

Netra™ t 1400/1405 Service and System Reference Manual



THE NETWORK IS THE COMPUTER™

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Preface

This manual comprises two parts:

- Part I, *Service*, is written for technicians, advanced computer system end-users with experience in replacing hardware and troubleshooting, system administrators, and authorized service providers (ASPs). Only suitably qualified service personnel may carry out tasks described in this manual that involve the removal of the top cover.
- Part II, *System Reference*, is written for OEM engineers, system designers and application programmers who have to perform advanced tasks concerned with the maintenance and configuration of the system.

How This Book Is Organized

The manual is arranged as follows:

Chapter 1 provides information about the system components and features.

Chapter 2 contains an overview of the Netra t 1400/1405 Sun VTS diagnostic tool.

Chapter 3 describes the power-on self-test (POST) diagnostics.

Chapter 4 describes how to troubleshoot possible problems and suggests corrective actions.

Chapter 5 provides a description of the tools required.

Chapter 6 describes the procedures for powering on and powering off the system, attaching the wrist strap, and removing and replacing the top access cover.

Chapter 7 describes the procedures for removing and replacing the power subassemblies.

Chapter 8 describes the procedures for removing and replacing the storage devices.

Chapter 9 describes the procedures for removing and replacing the motherboard and its components.

Chapter 10 provides information on the back panel connectors.

Chapter 11 provides information on modem specifications. Any modem compatible with CCITT V.24 can be connected to the Netra t 1400/1405.

Chapter 12 provides information about the motherboard jumpers.

Appendix A provides a functional description of the Netra t 1400/1405.

Appendix B lists the authorized replaceable parts for the Netra t 1400/1405 and briefly describes each listed component.

Appendix C provides physical, electrical and environmental specifications for the Netra t 1400/1405.

Typographic Conventions

TABLE P-1 Typographic Conventions

Typeface	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	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. You <i>must</i> be superuser to do this.
	Command-line variable; replace with a real name or value	To delete a file, type <code>rm filename</code> .

Shell Prompts

TABLE P-2 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 Documentation

TABLE P-3 Related Documentation

Application	Title	Part Number
Compliance and Safety	<i>Netra t 1400/1405 Compliance and Safety Manual</i>	806-0574-10
Installation and User	<i>Netra t 1400/1405 Installation and User's Guide</i>	806-0575-10

Note – It is essential that you read the Netra t 1400/1405 Compliance and Safety Manual before proceeding.

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

PART I **Service**

System Description

The Netra t 1400/1405 computer system is a one- to four-processor device that uses the family of UltraSPARC™ II processors. Housed within a rack-mounting enclosure, the Netra t 1400/1405 provides the following:

- High performance processors
- Extensive I/O expansion and a wide range of options
- Modular internal design
- High performance disk, system, memory and I/O subsystems
- High performance peripheral component interconnect (PCI) I/O
- Redundant hot swap power supply units
- Rack mounting options available
- Alarms functionality for remote management

The Netra t 1400 is powered by -48V / -60V DC supplies. The Netra t 1405 is powered by standard AC supplies. This is the only difference between the systems.

FIGURE 1-1 and FIGURE 1-2 on page 1-3 illustrate the front and rear, respectively, of the Netra t 1400; FIGURE 1-3 and FIGURE 1-4 on page 1-4 illustrate the front and rear, respectively, of the Netra t 1405. The following sections provide a brief description of the Netra t 1400/1405 I/O devices and a detailed overview of the system unit features.

1.1 System Unit Features

System unit components are housed in a rack-mounting enclosure. Overall enclosure dimensions (width x depth x height) are 431.8mm x 477.3mm x 264mm (17.00in. x 18.79in. x 10.39in. (6U)). System unit electronics are contained on a single printed circuit board (motherboard). The motherboard contains the CPU module(s), memory, system control application-specific integrated circuits (ASICs) and I/O ASICs.

The system unit has the following features:

- Rack mounting enclosure with n + 1 redundant hot swap -48VDC / -60VDC (Netra t 1400) or AC (Netra t 1405) power supplies
- Support for up to four modular 440MHz UltraSPARC II processors with 4Mbyte cache
- UltraSPARC Port Architecture (UPA) coherent memory interconnect
- Use of DIMMs, with an interleaved memory system. Each pair of DIMM slots (four rows of two pairs each) accepts 64 or 256Mbyte DIMM modules. Populating with two pairs of identical capacity DIMMs enables the memory controller to interleave and overlap, providing optimal system performance. There are a total of 16 DIMM slots supplying a minimum of 256Mbyte (4 x 64Mbyte) and a maximum of 4Gbyte (16 x 256Mbyte) of memory.
- Four PCI slots:
 - two 33MHz, 64- or 32-bit, 5VDC slots
 - one 33MHz 32-bit only 5VDC slot
 - one 66MHz or 33MHz, 64- or 32-bit, 3.3VDC slot

Universal PCI cards can be used in any of the four PCI slots.

- 10/100 Megabit per second (Mbps) Ethernet
- 40Mbps Fast-20 (UltraSCSI) disk subsystem supporting up to four 18Gbyte disk drives
- Two RS232/423 DB-25 serial ports (asynchronous protocols)
- Parallel port
- External Fast-20 (UltraSCSI) 68-pin port
- Up to two SCSI removable media drives (CD-ROM or DAT or both)
- Alarms card implementing Lights Out Management

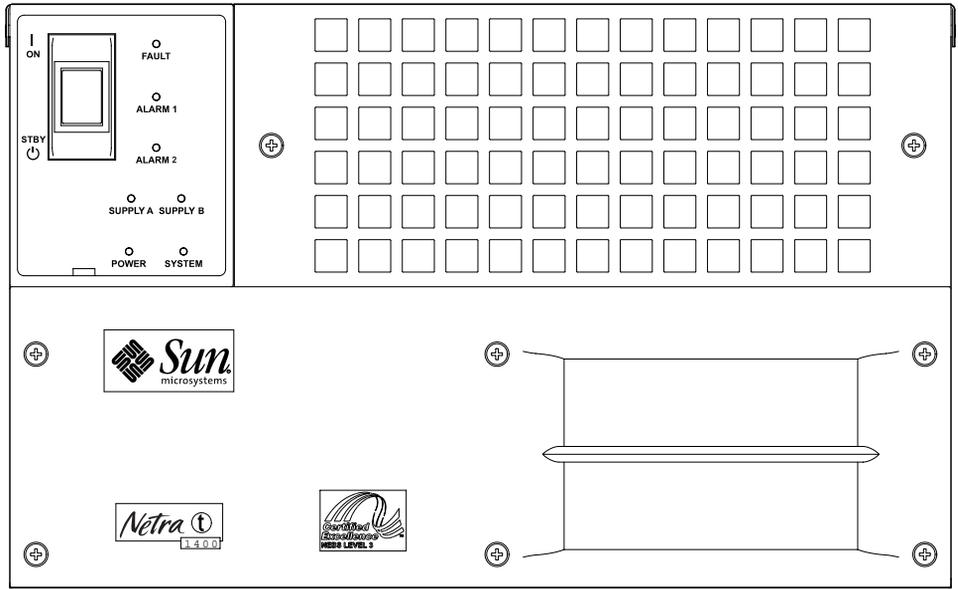


FIGURE 1-1 Netra t 1400 System Unit Front View

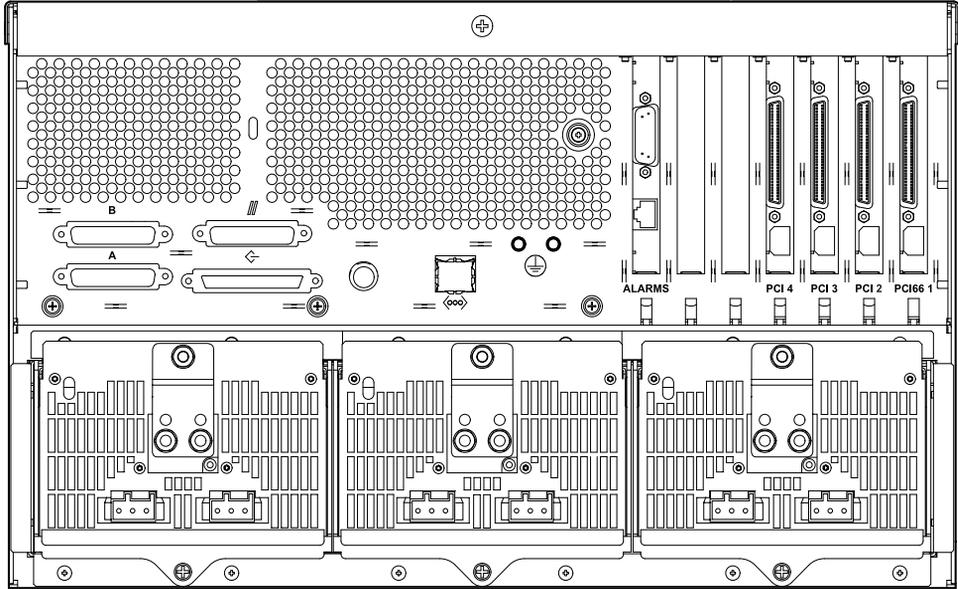


FIGURE 1-2 Netra t 1400 System Unit Rear View

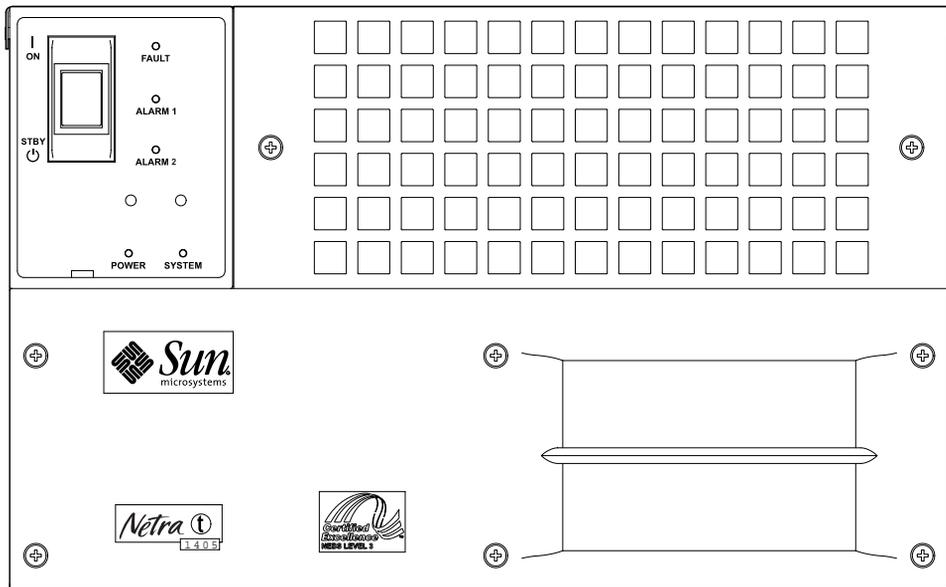


FIGURE 1-3 Netra t 1405 System Unit Front View

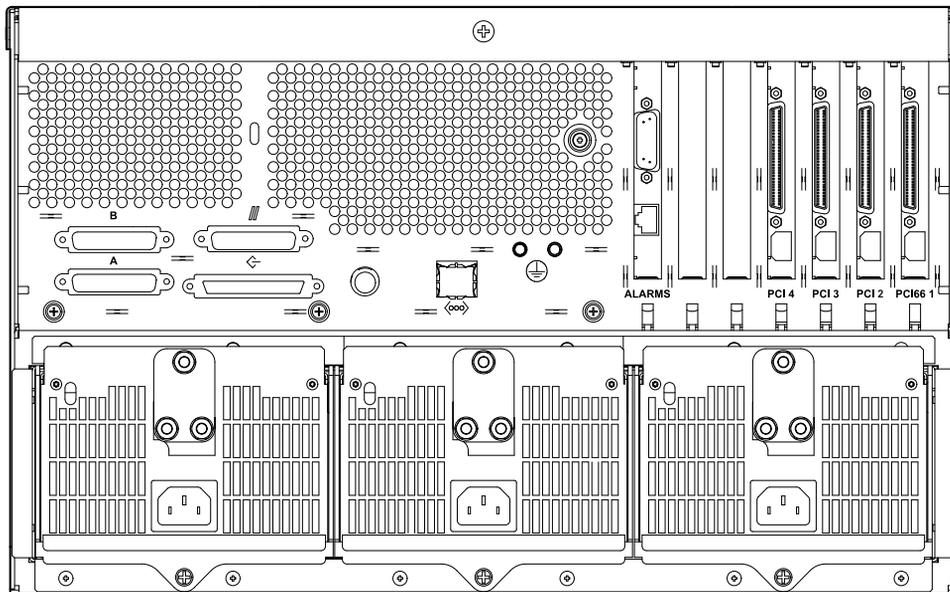


FIGURE 1-4 Netra t 1405 System Unit Rear View

1.2 System Unit Components

The system units components are listed by part number in Appendix B “Illustrated Parts List.

Note – The part numbers listed in Appendix B were correct when this manual was published but they are subject to change without notice. Numerical references illustrated in FIGURE B-1 on page B-2 correlate to the references listed in TABLE B-1 and TABLE B-2. Refer to your authorized Sun sales representative or service provider to confirm a part number prior to ordering a replacement part.

1.3 LEDs

The LEDs on the front of the Netra t 1400/1405 indicate the current status of the system.

Note – The System, Alarm and Fault LEDs can also be forced on or off by a LOM command (see the *Netra t 1400/1405 Installation and User Guide*).

1.3.1 Netra t 1400

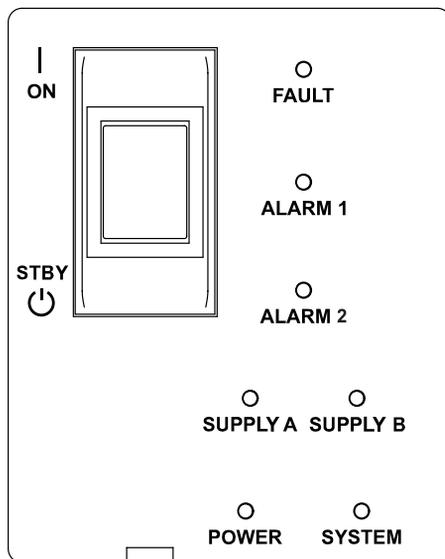


FIGURE 1-5 Netra t 1400 System LEDs

TABLE 1-1 Netra t 1400 System LED Functions

POWER	Green	Illuminated at all times when the system is on
SUPPLY A	Green	Illuminated whenever DC input A is present on all fitted PSUs
SUPPLY B	Green	Illuminated whenever DC input B is present on all fitted PSUs
SYSTEM	Green	Off (or reset) during power up procedures Illuminated whenever UNIX is running and the alarms driver is installed This LED is reset by a hardware watchdog timeout, or whenever the user-defined Alarm 3 is asserted.
ALARM 1	Amber	Illuminated whenever the user-defined Alarm 1 is asserted
ALARM 2	Amber	Illuminated whenever the user-defined Alarm 2 is asserted
FAULT	Amber	Flashes when a fan or PSU has failed Illuminated continuously when the ASR watchdog has timed out or when it is manually switched on

1.3.2 Netra t 1405

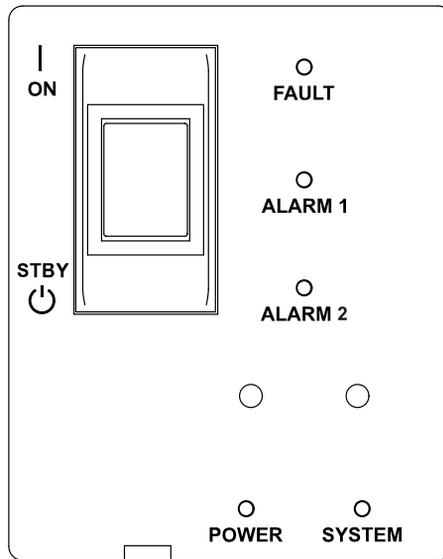


FIGURE 1-6 Netra t 1405 System LEDs

TABLE 1-2 Netra t 1405 System LED Functions

POWER	Green	Illuminated at all times when the system is on
SYSTEM	Green	Off (or reset) during power up procedures Illuminated whenever UNIX is running and the alarms driver is installed This LED is reset by a hardware watchdog timeout, or whenever the user-defined Alarm 3 is asserted.
ALARM 1	Amber	Illuminated whenever the user-defined Alarm 1 is asserted
ALARM 2	Amber	Illuminated whenever the user-defined Alarm 2 is asserted
FAULT	Amber	Flashes when a fan or PSU has failed Illuminated continuously when the ASR watchdog has timed out or when it is manually switched on

SunVTS

This chapter contains an overview of the Netra t 1400/1405 SunVTS™ diagnostic tool.

