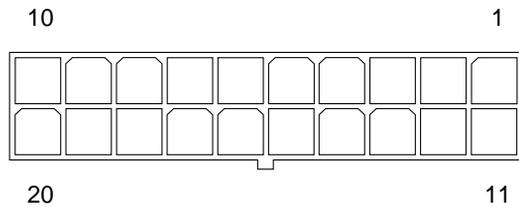


FIGURE B-1 Power Supply Connector J12 Pin Configuration

TABLE B-1 Power Supply Connector J13 Pin Assignments

Pin	Signal	Description
1	Gnd	Chassis ground
2	Gnd	Chassis ground
3	SEN_COM	Sense common
4	SEN_+3.3V	Sense 3.3 Vdc
5	+3.3V	+3.3 Vdc
6	+3.3V	+3.3 Vdc

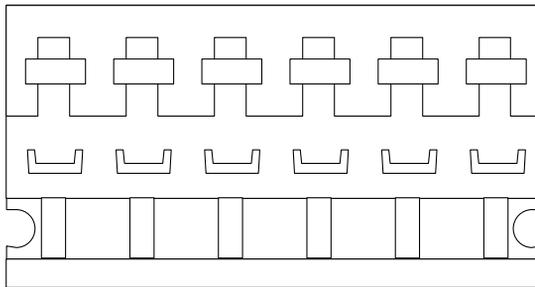


FIGURE B-2 Power Supply Connector J13 Pin Configuration

TABLE B-2 Power Supply Connector J12 Pin Assignments

Pin	Signal	Description
1	+3.3V	+3.3 Vdc
2	+3.3V	+3.3 Vdc
3	Gnd	Chassis ground
4	+5V	+5 Vdc

TABLE B-2 Power Supply Connector J12 Pin Assignments (*Continued*)

Pin	Signal	Description
5	Gnd	Chassis ground
6	+5V	+5 Vdc
7	Gnd	Chassis ground
8	PWR_OK	Power okay
9	5VSB	
10	+12V	+12 Vdc
11	+3.3V	+3.3 Vdc
12	-12V	-12 Vdc
13	Gnd	Chassis ground
14	PS_ON	Power supply on
15	Gnd	Chassis ground
16	Gnd	Chassis ground
17	Gnd	Chassis ground
18	-5V	-5 Vdc
19	+5V	+5 Vdc
20	+5V	+5 Vdc

B.2 Keyboard/Mouse Connector

The keyboard/mouse connector is a DIN-8 type connector located on the motherboard back panel. The following figure illustrates the keyboard/mouse connector configuration and the following table lists the pin assignments.

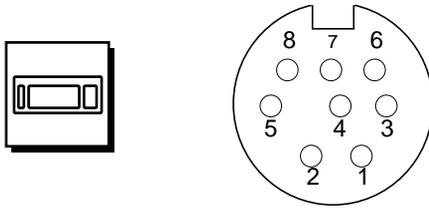


FIGURE B-3 Keyboard/Mouse Connector Pin Configuration

TABLE B-3 Keyboard/Mouse Connector Pin Assignments

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

B.3 Twisted-Pair Ethernet Connector

The twisted-pair Ethernet (TPE) connector is an RJ-45 type connector located on the motherboard back panel. The following figure illustrates the TPE connector configuration and the following table lists the pin assignments.



Caution – Connect only TPE-type cable into the TPE connector.

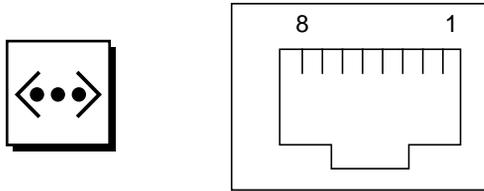


FIGURE B-4 TPE Connector Pin Configuration

TABLE B-4 TPE Connector Pin Assignments

Pin	Signal	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.3.1 TPE Cable-Type Connectivity

The following types of TPE cables can be connected to the TPE connector.

- For 10BASE-T applications, unshielded twisted-pair (UTP) cable:
 - Category 3 (UTP-3, “voice grade”)
 - Category 4 (UTP-4)
 - Category 5 (UTP-5, “data grade”)
- For 100BASE-T applications, UTP cable, UTP-5, “data grade”

B.3.2 External UTP-5 Cable Lengths

The following table lists TPE UTP-5 types, application, and maximum lengths.

TABLE B-5 TPE UTP-5 Cables

Cable Type	Application(s)	Maximum Length (Metric)	Maximum Length (US)
UTP-5, "data grade"	10BASE-T or 100BASE-T	100 meters	109 yards

B.4 Serial Port A Connector

The serial port A connector is a DB-25 type connector located on the motherboard back panel. The serial port A connector provides both synchronous and asynchronous serial communications. The following figure illustrates the serial port A connector configuration and the following table lists the pin assignments.

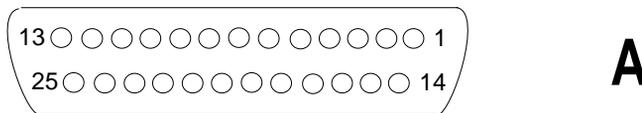


FIGURE B-5 Serial Port A Connector Pin Configuration

TABLE B-6 Serial Port A Connector Pin Assignments

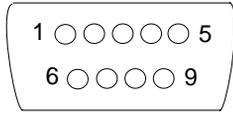
Pin	Signal	Description
1	NC	Not connected
2	TXD_A	Transmit data A
3	RXD_A	Receive data A
4	RTS_A	Read to send A
5	CTS_A	Clear to send A
6	DSR_A	Data set ready A
7	Gnd	Signal ground

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

Pin	Signal	Description
8	DCD_A	Data carrier detect A
9	NC	Not connected
10	NC	Not connected
11	NC	Not connected
12	NC	Not connected
13	NC	Not connected
14	NC	Not connected
15	RTXC_A	Transmit clock A
16	NC	Not connected
17	RXC_A	Receive clock A
18	NC	Not connected
19	NC	Not connected
20	DTR_A	Data terminal ready A
21	NC	Not connected
22	NC	Not connected
23	NC	Not connected
24	TXCA	Data terminal ready A
25	NC	Not connected

B.5 Serial Port B Connector

The serial port B connector is a DB-9 type connector located on the serial/parallel connector back panel. The serial port B connector provides asynchronous serial communications. The following figure illustrates the serial port A connector configuration and the following table lists the pin assignments.



B

FIGURE B-6 Serial Port B Connector Pin Configuration

TABLE B-7 Serial Port B Connector Pin Assignments

Pin	Signal	Description
1	CD	Carrier detect
2	RD	Receive data
3	TD	Transmit data
4	DTR	Data terminal ready
5	GND	Ground
6	DSR	Data set ready
7	RTS	Request to send
8	CTS	Clear to send
9	RI	Ring indicator

B.6 Parallel Port Connector

The parallel port connector is a DB-25 type connector located on the serial/parallel connector back panel. The following figure illustrates the parallel port connector configuration and the following table lists the connector pin assignments.

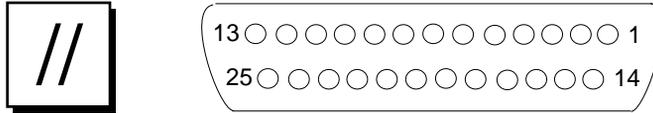


FIGURE B-7 Parallel Port Connector Pin Configuration

TABLE B-8 Parallel Port Connector Pin Assignments

Pin	Signal	Description
1	Data_Strobe_L	Set low during forward channel transfers to latch data into peripheral device. Set high during reverse channel transfers.
2 to 9	Data[0..7]	The main data bus for the parallel port. Data0 is the least significant bit (LSB). Are not used during reverse channel transfers.
10	ACK_L	Driven low by the peripheral device to acknowledge data byte transfer from host during forward channel transfer. Qualifies data being transferred to host in reverse channel transfer.
11	BUSY	Driven high to indicate the peripheral device is not ready to receive data during forward channel transfer. Used to send Data3 and Data7 during reverse channel transfer.
12	PERROR	Driven high by peripheral device to indicate an error in the paper path during forward channel transfer. Used to send Data2 and Data6 during reverse channel transfer.
13	SELECT_L	Indicates the peripheral device is on-line during forward channel transfer. Used to send Data1 and Data5 during reverse channel transfer.
14	AFXN_L	Set low by the host to drive the peripheral into auto-line feed mode during forward channel transfer. During reverse channel transfer, set low to indicate host can receive peripheral device data and then set high to acknowledge receipt of peripheral data.

TABLE B-8 Parallel Port Connector Pin Assignments (*Continued*)

Pin	Signal	Description
15	ERROR_L	Set low by the peripheral device to indicate an error during forward channel transfer. In reverse channel transfer, set low to indicate peripheral device has data ready to send to the host. Used to send Data0 and Data4.
16	INIT_L	Driven low by the host to reset peripheral.
17	PAR_IN_L	Set low by the host to select peripheral device for forward channel transfer. Set high to indicate bus direction is from peripheral to host.
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.7 Audio Connectors

The audio connectors are located on the motherboard. These connectors use EIA standard 0.125-inch (3.5-mm) jacks. The following figure illustrates each audio connector configuration and the following table lists each connector line assignment.

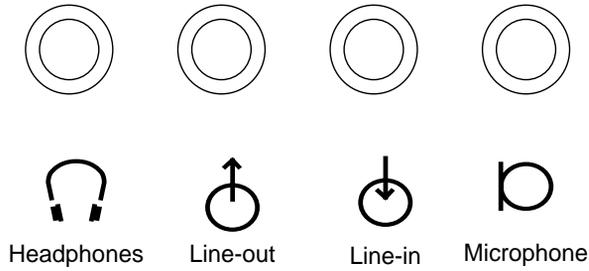


FIGURE B-8 Audio Connector Configuration

TABLE B-9 Audio Connector Line Assignment

Component	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.8 UPA Graphics Card Connector (Ultra 10 Only)

The UPA graphics card connector is a 13W3 type connector located on the UPA graphics card. The following figure illustrates the UPA graphics card connector configuration and the following table lists the connector pin assignments.

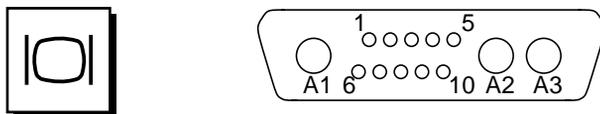


FIGURE B-9 UPA Graphics Card Connector Pin Configuration

TABLE B-10 UPA Graphics Card 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 synchronization
3	Sense <0>	Sense <0>
4	Gnd	Ground
5	Comp Sync	Composite synchronization
6	Horiz Sync	Horizontal synchronization
7	Serial Write	Serial write
8	Sense <1>	Sense <1>
9	Sense <2>	Sense <2>
10	Gnd	Ground

B.9 Video Connector

The video connector is a 15-pin mini D-sub connector located on the motherboard. The following figure illustrates the video connector configuration and the following table lists the video connector pin assignment.

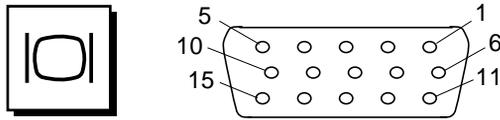


FIGURE B-10 Video Connector Pin Configuration

TABLE B-11 Video Connector Pin Assignments

Pin	Signal	Description
1	Red	Red video signal
2	Green	Green video signal
3	Blue	Blue video signal
4	Gnd	Ground
5	NC	Not connected
6	Gnd	Ground for red video signal
7	Gnd	Ground for green video signal
8	Gnd	Ground for green video signal
9	NC	Not connected
10	Gnd	Ground
11	Gnd	Ground
12	SDA	Bidirectional data
13	Horizontal sync	Horizontal synchronizing signal
14	Vertical sync	V. clock
15	SCL	Data clock

Functional Description

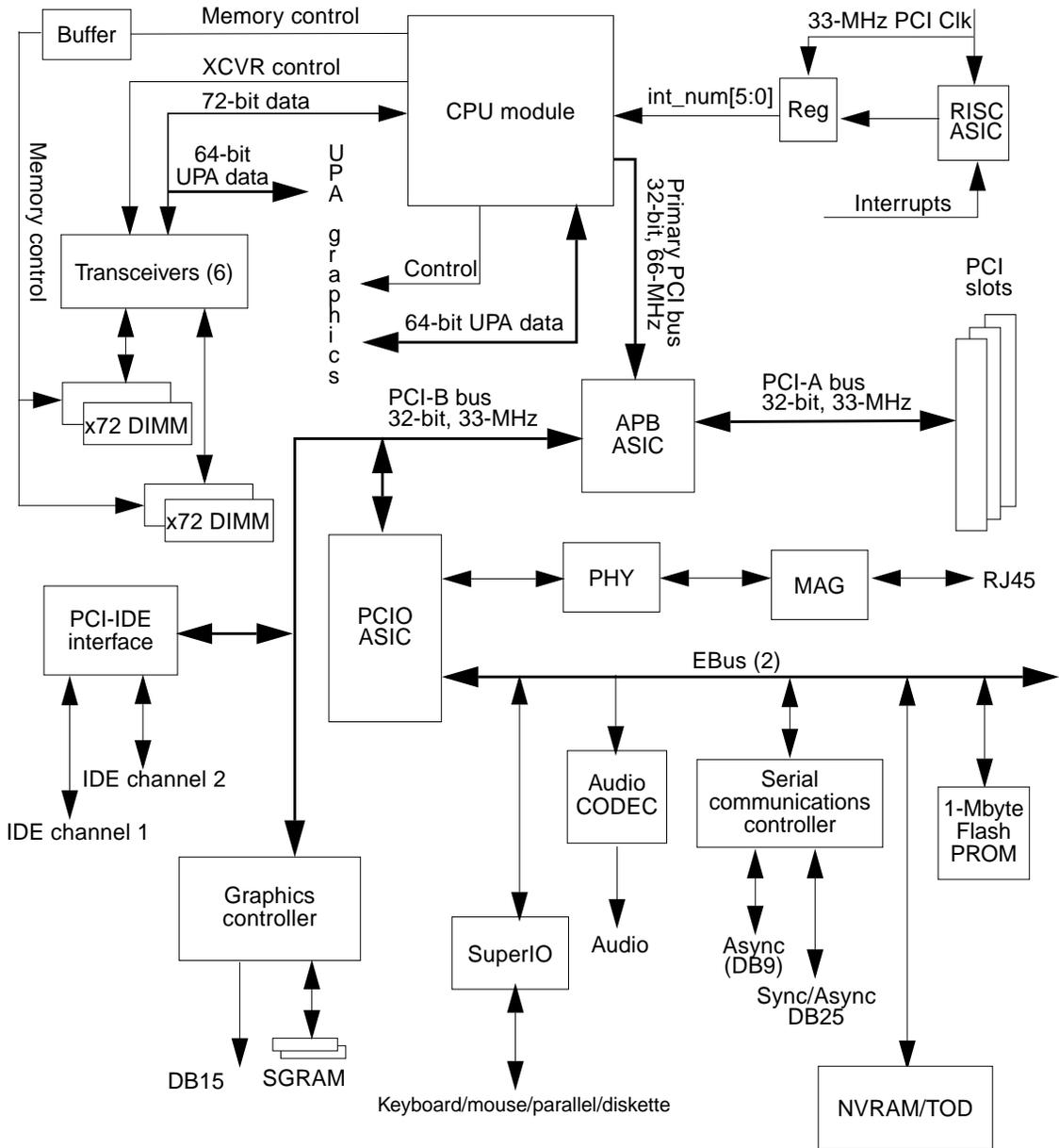
This appendix provides a functional description of the Ultra 5 and Ultra 10 computers.

- Section C.1 “System Unit” on page C-1
- Section C.2 “Clocking” on page C-28
- Section C.3 “Address Mapping” on page C-30
- Section C.4 “Interrupts” on page C-33
- Section C.5 “Power” on page C-36
- Section C.6 “Motherboard” on page C-37
- Section C.7 “Jumper Descriptions” on page C-39
- Section C.8 “Enclosure” on page C-42

C.1 System Unit

The Ultra 5 and Ultra 10 system units are UltraSPARC port architecture (UPA)-based uniprocessor machines that use peripheral component interconnect (PCI) as the I/O bus. The CPU module, APB ASIC (advanced PCI bridge), and UPA graphics communicate with each other using the UPA64S and PCI protocols. The UPA graphics card is a UPA slave-only device. The RISC ASIC routes interrupts to the CPU module. The following figure shows a functional block diagram of the system unit.

This section discusses the following topics:



Note: Dash lines denote Ultra 10 only

FIGURE C-1 System Unit Functional Block Diagram

- Section C.1.1 “CPU Module” on page C-3
- Section C.1.2 “UPA” on page C-4
- Section C.1.3 “PCI-IDE Interface” on page C-5
- Section C.1.4 “Memory Architecture” on page C-11
- Section C.1.5 “Riser Board” on page C-15
- Section C.1.6 “ASICs” on page C-20
- Section C.1.7 “EBus2 Devices” on page C-22
- Section C.1.8 “Power and Standby Switching” on page C-27

C.1.1 CPU Module

The system unit CPU module is the UltraSPARC-III processor. The CPU module is a high-performance, highly-integrated superscalar processor implementing the SPARC-V9 64-bit RISC architecture. The CPU module is capable of sustaining the execution of up to four instructions per cycle even in the presence of conditional branches and cache misses. This sustained performance is supported by a decoupled prefetch and dispatch unit with instruction buffer. The CPU module supports both 2D and 3D graphics, as well as image processing, video compression and decompression, and video effects through the sophisticated visual instruction set (VIS). VIS provides high levels of multimedia performance, including real-time video compression/decompression and two streams of MPEG-2 decompression at full broadcast quality with no additional hardware support. The CPU module characteristics and associated features include:

- SPARC-V9 architecture compliant
- Binary compatible with all SPARC application code
- Snooping or directory based protocol support
- Four-way superscalar design with nine execution units
 - Four integer execution units
 - Three floating-point execution units
 - Two graphics execution units
- Selectable little-endian or big-endian byte ordering
- 64-bit address pointers
- 16-Kbyte non-blocking data cache
- 16-Kbyte instruction cache with single cycle branch following
- Power management
- Software prefetch instruction support
- Multiple outstanding requests

C.1.1.1 CPU Module (Ultra 5)

The Ultra 5 CPU module may contain either a 270-MHz CPU module or a 333-MHz CPU module. The following table identifies the cache and SRAM for each module.

TABLE C-1 Ultra 5 CPU Module Cache and SRAM

Module	Second-Level Cache	Data SRAMs	TAG SRAMs
270-Mhz	256-KByte	2 - 32K x 36	1 - 32K x 36k
333-Mhz	2-Mbyte	4 - 256K x 18	1 - 64K x 18

C.1.1.2 CPU Module (Ultra 10)

The Ultra 10 may contain either a 300-MHz CPU module, a 333-MHz CPU module, or a 360-MHz CPU module. The following table identifies the cache and SRAM for each module.

TABLE C-2 Ultra 10CPU Module Cache and SRAM

Module	Second-Level Cache	Data SRAMs	TAG SRAMs
300-Mhz	500-Kbyte	4 - 64K x 18	1 - 64K x 18
333-Mhz	2-Mbyte	4 - 256K x 18	1 - 64K x 18
360-Mhz	2-Mbyte	4 - 256K x 18	1 - 64K x 18

C.1.2 UPA

The system unit supports one slave-only UPA slot for a UPA-based graphics device. The UPA 64-bit data bus provides the connection between the CPU module and the UPA graphics. The 64-bit UPA data shares the data bus with memory through six transceiver chips.

The UPA graphics slot receives a differential signal (UPA_CLK +/–) from the CPU module which is in synchronization with the CPU module clock. UPA_CLK +/– clocks at one third the frequency as the CPU module frequency. All transfers to and from the graphics connector are fully synchronous. The CPU module transfers UPA data to the graphics connector on leading clock edges that correspond to the UPA clock edges. The maximum interface rate is 120 MHz.

The following figure is a functional block diagram of the UPA graphics.

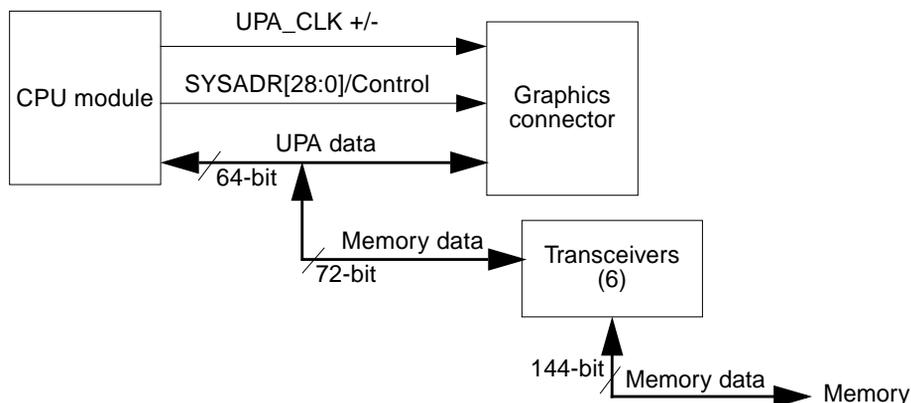


FIGURE C-2 UPA Graphics Functional Block Diagram

C.1.3 PCI-IDE Interface

The 32-bit, 66-MHz PCI bus is interfaced through a connector to the motherboard. This interface operates at 66 MHz and interfaces to the APB ASIC. There are three PCI buses: primary PCI bus, secondary PCI bus A, and secondary PCI bus B.

- Section C.1.3.1 “Primary PCI Bus” on page C-5
- Section C.1.3.2 “Secondary PCI Buses” on page C-6
- Section C.1.3.3 “APB ASIC” on page C-6
- Section C.1.3.4 “PCIO ASIC” on page C-6
- Section C.1.3.5 “10-/100-Mbit Ethernet” on page C-6
- Section C.1.3.6 “EBus2 Interface” on page C-7
- Section C.1.3.7 “EIDE Interface” on page C-8
- Section C.1.3.8 “PCI-Based Graphics” on page C-10

C.1.3.1 Primary PCI Bus

The CPU module interfaces to the APB ASIC through the primary PCI bus. The primary PCI bus is a 32-bit, 66-MHz bus. The primary PCI bus is 3.3-VDC bus only, and there cannot be a 5-VDC device residing on this bus. In the Ultra 5 and Ultra 10 system units, the primary PCI bus is a point-to-point bus between the CPU module and the APB ASIC. There are no other devices or slots on the primary PCI bus.

C.1.3.2 Secondary PCI Buses

The secondary PCI buses are designated as PCI bus A and PCI bus B.

Bus A is a 33-MHz, 32-bit bus that interfaces between the APB ASIC and the PCI slots, there is no motherboard device communications. PCI bus A is a 5-VDC-only bus and the only supported boards are 5-VDC type.

PCI bus B is also a 33-MHz, 32-bit bus. Unlike PCI bus A, PCI bus B does not interface to any PCI slots, however, does communicate with motherboard devices. The motherboard devices residing on PCI bus B include:

- APB ASIC
- PCIO ASIC
- PCI-based graphics controller
- PCI-IDE interface

C.1.3.3 APB ASIC

Refer to Section C.1.6.1 “APB” on page C-20.

C.1.3.4 PCIO ASIC

Refer to Section C.1.6.2 “PCIO” on page C-20.

C.1.3.5 10-/100-Mbit Ethernet

The Ethernet channel engine within the PCIO ASIC provides a buffered full-duplex DMA engine and a media access controller (MAC) function. The descriptor-based DMA engine contains independent transmit and receive channels, each with 2 Kbytes of on-chip buffering. The MAC provides a 10-Mbps or a 100-Mbps CSMA/CD protocol based upon a network interface conforming to IEEE 802.3, proposed IEEE 802.30 and Ethernet specifications. The following figure shows a functional block diagram of the 10-/100-Mbit Ethernet.

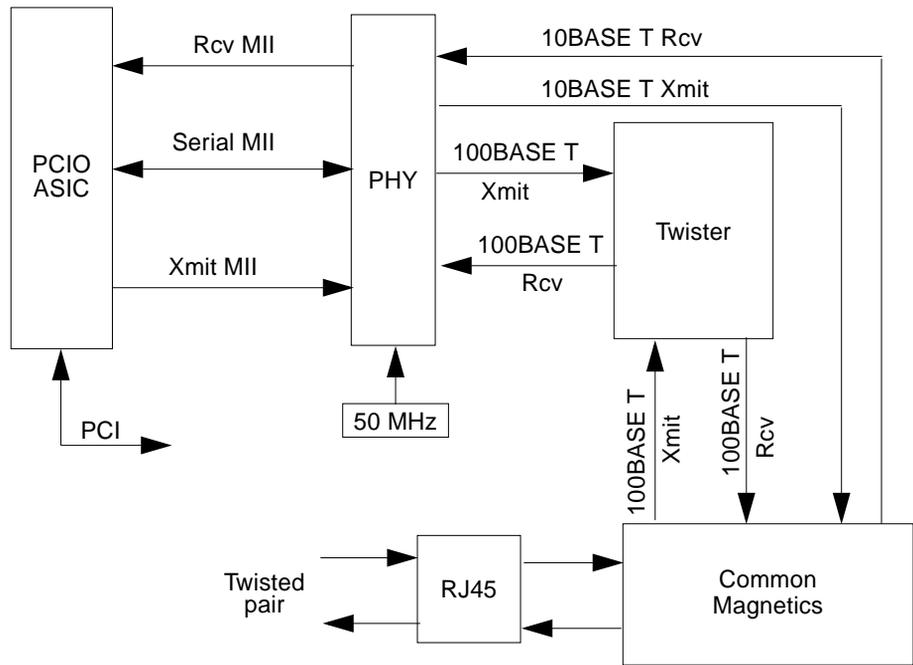


FIGURE C-3 10-/100-Mbit Ethernet Functional Block Diagram

C.1.3.6 EBus2 Interface

The PCIO ASIC provides the EBus2 interface to connect as many as eight 8-bit devices. The following devices reside on the EBus2:

- Audio CODEC
- SuperIO
- Serial communications controller
- TOD/NVRAM
- Flash PROM

Up to eight single or multi-function Intel-style 8-bit devices can be accommodated. Four internal DMA engines can be attached to any of the 8-bit devices, buffering data streams in 128-byte FIFOs for each channel.

The EBus2 channel engine provides access to several general purpose AUXIO (auxiliary IO) lines used to control miscellaneous system unit functions.

C.1.3.7 EIDE Interface

The enhanced integrated drive electronics (EIDE) interface is a hard drive interface that is also termed ATA bus interface. With the advent of faster hard drives, the definition of the EIDE interface has been expanded to include new operating PIO and DMA modes. The five PIO modes, numbered zero through four, offer increasingly faster interface speeds, with the higher number mode being the faster. PIO modes 0, 1, and 2 correspond to the EIDE interface as originally defined. PIO mode 3 defines a maximum transfer rate 11.1 Mbytes per second and PIO mode 4 defines a maximum transfer rate of 16.67 Mbytes per second. Additional DMA modes have also been defined with Multiword DMA wired 0 corresponding to the original DMA interface and DMA modes 1 and 2 being faster transfer rates. Multiword DMA mode 2 is the same speed as the new PIO mode 4.

The following figure shows the EIDE interface functional block diagram.

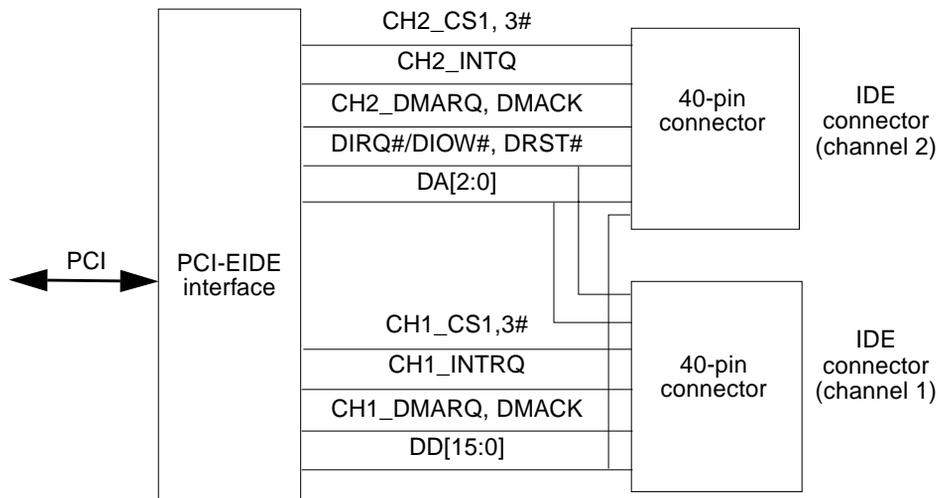


FIGURE C-4 EIDE Interface Functional Block Diagram

Cable Electrical Requirements

To allow automatic cable selection of a master and a slave hard drive without the need to change drive jumper selection, an ATA cable is used to interface the host with the hard drives. Device 0 must be installed on the connector nearest on the cable to the host and device 1 must be installed on the connector farthest from the host.

Cable Labeling

The ATA cable and/or connectors on the cable are clearly marked to indicate which connector should be connected to the slave device, master device, and motherboard (following figure).

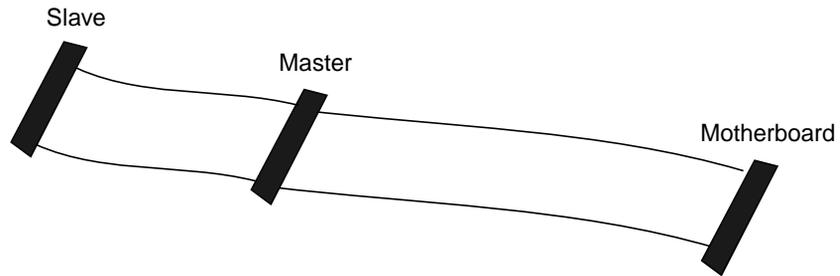


FIGURE C-5 EIDE Cable Labeling

Configuration Support

The following figure shows the Ultra 5 ATA cable configuration and FIGURE C-7 shows the Ultra 10 ATA cable configurations.