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.

2.2 SunVTS Operation

lists the documentation for the SunVTS software. These documents are available on the *Solaris on Sun Hardware AnswerBook*, which is on the *SMCC Updates CD-ROM* for the Solaris release.

SunVTS Documentation

Title	Description
SunVTS User's Guide	Describes the SunVTS environment; starting and controlling various user interfaces; feature descriptions
SunVTS Test Reference Manual	Describes each SunVTS test; provides various test options and command line arguments
SunVTS Quick Reference Card	Provides overview of vtsui interface features

2.3 LOMlite VTS

The procedure for installing the LOMlite software is given in chapter 5 of the *Netra t 1400/1405 Installation and User's Guide*. Note that the SunVTS software must be loaded before the LOMlite software can be installed.

For a description of the LOMlite functionality, see chapter 10 of the *Netra t 1400/1405 Installation and User's Guide*.

Power-On Self Test

This chapter contains procedures to initiate the Netra t 1400/1405 system unit power-on self-test (POST) diagnostics. Procedures are also included to support pre-POST preparation, POST data interpretation and the bypassing of POST diagnostics.

3.1 POST Overview

POST can be used to determine if part 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 `diag-level` flags, determines if POST is executed. TABLE 3-1 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

<code>diag-level</code> Setting	POST Initialization	Serial Port A IO	Serial Port A Error Output	<code>diag-switch?</code> 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 a workstation or terminal to view POST progress and error messages. See Section 3.2.1 “To Set Up a `tip` Connection” below.
- Verifying baud rates between a Netra t 1400/1405 and a terminal. See Section 3.2.2 “To Verify the Baud Rate” on page 3-3”.

3.2.1 To Set Up a `tip` Connection

A `tip` connection enables a remote shell window to be used as a terminal to display test data from a system being tested. Serial ports A or B are used to establish the `tip` connection between the system unit being tested and a Sun workstation monitor or TTY-type terminal. The `tip` connection is used in a SunOS window and provides features to help with the OBP.

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

```
hardware:\
      :dv=/dev/term/b:br#9600:e1=^C^S^Q^U^D:ie=%$:oe=^D:
```

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

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

```
hardware:\
      :dv=/dev/term/b:br#9600:e1=^C^S^Q^U^D:ie=%$:oe=^D:
```

- b. **Then modify as follows:**

```
hardware:\
      :dv=/dev/term/a:br#9600:e1=^C^S^Q^U^D:ie=%$:oe=^D:
```

4. In a Shell Tool window on the Sun workstation, type `tip hardware`.
Verify the response:

```
hostname% 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 by typing `~.` (tilde+period).

3.2.2 To Verify the Baud Rate

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

1. Open a Shell Tool.
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 To Initialize POST

POST is initialized by setting `diag-switch?` to `true` and `diag-level` to `max` or `min`, followed by power cycling the system unit.

1. At the system prompt, type:

```
setenv diag-switch? true
```

2. When the POST is complete, set `diag-switch?` to `false` (default setting).

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 on the setting of `diag-level`, an 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`” on page 3-5”. 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 3-10”.

To set `diag-level` 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. CODE EXAMPLE 3-1 identifies a typical serial port A POST output with `diag-level` set to `max`.

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

```
Hardware Power ON
Master CPU : 0000.0000.0055.11a0
Slave CPU  : 0000.0001.0055.11a0
Slave CPU  : 0000.0002.0055.11a0
Slave CPU  : 0000.0003.0055.11a0
Master E$  : 0000.0000.0040.0000
Slave E$   : 0000.0000.0040.0000
Slave E$   : 0000.0000.0040.0000
Slave E$   : 0000.0000.0040.0000

Button Power ON
Master CPU : 0000.0000.0055.11a0
Slave CPU  : 0000.0001.0055.11a0
Slave CPU  : 0000.0002.0055.11a0
Slave CPU  : 0000.0003.0055.11a0
Master E$  : 0000.0000.0040.0000
Slave E$   : 0000.0000.0040.0000
Slave E$   : 0000.0000.0040.0000
Slave E$   : 0000.0000.0040.0000

Probing keyboard Done
Executing Power On SelfTest
0>
0>@(#) Sun Ultra 80(UltraSPARC-II 4-way) UPA/PCI POST 1.2.6 04/23/
1999 07:10 PM
0>INFO: Processor 0 is master. CPU 440 MHz. 5760KB Ecache.
0>
0> <00> Init System BSS
0> <00> NVRAM Battery Detect Test
0> <00> NVRAM Scratch Addr Test
0> <00> DMMU TLB Tag Access Test
0> <00> DMMU TLB RAM Access Test
0> <00> IMMU TLB Tag Access Test
0> <00> IMMU TLB RAM Access Test
0> <00> Probe Ecache
0> <00> Ecache RAM Addr Test
0> <00> Ecache Tag Addr Test
0> <00> Ecache Tag Test
0> <00> Invalidate Ecache Tags
0>INFO: Processor 1 - UltraSPARC-II.
```

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

```
Hardware Power ON
0>INFO: Processor 2 - UltraSPARC-II.
0>INFO: Processor 3 - UltraSPARC-II.
0> <00> Init SC Regs
0> <00> SC Address Reg Test
0> <00> SC Reg Index Test
0> <00> SC Regs Test
0> <00> SC Dtag RAM Addr Test
0> <00> SC Cache Size Init
0> <00> SC Dtag RAM Data Test
0> <00> SC Dtag Init
0> <00> Probe Memory
0>INFO: 1024MB Bank 0
0>INFO:   OMB Bank 1
0>INFO:   OMB Bank 2
0>INFO:   OMB Bank 3
0> <00> Malloc Post Memory
0> <00> Init Post Memory
0> <00> Post Memory Addr Test
0> <00> Map PROM/STACK/NVRAM in DMMU
0> <00> Memory Stack Test
3> <00> DMMU TLB Tag Access Test
1> <00> DMMU TLB Tag Access Test
2> <00> DMMU TLB Tag Access Test
3> <00> DMMU TLB RAM Access Test
2> <00> DMMU TLB RAM Access Test
1> <00> DMMU TLB RAM Access Test
3> <00> IMMU TLB Tag Access Test
2> <00> IMMU TLB Tag Access Test
1> <00> IMMU TLB Tag Access Test
3> <00> IMMU TLB RAM Access Test
2> <00> IMMU TLB RAM Access Test
1> <00> IMMU TLB RAM Access Test
3> <00> Probe Ecache
2> <00> Probe Ecache
3> <00> Ecache RAM Addr Test
2> <00> Ecache RAM Addr Test
1> <00> Probe Ecache
3> <00> Ecache Tag Addr Test
2> <00> Ecache Tag Addr Test
1> <00> Ecache RAM Addr Test
3> <00> Ecache Tag Test
2> <00> Ecache Tag Test
1> <00> Ecache Tag Addr Test
1> <00> Ecache Tag Test
3> <00> Invalidate Ecache Tags
2> <00> Invalidate Ecache Tags
```

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

```
Hardware Power ON
1> <00> Invalidate Ecache Tags
3> <00> Map PROM/STACK/NVRAM in DMMU
2> <00> Map PROM/STACK/NVRAM in DMMU
3> <00> Update Slave Stack/Frame Ptrs
1> <00> Map PROM/STACK/NVRAM in DMMU
2> <00> Update Slave Stack/Frame Ptrs
0> <00> DMMU Hit/Miss Test
1> <00> Update Slave Stack/Frame Ptrs
0> <00> IMMU Hit/Miss Test
0> <00> DMMU Little Endian Test
0> <00> IU ASI Access Test
0> <00> FPU ASI Access Test
3> <00> DMMU Hit/Miss Test
1> <00> DMMU Hit/Miss Test
2> <00> DMMU Hit/Miss Test
3> <00> IMMU Hit/Miss Test
1> <00> IMMU Hit/Miss Test
2> <00> IMMU Hit/Miss Test
3> <00> DMMU Little Endian Test
1> <00> DMMU Little Endian Test
2> <00> DMMU Little Endian Test
3> <00> IU ASI Access Test
1> <00> IU ASI Access Test
2> <00> IU ASI Access Test
3> <00> FPU ASI Access Test
1> <00> FPU ASI Access Test
2> <00> FPU ASI Access Test
3> <00> Dcache RAM Test
2> <00> Dcache RAM Test
1> <00> Dcache RAM Test
3> <00> Dcache Tag Test
2> <00> Dcache Tag Test
1> <00> Dcache Tag Test
3> <00> Icache RAM Test
2> <00> Icache RAM Test
1> <00> Icache RAM Test
3> <00> Icache Tag Test
2> <00> Icache Tag Test
1> <00> Icache Tag Test
3> <00> Icache Next Test
2> <00> Icache Next Test
1> <00> Icache Next Test
3> <00> Icache Predecode Test
2> <00> Icache Predecode Test
1> <00> Icache Predecode Test
0> <1f> Init Psycho
```

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

```
Hardware Power ON
0> <1f> PIO Read Error, Master Abort Test
0> <1f> PIO Read Error, Target Abort Test
0> <1f> PIO Write Error, Master Abort Test
0> <1f> PIO Write Error, Target Abort Test
0> <1f> Timer Increment Test
0> <1f> Init Psycho
0> <1f> Consistent DMA UE ECC Rd Err Lpbk Test
0> <1f> Pass-Thru DMA UE ECC Rd Err Lpbk Test
0> <00> V9 Instruction Test
0> <00> CPU Tick and Tick Compare Reg Test
0> <00> CPU Soft Trap Test
0> <00> CPU Softint Reg and Int Test
3> <00> V9 Instruction Test
1> <00> V9 Instruction Test
2> <00> V9 Instruction Test
3> <00> CPU Tick and Tick Compare Reg Test
1> <00> CPU Tick and Tick Compare Reg Test
2> <00> CPU Tick and Tick Compare Reg Test
0> <00> UltraSPARC-2 Prefetch Instructions Test
0> <00> Test 0: prefetch_mr
0> <00> Test 1: prefetch to non-cacheable page
0> <00> Test 2: prefetch to page with dmmu miss
0> <00> Test 3: prefetch miss does not check alignment
0> <00> Test 4: prefetcha with asi 0x4c is noped
0> <00> Test 5: prefetcha with asi 0x54 is noped
0> <00> Test 6: prefetcha with asi 0x6e is noped
0> <00> Test 7: prefetcha with asi 0x76 is noped
0> <00> Test 8: prefetch with fcn 5
0> <00> Test 9: prefetch with fcn 2
0> <00> Test 10: prefetch with fcn 12
0> <00> Test 11: prefetch with fcn 16 is noped
0> <00> Test 12: prefetch with fcn 29 is noped
0> <00> Test 13: prefetcha with asi 0x15 is noped
0> <00> Test 14: prefetch with fcn 3
0> <00> Test 15: prefetcha14 with fcn 2
0> <00> Test 16: prefetcha80_mr
0> <00> Test 17: prefetcha81_lr
0> <00> Test 18: prefetcha10_mw
0> <00> Test 19: prefetcha80_17 is noped
0> <00> Test 20: prefetcha10_6: illegal instruction trap
0> <00> Test 21: prefetcha11_lw
0> <00> Test 22: prefetcha81_31
0> <00> Test 23: prefetcha11_15: illegal instruction trap
0>STATUS =PASSED
```

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

```
Hardware Power ON
Power On Selftest Completed
ú Status = 0000.0000.0000.0000 ffff.ffff.f00b.3ea0
ff9f.ffff.0bd1.1111
Software Power ON
Master CPU : 0000.0000.0055.11a0
Slave CPU : 0000.0001.0055.11a0
Slave CPU : 0000.0002.0055.11a0
Slave CPU : 0000.0003.0055.11a0
Master E$ : 0000.0000.0040.0000
Slave E$ : 0000.0000.0040.0000
Slave E$ : 0000.0000.0040.0000
Slave E$ : 0000.0000.0040.0000

@(#) Sun Ultra 80 UPA/PCI 3.21 Version 2 created 1999/05/06 15:39
Clearing DTAGS Done
Probing Memory
CONFIG = 0000.0000.0000.0010
MEM BASE = 0000.0000.0000.0000
MEM SIZE = 0000.0000.4000.0000
MMUs ON
Copy Done
PC = 0000.01ff.f000.2a60
PC = 0000.0000.0000.2aa4
Decompressing into Memory Done
Size = 0000.0000.0006.ed70
ttya initialized
SC Control: EWP:0 IAP:0 FATAL:0 WAKEUP:0 BXIR:0 BPOR:0 SXIR:0
SPOR:1 POR:0
Probing Memory Bank #0 256 256 256 256 : 1 Gigabytes
Probing Memory Bank #1 0 0 0 0 : 0 Megabytes
Probing Memory Bank #2 0 0 0 0 : 0 Megabytes
Probing Memory Bank #3 0 0 0 0 : 0 Megabytes
Probing Floppy: No drives detected
Probing EBUS SUNW,lom
Probing UPA Slot at 1e,0 Nothing there
Probing UPA Slot at 1d,0 Nothing there
Probing /pci@1f,4000 at Device 1 pci108e,1000 network
Probing /pci@1f,4000 at Device 3 scsi disk tape scsi disk tape
Probing /pci@1f,4000 at Device 2 pci1214,334
Probing /pci@1f,4000 at Device 4 pci1214,334
Probing /pci@1f,4000 at Device 5 pci1214,334
Probing /pci@1f,2000 at Device 1 pci114f,1c
Probing /pci@1f,2000 at Device 2 Nothing there
screen not found.
Can't open input device.
Keyboard not present. Using ttya for input and output.
```

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

```
Hardware Power ON
SC Control: EWP:0 IAP:0 FATAL:0 WAKEUP:0 BXIR:0 BPOR:0 SXIR:0
SPOR:1 POR:0
Probing Memory Bank #0 256 256 256 256 : 1 Gigabytes
Probing Memory Bank #1 0 0 0 0 : 0 Megabytes
Probing Memory Bank #2 0 0 0 0 : 0 Megabytes
Probing Memory Bank #3 0 0 0 0 : 0 Megabytes
Probing Floppy: No drives detected
Probing EBUS SUNW,lom
Probing UPA Slot at 1e,0 Nothing there
Probing UPA Slot at 1d,0 Nothing there
Probing /pci@1f,4000 at Device 1 pci108e,1000 network
Probing /pci@1f,4000 at Device 3 scsi disk tape scsi disk tape
Probing /pci@1f,4000 at Device 2 pci1214,334
Probing /pci@1f,4000 at Device 4 pci1214,334
Probing /pci@1f,4000 at Device 5 pci1214,334
Probing /pci@1f,2000 at Device 1 pci114f,1c
Probing /pci@1f,2000 at Device 2 Nothing there

Sun Ultra 80 UPA/PCI (4 X UltraSPARC-II 440MHz), No Keyboard
OpenBoot 3.21, 1024 MB memory installed, Serial #10658904.
Ethernet address 8:0:20:a2:a4:58, Host ID: 80a2a458.
```

3.4.2 diag-level Variable Set to min

When `diag-level` is set to `min`, POST enables an abbreviated set of diagnostic-level tests. CODE EXAMPLE 3-2 identifies a serial port A POST output with `diag-level` set to `min`.

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

```
screen not found.
Can't open input device.
Keyboard not present. Using ttya for input and output.

Sun Ultra 80 UPA/PCI (4 X UltraSPARC-II 440MHz), No Keyboard
OpenBoot 3.21, 1024 MB memory installed, Serial #10658904.
Ethernet address 8:0:20:a2:a4:58, Host ID: 80a2a458.
```

3.5 POST Progress and Error Reporting

While POST is initialized, POST progress indications are 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 execution, POST attempts to send a failure message to the POST monitoring system. CODE EXAMPLE 3-3 identifies the typical appearance of a failure message.

CODE EXAMPLE 3-3 Typical POST Failure Message

```
Hardware Power ON
Master CPU : 0000.0000.0055.11a0
Slave CPU  : 0000.0001.0055.11a0
Slave CPU  : 0000.0002.0055.11a0
Slave CPU  : 0000.0003.0055.11a0
Master E$  : 0000.0000.0040.0000
Slave E$   : 0000.0000.0040.0000
Slave E$   : 0000.0000.0040.0000
Slave E$   : 0000.0000.0040.0000

Button Power ON
Master CPU : 0000.0000.0055.11a0
Slave CPU  : 0000.0001.0055.11a0
Slave CPU  : 0000.0002.0055.11a0
Slave CPU  : 0000.0003.0055.11a0
Master E$  : 0000.0000.0040.0000
Slave E$   : 0000.0000.0040.0000
Slave E$   : 0000.0000.0040.0000
Slave E$   : 0000.0000.0040.0000

Probing keyboard Done
Executing Power On SelfTest
0>
0>@(#) Sun Ultra 80(UltraSPARC-II 4-way) UPA/PCI POST 1.2.6 04/23/
1999 07:10 PM
0>INFO: Processor 0 is master. CPU 440 MHz. 4304KB Ecache.
0>
0> <00> Init System BSS
0> <00> NVRAM Battery Detect Test
0> <00> NVRAM Scratch Addr Test
0> <00> DMMU TLB Tag Access Test
0> <00> DMMU TLB RAM Access Test
0> <00> IMMU TLB Tag Access Test
0> <00> IMMU TLB RAM Access Test
```

CODE EXAMPLE 3-3 Typical POST Failure Message (Continued)

```
Hardware Power ON
0> <00> Probe Ecache
0> <00> Ecache RAM Addr Test
0> <00> Ecache Tag Addr Test
0> <00> Ecache Tag Test
0> <00> Invalidate Ecache Tags
0>INFO: Processor 1 - UltraSPARC-II.
0>INFO: Processor 2 - UltraSPARC-II.
0>INFO: Processor 3 - UltraSPARC-II.
0> <00> Init SC Regs
0> <00> SC Address Reg Test
0> <00> SC Reg Index Test
0> <00> SC Regs Test
0> <00> SC Dtag RAM Addr Test
0> <00> SC Cache Size Init
0> <00> SC Dtag RAM Data Test
0> <00> SC Dtag Init
0> <00> Probe Memory
0>WARNING:      SIMM missing in Bank 0, Addr = 00000000.00000000
0>INFO:      OMB Bank 0
0>INFO:      OMB Bank 1
0>INFO:      OMB Bank 2
0>INFO:      OMB Bank 3
0>STATUS =FAILED
0>TEST      =SC Dtag Init
TTF      =0
PASSES =1
ERRORS =1
SUSPECT=System Failure
0>MESSAGE=No Memory Detected
0> <00> Malloc Post Memory
0>STATUS =FAILED
0>TEST      =Malloc Post Memory
TTF      =0
PASSES =1
ERRORS =1
SUSPECT=SIMM U1301
0>MESSAGE=Can't Malloc Memory for Post <00>      Memory Stack Test
0>STATUS =FAILED
0>TEST      =Malloc Post Memory
TTF      =0
PASSES =1
ERRORS =1
SUSPECT=SIMM U1301
0>MESSAGE=Memory compare error
          addr 00000000.007f8098
          exp 00000000.007f8098
```

CODE EXAMPLE 3-3 Typical POST Failure Message (*Continued*)

```
Hardware Power ON
      obs 00100010.00000000
0>ERROR: Stack memory test failed, psycho and memory testing will
produce
unreliable results.
```

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

3.6 Motherboard Test

To initialize the motherboard POST:

1. **If Solaris is running, perform either a. or b. below:**
 - a. **From a terminal connected to `ttyA`, issue a `break` command to enter OBP, or**
 - b. **From a `tip` hardwire connection, send a `break` command.**
2. **At the OK prompt, type:**