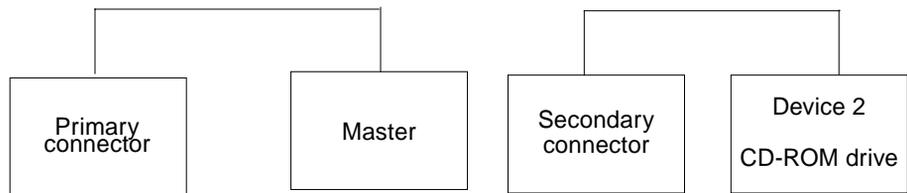


FIGURE C-6 Supported Ultra 5 Configuration

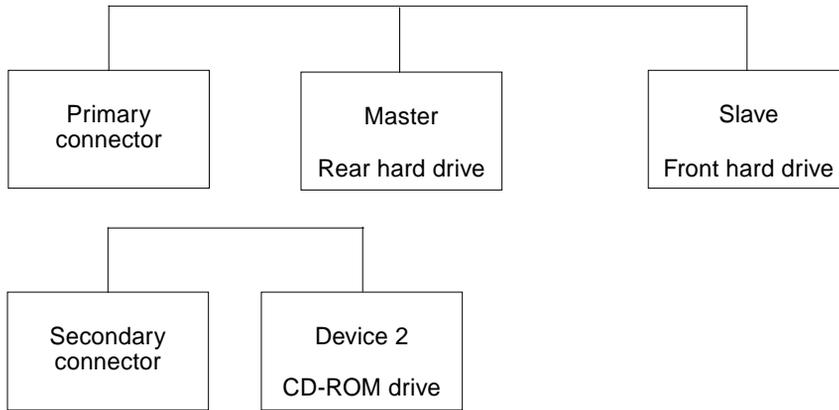


FIGURE C-7 Supported Ultra 10 Configuration

C.1.3.8 PCI-Based Graphics

The system unit has an on-board PCI-based graphics controller. The graphics controller uses either 2-Mbytes SGRAM or 4-Mbytes SGRAM as the graphics memory. The on-board graphics connector is a standard DB15 VGA connector. The PGX graphics controller provides 8-bit graphics with 2-Mbytes SGRAM. The PGX24 graphic controller provides 24-bit graphics with 4-Mbytes SGRAM.

The following two figures show a functional block diagram of the PGX and the PGX24 PCI-based graphics.

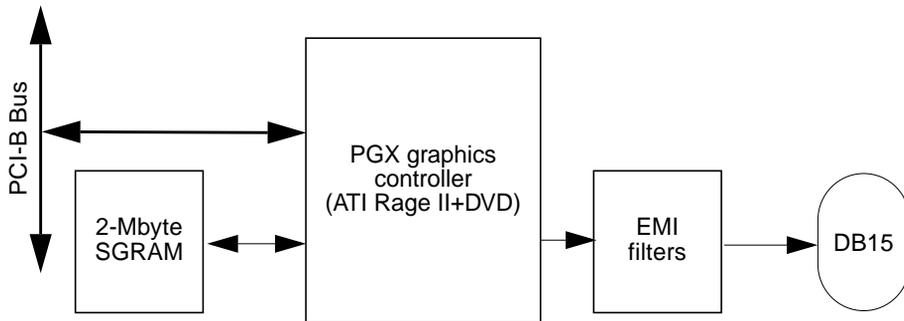


FIGURE C-8 PCI-Based Graphics Functional Block Diagram (PGX)

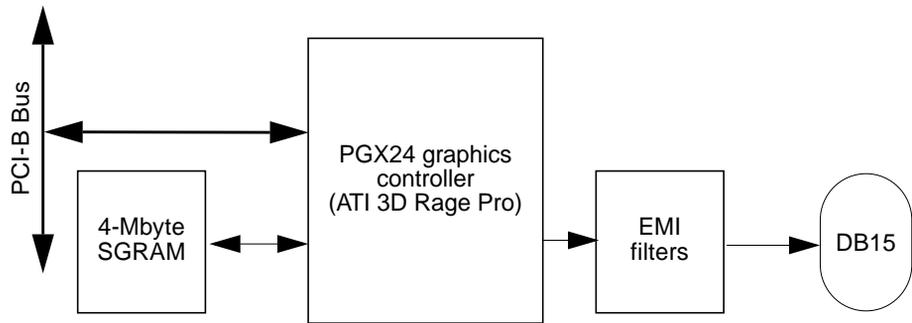


FIGURE C-9 PCI-Based Graphics Functional Block Diagram (PGX24)

C.1.4 Memory Architecture

The memory architecture uses the 168-pin JEDEC standard extended data out (EDO) 3.3-VDC buffered DIMMs. The memory controller unit (MCU) is embedded within the CPU module. All memory addressing and control are driven from the CPU module to the motherboard and then buffered prior to being gated to the DIMM DRAMs (assuming buffered DIMMs). The data path on the DRAM side is 144 bits (2-bit x 72-bit) wide, and data is multiplexed to 72 bits wide on the processor side by using the transceiver switches.

The interface between CPU module MCU and the system memory subsystem consists of the following:

- A 12-bit multiplexed row-column address
- Two column address select (CAS) lines
- Eight row address select (RAS) lines
- One write enable (WE) lines
- Support for 60-ns EDO DRAMs

Up to four DIMMs can be installed. Having only four DIMM connectors requires a stacked and dual-bank DIMM architecture to achieve the 1-Gbyte capacity.

All memory transfers have error checking code (ECC). The MCU performs ECC generation and checking. The following figure is a functional block diagram of the memory interface.

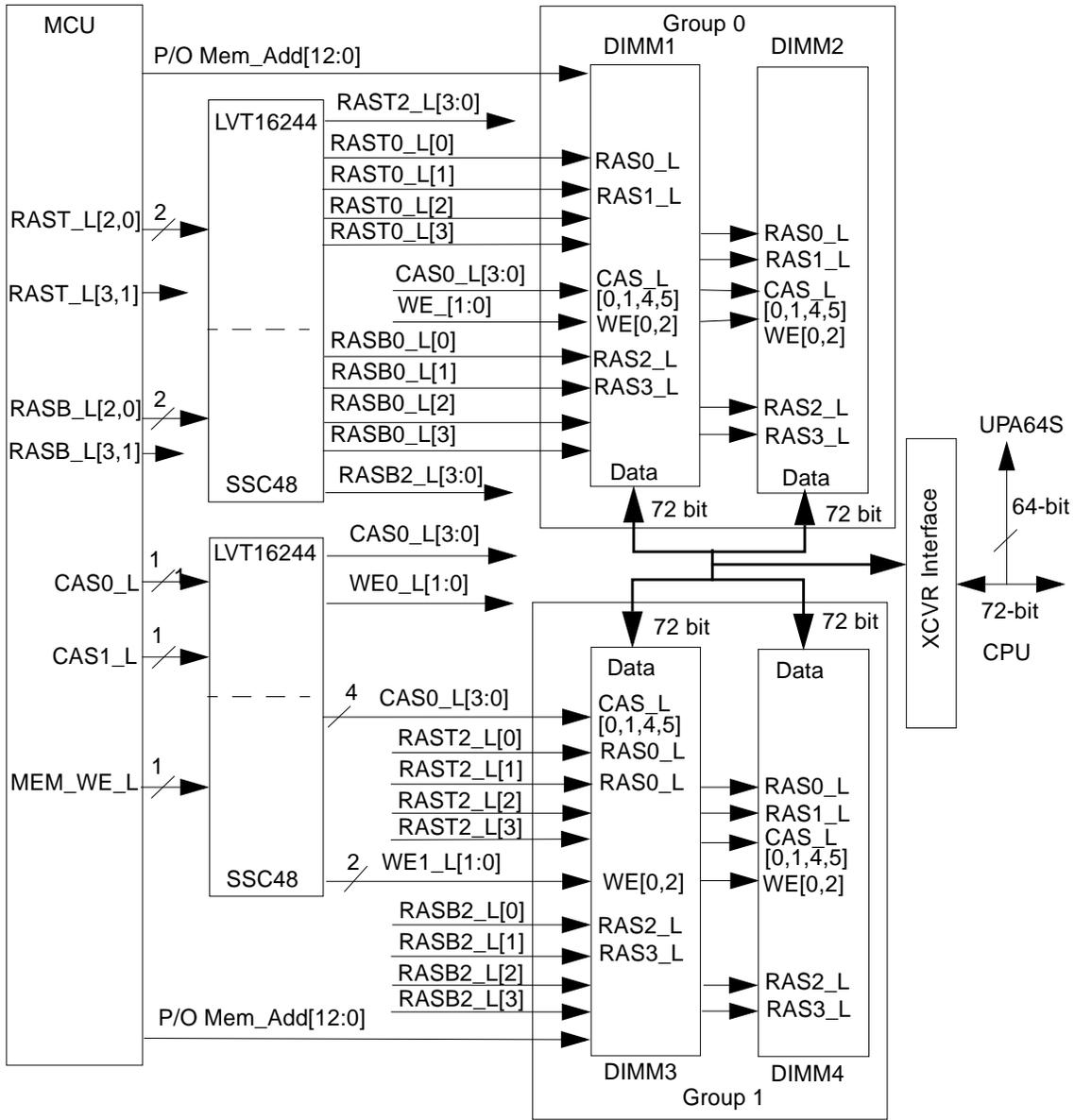


FIGURE C-10 Memory Interface Functional Block Diagram

C.1.4.1 DIMM Memory Configuration



Caution – If the system unit memory is configured with 16-Mbyte DIMMs, and the system unit memory is being upgraded with anything other than 16-Mbyte DIMMs, you must remove the 16-Mbyte DIMMs and replace them with the memory upgrade.

An additional mode in the MCU supports 11-bit column addressing. Since the total available address bits in the MCU is constant (1-Gbyte maximum addressable), the maximum number of DIMM pairs in this mode is halved in 11-bit column address mode (4 DIMMs). The MCU can only be programmed in 11-bit column address or 10-bit column address mode (16-Mbyte DIMM memory size), therefore the two types of DIMMs can not be mixed. If 16-Mbyte DIMMs (10-bit column address) are installed and you wish to upgrade with 11-bit column address DIMMs, then the 10-bit DIMMs need to be removed and then repopulated with 11-bit column address DIMMs. The following table lists memory DIMM configurations.

TABLE C-3 Memory DIMM Configuration

Sun Part Number	DIMM Configuration	Number of DRAMs on Module	DIMM Memory Size	Bank Memory Size (2 DIMMs)	Fully Loaded (2 banks, 4 DIMMs)	Column Address Bits
370-3211	2-Mbyte x 72	9	16-Mbyte*	32-Mbyte	64-Mbyte	10
370-3198	4-Mbyte x 72	18	32-Mbyte	64-Mbyte	128-Mbyte	11
370-3199	8-Mbyte x 72	9	64-Mbyte	128-Mbyte	256-Mbyte	11
370-3200	16-Mbyte x 72	18	128-Mbyte	256-Mbyte	512-Mbyte	11
370-3201	32M x 72	36	256-Mbyte	512-Mbyte	1 Gbyte	11

*. Do not mix with other DIMM memory size.

C.1.4.2 DIMM Characteristics

The DIMMs used in the system unit have the following characteristics:

- JEDEC standard in 168-pin DIMM
- Support ECC (x72)
- Single 3.3-VDC +/- 0.3-VDC power supply
- LVTTTL-compatible input and outputs
- All inputs are buffered with exception of RAS_L
- CAS_L before RAS_L refresh capability

C.1.4.3 Memory Address Assignment

The system unit main memory spans a 1-Gbyte region starting at physical address 0x000.0000.0000. The system unit has four DIMM sockets that accept from 16-Mbyte to 256-Mbyte DIMMs. DIMMs must be installed in pairs. If the same size pair of DIMMs are not installed, software configures them to the lower size DIMM. Address mapped to memory must be cacheable. Transfers between any port and memory is done in 64-byte cache line size. Non-cacheable accesses to memory are not supported and is treated as an error. Parameters which effect the address assignment of each DIMM module are DIMM size and which group (group 0 or group 1) the DIMM is installed.

PA[28:27] are used as the DIMM-pair select. PA[29] is used as a upper stack or a lower stack select; 0 is bottom stack and 1 is the upper stack. DIMMs that contain a single bottom stack must have PA[29] set to 0 (lo) to be accessed. The way that PA[29:27] maps into RASx_L is listed in the following table. TABLE C-5 lists the memory address range based on installed DIMMs.

TABLE C-4 PA Map Into RASx_L Signals

PA[29:27]	RASx_L Asserted	PA[29:27]	RASx_L Asserted
000	RASB_L[0]	100	RAST_L[0]
010	RASB)L[2]	110	RAST_L[2]

TABLE C-5 Memory Address Range Based on Installed DIMMs

DIMM Pair Number	DIMM Size	DIMM Pair Size	Address Range	Notes
0	16 Mbyte	32 Mbyte	0x0000.0000 - 0x01FF.FFFF	
0	32 Mbyte	64 Mbyte	0x0000.0000 - 0x03FF.FFFF	
0	64 Mbyte	128 Mbyte	0x0000.0000 - 0x07FF.FFFF	
0	128 Mbyte	256 Mbyte	0x0000.0000 - 0x0FFF.FFFF	
0	256 Mbyte	512 Mbyte	0x0000.0000 - 0x1FFF.FFFF	Stacked or Dual banks
1	16 Mbyte	32 Mbyte	0x2000.0000 - 0x21FF.FFFF	
1	32 Mbyte	64 Mbyte	0x2000.0000 - 0x23FF.FFFF	

TABLE C-5 Memory Address Range Based on Installed DIMMs (Continued)

DIMM Pair Number	DIMM Size	DIMM Pair Size	Address Range	Notes
1	64 Mbyte	128 Mbyte	0x2000.0000 - 0x27FF.FFFF	
1	128 Mbyte	256 Mbyte	0x2000.0000 - 0x2FFF.FFFF	
1	256 Mbyte	512 Mbyte	0x2000.0000 - 0x3FFF.FFFF	Stacked or Dual banks

Note – When upgrading system unit memory, 16-Mbyte DIMMs must be configured only with 16-Mbyte DIMMs.

C.1.4.4 Transceivers

The system unit motherboard transceivers are a hub of all data transfers among memory, CPU module, and the UPA graphics. The transceivers are bit-sliced so that six parts are required to implement the system unit memory subsystem.

C.1.5 Riser Board

Because of the limitations to the system unit enclosures, a riser board is present in the system units. The riser board supports a maximum of four PCI cards.

C.1.5.1 Connector Definition

The riser board uses the PCI 64-bit standard connector with revised pinout for additional power needed to support four PCI cards. The following table lists the riser board pin summary.

TABLE C-6 Riser Board Pin Summary

Pin Type	Number of Pins	Current Rating
Gnd	38	N/A
+5V	18 + 4 + 3 = 25	26 amp (max)
+12V	1 + 2 = 3	2 amp (max)
-12V	1	1 amp (max)

- Current rating is 1 ampere at 30°C for each pin.
- Pinout follows the 64-bit 5-VDC PCI specification (with modifications for additional power).
- The IDSEL pin for each PCI slot is reserved.