```
setenv diag-level max
setenv diag-switch? true
reset-all
```

The system will now reset and commence POST.

Troubleshooting

This chapter describes how to troubleshoot possible problems with the Netra t 1400/1405 system unit and includes suggested corrective actions. To follow these troubleshooting procedures, a terminal should be connected to the Netra t 1400/1405 system serial port A.

Several processes, notably those involving Power and Fans modules, can be diagnosed using the LightsOut Management (LOM) facility. For details refer to the *Netra t 1400/1405 Installation and User's Guide* (part number 806-0575-10).

4.1 Power-On Failure

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

Symptom

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

Action

Check that:

- The input power connectors are correctly fitted
- External circuit breakers are correctly set
- A minimum of two functioning PSUs are present

Press the power switch at the front of the system unit. If the system powers on, no further action is required. If the system does not power on, one of the CPU modules may not be properly seated. Remove the top cover and inspect each CPU module for proper seating. If the system powers on, no further action is required.

If the input AC or DC power has been verified, each CPU module is properly seated, and the power-on key has been pressed but the system does not power up, the system power supply may be defective. See Section 4.3 “Power Subsystem Failure” on page 4-4”.

4.2 Disk Drive or Removable Media Drive Failure

This section provides disk drive and removable media drive failure symptoms and suggested actions.

Symptom

- A disk drive read, write or parity error is reported by the operating system or customer application.
- A removable media drive read error or parity error is reported by the operating system or customer application.

Action

- Check the data cables between the SCSI Disk, DAT Tape or CD-ROM drive and the adapter card.
- If the fault persists, replace the drive indicated by the failure message. The operating system identifies the internal drives as identified in TABLE 4-1.

TABLE 4-1 Internal Drive Identification

Operating System Address	Drive Physical Location and Target
c0t0d0s#	Left-most location SCSI Disk, target 0
c0t1d0s#	SCSI Disk, target 1 (optional)
c0t2d0s#	SCSI Disk, target 2 (optional)
c0t3d0s#	Right-most SCSI Disk, target 3 (optional)
c0t4d0s#	DAT Tape drive, target 4 (optional)
c0t6d0s#	CD-ROM drive, target 6 (optional)

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

Symptom

Disk drive or removable media drive fails to respond to commands.

Note – If POST is to be bypassed, type `setenv diag-switch? false` at the `ok` prompt.

Action

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

■ At the system `ok` prompt:

a. Type `reset-all`

b. Type `probe-scsi`

If the drives respond and a message is displayed, the system SCSI controller has successfully probed the devices. This indicates that the system board is operating correctly. If one drive does not respond to the SCSI controller probe but the others do, replace the unresponsive drive (see Section 8.1 “Hard Disk Drive” on page 8-1”).

If one internal disk drive is configured with the system and the `probe-scsi` test fails to show the device in the message, replace the drive (see Section 8.1 “Hard Disk Drive” on page 8-1”).

If the problem is still evident after replacing the drive, replace the SCSI adapter card assembly (see Section 8.3 “SCSI Adapter Card” on page 8-7”).

If replacing both the disk drive and the SCSI adapter card does not correct the problem, replace the motherboard (see Chapter 9 “Motherboard and Component Replacement”).

4.3 Power Subsystem Failure

This section provides PSU failure symptoms and suggested actions.

If a PSU failure is suspected:

- Check the status of the Fault LED and the LOM event log (see the *Netra t 1400/1405 Installation and User's Guide*, part number 806-0857-10).
- Check the status of LED on the rear of the PSU. Green indicates that the PSU is working correctly; amber indicates that the input supply is connected but the PSU is faulty.

If the PSU is functioning correctly, the fault may be in the cabling. Check the connections and cabling between the PDB and motherboard, fans distribution board and SCSI adapter card.

Failure to power on may also be due to a short circuit.

Tool Requirements

This chapter lists the tools required to service the Netra t 1400/1405 system:

- No.1 and No.2 Phillips-head screwdriver
- Antistatic wrist strap
- Digital voltage meter (DVM)
- Antistatic mat
- Riser card torque tool (part number 340-6091)

Place ESD-sensitive components such as system board, circuit cards, disk drives and NVRAM/TOD on an antistatic mat.

Accessing the System

This chapter describes how to power on and power off the Netra t 1400/1405 and access the system.

6.1 System ON/STBY Switch

The system switch of the Netra t 1400/1405 is a rocker, momentary switch which functions as a standby device only, controlling logic circuits which enable power module output.

▼ To Power On the System

1400

1. **Prior to powering on, inspect the supply conductors for correct polarity and mechanical security, and ensure that they are wired correctly (see the *Netra t 1400/1405 Installation and User's Guide*).**

1405

2. **Activate the external circuit breaker(s), or plug it into the mains supply.**
3. **Set the front panel ON/STBY system switch to the ON | position and hold it until the system starts to power up, or use the LOMlite `poweron` command.**

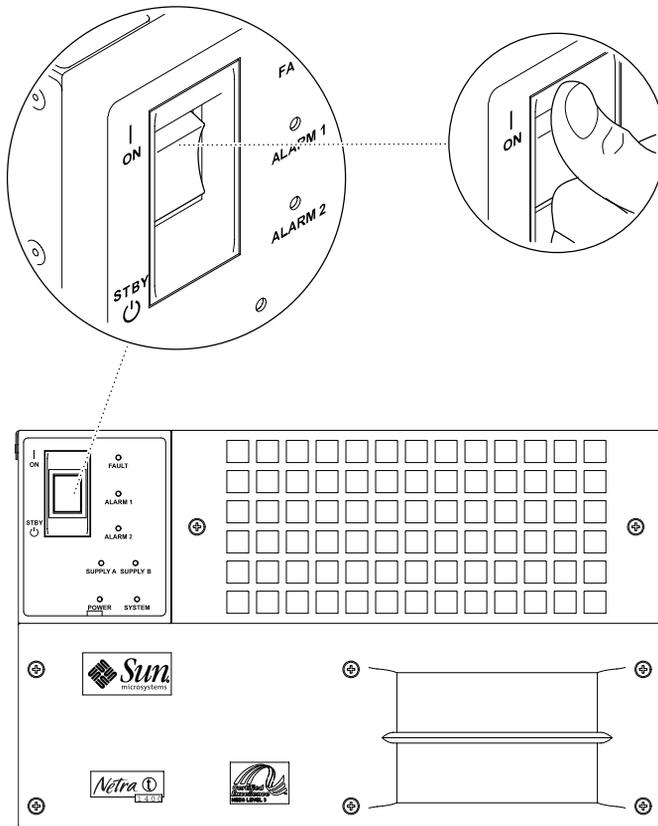


FIGURE 6-1 System Power-On (Front Panel)

▼ To Power Off the System



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

1. Where necessary, notify the users that the system is going down.
2. Back up system files and data.
3. Continue with step a. or b., as appropriate.
 - a. Set the ON/STBY switch at the front of the system to the STBY  position and release it immediately to initiate a clean shut down followed by a power off.

b. Halt the operating system.

Set the ON/STBY switch at the front of the system to the STBY  position and hold it until the system shuts down (this can take several seconds) or use the LOMlite `poweroff` command.

4. Verify that the Power LED is off.

5. Disconnect the AC or DC power connector(s) from the rear of the system, or open the external circuit breaker(s).



1400

Caution –

Regardless of the position of the ON/STBY switch, when a DC power cord remains connected to the system, DC voltage is always present within the power supply.

1405

Regardless of the position of the ON/STBY switch, when an AC power cord remains connected to the system, hazardous voltage is always present within the power supply.

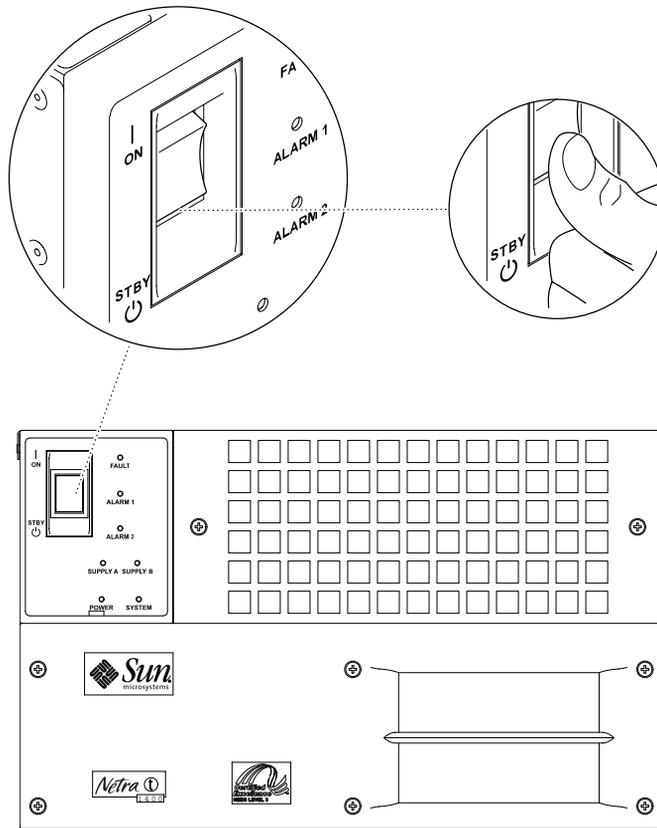


FIGURE 6-2 System Power-off (Front Panel)

6.2 Antistatic Wrist Strap



Caution – Wear an antistatic wrist strap and use an ESD-protected mat when handling components. When servicing or removing system unit components, use a antistatic wrist strap with a 10mm press stud connection and attach the antistatic wrist strap to the press stud at the front or rear of the chassis. This should be performed before the top access cover is removed.

▼ To Attach the Antistatic Wrist Strap

1. To attach the antistatic wrist strap to the front of the chassis, remove the front panels by turning the captive quarter-turn Phillips screws anticlockwise through 90° and connect the strap as shown in FIGURE 6-3.

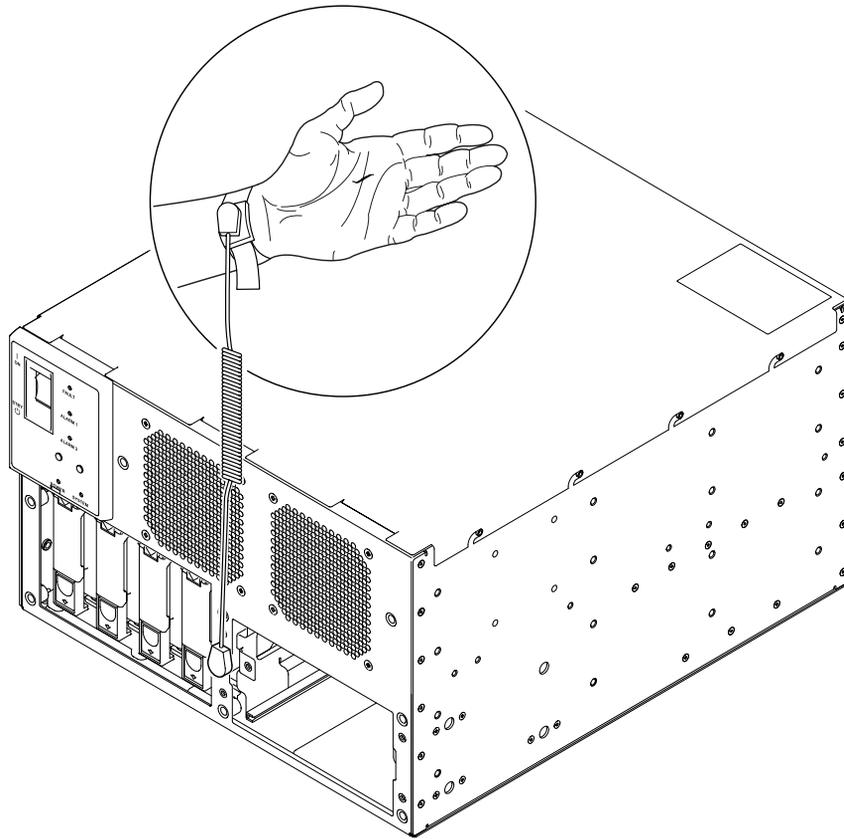


FIGURE 6-3 Attaching the Antistatic Wrist Strap to the Front of the Chassis

2. To attach the antistatic wrist strap to the rear of the chassis, connect the strap as shown in FIGURE 6-4 on page 6-6.

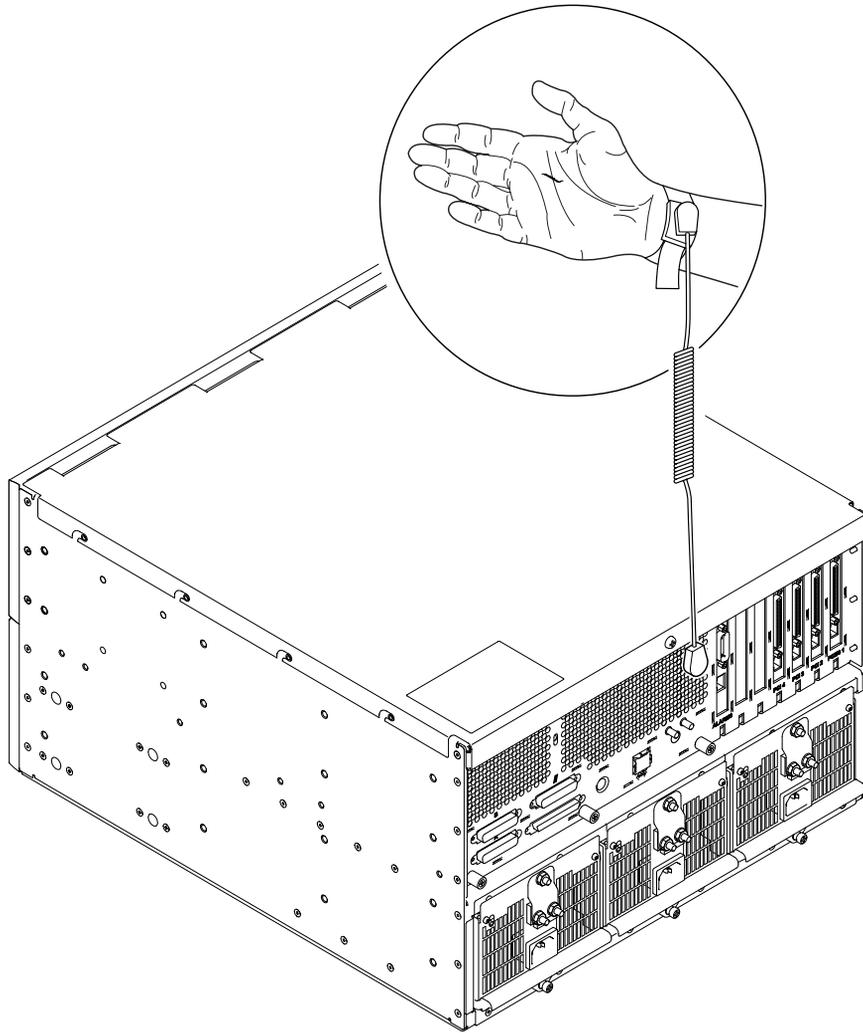


FIGURE 6-4 Attaching the Antistatic Wrist Strap to the Rear of the Chassis

6.3 Top Access Cover

▼ To Remove the Top Access Cover



Caution – Wear an antistatic wrist strap and use an ESD-protected mat when handling components. When servicing or removing system unit components, an ESD Strap should be attached to the wrist, then to one of the connection points provided on the system, and then the power connectors should be removed from the system unit. Following this caution equalizes all electrical potentials with the system unit.

1. Power off the system.

See "To Power Off the System" on page 6-2.

2. Disconnect all power cords.

3. Attach the antistatic wrist strap to the rear of the system.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

4. Release the single captive screw from the rear of the top access cover pulling the cover towards you, and lift off the cover.

▼ To Replace the Top Access Cover



Caution – Wear an antistatic wrist strap and use an ESD-protected mat when handling components. When servicing or removing system unit components, an ESD Strap should be attached to the wrist, then to one of the connection points provided on the system, and then the power connectors should be removed from the system unit. Following this caution equalizes all electrical potentials with the system unit.

1. Attach the antistatic wrist strap to the rear of the system.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

2. Position the top access cover.

See FIGURE 6-5.

3. Push the cover forwards and tighten the captive retaining screw.

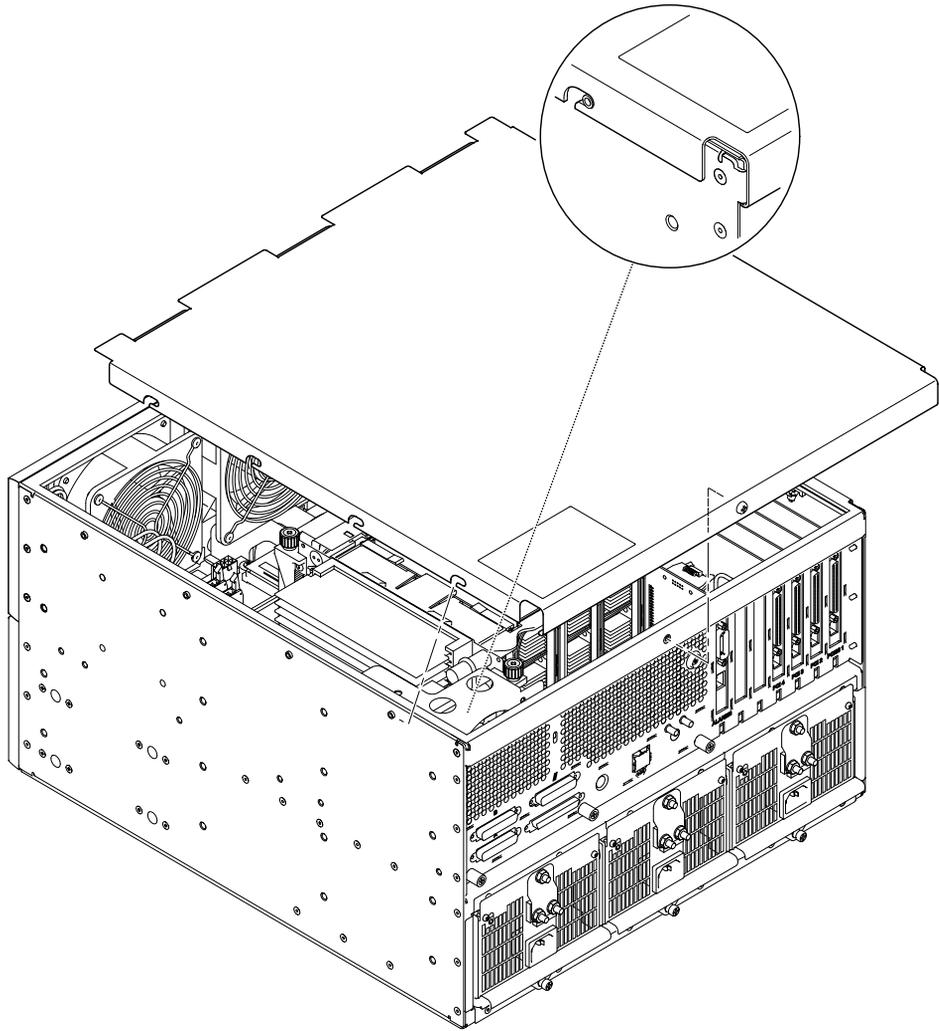


FIGURE 6-5 Top Access Cover

Power Subassemblies

This chapter contains procedures to remove and replace the power subassemblies of the Netra t 1400/1405 system unit enclosure.

7.1 Power Supply Unit

Note – The Power Supply Unit (PSU) contains no user-serviceable parts and should be replaced if it fails.

▼ To Remove a Power Supply Unit



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. Attach the antistatic wrist strap to the rear of the system.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
- 2. Isolate the power supply by opening the circuit breakers to the faulty PSU.**
- 3. Disconnect the AC or DC power connections.**

4. Release the knurled, Phillips screw securing the PSU locking/release lever (see FIGURE 7-1).

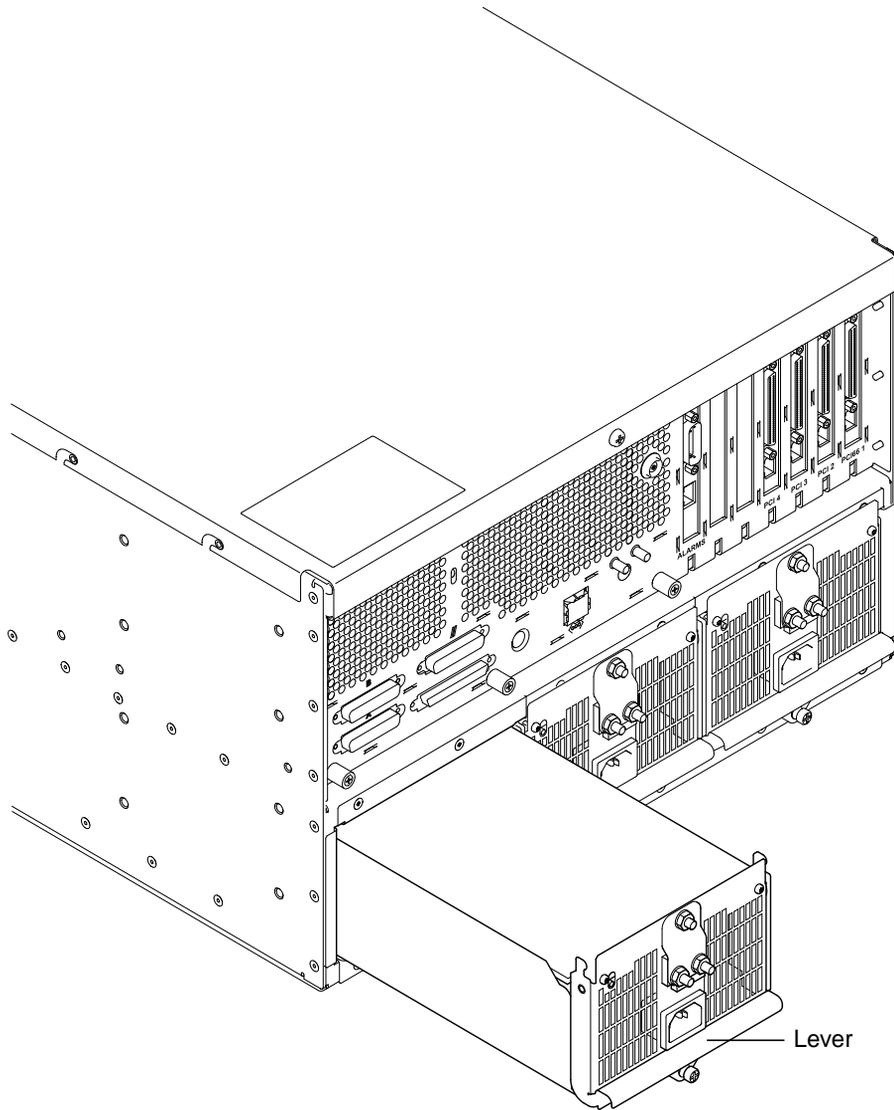


FIGURE 7-1 Power Supply

5. Lift the PSU locking/release lever and pull the unit forward to remove it from the chassis.

▼ To Fit a Power Supply Unit



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. Attach the antistatic wrist strap to the rear of the system.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
- 2. Position the PSU in the vacant position at the rear of the chassis.**
- 3. Lift the locking/release lever to the horizontal position and slide the PSU into the system until the unit just engages with the power backplane.**
- 4. Press the locking/release lever home and secure it with the captive, Phillips screw.**
- 5. Connect the power cables to the PSU.**
- 6. Close the circuit breakers to the PSU.**
- 7. Detach the antistatic wrist strap.**
- 8. Power on the system.**
See "To Power On the System" on page 6-1.

7.2 Power Distribution Board

This section describes how to remove and fit the Power Distribution Board (PDB).

▼ To Remove the Power Distribution 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. Power off the system.**
See "To Power Off the System" on page 6-2.
- 2. Attach the antistatic wrist strap to the rear of the system.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
- 3. Remove all PSUs.**
See "To Remove a Power Supply Unit" on page 7-1.
- 4. Remove the top access cover.**
See "To Remove the Top Access Cover" on page 6-7.
- 5. At the motherboard, disconnect the power supply services cable (J4) and the power supply cable (J5).**
- 6. At the alarms card, disconnect the power supply connector (J6).**
- 7. At the SCSI adapter board, disconnect the power supply cable (J10).**
- 8. At the fan distribution board, disconnect the power supply cable (J11).**
- 9. Remove the ten M3 countersunk screws securing the PSU cage to the rear of the system chassis.**
- 10. Withdraw the cage and PDB assembly and place it on an ESD mat.**
Ensure that the cables are free as you remove the cage.

▼ To Fit the Power Distribution 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. Attach the antistatic wrist strap to the rear of the system.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
- 2. Ensure that the PDB cables are free and partially insert the cage and PDB assembly in the rear of the system chassis.**
Feed the cables up between the PDB and the SCSI backplane and SCSI adapter card.
- 3. Push the cage fully into the system chassis and secure it with ten M3 countersunk screws.**
- 4. At the mother board, connect the power supply services cable (J4) and the power supply cable (J5).**
- 5. At the alarms card, connect the power supply connector (J6).**
- 6. At the SCSI adapter board, connect the power supply cable (J10).**
- 7. At the fan distribution board, connect the power supply cable (J11).**
- 8. Replace the top access cover.**
See "To Replace the Top Access Cover" on page 6-7.
- 9. Fit the PSUs into the cage.**
See "To Fit a Power Supply Unit" on page 7-3.
- 10. Detach the antistatic wrist strap.**
- 11. Power on the system.**
See "To Power On the System" on page 6-1.

7.3 System Switch Assembly

▼ To Remove the System Switch 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. Power off the system.

See "To Power Off the System" on page 6-2.

2. Attach the antistatic wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

3. Remove the top access cover.

See "To Remove the Top Access Cover" on page 6-7.

4. Disconnect the system switch connector from the back of the LED board.

5. Grasp both sides of the switch while pushing the switch towards the front of the system. Once free, the switch can be removed completely.

6. Remove the System switch assembly from the chassis front. See FIGURE 7-2 on page 7-7.

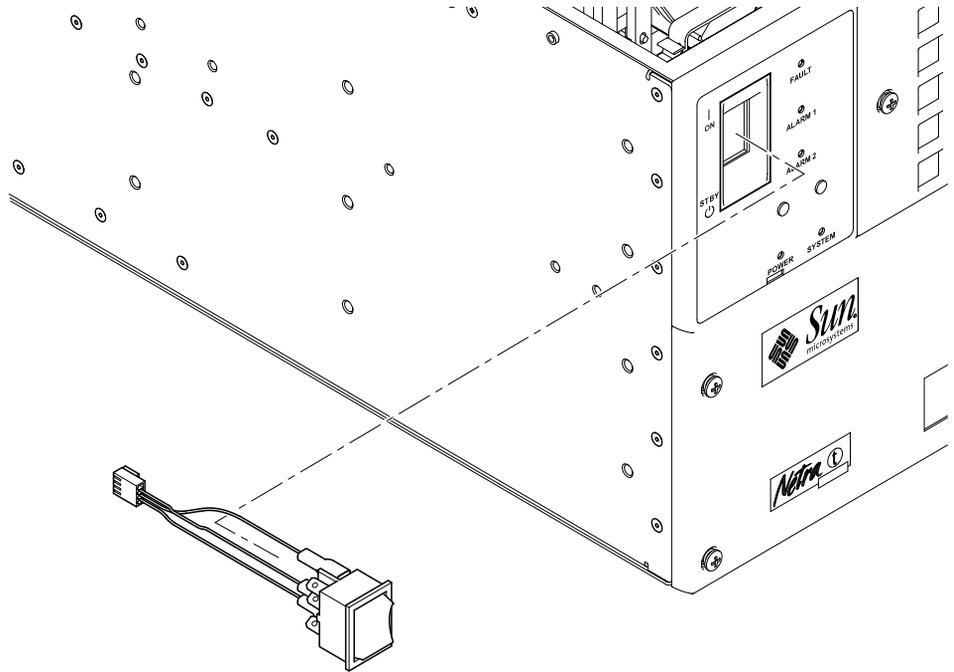


FIGURE 7-2 Removing and Fitting the System Switch Assembly

▼ To Fit the System Switch 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. **Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
2. **Feed the system switch assembly power connector through the chassis front.**
3. **Position the system switch assembly into the chassis housing and snap it into place. The switch should be rotated so that the cables are connected to the left-hand terminals when viewed from the rear. See also the note below.**
4. **Connect the system switch connector to the LED card.**

5. Replace the top access cover.

See "To Replace the Top Access Cover" on page 6-7.

6. Detach the antistatic wrist strap.

Note – The switch and cables are supplied as a unit with the cables attached. If, for any reason, the cables become detached, rotate the switch so that the two pairs of terminals are uppermost. Viewing the switch from the rear, connect the three cables to the left-hand set of terminals as follows: Top - Red, Middle - Grey, Bottom - Black.

7.4 LED Card

The LEDs are mounted on a card attached to the front of the chassis. Handle the card carefully to avoid damaging the LED light pipes.

▼ To Remove the LED 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.

1. Power off the system.

See "To Power Off the System" on page 6-2.

2. Attach the antistatic wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

3. Remove the top access cover.

See "To Remove the Top Access Cover" on page 6-7.

4. Disconnect the 10-way alarms cable from the LED card.

5. Disconnect the 4-way power switch cable from the LED card.

6. Disconnect the 6-way cable motherboard cable from the LED card.

7. Pull the LED card from the standoffs. See FIGURE 7-3 on page 7-9.
8. Place the LED card on an ESD mat.

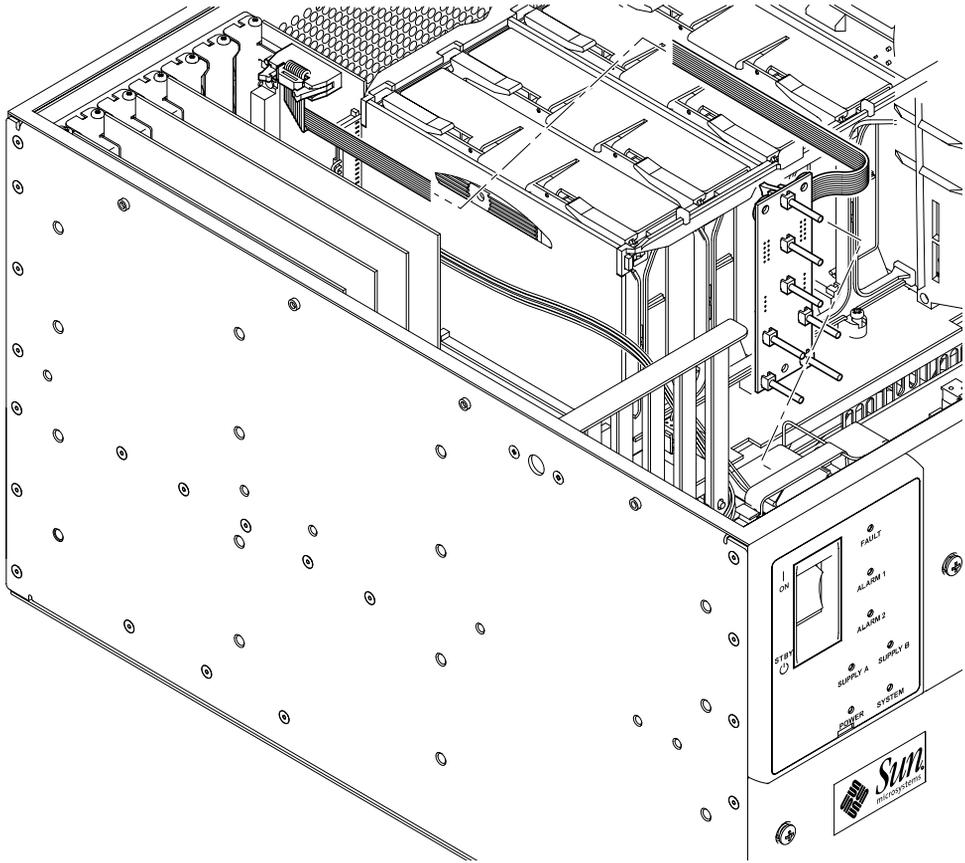


FIGURE 7-3 Removing and Replacing the LED Card.

▼ To Replace the LED 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.

- 1. Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
- 2. Position the LED card in the chassis.**
- 3. Carefully ensure all light pipes are aligned with the corresponding holes in the front panel.**
- 4. Carefully push home the LED card until all the standoffs are fully engaged.**
- 5. Reconnect the 10-way alarms card cable to the LED card.**
- 6. Reconnect the 4-way power switch cable to the LED card.**
- 7. Reconnect the 6-way motherboard cable to the LED card.**
- 8. Replace the top access cover.**
See "To Replace the Top Access Cover" on page 6-7.
- 9. Detach the antistatic wrist strap.**

Storage Devices

This chapter contains procedures to remove and replace the Netra t 1400/1405 system unit storage devices.

8.1 Hard Disk Drive

Up to four hard disk drives are located behind the lower front cover. The drives are mounted in a drive cage and SCSI backplane assembly.

▼ To Remove a Hard Disk Drive

See FIGURE 8-1 on page 8-2.



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

- 1. Power off the system.**
See "To Power Off the System" on page 6-2.
- 2. Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
- 3. Remove the lower front cover by turning the six captive quarter-turn Phillips screws anti-clockwise through 90 °.**
- 4. Push the handle latch down to open the drive handle.**

5. Extend the drive handle to disconnect the drive from the system.
6. Holding the drive handle, pull the drive from the drive bay.
7. The hard disk drive rear connector is disconnected when the drive is ejected.
8. Place the drive on an ESD mat.
9. If required, replace the drive as described in "To Install a Hard Disk Drive" on page 8-3
10. Replace the front cover and secure by turning the six captive quarter-turn screws clockwise through 90°.
11. Detach the antistatic wrist strap.

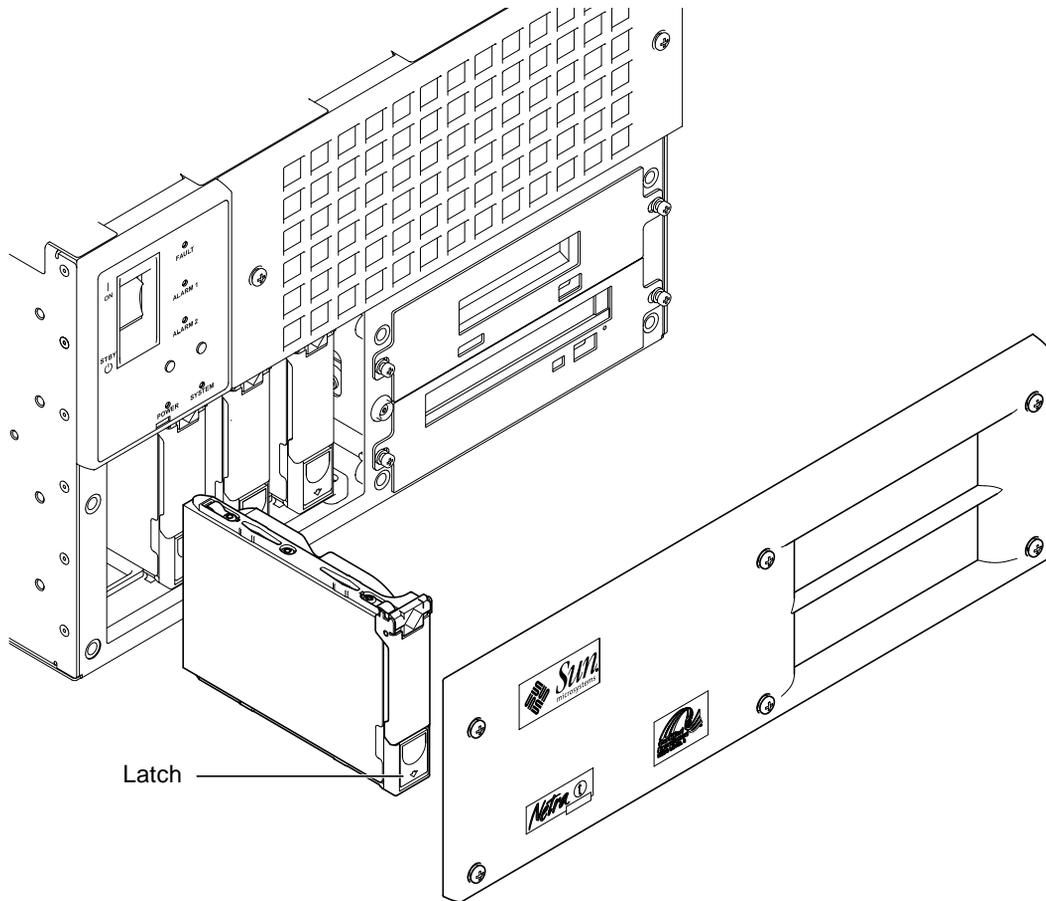


FIGURE 8-1 Removing and Replacing a Hard Disk Drive

▼ To Install a Hard Disk 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.

1. Power off the system.

See "To Power Off the System" on page 6-2.

2. Attach the antistatic wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

3. Remove the lower front cover by turning the six captive quarter-turn Phillips screws anti-clockwise through 90°.

4. Locate the drive so that the drive handle lock is at the bottom.

5. Holding the drive handle, insert the drive into the drive bay.

6. Push the front of the drive to connect it to the SCSI bus.

7. Close the drive handle to lock the drive into the system.

8. Replace the front cover and secure by turning the six captive quarter-turn screws clockwise through 90°.

9. Detach the antistatic wrist strap.

8.2 Removable Media Drive

Optional DAT tape and CD-ROM drives can be mounted in a media cage to the right of the hard drives.

Note – If a drive is removed permanently, refit the blanking panel.

Note – Mount the DAT tape drive in the upper position and the CD-ROM drive in the lower position.

▼ To Remove a Removable Media 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.

1. Attach the antistatic wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

2. Remove the lower front cover.

See "To Remove a Hard Disk Drive" on page 8-1.

3. Undo the two captive screws on the front of the media cage using a No.1 Phillips-head screwdriver.

4. Remove the upper and lower blanking panels by slackening the captive Phillips screws (two per panel).

5. Withdraw the media cage from the system chassis with the cables attached.

6. Disconnect the SCSI and power connectors from the rear of the drive(s).

7. Remove the media cage from the chassis and place it on an ESD mat.

8. Remove the drive(s) from the media cage by releasing the four captive Phillips screws (each drive has two retaining screws on each side of the media cage).

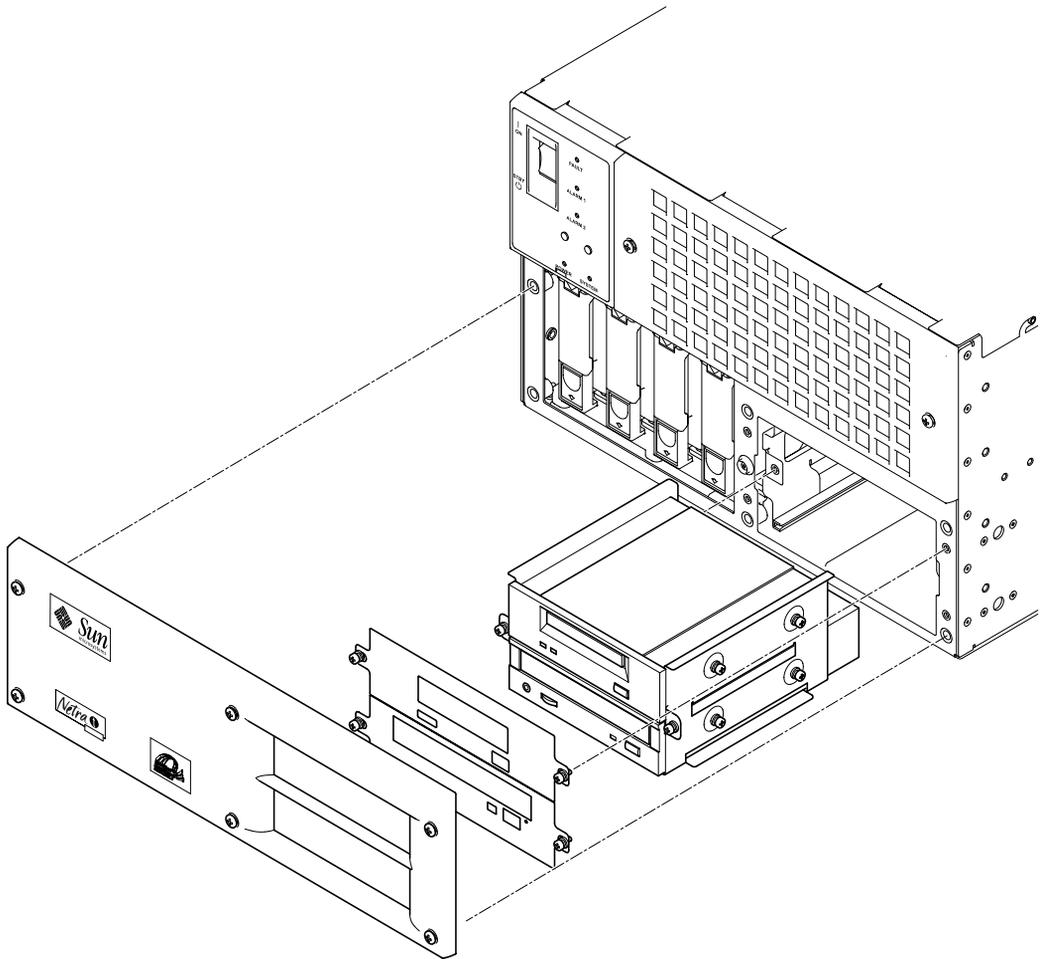


FIGURE 8-2 Removing and Replacing the CD-ROM or Tape Drive

▼ To Install or Replace a Removable Media 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.

- 1. Remove the lower front cover.**
See "To Remove a Hard Disk Drive" on page 8-1.
- 2. Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5
- 3. Remove the CD-ROM and DAT tape blanking plates.**
- 4. If necessary, remove the media cage (see "To Remove a Removable Media Drive" on page 8-4, step 4.**
- 5. Discard the plastic filler panel.**
- 6. Mount the DAT tape or CD-ROM drive in the media cage and secure it with the four captive phillips screws (two each side of the cage).**

Note – Mount the DAT tape drive in the upper position and the CD-ROM drive in the lower position.

- 7. Connect the SCSI and power cables to the rear of the drive(s).**
- 8. Push the media cage fully into the runners on the system chassis (FIGURE 8-2 on page 8-5).**
- 9. Using a No.1 Phillips-head screwdriver, replace the two captive screws securing the media cage drive.**
- 10. Replace CD-ROM and DAT tape ESD plates.**
- 11. Remove the antistatic wrist strap.**
- 12. Replace the front cover.**
See "To Replace the Top Access Cover" on page 6-7.

8.3 SCSI Adapter Card

▼ To Remove the SCSI Adapter 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.

1. Power off the system.

See "To Power Off the System" on page 6-2.

2. Attach the antistatic wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

3. Remove the top access cover.

See "To Remove the Top Access Cover" on page 6-7.

4. Remove the SCSI connector from the removable media drive.

5. Remove the two data cable connectors to the removable media drive(s).