C.1.5.2 Riser Board Pin Assignment

The following table lists the riser board pin assignments.

TABLE C-7 Riser Board Pin Assignment

Pin Number	Signal	Pin Number	Signal
A1	TRST_L	A9	Reserved
A2	+12V	A10	+5V
A3	TMS	A11	Reserved
A4	TDI	A12	Gnd
A5	+5V	A13	Gnd
A6	INTA1_L	A14	Reserved
A7	INTC1_L	A15	RST_L
A8	+5V	A16	+5V
A17	GNT1_L	A43	PAR

TABLE C-7 Riser Board Pin Assignment (*Continued*)

Pin Number	Signal	Pin Number	Signal
A18	Gnd	A44	AD15
A19	Reserved	A45	Not connected
A20	AD30	A46	AD13
A21	Not connected	A47	AD11
A22	AD28	A48	Gnd
A23	AD26	A49	AD9
A24	Gnd	A50	Key
A25	AD24	A51	Key
A26	IDSEL1	A52	C/BE0_L
A27	Not connected	A53	Not connected
A28	Gnd	A54	AD6
A29	AD20	A55	AD4
A30	Gnd	A56	Gnd
A31	AD18	A57	AD2
A32	AD16	A58	AD0
A33	Not connected	A59	+5V
A34	FRAME_L	A60	REQ64_L
A35	Gnd	A61	+5V
A36	TRDY_L	A62	+5V
A37	Gnd	A63	Gnd
A38	STOP_L	A64	+5V
A39	Not connected	A65	+12V
A40	SDONE	A66	+5V
A41	SBO_L	A67	+12V
A42	Gnd	A68	Not connected
A69	Gnd	B2	TCK

TABLE C-7 Riser Board Pin Assignment (*Continued*)

Pin Number	Signal	Pin Number	Signal
A70	INTA2_L	B3	Gnd
A71	REQ2_L	B4	TDO
A72	Gnd	B5	+5V
A73	REQ3_L	B6	+5V
A74	INTA3_L	B7	INTB1_L
A75	+5V	B8	INTD1_L
A76	INTA4_L	B9	PRSNT1_L
A77	REQ4_L	B10	Reserved
A78	Gnd	B11	PRSNT2_L
A79	Not connected	B12	Gnd
A80	INTC2_L	B13	Gnd
A81	Gnd	B14	Reserved
A82	INTC3_L	B15	Gnd
A83	GNT2_L	B16	CLK1
A84	+5V	B17	Gnd
A85	GNT3_L	B18	REQ1_L
A86	INTC4_L	B19	+5V
A87	Gnd	B20	AD31
A88	+5V	B21	AD29
A89	GNT4_L	B22	Gnd
A90	Gnd	B23	AD27
A91	+5V	B24	AD25
A92	Reserved	B25	Not connected
A93	Gnd	B26	C/BE3_L
A94	Reserved	B27	AD23
B1	-12V	B28	Gnd
B29	AD21	B52	AD8

TABLE C-7 Riser Board Pin Assignment (*Continued*)

Pin Number	Signal	Pin Number	Signal
B30	AD19	B53	AD7
B31	Not connected	B54	Not connected
B32	AD17	B55	AD5
B33	C/BE2_L	B56	AD3
B34	Gnd	B57	Gnd
B35	IRDY_L	B58	AD1
B36	Not connected	B59	+5V
B37	DEVSEL_L	B60	ACK64_L
B38	Gnd	B61	+5V
B39	LOCK_L	B62	+5V
B40	PERR_L	B63	Reserved
B41	Not connected	B64	Gnd
B42	SERR_L	B65	IDSEL4
B43	Not connected	B66	IDSEL2
B44	C/BE1_L	B67	Gnd
B45	AD14	B68	IDSEL3
B46	Gnd	B69	+5V
B47	AD12	B70	+5V
B48	AD10	B71	INTD2_L
B49	Gnd	B72	Not connected
B50	Key	B73	INTD3_L
B51	Key	B74	Gnd
B75	INTD4_L	B85	Gnd

TABLE C-7 Riser Board Pin Assignment (*Continued*)

Pin Number	Signal	Pin Number	Signal
B76	CLK2	B86	Gnd
B77	INTB2_L	B87	+5V
B78	Gnd	B88	+5V
B79	+5V	B89	+5V
B80	CLK3	B90	+5V
B81	INTB3_L	B91	Gnd
B82	Gnd	B92	Reserved
B83	INTB4_L	B93	Reserved
B84	CLK4	B94	Gnd

C.1.6 ASICs

System unit ASICs include APB, PCIO, and RISC.

C.1.6.1 APB

The advanced PCI bridge (APB) ASIC provides a connection path between the primary PCI bus and the two secondary PCI buses. APB features include:

- 32-bit memory addressing for PIO, 64-bit memory addressing (DACs) for DMA
- 16-bit I/O addressing
- Full concurrences for primary and secondary PCI interfaces
- 72-byte FIFO data buffering on each of the DMA and PIO paths
- Arbitration/prioritization
- PIO reads and writes are in non-cacheable memory space

C.1.6.2 PCIO

The PCI-to-EBus/Ethernet controller (PCIO) ASIC interfaces to the PCI bus and implements three major functions:

- 10-/100-Mbit Ethernet media access controller (MAC)
- Asynchronous 8-bit EBus2 interface

- Four dedicated DMA channels:
 - Parallel port
 - Audio capture/record
 - Audio playback
 - Diskette

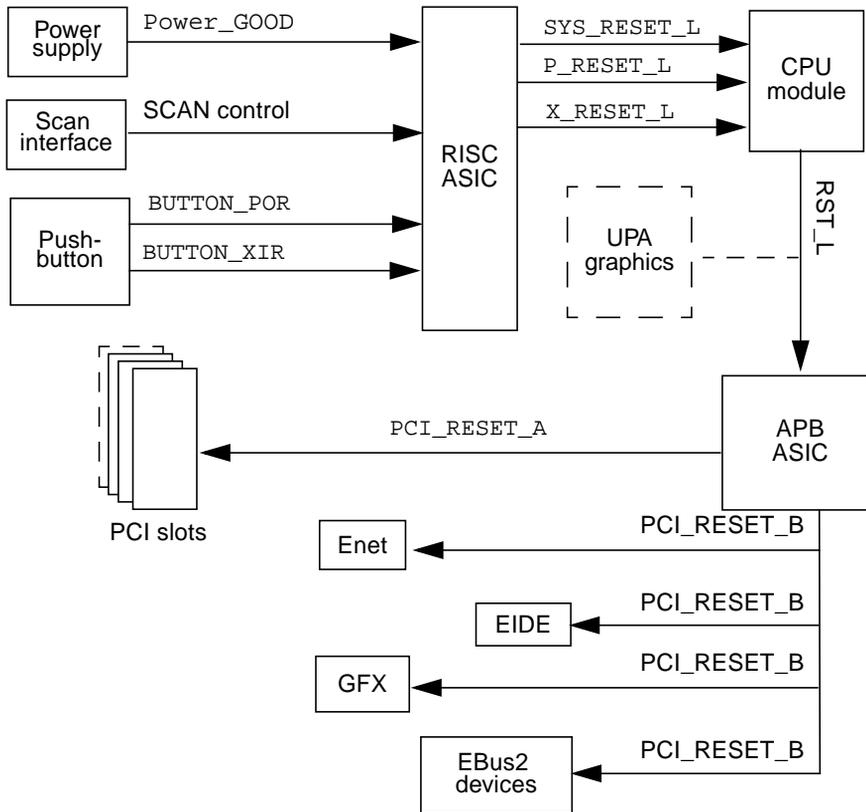
A PCIO ASIC interrupt router directs the channel engine interrupts to the appropriate device. EBus2 interrupts (only those associated with a DMA channel) are assigned to INTA# and Ethernet interrupts are assigned to INTB#. In PC card mode, this is in add-in mode. The PCIO ASIC has separate interrupt lines for each internal device. INTA# becomes `ent_irq_1`, INTB# is unused, INTC# becomes `pport_irq_1` and INTD# becomes `fp_irq_1`. Interrupts from the audio capture are routed to `audio_cap_irq_1` while interrupts from audio playback are routed to `audio_pb_irq_1`.

In the main logic board mode, interrupts from external EBus2 devices not associated with DMA channels (for example, keyboard and mouse) are connected directly to the system interrupt controller (RISC) ASIC.

C.1.6.3 RISC

The reset, interrupt, scan, and clock (RISC) ASIC combines the five reset conditions into three signals to the CPU module. Based on these signals, the CPU module sets the proper control register bit to enable the software to identify the source of reset. The following figure shows the system reset functional block diagram. The five reset conditions include:

- POWER_GOOD from power supply
- Scan control
- Button POR
- Button XIR
- Scan XIR.



Note: Dash lines denote Ultra 10 only

FIGURE C-11 System Reset Functional Block Diagram

C.1.7 EBus2 Devices

The devices described in the sections below interface to the EBus2 within PCIO ASIC. The EBus2 is a slave interface that provides slave cycles on the EBus2. The EBus2 slave interface provides eight chip selects. The slave cycle timing(s) on the EBus2 is programmable. Timing control is provided for 7 address ranges that correspond to the `EB_CS1` through `EB_CS7` address ranges.

- Section C.1.7.1 “SuperIO” on page C-23
- Section C.1.7.2 “Serial Communications Controller” on page C-24
- Section C.1.7.3 “Flash PROM” on page C-24
- Section C.1.7.4 “NVRAM/TOD” on page C-25
- Section C.1.7.5 “Audio” on page C-25

C.1.7.1 SuperIO

The SuperIO is a chip device that provides the following functions:

- On-chip diskette controller
- Two standard 16550 UARTs used for the serial mouse and keyboard
- Parallel port
- Mixed voltage support
- 100-pin PQFP

Serial Ports/Keyboard and Mouse

The on-chip serial ports are used as the mouse and keyboard devices due to the system unit not having fast and synchronous serial ports. The following figure is a functional block diagram of the serial port.

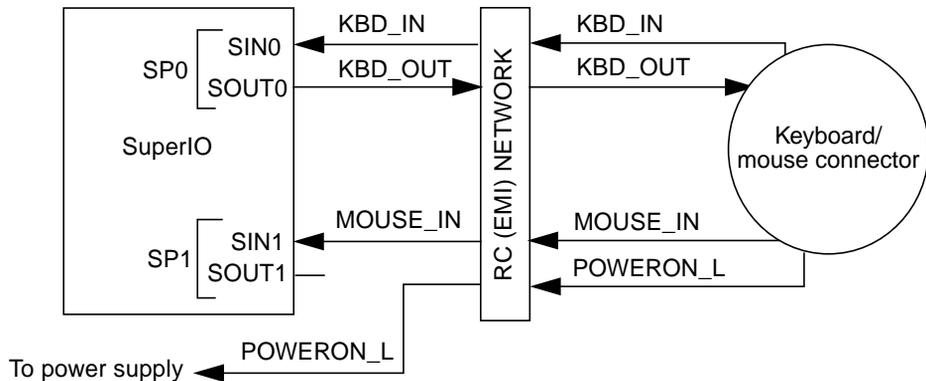


FIGURE C-12 Standard Serial Port Functional Block Diagram

Parallel Port

- IEEE 1284-compatible parallel port

All five modes supported:

- Compatible mode
- Nibble mode
- Byte mode
- ECP
- EPP
- One legacy DMA channel supported

C.1.7.2 Serial Communications Controller

The Siemens serial communications controller enables a two-channel increased throughput because of 32-byte first-in-first-out (FIFO) architecture. Serial port A (DB25 connector) is fully synchronous/asynchronous, while serial port B (DB9 connector) is asynchronous only. The serial communications controller has 64-byte buffering on both input and output, hence the serial ports take less CPU bandwidth. Interrupts are driven when the buffer is half full. The controller has a dedicated crystal that enables using integer dividers to achieve exact baud rates in most cases. The serial communications controller supports rates up to 921.6 Kbaud. The limitation is the line drivers which support up to 460.8 Kbaud.

The serial communications controller operates up to 430 Kbaud in asynchronous mode. Synchronous mode operation is up to 460 Kbaud with external clocks.

The line drivers used are compatible with RS232 and RS423 protocols and are set with a jumper on the motherboard. The slew rate of the line drivers is programmable. The system unit slew rates is set at 10 VDC per microsecond for baud rates greater than 100 Kbaud, and at 5 VDC per microsecond for baud rates less than 100 Kbaud. The following figure is a functional block diagram of the communications controller serial ports.

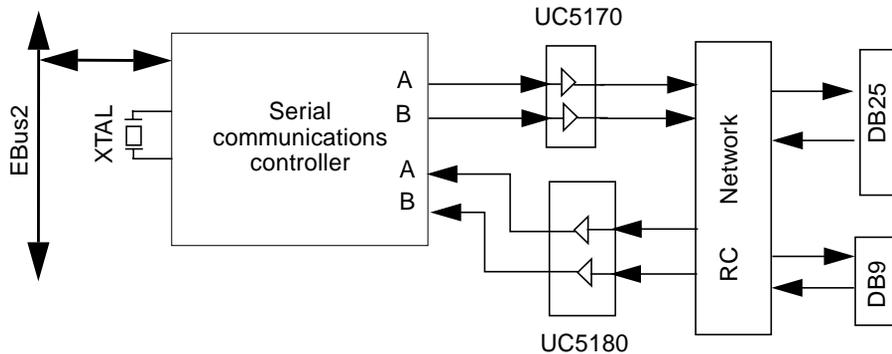


FIGURE C-13 Communications Controller Serial Ports Functional Block Diagram

C.1.7.3 Flash PROM

The flash PROM is an 8-Mbit, 5.0 VDC, 1-Mbyte by 8-bit flash memory. The 1 Mbyte of data is divided into 16 sectors of 64 Kbytes of flexible erase capability. This device is designed to be programmed in-system with the standard system 5.0 VDC VCC supply. 12.0 VDC Vpp is not required for program or erase operations. The flash PROM is also programmed in a standard EPROM programmer. The flash PROM has an access time of approximately 120 nanoseconds.

The flash PROM is divided into two halves, the open boot PROM (OBP) half, and the power-on self-test (POST)/open boot diagnostic (OBDiag) half. There are two physical jumpers on the motherboard. One jumper is used to enable either ROMBO or the on-board flash. The second jumper protects the flash prom from accidental writes to flash PROM.

C.1.7.4 NVRAM/TOD

The non-volatile RAM/time of day (NVRAM/TOD), is an 8K x 8 nonvolatile static RAM and real time clock. The programmable alarm output is used for turning the system unit on when Energy Star is enabled and the system unit has turned itself off. The following figure shows the NVRAM/TOD functional block diagram.

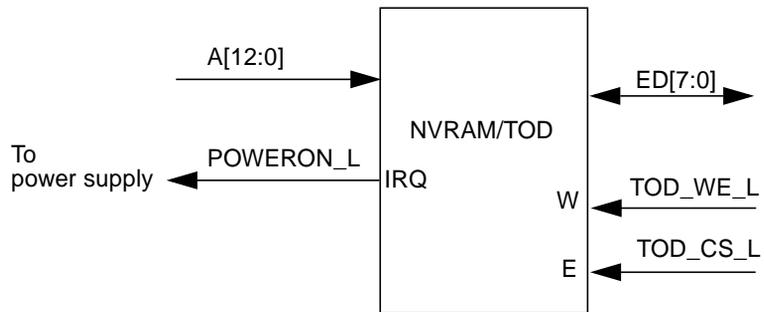


FIGURE C-14 NVRAM/TOD Functional Block Diagram

C.1.7.5 Audio

The system unit audio consists of a single-chip CODEC, integrated amplifier, and supporting analog circuitry.

The CODEC is a single-chip stereo, analog-to-digital and digital-to-analog converter based on delta-sigma conversion technique. The microphone input specifications are designed for the SunMicrophone II or equivalent. The following figure shows a functional block diagram of system unit audio circuit. The following table lists the audio input electrical specifications and TABLE C-9 lists the audio output electrical specifications.

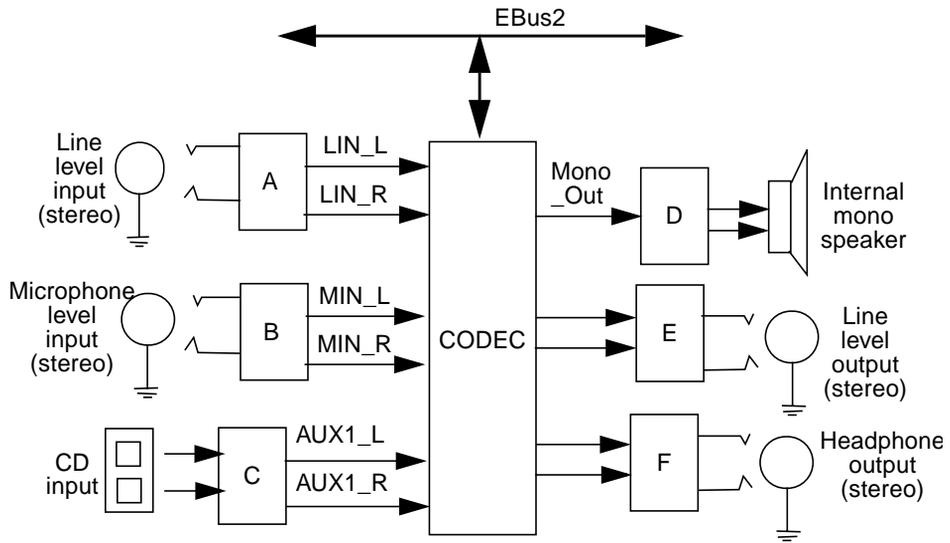


FIGURE C-15 Audio Circuit Functional Block Diagram

TABLE C-8 Audio Input Electrical Specification

Parameter (Rec=50, Mon, Play=100)	Min	Nom	Max	Unit
Input voltage at microphone jack input that results in full scale digital output	66.9	70.4	77.4	mV (p-p)
Input voltage at line in jack that results in full scale digital output	6.00	6.54	6.99	V (p-p)
Microphone input impedance	1.5	2.21	2.5	Kohm
Microphone input capacitance	200	220	240	pF
Line-in input impedance	8.7	9.16	9.62	Kohm
Line-in input capacitance	200	220	240	pF

TABLE C-9 Audio Output Electrical Specification

Parameter OLB= 1 (Rec=50, Mon, Play=100)	Min	Nom	Max	Unit
Output voltage at line out that results from a full scale digital signal (ATTN= 0dB)	2.60	2.8	3.20	V (p-p)

TABLE C-9 Audio Output Electrical Specification (*Continued*)

Parameter OLB= 1 (Rec=50, Mon, Play=100)	Min	Nom	Max	Unit
Output voltage at headphone out that results from a full scale digital signal (ATTN= 10.5 dB)	1.55	1.67	1.91	V (p-p)
Headphone output impedance	15	16	1.0K	ohm
Line-out output Impedance	207	220	233	ohm

C.1.8 Power and Standby Switching

The system unit has one power switch and two standby switches. These switches include the power supply on/off switch, the keyboard standby key, and the front panel standby switch.

C.1.8.1 Power Supply On/Off Switch

The power supply on/off switch is located on the system unit rear on the power supply. When set to off, the system unit is completely off with no power.

C.1.8.2 Keyboard Standby Key

The keyboard standby key turns on the system unit if the power supply on/off switch is set to on and the system unit has been previously placed in the standby mode.

The keyboard standby key can also be used to suspend the operating system and place the system unit in the standby mode if the Energy Star power management software (dtpower) has been installed.

C.1.8.3 Front Panel Standby Switch

The front panel standby switch turns on the system unit if the power supply on/off switch is set to on and the system unit has been previously placed in the standby mode.

The front panel standby switch can also be used to halt the operating system and place the system unit in standby mode.

C.2 Clocking

There are five system unit clock domains; CPU, second level cache SRAMs, UPA, PCI, and miscellaneous clocks for the various IO devices.

C.2.1 CPU and UPA Clocking

The CPU and UPA clocks are generated using a frequency synthesizer on the CPU module. The synthesizer output frequency is divided by four prior to being driven to the CPU and SRAMs. In addition, one synthesizer output frequency is divided by six and is gated to the CPU module and to the UPA graphics slot as the UPA clock.

C.2.2 PCI Clock Generation

All PCI clocks are generated on the motherboard. Additionally, two 66-MHz PCI clocks are gated to the CPU module through the module connector. The following table lists the generated PCI clocks.

The motherboard supports two different PCI clock generators; the ICW48C60-422G clock generator or the CY2254A-2 clock generator. TABLE C-11 and TABLE C-12 list the PCI clock generator frequency select bits for the ICW48C60-422G and the CY2254A-2 PCI clock generators, respectively.

TABLE C-10 PCI Clocks

Component	66 MHz	33 MHz
CPU module	2	
APB	1	1
PCI expansion slots		2
RISC		1
PCIO		1

TABLE C-10 PCI Clocks (Continued)

Component	66 MHz	33 MHz
IDE		1
ATI PCI based VGA		1
Total number of PCI clocks	3	7

TABLE C-11 PCI Clock Generator Frequency Select (ICW48C60-422G)

SEL0	SEL1	SEL2	R%EF1:2	CPUx (60/66 MHz)	PCIx (30/33)
0	0	0	14.318 MHz	50 MHz	25 MHz
0	1	0	14.318 MHz	60 MHz	30 MHz
1	0	0	14.318 MHz	66 MHz	33 MHz
1	1	0	14.318 MHz	66 MHz	33 MHz

TABLE C-12 PCI Clock Generator Frequency Select (CY2254A-2)

SEL0	SEL1	OE	R%EF1:2	CPUx (60/66 MHz)	PCIx (30/33)
0	0	1	14.318 MHz	50 MHz	25 MHz
0	1	1	14.318 MHz	60 MHz	30 MHz
1	0	1	14.318 MHz	66 MHz	33 MHz
1	1	1	14.318 MHz	55 MHz	27.5 MHz

C.3 Address Mapping

This section provides the overview of address partitioning and software visible registers and their respective functionality. The physical address associated with each of these registers is listed along with a brief description of the register. For further details on the description of the registers and chips functionality refer to the respective chip specification.

- Section C.3.1 “Port Allocations” on page C-30
- Section C.3.2 “UPA Graphics Address Assignments” on page C-31
- Section C.3.3 “PCI Address Assignments” on page C-32

C.3.1 Port Allocations

The following table lists the system unit port allocations. The CPU module divides the physical address space among:

- Main memory (DRAM)
- UPA graphics
- PCI (which is further subdivided into the primary PCI bus (PCI-A) and the secondary PCI bus (PCI-B bus) when the APB ASIC is used).

TABLE C-13 Port Allocations

Address Range in PA<40:0>	Size	Port Access	Access Type
0x000.0000.0000 - 0x000.3FFF.FFFF	1 Gbyte	Main memory	Cacheable
0x000.4000.0000 - 0x1FF.FFFF.FFFF	Do not use	Undefined	Cacheable
0x1FC.0000.0000 - 0x1FD.FFFF.FFFF	8 Gbytes	UPA graphics	Non-cacheable
0x1FE.0000.0000 - 0x1FF.FFFF.FFFF	8 Gbytes	CPU IO	Non-cacheable

C.3.2 UPA Graphics Address Assignments

The following table lists the UPA graphics address assignments. TABLE C-15 lists additional CPU module internal CSR space (non-cacheable).

TABLE C-14 UPA Address Space

UPA Address Space	PA[40:0]	Size	CPU Commands Supported	PCI Commands Generated
PCI Config. Space	0x1FE.0100.0000 - 0x1FE.01FF.FFFF	16 Mbytes	NC read (max 4 bytes) NC write (max 4 bytes)	Configuration read, configuration write (may also be Special cycle)
PCI bus IO space	0x1FE.0200.0000 - 0x1FE.02FF.FFFF	16 Mbytes	NC Read (any), NC Write (any)	IO read IO write
Don't use	0x1FE.0300.0000 - 0x1FE.FFFF.FFFF		May wrap to configuration or IO Space behavior	
PCI bus memory space	0x1FF.0000.0000 - 0x1FF.FFFF.FFFF	4 Gbytes	NC read (4 byte) NC read (8 byte) NC block read NC write NC block write NC Instruction fetch	Memory read Memory read multiple Memory read line Memory write Memory write memory Read

TABLE C-15 CPU Module Internal CSR Space

PA[40:0]	Owner
0x1FE.0000.0000 - 0x1FE.0000.01FF	MCU
0x1FE.0000.0200 - 0x1FE.0000.03FF	IOM
0x1FE.0000.0400 - 0x1FE.0000.1FFF	PIE
0x1FE.0000.2000 - 0x1FE.0000.5FFF	PBM
0x1FE.0000.6000 - 0x1FE.0000.9FFF	PIE
0x1FE.0000.A000 - 0x1FE.0000.A7FF	IOM
0x1FE.0000.A800 - 0x1FE.0000.EFFF	PIE
0x1FE.0000.F000 - 0x1FE.00FF.FFFF	MCU

C.3.3 PCI Address Assignments

The following table lists the PCI address assignments.

TABLE C-16 PCI Address Assignments

Address Range in PCI Address	Size	PCI Space Addressed	Notes
0x8000.0000 - 0xBFFF.FFFF	1 Gbyte	Primary PCI DVMA space	CPU module DVMA register (equals 0x30)
0x4000.0000 - 0x7FFF.FFFF	1 Gbyte	PCI bus A memory space	PCI slots APB ASIC register (equals 0xc)
0x40.0000 - 0x7f.ffff	4 Mbytes	PCI bus A I/O space	PCI slots
0x0000.0000 - 0x3FFF.FFFF 0xC000.0000 - 0xFFFF.FFFF	2 Gbytes	PCI bus B memory space	On-board PCI bus APB ASIC B register (equals 0xc3)
0x00.0000 - 0x3f.ffff 0xC0.0000 - 0xFF.FFF	8 Mbytes	PCI bus B I/O space	

C.3.3.1 PCI Bus A Address Assignments

PCI bus A has all the PCI slots and the address is programmable by the OpenBoot™ Prom (OBP).

C.3.3.2 PCI Bus B Address Assignments

The PCI bus B address assignments are as follows:

PCIO ASIC Registers

The PCIO ASIC is a PCI client and the address can be re-programmed by software during boot only. Therefore, instead of providing absolute addresses for each of the registers, only offset addresses, relative to a base address, are given.

The PCIO ASIC is a multi-function PCI device and its configuration space has three base address pointers:

- Boot Prom
- EBus2 (function 0)
- Ethernet (function 1)

Boot PROM

The PCIO ASIC is strapped so that the red mode trap address is:

UPA: 0x1FF.F000.0000

PCI: 0xF000.0000

EBus2: 0x00.0000

The following table list the boot and flash PROM address assignments.

TABLE C-17 Boot PROM/Flash PROM Address Assignments

Offset	Register Description	Type	Size
0x00.0000 - 0xFF.FFFF	Flash Prom/EPROM	R	1 or 4 bytes

C.4 Interrupts

Interrupts utilize a UPA-provided interrupt vector mechanism. All interrupts are delivered to the CPU module through a packet-write scheme which provides 24 bytes of data to the CPU module. Level sensitive software-acknowledge interrupts, which would typically be communicated through dedicated interrupt lines, are converted into interrupt packets and delivered to the CPU module.

The output of `INT_NUM` is registered externally and synchronized to the PCI clock before being transferred to the CPU module. The following figure shows the interrupt scheme block diagram and the following table summarizes the interrupt routing.

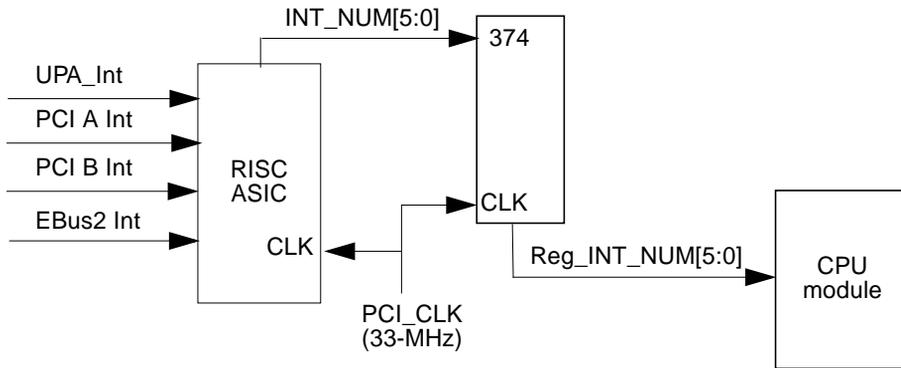


FIGURE C-16 Interrupt Scheme Block Diagram

TABLE C-18 Interrupt Routing

RISC Pin	Interrupt	Int/Ext	Source	INT_NUM (from RISC)	Type	Offset	Priority
SB0_INTREQ7	Not used	Ext	PCI	0x07	Level	0x00	7
SB0_INTREQ5	Not used	Ext	PCI	0x05	Level	0x01	5
SB2_INTREQ5	Not used	Ext	PCI	0x05	Level	0x02	5
SB0_INTREQ2	Not used	Ext	PCI	0x02	Level	0x03	2
SB1_INTREQ7	Not used	Ext	PCI	0x0F	Level	0x04	7
SB1_INTREQ5	Not used	Ext	PCI	0x0D	Level	0x05	5
SB3_INTREQ5	Not used	Ext	PCI	0x1D	Level	0x06	5
SB1_INTREQ2	Not used	Ext	PCI	0x0A	Level	0x07	2
SB2_INTREQ7	Not used	Ext	PCI	0x17	Level	0x08	6
NO RISC PIN	Not used	Ext	PCI	0x38	Level	0x09	5
NO RISC PIN	Not used	Ext	PCI	0x10	Level	0x0A	2
SB1_INTREQ2	Not used	Ext	PCI	0x12	Level	0x0B	1
NO RISC PIN	Not used	Ext	PCI	0x18	Level	0x0C	6
NO RISC PIN	Not used	Ext	PCI	0x39	Level	0x0D	5