6. Disconnect the data cable to the SCSI backplane.

7. Disconnect the power cables to the removable media drive(s) and Power Distribution Board (PDB).

8. Using a No. 1 Phillips-head screwdriver, remove the four screws securing the SCSI adapter card.

9. Remove the SCSI adapter card from the chassis and place it on an ESD mat.

▼ To Replace the SCSI Adapter 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.

1. Attach the antistatic wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

2. Remove the top access cover.

See "To Remove the Top Access Cover" on page 6-7.

3. Reconnect the two data cable connectors from the removable media drive(s).

4. Reconnect the removable media drive power connector.

5. Refit the SCSI adapter card, ensuring that the removable media drive data and power cables are routed under the right-hand (viewed from the front) fan housing, and secure it with the four screws.

6. Reconnect the data cable to the SCSI backplane.

7. Reconnect the power cable to the PDB.

8. Replace the top access cover.

See "To Replace the Top Access Cover" on page 6-7.

9. Remove the antistatic wrist strap and replace the front cover.

8.4 SCSI Backplane

The SCSI backplane and hard drive cage form a single replaceable unit.

▼ To Remove the SCSI Backplane



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. Power off the system.**
See "To Power Off the System" on page 6-2.
- 2. Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
- 3. Remove the top access cover.**
See "To Remove the Top Access Cover" on page 6-7.
- 4. Remove all hard disk drives.**
See "To Remove a Hard Disk Drive" on page 8-1.
- 5. Remove the left-hand (viewed from the front) fan housing.**
See "To Remove a System Fan Assembly" on page 9-3.
- 6. Disconnect the SCSI backplane to motherboard cable at the motherboard.**
- 7. Remove the SCSI adapter card.**
See "To Remove the SCSI Adapter Card" on page 8-7.
- 8. Remove the media cage.**
See "To Remove a Removable Media Drive" on page 8-4.
- 9. On the left-hand side of the system chassis, remove the recessed Phillips screw securing the top of the hard drive cage.**
- 10. Turn the system chassis on its side or front and from the base of the chassis remove the four M3 Phillips pan-head screws securing the hard drive cage.**

11. **Lift out the cage and SCSI backplane assembly and place it on an ESD mat.**
12. **Remove the antistatic wrist strap and replace the front cover.**

▼ To Replace the SCSI Backplane



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. **Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
2. **Remove the top access cover.**
See "To Remove the Top Access Cover" on page 6-7.
3. **Turn the system chassis on its side or front.**
4. **Carefully locate the hard drive and SCSI backplane assembly in the system chassis and secure it with four M3 Phillips pan-head screws through the base of the chassis.**
Ensure that the data cable to the motherboard and the power and data cables to the SCSI adapter card are routed between the cage and motherboard.
5. **Turn the system chassis upright and replace the Phillips screw through the recess in the left-hand side of the chassis to secure the top of the hard drive cage.**
6. **Replace the media cage.**
See "To Install or Replace a Removable Media Drive" on page 8-5.
7. **Replace the SCSI adapter card.**
See "To Replace the SCSI Adapter Card" on page 8-8.
8. **Reconnect the SCSI backplane to motherboard data cable at the motherboard.**
9. **Replace the left-hand fan unit.**
See "To Replace the System Fan Assembly" on page 9-4.
10. **Replace the hard drive(s).**
See "To Install a Hard Disk Drive" on page 8-3.

11. Replace the top access cover.

See "To Replace the Top Access Cover" on page 6-7.

12. Remove the antistatic wrist strap.

Motherboard and Component Replacement

This chapter contains removal and replacement procedures for the Netra t 1400/1405 motherboard and components of the motherboard.

9.1 CPU Modules

Up to four self-contained CPU modules are housed in a cage which is fixed to the motherboard.

▼ To Remove a 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. Power off the system.**
See "To Power Off the System" on page 6-2.
- 2. Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
- 3. Remove the top access cover.**
See "To Remove the Top Access Cover" on page 6-7.

4. Using both thumbs, simultaneously lift the two levers on the CPU module upward and to the side. See FIGURE 9-1 below.

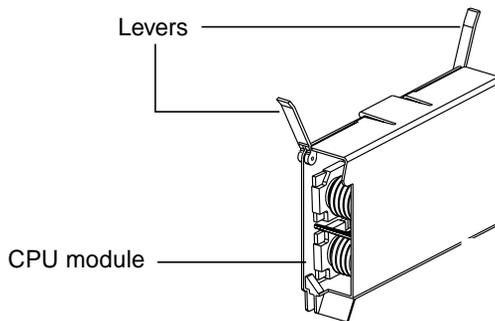


FIGURE 9-1 CPU Module Levers

5. Using the two levers, lift the CPU module upwards until it clears the system chassis.
6. Place the CPU module on an ESD mat.

▼ To Install or Replace a 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. **Power off the system.**
See "To Power Off the System" on page 6-2.
2. **Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
3. **On the antistatic mat, hold the CPU module in an upright position with the plastic surface facing you.**
4. **Move the levers on the CPU module to point straight upwards.**
5. **Lower the CPU module along the vertical plastic guides until the module touches the motherboard slot socket. Ensure connectors are aligned. With both hands, simultaneously turn and press the levers downward to the fully horizontal position.**

6. **Firmly press the module downward into the socket until it is fully seated and the levers are fully locked.**
7. **Replace the top access cover.**
See "To Replace the Top Access Cover" on page 6-7.
8. **Detach the antistatic wrist strap and replace the front cover.**
9. **Power on the system.**
See "To Power On the System" on page 6-1.

9.2 System Fan Assembly

Two system fans are located in the front of the system chassis. The fan assembly contains no user-serviceable parts and must be replaced as a unit if it is faulty.

▼ To Remove a System 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. **Power off the system.**
See "To Power Off the System" on page 6-2.
2. **Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
3. **Remove the top access cover.**
See "To Remove the Top Access Cover" on page 6-7.
4. **Remove the fan cover by turning the two captive Phillips-head quarter-turn screws anticlockwise through 90° Remove the cover and filter from the immediate vicinity of the system.**
5. **Disconnect the fan assembly power cable from the fan control board.**
6. **Using a No.2 Phillips-head screwdriver, from the front of the chassis undo the four screws securing the fan assembly and carefully remove the assembly from the chassis.**

Note – Refer to the diagram on the inside of the top access cover for details of the fan connections to the fan control board.

▼ To Replace the System 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. Attach the antistatic wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

2. Carefully position the fan assembly in the chassis and secure with four Phillips-head countersunk screws.

3. Connect the fan assembly power cable to the fan control board.

Note – Refer to the diagram on the inside of the top access cover for details of the fan connections to the fan control board.

4. Replace the top access cover.

See "To Replace the Top Access Cover" on page 6-7.

5. Replace the front cover and filter and secure by turning the two captive Phillips-head quarter-turn screws clockwise through 90°. If necessary, clean or replace the filter before refitting the cover.

6. Detach the antistatic wrist strap.

7. Power on the system.

See "To Power On the System" on page 6-1.

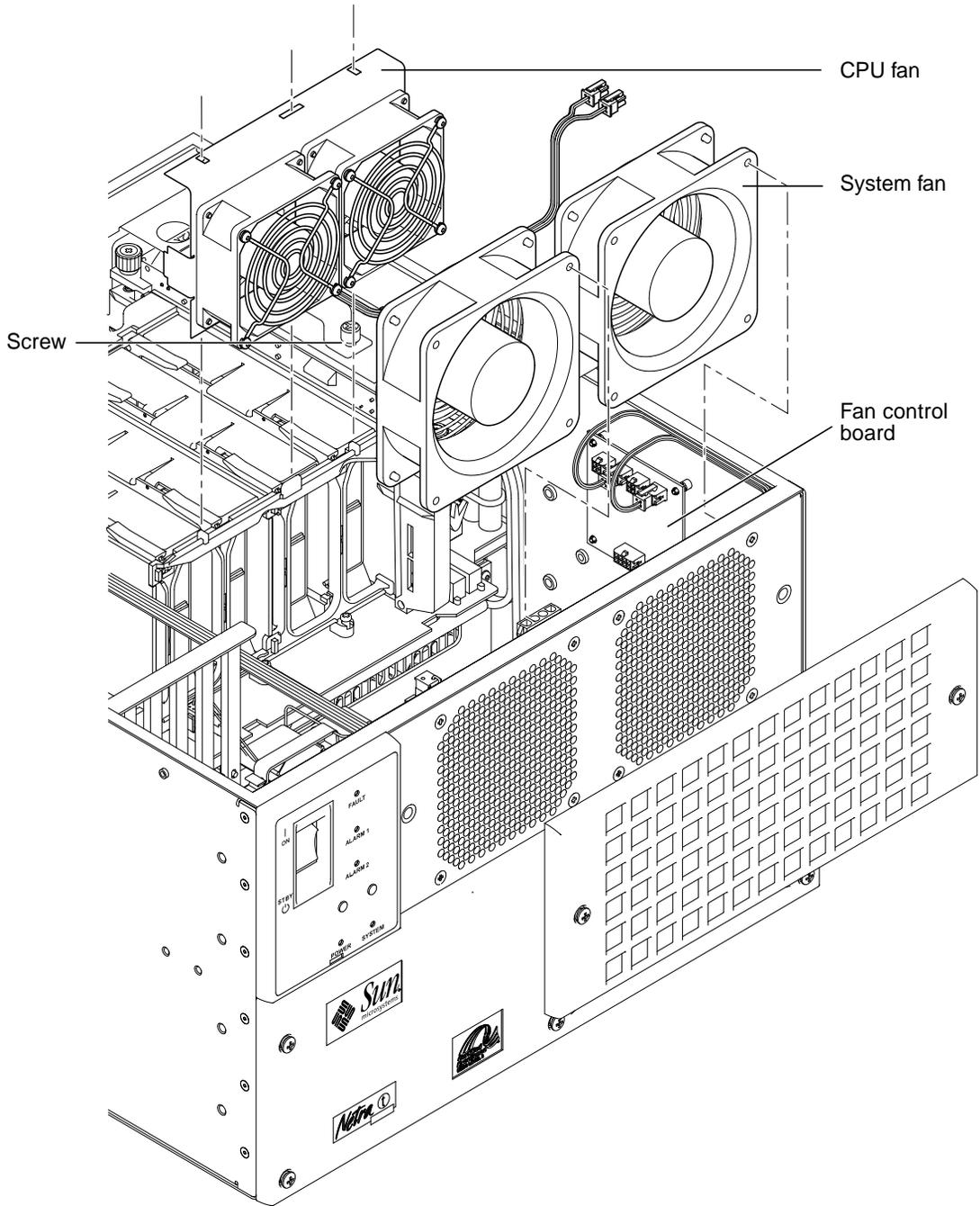


FIGURE 9-2 Removing and Replacing the Fan Assemblies

9.3 CPU Fan Assembly

The two CPU fans are mounted together in single cage.

▼ To Remove 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. **Power off the system.**
See "To Power Off the System" on page 6-2.
2. **Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
3. **Remove the top access cover.**
See "To Remove the Top Access Cover" on page 6-7.
4. **Disconnect the fan assembly power cable from the fan control board.**
5. **Release the lower fan bracket from the drive assembly cage by slackening the captive Phillips-head screw (see "Removing and Replacing the Fan Assemblies" on page 9-5.**
6. **Lift off the fan unit from the locating pins on the CPU cage and remove it from the chassis.**

▼ To Replace 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. **Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.

2. Carefully position the fan assembly over the locating pins on the CPU cage and secure the lower fan bracket to the disk drive cage by tightening the single captive Phillips-head screw.
3. Connect the fan assembly power cable to the fan control board.

Note – Refer to the diagram on the inside of the top access cover for details of the fan connections to the fan control board.

4. **Replace the top access cover.**
See "To Replace the Top Access Cover" on page 6-7.
5. **Replace the front cover and filter and secure by turning the two captive Phillips-head quarter-turn screws clockwise through 90°. If necessary, clean or replace the filter before refitting the cover.**
6. **Detach the antistatic wrist strap.**
7. **Power on the system.**
See "To Power On the System" on page 6-1.

9.4 Fan Control Board

The fan control board is mounted on the right-hand side of the system chassis, above the SCSI adapter board.

▼ To Remove the Fan Control 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. **Power off the system.**
See "To Power On the System" on page 6-1.
2. **Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.

3. Remove the top access cover.

See "To Remove the Top Access Cover" on page 6-7.

4. Disconnect the four cables to the fans and the single cable to the PDB.

5. Pull off the fan control board and place it on an ESD mat.

▼ To Replace the Fan Control 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. Attach the antistatic wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

2. Locate the fan control board over the four stand off-pins and gently press until it snaps into place.

3. Reconnect the four cables to the fans and the cable to the PDB.

Note – Refer to the diagram on the inside of the top access cover for details of the fan connections to the fan control board.

4. Replace the top access cover.

See "To Replace the Top Access Cover" on page 6-7.

5. Detach the antistatic wrist strap.

6. Power on the system.

See "To Power On the System" on page 6-1.

9.5 PCI Card

▼ To Remove 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.

1. Power off the system.

See "To Power Off the System" on page 6-2.

2. Attach the antistatic wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