TABLE C-18 Interrupt Routing (Continued)

RISC Pin	Interrupt	Int/Ext	Source	INT_NUM (from RISC)	Type	Offset	Priority
NO RISC PIN	Not used	Ext	PCI	0x00	Level	0x0E	2
SB3_INTREQ2	On Board PCI GFX	Ext	PCI	0x1A	Level	0x0F	1
SB0_INTREQ6	PCI A slot 0, INTA#	Ext	PCI	0x06	Level	0x10	6
SB0_INTREQ4	PCI A slot 0, INTB#	Ext	PCI	0x04	Level	0x11	4
SB0_INTREQ3	PCI A slot 0, INTC#	Ext	PCI	0x03	Level	0x12	3
SB0_INTREQ1	PCI A slot 0, INTD#	Ext	PCI	0x01	Level	0x13	1
SB1_INTREQ6	PCI A Slot 1, INTA#	Ext	PCI	0x0E	Level	0x14	6
SB1_INTREQ4	PCI A slot 1, INTB#	Ext	PCI	0x0C	Level	0x15	4
SB1_INTREQ3	PCI A slot 1, INTC#	Ext	PCI	0x0B	Level	0x16	3
SB1_INTREQ1	PCI A slot 1, INTD#	Ext	PCI	0x09	Level	0x17	1
SB2_INTREQ6	PCI A Slot 2, INTA#	Ext	PCI	0x16	Level	0x18	6
SB2_INTREQ4	PCI A slot 2, INTB#	Ext	PCI	0x14	Level	0x19	4
SB2_INTREQ3	PCI A slot 2, INTC#	Ext	PCI	0x13	Level	0x1A	3
SB2_INTREQ1	PCI A slot 2, INTD#	Ext	PCI	0x11	Level	0x1B	1
SB3_INTREQ6	PCI A Slot 3, INTA#	Ext	PCI	0x1E	Level	0x1C	6
SB3_INTREQ4	PCI A slot 3, INTB#	Ext	PCI	0x1C	Level	0x1D	4
SB3_INTREQ3	PCI A slot 3, INTC#	Ext	PCI	0x1B	Level	0x1E	3
SB3_INTREQ1	PCI A slot 3, INTD#	Ext	PCI	0x19	Level	0x1F	1
SCSI_INT	IDE	Ext	OBIO	0x20	Level	0x20	3
ETHERNET_INT	Ethernet	Ext	OBIO	0x21	Level	0x21	3
PARALLEL_INT	Parallel Port	Ext	OBIO	0x22	Level	0x22	2
AUDIO_INT	Audio Capture/Rec	Ext	OBIO	0x24	Level	0x23	8
SB3_INTREQ7	Audio Playback	Ext	OBIO	0x1F	Level	0x24	7

TABLE C-18 Interrupt Routing (Continued)

RISC Pin	Interrupt	Int/Ext	Source	INT_NUM (from RISC)	Type	Offset	Priority
Power_FAIL_INT	Power Fail	Ext	OBIO	0x25	Level	0x25	8
KEYBOARD_INT	IDE Channel 2 (Not used)	Ext	OBIO	0x28	Level	0x26	7
FLOPPY_INT	Diskette	Ext	OBIO	0x29	Level	0x27	8
SPARE_INT	Spare hardware	Ext	OBIO	0x2A	Level	0x28	2
SKEY_INT	Keyboard	Ext	OBIO	0x2B	Level	0x29	4
SMOU_INT	Mouse	Ext	OBIO	0x2C	Level	0x2A	4
SSER_INT	Serial Ports	Ext	OBIO	0x2D	Level	0x2B	7
	Reserved					0x2C - 0x2D	
	Uncorrectable ECC	Int	ECC		Level	0x2E	8
	Correctable ECC	Int	ECC		Level	0x2F	8
	PCI Bus Error	Int	PBM		Level	0x30	8
	Reserved	Int				0x31 - 0x32	
Graphics1_INT	Graphics	Ext	UPA64	0x23	Pulse	FROM INR	5
Graphics1_INT	Graphics (Not used)	Ext	UPA64	0x26	Pulse	FROM INR	5
	No Interrupt	Ext	NONE	0x3F	N/A	N/A	N/A

C.5 Power

- Section C.5.1 “On-Board Voltage Regulator” on page C-37
- Section C.5.2 “Power Supply Memory” on page C-37

C.5.1 On-Board Voltage Regulator

The on-board voltage regulator meets VRM8.1 specification. The output of the voltage regulator is programmed by the module. The module drives VID[3:0], which asks the regulator to generate the correct core voltage for the CPU module core voltage and SRAM IO.

C.5.2 Power Supply Memory

The system unit remembers the state that it was in before a power failure or accidental power cord removal. This circuit is implemented on the motherboard. A latching relay circuit on the motherboard performs this function.

C.5.3 Power Management

To meet EPA Energy Star requirements, the system unit power consumption is lower than 30 watts.

In system unit software monitors system unit activity and based on the system unit control settings, system unit software saves the machine state (including the memory) onto the hard drive and halts the operation system. The system unit software then turns off the power supply.

Based on the setting of the NVRAM/TOD, which has an alarm clock, the system unit is turned on automatically if the alarm is set. This is done by having the interrupt out of the NVRAM/TOD directly connected to the power supply. The power supply requires a `power_off` signal for the system unit software to be able to write to a bit within a register and have the power supply shut down.

C.6 Motherboard

The following figure illustrates a block diagram of the system unit motherboard.

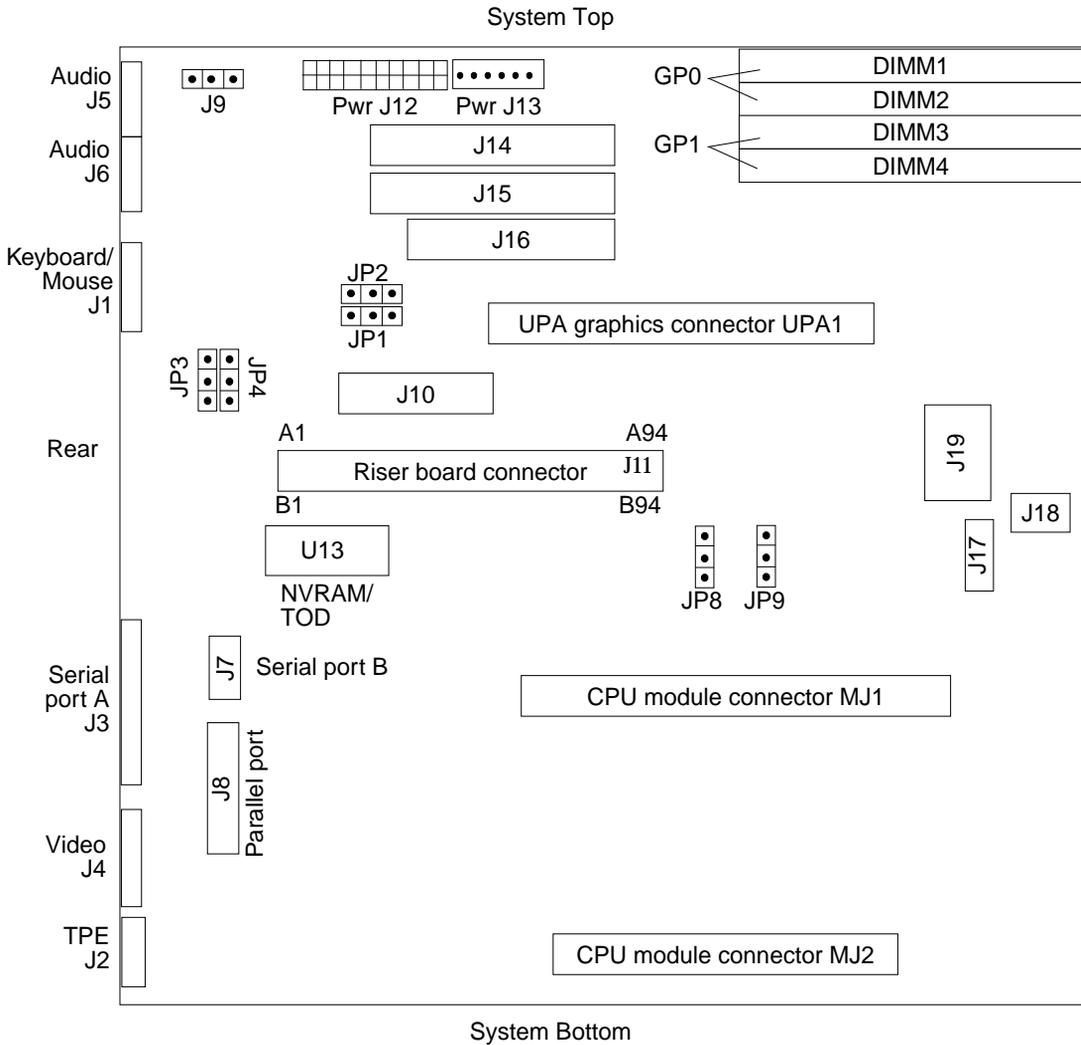


FIGURE C-17 Motherboard Block Diagram

C.7 Jumper Descriptions

Jumper configurations can be changed by setting jumper switches on the motherboard. The motherboard's jumpers are preset at the factory.

A jumper switch is *closed* (sometimes referred to as shorted) with the plastic cap inserted over two pins of the jumper. A jumper is *open* with the plastic cap inserted over one or no pin(s) of the jumper. The following figure shows the different jumper settings that are used on the motherboard.

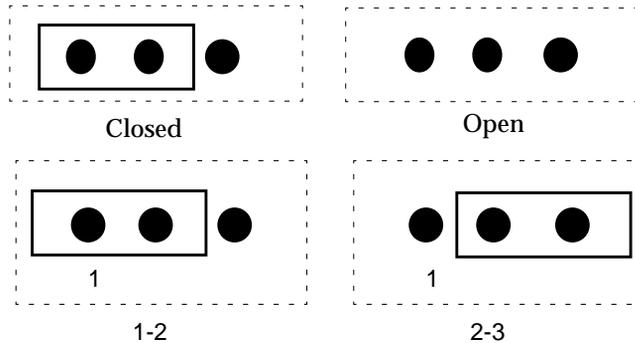


FIGURE C-18 Selected Jumper Settings

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 in the following figure. Ensure that the serial port jumpers are set correctly.

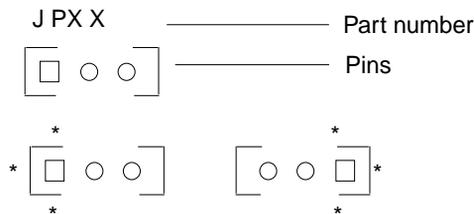


FIGURE C-19 Identifying Jumper Pins

C.7.1 Serial Port Jumpers

Serial port jumpers JP3 and JP4 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. The following table 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. The following figure illustrates the JP3/JP4 jumper settings for RS-423 (default) interface.

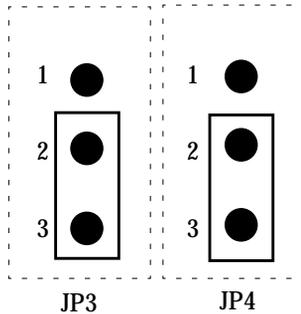


FIGURE C-20 JP3/JP4 Jumper Settings for RS-423 Interface

To change the serial port jumper setting from RS-423 (default) to RS-232:

- 1. Power off the system.**

See Section 6.2 “Powering Off the System Unit” on page 6-4.

- 2. Remove the access cover.**

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



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 them on any surface.

- 3. Attach the wrist strap.**

See Section 7.2 “Attaching the Wrist Strap” on page 7-4.

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

- 5. Locate the jumpers on the system board and change the selection of jumpers JP3 and JP4 from 2-3 to 1-2.**

- 6. Connect the AC power cord to the system unit.**

- 7. Detach the wrist strap.**

8. Replace the side access cover.

See Section 7.4 “Replacing the Top Cover” on page 7-7.

9. Power on the system.

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

TABLE C-19 Serial Port Jumper Settings

Jumper	Pins 1-2 Select	Pins 2-3 Select	Default Jumper on Pins
JP3	RS-232	RS-423	2-3
JP4	RS-232	RS-423	2-3

C.7.2 Flash PROM Jumpers

Flash PROM jumpers JP1 and JP2 are for reprogramming specific code blocks and remote programming of the flash PROM. The following figure illustrates the JP1/JP2 jumper settings (default) for the flash PROM and the following table identifies the flash PROM jumper settings. The default shunt settings of jumpers JP1 and JP2 are 1-2. Placing the shunt on pins 2 and 3 enables reprogramming of the flash PROM.

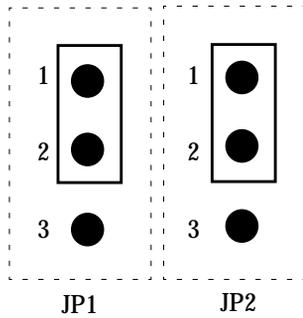


FIGURE C-21 JP1/JP2 Jumper Settings for the Flash PROM

TABLE C-20 Flash PROM Jumper Settings

Jumper	Pins 1-2 Select	Pins 2-3 Select	Default Jumper on Pins
JP1	To onboard PROM	To ROMBO	1-2
JP2	Disable (default)	Enable	1-2

C.8 Enclosure

The system unit uses an enclosure that reflects style, ergonomics, serviceability, functionality, versatility, and quality. Physical orientation allows for a rack-mount, desktop, or under desk installation. The enclosure design complies with all necessary environmental and regulatory specifications.

C.8.1 Ultra 5 Enclosure Basics

The Ultra 5 enclosure houses:

- One 3.5-inch (8.89-cm) diskette drive
- One 1.6-inch (4.064-cm) CD-ROM drive
- One 3.5-inch (8.89-cm) hard drive bay
- One plug-in UltraSPARC module
- Four DIMMs
- Three PCI slots

C.8.2 Ultra 10 Enclosure Basics

The Ultra 10 enclosure houses:

- One 3.5-inch (8.89-cm) diskette drive
- One 1.6-inch (4.064-cm) CD-ROM drive
- One 3.5-inch (8.89-cm) hard drive bay
- One plug-in UltraSPARC module
- Four DIMMs
- Four PCI slots
- One UPA64S module

Conformity

D.1 Declaration of Conformity

The following pages provide the decalration of conformity for the SunUltra 5 and Ultra 10 computers.

Declaration of Conformity

Compliance ID: 200

Product Name: Sun Ultra 5 Family

This product has been tested and complies with:

EMC

USA—FCC Class B

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

European Union—EC

This equipment complies with the following requirements of the EMC Directive 89/336/EEC

EN55022 / CISPR22 (1985)	Class B
EN50082-1	IEC801-2 (1991) 4 kV (Direct), 8 kV (Air)
	IEC801-3 (1984) 3 V/m
	IEC801-4 (1988) 1.0 kV Power Lines, 0.5 kV Signal Lines
EN61000-3-2/IEC1000-3-2(1994)	Pass

Safety

This equipment complies with the following requirements of the Low Voltage Directive 73/23/EEC:

EC Type Examination Certificates:

EN60950/IEC950 (1993)

EN60950 w/ Nordic Deviations

Supplementary Information

This product was tested and complies with all the requirements for the CE Mark.

/ S /

Dennis P. Symanski DATE
Manager, Product Compliance

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Quality Assurance Manager

Sun Microsystems Sco
Springfield, Linlithgow
West Lothian, EH49 7LR
Scotland, United Kingdom
Tel: 0506 670000
Fax: 0506 760011

Declaration of Conformity

Compliance ID: 201

Product Name: Sun Ultra 10 Family

This product has been tested and complies with:

EMC

USA—FCC Class B

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

European Union—EC

This equipment complies with the following requirements of the EMC Directive 89/336/EEC

EN55022 / CISPR22 (1985)		Class B
EN50082-1	IEC801-2 (1991)	4 kV (Direct), 8 kV (Air)
	IEC801-3 (1984)	3 V/m
	IEC801-4 (1988)	1.0 kV Power Lines, 0.5 kV Signal Lines
EN61000-3-2/IEC1000-3-2(1994)		Pass

Safety

This equipment complies with the following requirements of the Low Voltage Directive 73/23/EEC:

EC Type Examination Certificates:

EN60950/IEC950 (1993)
EN60950 w/ Nordic Deviations

Supplementary Information

This product was tested and complies with all the requirements for the CE Mark.

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D.2 Regulatory Compliance Statement

The following pages provide the regulatory compliance statements for the SunUltra 5 and Ultra 10 computers.

Regulatory Compliance Statements

Your Sun product is marked to indicate its compliance class:

- Federal Communications Commission (FCC) — USA
- Department of Communications (DOC) — Canada
- Voluntary Control Council for Interference (VCCI) — Japan

Please read the appropriate section that corresponds to the marking on your Sun product before attempting to install the product.

FCC Class A Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Shielded Cables: Connections between the workstation and peripherals must be made using shielded cables in order to maintain compliance with FCC radio frequency emission limits. Networking connections can be made using unshielded twisted-pair (UTP) cables.

Modifications: Any modifications made to this device that are not approved by Sun Microsystems, Inc. may void the authority granted to the user by the FCC to operate this equipment.

FCC Class B Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

Shielded Cables: Connections between the workstation and peripherals must be made using shielded cables in order to maintain compliance with FCC radio frequency emission limits. Networking connections can be made using unshielded twisted pair (UTP) cables.

Modifications: Any modifications made to this device that are not approved by Sun Microsystems, Inc. may void the authority granted to the user by the FCC to operate this equipment.

DOC Class A Notice - Avis DOC, Classe A

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.
Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

DOC Class B Notice - Avis DOC, Classe B

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.
Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

VCCI 基準について

第一種 VCCI 基準について

第一種 VCCI の表示があるワークステーションおよびオプション製品は、第一種情報装置です。これらの製品には、下記の項目が該当します。

この装置は、第一種情報装置(商工業地域において使用されるべき情報装置)で商工業地域での電波障害防止を目的とした情報処理装置等電波障害自主規制協議会(VCCI)基準に適合しております。したがって、本製品を、住宅地域または住宅地域に隣接した地域でご使用になりますと、ラジオ、テレビジョン受信機等に受信障害を与えることがあります。

取り扱い説明書に従って正しくお取り扱いください。

第二種 VCCI 基準について

第二種 VCCI の表示  があるワークステーションおよびオプション製品は、第二種情報装置です。これらの製品には、下記の項目が該当します。

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取り扱い説明書に従って正しくお取り扱いください。

D.3 Agency Compliance

The system unit complies with international and domestic regulatory requirements for safety, ergonomics, and electromagnetic compatibility. When installed and operated in accordance with this service manual, the EMC class marked on your system unit label remains the same.

D.4 German Acoustic Compliance

ACHTUNG: Der arbeitsplatzbezogenr Schalldruckpegel nach DIN 45 635.

Teil 1000 beträgt 70 Db(A) oder weniger.

Safety Agency Compliance Statement

Safety Agency Compliance Statements

Read this section before beginning any procedure. The following text provides safety precautions to follow when installing a Sun Microsystems product.

Safety Precautions

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

- Follow all cautions and instructions marked on the equipment.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment's electrical rating label.
- Never push objects of any kind through openings in the equipment. Dangerous voltages may be present. Conductive foreign objects could produce a short circuit that could cause fire, electric shock, or damage to your equipment.

Symbols

The following symbols may appear in this book:



Caution – There is risk of personal injury and equipment damage. Follow the instructions.



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



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



On – Applies AC power to the system.

Depending on the type of power switch your device has, one of the following symbols may be used:



Off – Removes AC power from the system.



Standby – The On/Standby switch is in the *standby* position.

Modifications to Equipment

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

Placement of a Sun Product



Caution – Do not block or cover the openings of your Sun product. Never place a Sun product near a radiator or heat register. Failure to follow these guidelines can cause overheating and affect the reliability of your Sun product.

SELV Compliance

Safety status of I/O connections comply to SELV requirements.

Power Cord Connection



Caution – Sun products are designed to work with single-phase power systems having a grounded neutral conductor. To reduce the risk of electric shock, do not plug Sun products into any other type of power system. Contact your facilities manager or a qualified electrician if you are not sure what type of power is supplied to your building.



Caution – Not all power cords have the same current ratings. Household extension cords do not have overload protection and are not meant for use with computer systems. Do not use household extension cords with your Sun product.



Caution – Your Sun product is shipped with a grounding type (three-wire) power cord. To reduce the risk of electric shock, always plug the cord into a grounded power outlet.

The following caution applies only to devices with a **Standby** power switch:



Caution – 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 plug the power cord into a grounded power outlet 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.

Lithium Battery



Caution - On Sun CPU boards, there is a lithium battery molded into the real-time clock, SGS No. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, or MK48T08. Batteries are not customer replaceable parts. They may explode if mishandled. Do not dispose of the battery in fire. Do not disassemble it or attempt to recharge it.

System Unit Cover

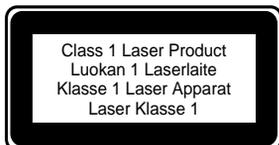
You must remove the cover of your Sun computer system unit in order to add cards, memory, or internal storage devices. Be sure to replace the top cover before powering up your computer system.



Caution - Do not operate Sun products without the top cover in place. Failure to take this precaution may result in personal injury and system damage.

Laser Compliance Notice

Sun products that use laser technology comply with Class 1 laser requirements.



CD-ROM



Caution - Use of controls, adjustments, or the performance of procedures other than those specified herein may result in hazardous radiation exposure.

Einhaltung sicherheitsbehördlicher Vorschriften

Auf dieser Seite werden Sicherheitsrichtlinien beschrieben, die bei der Installation von Sun-Produkten zu beachten sind.

Sicherheitsvorkehrungen

Treffen Sie zu Ihrem eigenen Schutz die folgenden Sicherheitsvorkehrungen, wenn Sie Ihr Gerät installieren:

- Beachten Sie alle auf den Geräten angebrachten Warnhinweise und Anweisungen.

- Vergewissern Sie sich, daß Spannung und Frequenz Ihrer Stromquelle mit der Spannung und Frequenz übereinstimmen, die auf dem Etikett mit den elektrischen Nennwerten des Geräts angegeben sind.
- Stecken Sie auf keinen Fall irgendwelche Gegenstände in Öffnungen in den Geräten. Leitfähige Gegenstände könnten aufgrund der möglicherweise vorliegenden gefährlichen Spannungen einen Kurzschluß verursachen, der einen Brand, Stromschlag oder Geräteschaden herbeiführen kann.

Symbole

Die Symbole in diesem Handbuch haben folgende Bedeutung:



Achtung - Gefahr von Verletzung und Geräteschaden. Befolgen Sie die Anweisungen.



Achtung - Hohe Temperatur. Nicht berühren, da Verletzungsgefahr durch heiße Oberfläche besteht.



Achtung - Gefährliche Spannungen. Anweisungen befolgen, um Stromschläge und Verletzungen zu vermeiden.



Ein - Setzt das System unter Wechselstrom.

Je nach Netzschaltertyp an Ihrem Gerät kann eines der folgenden Symbole benutzt werden:



Aus - Unterbricht die Wechselstromzufuhr zum Gerät.



Wartezustand (Stand-by-Position) - Der Ein-/Wartezustand-Schalter steht auf Wartezustand. Änderungen an Sun-Geräten.

Nehmen Sie keine mechanischen oder elektrischen Änderungen an den Geräten vor. Sun Microsystems, übernimmt bei einem Sun-Produkt, das geändert wurde, keine Verantwortung für die Einhaltung behördlicher Vorschriften

Aufstellung von Sun-Geräten



Achtung – Um den zuverlässigen Betrieb Ihres Sun-Geräts zu gewährleisten und es vor Überhitzung zu schützen, dürfen die Öffnungen im Gerät nicht blockiert oder verdeckt werden. Sun-Produkte sollten niemals in der Nähe von Heizkörpern oder Heizluftklappen aufgestellt werden.

Einhaltung der SELV-Richtlinien

Die Sicherung der I/O-Verbindungen entspricht den Anforderungen der SELV-Spezifikation.

Anschluß des Netzkabels



Achtung – Sun-Produkte sind für den Betrieb an Einphasen-Stromnetzen mit geerdetem Nulleiter vorgesehen. Um die Stromschlaggefahr zu reduzieren, schließen Sie Sun-Produkte nicht an andere Stromquellen an. Ihr Betriebsleiter oder ein qualifizierter Elektriker kann Ihnen die Daten zur Stromversorgung in Ihrem Gebäude geben.



Achtung – Nicht alle Netzkabel haben die gleichen Nennwerte. Herkömmliche, im Haushalt verwendete Verlängerungskabel besitzen keinen Überlastungsschutz und sind daher für Computersysteme nicht geeignet.



Achtung – Ihr Sun-Gerät wird mit einem dreidrigen Netzkabel für geerdete Netzsteckdosen geliefert. Um die Gefahr eines Stromschlags zu reduzieren, schließen Sie das Kabel nur an eine fachgerecht verlegte, geerdete Steckdose an.

Die folgende Warnung gilt nur für Geräte mit Wartezustand-Netzschalter:



Achtung – Der Ein/Aus-Schalter dieses Geräts schaltet nur auf Wartezustand (Stand-By-Modus). Um die Stromzufuhr zum Gerät vollständig zu unterbrechen, müssen Sie das Netzkabel von der Steckdose abziehen. Schließen Sie den Stecker des Netzkabels an eine in der Nähe befindliche, frei zugängliche, geerdete Netzsteckdose an. Schließen Sie das Netzkabel nicht an, wenn das Netzteil aus der Systemeinheit entfernt wurde.

Lithiumbatterie



Achtung – CPU-Karten von Sun verfügen über eine Echtzeituhr mit integrierter Lithiumbatterie (Teile-Nr. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, oder MK48T08). Diese Batterie darf nur von einem qualifizierten Servicetechniker ausgewechselt werden, da sie bei falscher Handhabung explodieren kann. Werfen Sie die Batterie nicht ins Feuer. Versuchen Sie auf keinen Fall, die Batterie auszubauen oder wiederaufzuladen.

Gehäuseabdeckung

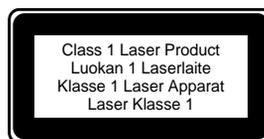
Sie müssen die obere Abdeckung Ihres Sun-Systems entfernen, um interne Komponenten wie Karten, Speicherchips oder Massenspeicher hinzuzufügen. Bringen Sie die obere Gehäuseabdeckung wieder an, bevor Sie Ihr System einschalten.



Achtung – Bei Betrieb des Systems ohne obere Abdeckung besteht die Gefahr von Stromschlag und Systemschäden.

Einhaltung der Richtlinien für Laser

Sun-Produkte, die mit Laser-Technologie arbeiten, entsprechen den Anforderungen der Laser Klasse 1.



CD-ROM



Warnung – Die Verwendung von anderen Steuerungen und Einstellungen oder die Durchführung von Prozeduren, die von den hier beschriebenen abweichen, können gefährliche Strahlungen zur Folge haben.

Conformité aux normes de sécurité

Ce texte traite des mesures de sécurité qu'il convient de prendre pour l'installation d'un produit Sun Microsystems.

Mesures de sécurité

Pour votre protection, veuillez prendre les précautions suivantes pendant l'installation du matériel :

- Suivre tous les avertissements et toutes les instructions inscrites sur le matériel.
- Vérifier que la tension et la fréquence de la source d'alimentation électrique correspondent à la tension et à la fréquence indiquées sur l'étiquette de classification de l'appareil.
- Ne jamais introduire d'objets quels qu'ils soient dans une des ouvertures de l'appareil. Vous pourriez vous trouver en présence de hautes tensions dangereuses. Tout objet conducteur introduit de la sorte pourrait produire un court-circuit qui entraînerait des flammes, des risques d'électrocution ou des dégâts matériels.

Symboles

Vous trouverez ci-dessous la signification des différents symboles utilisés :



Attention : risques de blessures corporelles et de dégâts matériels. Veuillez suivre les instructions.



Attention : surface à température élevée. Évitez le contact. La température des surfaces est élevée et leur contact peut provoquer des blessures corporelles.



Attention : présence de tensions dangereuses. Pour danger pour la tructions.

MARCHE – Votre système est sous tension (courant alternatif).

Un des symboles suivants sera peut-être utilisé en fonction du type d'interrupteur de votre système:



ARRET – Votre système est hors tension (courant alternatif).



VEILLEUSE – L'interrupteur Marche/Veilleuse est en position « Veilleuse ».

Modification du matériel

Ne pas apporter de modification mécanique ou électrique au matériel. Sun Microsystems n'est pas responsable de la conformité réglementaire d'un produit Sun qui a été modifié.

Positionnement d'un produit Sun



Attention : pour assurer le bon fonctionnement de votre produit Sun et pour l'empêcher de surchauffer, il convient de ne pas obstruer ni recouvrir les ouvertures prévues dans l'appareil. Un produit Sun ne doit jamais être placé à proximité d'un radiateur ou d'une source de chaleur.

Conformité SELV

Sécurité : les raccordements E/S sont conformes aux normes SELV.

Connexion du cordon d'alimentation



Attention : les produits Sun sont conçus pour fonctionner avec des alimentations monophasées munies d'un conducteur neutre mis à la terre. Pour écarter les risques d'électrocution, ne pas brancher de produit Sun dans un autre type d'alimentation secteur. En cas de doute quant au type d'alimentation électrique du local, veuillez vous adresser au directeur de l'exploitation ou à un électricien qualifié.



Attention : tous les cordons d'alimentation n'ont pas forcément la même puissance nominale en matière de courant. Les rallonges d'usage domestique n'offrent pas de protection contre les surcharges et ne sont pas prévues pour les systèmes d'ordinateurs. Ne pas utiliser de rallonge d'usage domestique avec votre produit Sun.



Attention : votre produit Sun a été livré équipé d'un cordon d'alimentation à trois fils (avec prise de terre). Pour écarter tout risque d'électrocution, branchez toujours ce cordon dans une prise mise à la terre.