3. Remove the top access cover.

See "To Remove the Top Access Cover" on page 6-7.

4. Disconnect the cables from the PCI card to be removed.

5. Using a No.2 Phillips-head screwdriver, remove the screw securing the PCI card bracket tab to the system chassis.



Caution – Avoid applying force to one end or one side of the board as this can damage the connector.

6. Pull the PCI card straight upwards from the slot.

7. Place the PCI card on an ESD mat.

▼ To Replace 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.

1. Power off the system.

See Section t “To Power Off the System” on page 6-2.

2. Attach the antistatic wrist strap.

See “To Attach the Antistatic Wrist Strap” on page 6-5.

3. Remove the top access cover.

See “To Remove the Top Access Cover” on page 6-7.

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

4. Lower the PCI card so that it touches its associated slot on the motherboard.

5. From the two upper corners of the card, push the card straight downwards into the slot until it is fully seated.

6. Using a No.2 Phillips-headed screwdriver, insert and tighten the screw securing the card bracket tab to the system chassis.

7. Replace the top access cover.

See “To Replace the Top Access Cover” on page 6-7.

8. Connect the cables to the PCI card.

9. Detach the antistatic wrist strap and replace the front cover.

10. Power on the system.

See “To Power On the System” on page 6-1.

9.6 DIMMs



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 bank must contain at least two DIMMs of equal density (for example, two 64Mbyte DIMMs) to function properly. Do not mix DIMM densities in any bank.

DIMMs must be inserted in pairs in both the motherboard and memory riser card, according to TABLE 9-1 on page 9-11.

Note – The system unit *must* have at least two identical DIMMs installed in paired sockets of any DIMM bank. For best system performance, install four identical DIMMs. TABLE 10-1 identifies DIMM installation locations.

TABLE 9-1 DIMM Bank and Bank Quads

Bank	U Number (Motherboard)	U Number (Memory Riser Card)
0	U1301 and U1302	U0301 and U0302
2	U1303 and U1304	U0303 and U0304
1	U1401 and U1402	U0401 and U0402
3	U1403 and U1404	U0403 and U0404

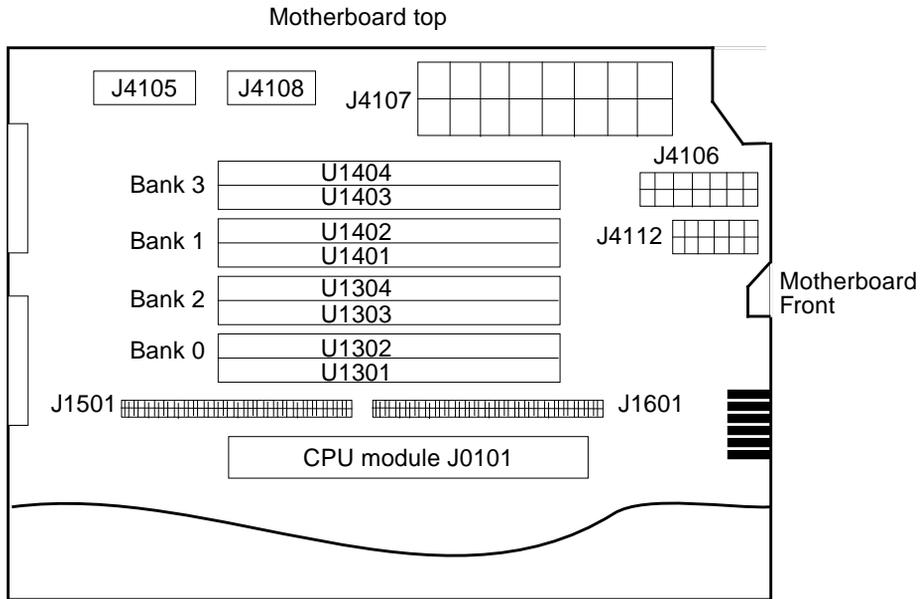


FIGURE 9-3 DIMM Mapping (Motherboard)

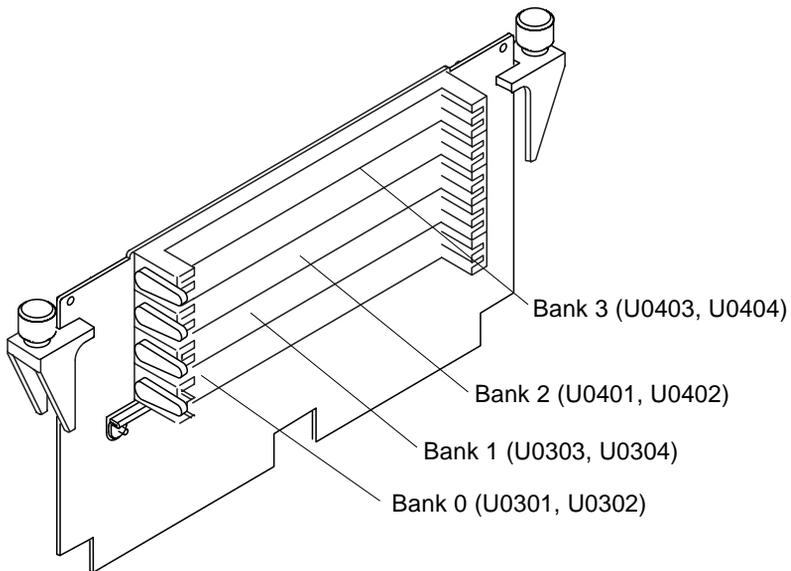


FIGURE 9-4 DIMM Mapping (Memory Riser Card)

▼ To Remove 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.



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. Power off the system.**
See "To Power Off the System" on page 6-2.
- 2. Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
- 3. Remove the top access cover.**
See "To Remove the Top Access Cover" on page 6-7.
- 4. Locate the DIMM to be removed.**
- 5. Push the lever away from the DIMM (see FIGURE 9-5) to be removed.**

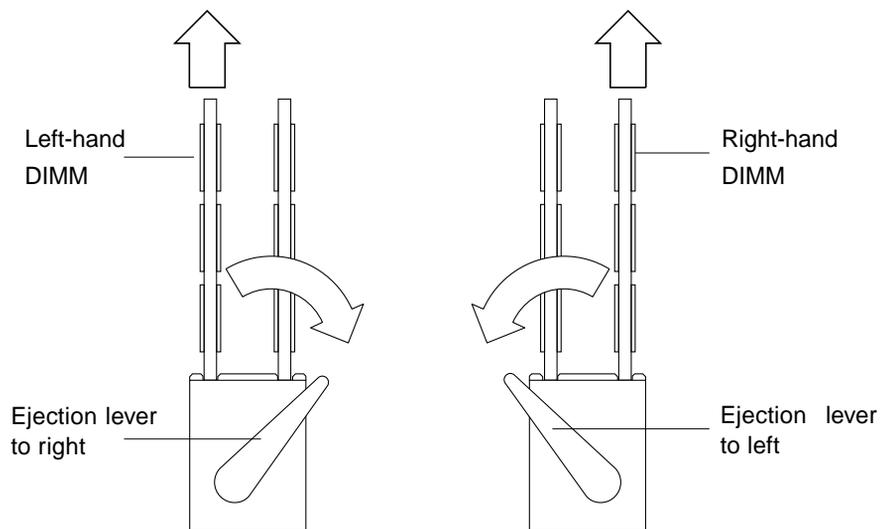


FIGURE 9-5 DIMM Ejection Lever

6. Remove the DIMM from the socket.

7. Place the DIMM on an ESD mat.

▼ To Replace 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 ready to install it on the motherboard. Handle DIMMs only by their edges. Do not touch DIMM components or metal parts. Always wear an antistatic wrist strap when handling DIMMs.



Caution – Each DIMM bank must contain two DIMMs of equal density (for example, two 64Mbyte DIMMs) to function properly. Do not mix DIMM density in any bank.



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

1. Attach the antistatic wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

2. Locate the appropriate DIMM slot(s) on the motherboard.

Note – The system unit *must* have at least two identical DIMMs installed in paired sockets of any DIMM bank. For best system performance, install four identical DIMMs. TABLE 10-1 identifies DIMM installation locations.



Caution – Hold DIMMs only by the edges.

3. Remove the DIMM from the antistatic container.

4. **Position the DIMM in the socket, ensuring that the notch is on the same side as the lever.**
5. **Using your thumbs, press firmly on the top of the DIMM until it is properly seated.**

Note – Proper DIMM seating is verified by a clicking sound. Ensure the DIMM is properly seated.

6. **Replace the top access cover.**
See "To Replace the Top Access Cover" on page 6-7.
7. **Detach the antistatic wrist strap.**
8. **Power on the system.**
See "To Power Off the System" on page 6-2.

▼ To Remove the Memory Riser 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.

1. **Power off the system.**
See "To Power Off the System" on page 6-2.
2. **Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
3. **Remove the top access cover.**
See "To Remove the Top Access Cover" on page 6-7.
4. **Slacken the two thumbscrews securing the memory riser card to the motherboard.**
Using equal pressure, gently ease the memory riser card from its connectors and place it on an ESD mat.

▼ To Replace the Memory Riser 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.

1. **Attach the antistatic wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
2. **Insert DIMMs in the memory riser card banks as required.**
3. **Position the memory riser card on its motherboard connectors.**



Caution – The memory riser card connectors must be seated straight into the motherboard connectors to avoid damaging the motherboard connector pins.

4. **Using equal pressure, seat the memory riser card into the motherboard connectors.**
5. **Fully seat the memory riser card by simultaneously turning clockwise, by hand, both thumbscrews at the upper corners of the memory riser card until the thumbscrews are finger tight.**
6. **Insert the short leg of the torque indicator driver (part number 340-6091-xx) into a thumbscrew on the memory riser card to tighten it to the correct torque.**
7. **Using the torque indicator driver, alternately turn each thumbscrew clockwise, one turn at a time. Stop turning each thumbscrew as soon as the torque indicator gap closes.**

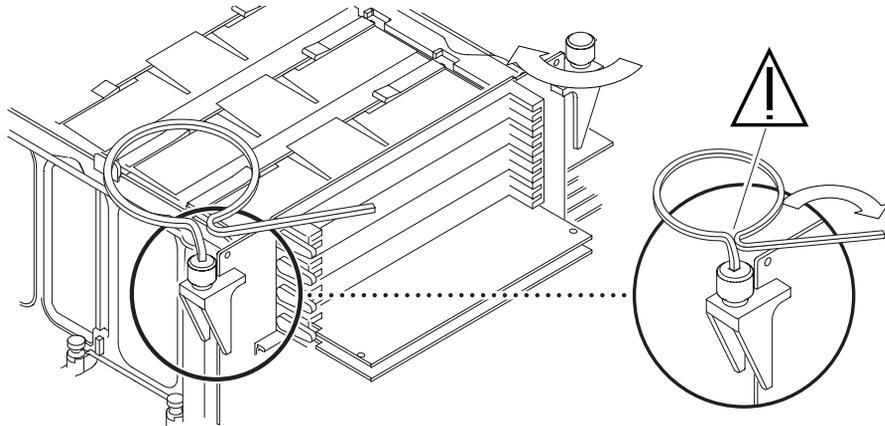


FIGURE 9-6 Setting the Memory Riser Card Thumbscrew Torque

8. Detach the antistatic wrist strap.

9.7 Alarms Card

The alarms card is mounted immediately behind the left-most CPU.

▼ To Remove the Alarms 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.

1. **Power off the system.**
See "To Power Off the System" on page 6-2.
2. **Disconnect the external Ethernet (RJ45) and serial (DB-15) cables to the alarms card.**

3. Attach the antistatic wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

4. Remove the top access cover.

See "To Remove the Top Access Cover" on page 6-7.

5. At the alarms card, disconnect the cable to the LED board.

6. At the alarms card, disconnect the cable to the PDB.

7. Using a No.2 Phillips-head screwdriver, remove the screw securing the alarms card bracket tab to the system chassis.



Caution – Avoid damaging the connector. Apply equal force to both ends or sides of the board.

8. At the two upper corners of the alarms card, pull the card straight upward from the slot. See FIGURE 9-7 on page 9-19.

9. Remove the alarms card and place it on an ESD mat.

▼ To Replace the Alarms 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.

1. Attach the antistatic wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

2. Position the alarms card into the chassis.

3. Lower the alarms card so that it touches the appropriate slot on the motherboard (immediately behind the left-most CPU).

4. At the two upper corners of the card, push the card straight downwards into the slot until it is fully seated.

5. Using a No.2 Phillips-head screwdriver, replace the screw securing the alarms card to the system chassis.

6. Reconnect the cable from the PDB.

7. Reconnect the cable from the LED board.

8. Replace the top access cover.

See "To Replace the Top Access Cover" on page 6-7.

9. Detach the antistatic wrist strap.

10. Reconnect the external Ethernet (RJ45) and serial (DB-15) cables to the alarms card.

11. Power on the system.

See "To Power On the System" on page 6-1.

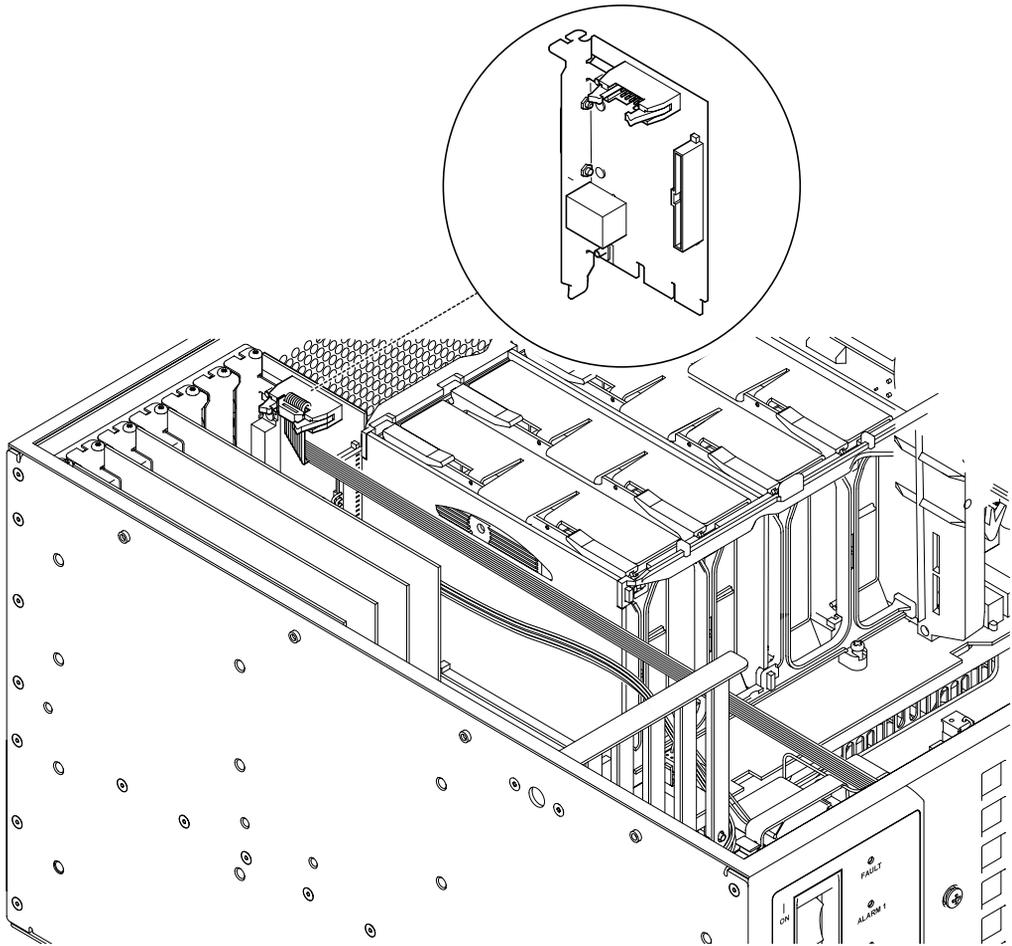


FIGURE 9-7 Removing and Replacing the Alarms Card

9.8 NVRAM/TOD

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 same NVRAM/TOD on the replacement motherboard after installation.

▼ To Remove 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. Power off the system.

See "To Power Off the System" on page 6-2.

2. Attach the wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

3. Remove the top access cover.

See "To Remove the Top Access Cover" on page 6-7.

4. Locate the NVRAM/TOD and carrier on the motherboard.

See "Motherboard Layout" on page 9-24.

5. Grasp the NVRAM/TOD carrier at each end and pull straight up.

Note – Gently rock the NVRAM/TOD from side to side as necessary.

6. Place the NVRAM/TOD and carrier on an ESD mat.

▼ To Replace 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. Attach the wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

2. Position the NVRAM/TOD and carrier on the motherboard.

3. Carefully insert the NVRAM/TOD and carrier into the socket.

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

4. Push the NVRAM/TOD into the carrier until properly seated.

5. Replace the top access cover.

See "To Replace the Top Access Cover" on page 6-7.

6. Detach the wrist strap.

9.9 DC-to-DC Converter

The DC-to-DC converter is located at the rear of the motherboard, in front of the serial ports.

▼ To Remove the DC-to-DC Converter



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. Power off the system.**
See "To Power Off the System" on page 6-2.
- 2. Attach the wrist strap.**
See "To Attach the Antistatic Wrist Strap" on page 6-5.
- 3. Remove the top access cover.**
See "To Remove the Top Access Cover" on page 6-7.
- 4. Locate the DC-to-DC converter and slacken the single captive Phillips-head screw securing it to the motherboard.**
- 5. Gently ease the assembly from of its two sockets and place it on an ESD mat.**

▼ To Replace the DC-to-DC Converter



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. Attach the wrist strap.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

2. Locate the open slot in the fan mounting panel on the DC-to-DC converter over the corresponding slot in the CPU cage, and align the connectors with those on the motherboard.

3. Gently press the DC-to-DC converter into the motherboard connectors.

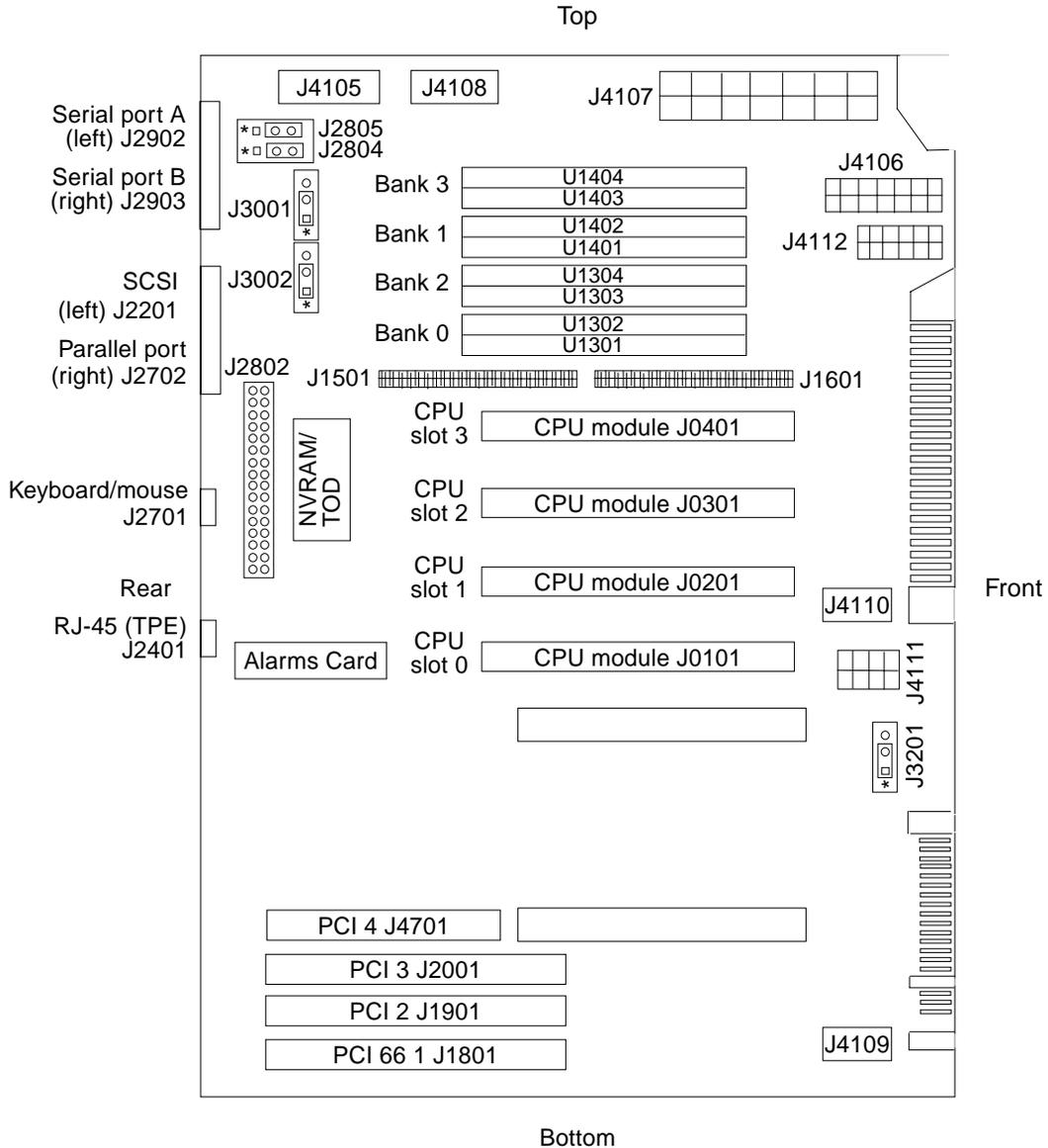
4. Secure the DC-to-DC converter to the motherboard by tightening the single captive, Phillips-head screw.

5. Replace the top access cover.

See "To Replace the Top Access Cover" on page 6-7.

6. Detach the antistatic wrist strap.

9.10 Motherboard



J2805+J2804=RS423/RS232, J3001=FPROM R/W, J3002=FPROM Select