L'avertissement suivant s'applique uniquement aux systèmes équipés d'un interrupteur VEILLEUSE:



Attention : le commutateur d'alimentation de ce produit fonctionne comme un dispositif de mise en veille uniquement. C'est la prise d'alimentation qui sert à mettre le produit hors tension. Veillez donc à installer le produit à proximité d'une prise murale facilement accessible. Ne connectez pas la prise d'alimentation lorsque le châssis du système n'est plus alimenté.

Batterie au lithium



Attention : sur les cartes CPU Sun, une batterie au lithium (référence MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, ou MK48T08.) a été moulée dans l'horloge temps réel SGS. Les batteries ne sont pas des pièces remplaçables par le client. Elles risquent d'exploser en cas de mauvais traitement. Ne pas jeter la batterie au feu. Ne pas la démonter ni tenter de la recharger.

Couvercle

Pour ajouter des cartes, de la mémoire, ou des unités de stockage internes, vous devez démonter le couvercle de l'unité système Sun. Ne pas oublier de remettre ce couvercle en place avant de mettre le système sous tension.



Attention : il est dangereux de faire fonctionner un produit Sun sans le couvercle en place. Si l'on néglige cette précaution, on encourt des risques de blessures corporelles et de dégâts matériels.

Conformité aux certifications Laser

Les produits Sun qui font appel aux technologies lasers sont conformes aux normes de la classe 1 en la matière.



CD-ROM



Attention - L'utilisation de contrôles, de réglages ou de performances de procédures autre que celle spécifiée dans le présent document peut provoquer une exposition à des radiations dangereuses.

Normativas de seguridad

El siguiente texto incluye las medidas de seguridad que se deben seguir cuando se instale algún producto de Sun Microsystems.

Precauciones de seguridad

Para su protección observe las siguientes medidas de seguridad cuando manipule su equipo:

- Siga todas las avisos e instrucciones marcados en el equipo.
- Asegúrese de que el voltaje y la frecuencia de la red eléctrica concuerdan con las descritas en las etiquetas de especificaciones eléctricas del equipo.
- No introduzca nunca objetos de ningún tipo a través de los orificios del equipo. Pueden haber voltajes peligrosos. Los objetos extraños conductores de la electricidad pueden producir cortocircuitos que provoquen un incendio, descargas eléctricas o daños en el equipo.

Símbolos

En este libro aparecen los siguientes símbolos:



Precaución - Existe el riesgo de lesiones personales y daños al equipo. Siga las instrucciones.



Precaución - Superficie caliente. Evite el contacto. Las superficies están calientes y pueden causar daños personales si se tocan.



Precaución - Voltaje peligroso presente. Para reducir el riesgo de descarga y daños para la salud siga las instrucciones.



Encendido - Aplica la alimentación de CA al sistema.

Según el tipo de interruptor de encendido que su equipo tenga, es posible que se utilice uno de los siguientes símbolos:

 **Apagado** – Elimina la alimentación de CA del sistema.

 **En espera** – El interruptor de Encendido/En espera se ha colocado en la posición de *En espera*.

Modificaciones en el equipo

No realice modificaciones de tipo mecánico o eléctrico en el equipo. Sun Microsystems no se hace responsable del cumplimiento de las normativas de seguridad en los equipos Sun modificados.

Ubicación de un producto Sun

 **Precaución** – Para asegurar la fiabilidad de funcionamiento de su producto Sun y para protegerlo de sobrecalentamientos no deben obstruirse o taparse las rejillas del equipo. Los productos Sun nunca deben situarse cerca de radiadores o de fuentes de calor.

Cumplimiento de la normativa SELV

El estado de la seguridad de las conexiones de entrada/salida cumple los requisitos de la normativa SELV.

Conexión del cable de alimentación eléctrica

 **Precaución** – Los productos Sun están diseñados para trabajar en una red eléctrica monofásica con toma de tierra. Para reducir el riesgo de descarga eléctrica, no conecte los productos Sun a otro tipo de sistema de alimentación eléctrica. Póngase en contacto con el responsable de mantenimiento o con un electricista cualificado si no está seguro del sistema de alimentación eléctrica del que se dispone en su edificio.

 **Precaución** – No todos los cables de alimentación eléctrica tienen la misma capacidad. Los cables de tipo doméstico no están provistos de protecciones contra sobrecargas y por tanto no son apropiados para su uso con computadores. No utilice alargadores de tipo doméstico para conectar sus productos Sun.

 **Precaución** – Con el producto Sun se proporciona un cable de alimentación con toma de tierra. Para reducir el riesgo de descargas eléctricas conéctelo siempre a un enchufe con toma de tierra.

La siguiente advertencia se aplica solamente a equipos con un interruptor de encendido que tenga una posición "En espera":

 **Precaución** – El interruptor de encendido de este producto funciona exclusivamente como un dispositivo de puesta en espera. El enchufe de la fuente de alimentación está diseñado para ser el elemento primario de desconexión del equipo. El equipo debe instalarse cerca del enchufe de forma que este último pueda ser fácil y rápidamente accesible. No conecte el cable de alimentación cuando se ha retirado la fuente de alimentación del chasis del sistema.

Batería de litio

 **Precaución** – En las placas de CPU Sun hay una batería de litio insertada en el reloj de tiempo real, tipo SGS Núm. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, o MK48T08. Las baterías no son elementos reemplazables por el propio cliente. Pueden explotar si se manipulan de forma errónea. No arroje las baterías al fuego. No las abra o intente recargarlas.

Tapa de la unidad del sistema

Debe quitar la tapa del sistema cuando sea necesario añadir tarjetas, memoria o dispositivos de almacenamiento internos. Asegúrese de cerrar la tapa superior antes de volver a encender el equipo.

 **Precaución** – Es peligroso hacer funcionar los productos Sun sin la tapa superior colocada. El hecho de no tener en cuenta esta precaución puede ocasionar daños personales o perjudicar el funcionamiento del equipo.

Aviso de cumplimiento con requisitos de láser
Los productos Sun que utilizan la tecnología de láser
cumplen con los requisitos de láser de Clase 1.



CD-ROM

 **Precaución** - El manejo de los controles, los ajustes o la ejecución de procedimientos distintos a los aquí especificados pueden exponer al usuario a radiaciones peligrosas.

GOST-R Certification Mark



Nordic Lithium Battery Cautions

Norge

 **A D V A R S E L** - Litiumbatteri — Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

Sverige

 **WARNING** - Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparatillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

Danmark

 **ADVARSEL!** - Litiumbatteri — Eksplosionsfare ved fejlagtig håndtering. Udsiftingning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

Suomi

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

Software Notes

Note – Systems with PGX24 graphics have "PGX24" printed on the serial number label that is affixed to the system cover.

F.1 PGX24 8- or 24-Bit Graphics

The PGX24 offers PCI-based onboard 8-bit or 24-bit graphics. Selected features of the PCI-based onboard 8-bit or 24-bit graphics are described in the following paragraphs. (Also included is an m64 driver installation procedure that is required for systems running either Solaris 2.5.1 HW:11/97 or Solaris 2.6 5/98.) Software support for PGX24 is included with Solaris 7. Software support for 2.5.1 HW:11/97 or 2.6 5/98 requires an update which is included on the *Sun Ultra 5/10 Software Supplement CD*.

F.1.1 What Does 8-Bit or 24-Bit Frame Buffer Refer To?

The 8-bit or 24-bit graphics describes the number of graphics bits available to store the information for each pixel on the screen. The Ultra 5/10 on-board PGX24 graphics supports 8-bit or 24-bit colormapping. In contrast, the earlier Ultra 5/10 on-board PGX graphics only supports 8-bit colormapping.

F.1.2 The Difference Between 8-Bit Mode and 24-Bit Mode on Ultra 5/10 On-Board Graphics

When in 8-bit mode, an 8-bit colormap is available. A main drawback of the 8-bit mode is colormap flashing. Because of the low number of colors, each application typically uses all the colors in the map. If two applications assigned different colors to the map, when one application is pulled into the foreground, the color map is changed and the colors of all the other open application windows change (i.e., flash) to use those in the map of the application just pulled into the foreground. The visual classes available for the 8-bit mode are; PseudoColor, StaticGray, StaticColor, GrayScale, TrueColor, and DirectColor. The 8-bit mode provides 256-different-colors availability at one time. All of the applications that run on previous Ultra 5/10 on-board frame buffers (PGX) are available.

When in 24-bit mode, a 24-bit colormap is available. The visual class available is TrueColor. The 24-bit mode provides up to 16.7 million different colors available at one time. The large number of colors available eliminate the colormap flashing. However, some of the applications that assume an 8-bit colormap do not initialize in 24-bit mode.

F.1.3 How to Install PGX24 Graphics Software on Solaris 2.5.1 HW:11/97

To load the Solaris 2.5.1 HW:11/97 PGX24 graphics software patch, patch 103792-14, proceed as follows:

1. **Become super-user on the system.**
2. **Go to the directory that contains the patch by typing**

```
# ./cdrom/sun_ultra_5_10_series_hw_ab/Patches/103792-14
```

3. **Install the patch by typing**

```
# ./installpatch .
```

4. **Reboot the system.**
5. **Become super-user on the system.**

6. Set the PGX24.graphics mode to 24-bit by typing

```
# m64config -depth 24 -res 1152x900x66
```

7. Either log out or exit the windowing system, then restart the windowing system.

When the windowing system starts up, the display the display will be in 24-bit mode.

Note – Software patches may be updated after the release of this product. You may contact Sun Enterprise Services, or go to the Sun Online Support Tools webpage, <http://www.sun.com/service/online/>, to obtain the latest software patch.

F.1.4 How to Install PGX24 Graphics Software on Solaris 2.6 5/98

To load the Solaris 2.6 5/98 PGX24 graphics software patch, patch 105362-13, proceed as follows:

- 1. Become super-user on the system.**
- 2. Go to the directory that contains the patch by typing**

```
# ./cdrom/sun_ultra_5_10_series_hw_ab/Patches/105362-13
```

- 3. Install the patch by typing**

```
# ./installpatch .
```

- 4. Reboot the system.**
- 5. Become super-user on the system.**
- 6. Set the PGX24.graphics mode to 24-bit by typing**

```
# m64config -depth 24 -res 1152x900x66
```

7. Either log out or exit the windowing system, then restart the windowing system.

When the windowing system starts up, the display the display will be in 24-bit mode.

Note – Software patches may be updated after the release of this product. You may contact Sun Enterprise Services, or go to the Sun Online Support Tools webpage, <http://www.sun.com/service/online/>, to obtain the latest software patch.

F.1.5 Which Mode is Running

The output of the command:

```
% /usr/sbin/m64config -propt
```

tells you this information. `depth 8` means that 8-bit mode is initialized. Likewise, `depth 24` means that the 24-bit mode is active. The default setting is 8-bit mode.

F.1.6 Changing From One Mode to the Other

1. Exit the window system.

2. Enter the command:

```
% /usr/sbin/m64config -res <current resolution> -depth <8/24>
```

3. Check the current resolution by entering:

```
% /usr/sbin/m64config -prconf
```

4. Example 1 - To change from 8-bit to 24-bit mode:

```
% /usr/sbin/m64config -res 1152x900x66 -depth 24
```

5. *Example 2* - To change from 24-bit to 8-bit mode:

```
% /usr/sbin/m64config -res 1152x900x66 -depth 8
```

Note – The `-res` option needs to be specified although the resolution is not changing.

Note – The maximum resolution supported by the 24-bit mode is 1152x900x76.

6. Restart the window system or reboot the machine.

Glossary

- address** A unique location within computer or peripheral memory. Reference made to an address is usually for retrieving or storing data.
- APB** Advanced PCI bridge. A PCI-to-PCI bridge ASIC that features a connection path between a 32-bit bus operating at speeds up to 66 MHz on the primary interface and two 32-bit, 5 Vdc or 3.3 Vdc, PCI buses (each operating at 33 MHz), on the secondary interface.
- ASIC** Application-specific integrated circuit.
- ASP** Authorized service provider.
- AUXIO** Auxiliary IO. General purpose lines used to control miscellaneous system unit functions.
- boot** A term used to identify the process of reading initial software into 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.
- CAS** Column address select.
- CDE** Common Desktop Environment.
- CD-ROM** Compact disc read-only memory.
- DBZ** Double buffer with Z.
- DCE** Data communication equipment. An external modem.
- default** A preset value that is assumed to be correct unless changed by the user.
- DIMM** Dual in-line memory module. A small printed circuit card that contains dynamic random access memory chips.
- DMA** Direct memory address.

DOC	Department of communications.
dpi	Dots per inch.
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.
DTAG	Dual tag or data tag.
DTE	Data terminal equipment.
EBus	Extension bus.
ECC	Error checking code.
EDO	Extended data out.
EIDE	Enhanced IDE.
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 provides communication between systems connected directly together by transceiver taps, transceiver cables, and various cable types such as coaxial, twisted-pair, and fiber-optic.
FBC	Frame buffer controller. An ASIC responsible for the interface between the UPA and the 3DRAM. Also controls graphic draw acceleration.
FCC	Federal communications commission.
FIFO	First-in-first-out.
flash PROM	Flash programmable read-only memory.
Gbyte	Gigabyte.
GUI	Graphical user interface.
IDC	Insulation displacement connector.
IDE	Integrated drive electronics.
I/O	Input/output.
JTAG	IEEE standard 1149.1.
Kbyte	Kilobyte.
LAN	Local area network.
LED	Light-emitting diode.
MAC	Media access controller.

Mbyte	Megabyte.
MBps	Megabyte per second.
Mbps	Megabit per second.
MCU	Memory controller unit.
MHz	Megahertz.
MII	Media independent interface.
ns	Nanosecond.
NVRAM	Non-volatile random access memory. Stores system variables used by the boot PROM. Contains the system hostID number and Ethernet address.
OBP	OpenBoot PROM. A routine that tests the network controller, diskette drive system, memory, cache, system clock, network monitoring, and control registers.
PCI	Peripheral component interconnect. A high-performance 32- or 64-bit-wide bus with multiplexed address and data lines.
PCIO	PCI-to-EBus/Ethernet controller. An ASIC that bridges the PCI bus to the EBus, enabling communication between the PCI bus and all miscellaneous I/O functions, as well as the connection to slower on-board functions.
PCMCIA	Personal Computer Memory Card International Association.
PID	Process ID.
POR	Power-on reset.
POST	Power-on self-test. A series of tests that verify motherboard components are operating properly. Initialized at system power-on or when the system is rebooted.
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.
RAS	Row address select.
RC	Resistive-capacitive.
RISC	Reset, interrupt, scan, and clock. An ASIC responsible for reset, interrupt, scan, and clock.
SB	Single buffer.
SDRAM	Synchronous DRAM.
SGRAM	Synchronous graphics RAM.

SRAM	Static random access memory.
Standby switch	Controls the standby state of the system unit.
STP	Shielded twisted-pair.
SunVTS	A diagnostic application designed to test hardware.
TPE	Twisted-pair Ethernet.
TOD	Time of day. A timekeeping intergrated circuit.
TTL	Transistor-transistor logic.
UPA	UltraSPARC port architecture. Provides processor-to-memory interconnection.
UTP	Unshielded twisted-pair.
VCCI	Voluntary control council for interference.
VIS	Visual instruction set.
Vrms	Volts root-mean-square.

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