FIGURE 9-8 Motherboard Layout



Caution – Use an ESD mat when working with the motherboard. An ESD 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, PCI card(s), alarms card, and CPU module prior to removing the motherboard. Note the chassis slot location for each DIMM 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 same NVRAM/TOD on the replacement motherboard after installation.

▼ To Remove the Motherboard

Note that the motherboard can be removed with the CPU cage assembly in place.



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. Attach an antistatic wrist strap to the rear of the chassis.

See "To Attach the Antistatic Wrist Strap" on page 6-5.

2. Power off the system.

See "To Power Off the System" on page 6-2.

3. Remove the top access cover.

See "To Remove the Top Access Cover" on page 6-7.

4. Depopulate the motherboard by removing the following:

a. CPU module(s)

See "To Remove a CPU Module" on page 9-1.

b. CPU fan assembly

See "To Remove the CPU Fan Assembly" on page 9-6.

c. Alarms card

See "To Remove the Alarms Card" on page 9-17.

d. PCI card(s)

See "To Remove a PCI Card" on page 9-9.

e. Motherboard DIMMs and memory riser card

See "To Remove a DIMM" on page 9-13 and "To Remove the Memory Riser Card" on page 9-15.

f. Remove the NVRAM/TOD

See "To Remove the NVRAM/TOD" on page 9-20.

5. Disconnect the SCSI cable at the motherboard.

6. Disconnect the external cables.

7. Disconnect the two power connectors at the motherboard.

8. Using a No.2 Phillips-head screwdriver, undo the three external captive screws securing the motherboard to the rear chassis panel.

9. Remove the motherboard by sliding it towards the front of the chassis slightly, then raising the front (viewed from the front of system).



Caution – Handle the motherboard by the edges only.

10. Place the motherboard on an ESD mat.

▼ To Replace 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.

1. **Attach an antistatic wrist strap to the rear of the chassis.**

See "To Attach the Antistatic Wrist Strap" on page 6-5.



Caution – Handle the motherboard by the edges only.

2. **Align the motherboard with the clips on the motherboard shelf and with the cut-outs in the rear panel of the chassis, then slide the motherboard into position.**
3. **Secure the motherboard by tightening the three external captive, Phillips-head screws, starting with the centre screw.**
4. **Using long-nose pliers, set the motherboard serial port jumpers as described in Chapter 12 "Motherboard Jumpers".**
5. **Connect the external cables.**
6. **Populate the motherboard by replacing the following:**
 - a. **DIMMs and memory riser card**
See "To Replace a DIMM" on page 9-14 and "To Replace the Memory Riser Card" on page 9-16.
 - b. **PCI card(s)**
See "To Replace a PCI Card" on page 9-10.
 - c. **Alarms card**
See "To Replace the Alarms Card" on page 9-18.
 - d. **NVRAM/TOD with carrier**
See "To Replace the NVRAM/TOD" on page 9-21.
 - e. **CPU module(s)**
See "To Install or Replace a CPU Module" on page 9-2.
7. **Replace the CPU fan assembly.**
See "To Replace the CPU Fan Assembly" on page 9-6.
8. **Reconnect the two power cables at the motherboard.**

9. Reconnect the SCSI cable at the motherboard.

10. Replace the top access cover.

See "To Replace the Top Access Cover" on page 6-7.

11. Detach the antistatic wrist strap.

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

a. Set system power to on.

See "To Power On the System" on page 6-1.

b. Send a Break command after the system banner appears on the monitor.

c. At the ok prompt, type:

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

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

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

PART II System Reference

Back Panel Connectors

10.1 Connector Layout

This chapter provides information about external I/O connections. Connector Layout

FIGURE 10-1 shows the locations of the Netra t 1400/1405 system back panel connectors.

Note – The figure shows the Netra t 1405. However, the layout of the connectors is identical on the Netra t 1400.

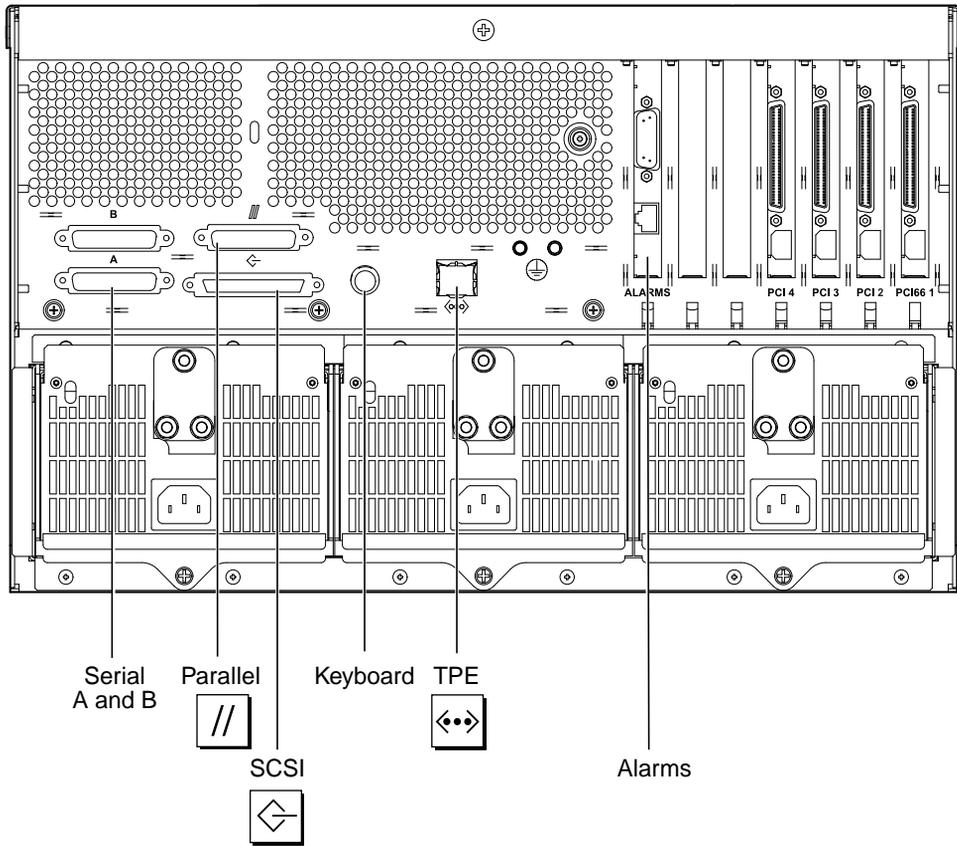


FIGURE 10-1 Back Panel Connectors

10.2 Parallel Interface

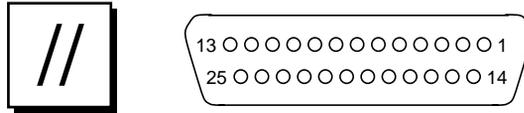


FIGURE 10-2 DB-25 Parallel Connector

TABLE 10-1 Parallel Connector Pinout

Pin	Signal Name	I/O	Service
1	DATA_STROBE_L		Data Strobe (active LOW)
2	DAT(0)		Data Bit 0
3	DAT(1)		Data Bit 1
4	DAT(2)		Data Bit 2
5	DAT(3)		Data Bit 3
6	DAT(4)		Data Bit 4
7	DAT(5)		Data Bit 5
8	DAT(6)		Data Bit 6
9	DAT(7)		Data Bit 7
10	ACK_L		Acknowledge (active LOW)
11	BSY		Busy (active HIGH)
12	PERROR		Paper End (active HIGH)
13	SELECT_L		Select (active LOW)
14	AFXN_L		Auto Line Feed (active LOW)
15	ERROR_L		Error (active LOW)
16	RESET_L		Initialize Printer (prime active LOW)
17	IN_L		Select Input (active LOW)
18	GND		Ground
19	GND		Ground
20	GND		Ground
21	GND		Ground

TABLE 10-1 Parallel Connector Pinout (*Continued*)

Pin	Signal Name	I/O	Service
22	GND		Ground
23	GND		Ground
24	GND		Ground
25	GND		Ground

10.3 Serial Connectors

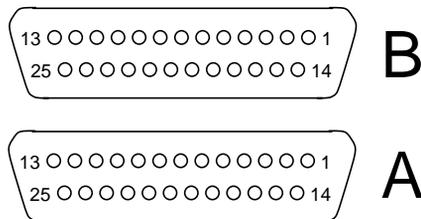


FIGURE 10-3 DB-25 Serial Connectors

TABLE 10-2 Serial Connector Pinout, RS423/RS232

Pin	Function	I/O	Signal Description
1			Not connected
2	TxD	O	Transmit Data
3	RxD	I	Receive Data
4	RTS	O	Ready To Send
5	CTS	I	Clear To Send
6	DSR	I	Data Set Ready
7	Gnd		Signal Ground
8	DCD	I	Data Carrier Detect
9-14			Not connected
15	TRxC	I	Transmit Clock
16			Not connected
17	RTxC	I	Receive Clock

TABLE 10-2 Serial Connector Pinout, RS423/RS232 (Continued) (Continued)

Pin	Function	I/O	Signal Description
18-19			Not connected
20	DTR	O	Data Terminal Ready
21-23			Not connected
24	TxC	O	Transmit Clock
25			Not connected

Note: For information about serial port jumpers on the Netra t 1400/1405 system main logic board, see the Netra t 1400/1405 *System Reference Manual*.

10.4 Twisted-Pair Ethernet (TPE) Connector



FIGURE 10-4 RJ45 TPE Socket

TABLE 10-3 TPE Connector Pinout

Pin	Description	Pin	Description
1	Transmit Data +	5	Common Mode Termination
2	Transmit Data -	6	Receive Data -
3	Receive Data +	7	Common Mode Termination
4	Common Mode Termination	8	Common Mode Termination

TPE Cable-Type Connectivity

The following types of twisted-pair Ethernet cable can be connected to the 8-pin TPE connector:

- For 10BASE-T applications, shielded twisted-pair (STP) cable:
 - Category 3 (STP-3, *voice grade*)
 - Category 4 (STP-4)
 - Category 5 (STP-5, *data grade*)
- For 100BASE-T applications, shielded twisted-pair category 5 (STP-5, *data grade*) cable.

TABLE 10-4 TPE STP-5 Cable Lengths

Cable Type	Application(s)	Max Length (Metric)	Max Length (Imperial)
Shielded twisted pair category 5 (STP-5, <i>data grade</i>)	10BASE-T	1000m	3282ft
Shielded twisted pair category 5 (STP-5, <i>data grade</i>)	100BASE-T	100m	327ft

10.5 SCSI Connector

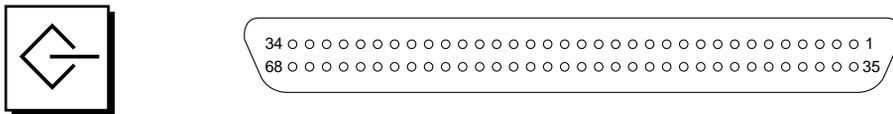


FIGURE 10-5 68-Pin SCSI Connector

TABLE 10-5 68-Pin SCSI Connector Pinout

Pin	Signal Name	Pin	Signal Name
1	GND	21	GND
2	GND	22	GND
3	GND	23	GND
4	GND	24	GND
5	GND	25	GND
6	GND	26	GND

TABLE 10-5 68-Pin SCSI Connector Pinout (Continued)

Pin	Signal Name	Pin	Signal Name
7	GND	27	GND
8	GND	28	GND
9	GND	29	GND
10	GND	30	GND
11	GND	31	GND
12	GND	32	GND
13	GND	33	GND
14	GND	34	GND
15	GND	35	-DB<12>
16	GND	36	-DB<13>
17	TERMPWR	37	-DB<14>
18	TERMPWR	38	-DB<15>
19	Not connected	39	-PAR<1>
20	GND	40	-DB<0>
41	-DB<1>	55	-ATN
42	-DB<2>	56	GND
43	-DB<3>	57	-BSY
44	-DB<4>	58	-ACK
45	-DB<5>	59	-RST
46	-DB<6>	60	-MSG
47	-DB<7>	61	-SEL
48	-PAR<0>	62	-CD
49	GND	63	-REQ
50	TERM.DIS	64	-IO
51	TERMPWR	65	-DB<8>
52	TERMPWR	66	-DB<9>
53	Reserved	67	-DB<10>
54	GND	68	-DB<11>

Note – All signals shown in TABLE 10-5 on page 10-6 are active low.

10.5.1 SCSI Implementation

- SCSI-3 Fast-20 (UltraSCSI) parallel interface
- 16-bit SCSI bus
- 40Mbps data transfer rate
- Support for 16 SCSI addresses:
 - Target 0 to 6 and 8 to F for devices
 - Target 7 reserved for SCSI host adapter on main logic board
- Support for up to seven internal SCSI devices (including the host adapter):
 - Fast-20 SCSI disk drive target 0 (left-most drive slot)
 - Fast-20 SCSI disk drive target 1
 - Fast-20 SCSI disk drive target 2
 - Fast-20 SCSI disk drive target 3 (right-most drive slot)
 - Fast-10 SCSI removable media device target 4
 - Fast-10 SCSI removable media device target 6
- Support for external 8-bit and 16-bit SCSI devices via 68-pin SCSI connector mounted on an adapter board

10.5.2 SCSI Cabling and Configuration

The SCSI-3 Fast-20 (UltraSCSI) specification requires that the external SCSI bus length be limited to 3m (10ft) for less than five devices (internal and external), and 1.5m (5ft) for five to eight devices. When SCSI-3 and SCSI-2 devices are connected to the Netra t 1400/1405 system SCSI bus, the system enables each device to operate at its respective data transfer rate. The last external SCSI device in a daisy-chain must be terminated internally (active termination) or with an external terminator according to Forced-Perfect Termination (FPT) technology.

10.5.2.1 SCSI Cabling Procedure

1. **Count the number of SCSI devices on the system SCSI bus. Be sure to count the host adapter as a SCSI device.**
2. **Determine the total SCSI bus length.**

TABLE 10-6 Determining SCSI Bus Length

SCSI Implementation	Bus Width	Data Transfer Rate, Mb/s	Number of Devices	SCSI Bus Length
SCSI-2, Fast	8 bits	10	1–8	6.0m
SCSI-2, Fast/Wide	16 bits	20	1–8	6.0m
SCSI-3 Parallel Interface, Fast-20 Wide (UltraSCSI) (WideUltra)	16 bits	40	1–4	3.0m
SCSI-3 Parallel Interface, Fast-20 Wide (UltraSCSI) (WideUltra)	16 bits	40	5–8*	1.5m

* The maximum number of single-ended/differential SCSI devices is 16.

3. Verify the cable type used to connect external SCSI devices. You must use Fast-20 SCSI cable(s).

Ensure that the total SCSI cable length does not exceed the permissible total SCSI bus length.

10.5.2.2 SCSI-2 (Fast Wide SCSI) External Devices

If you connect SCSI-2 (Fast Wide SCSI, 20Mb data transfer rate) external devices to a Netra t 1400/1405 system, follow these cabling and configuration guidelines (as shown in FIGURE 10-6) to ensure proper device addressing and operation:

- If all external mass storage devices use 68-pin connectors, connect all non-Sun devices to the Netra t 1400/1405 system first and follow them with Sun devices. Sun devices use auto-termination.
- If external mass storage devices consist of 68-pin Sun devices and 50-pin devices, connect the Sun 68-pin devices to the Netra t 1400/1405 system first and terminate the daisy chain with the 50-pin device and its terminator.
- The total SCSI bus length for all external SCSI devices is 6.0m (19.7ft).

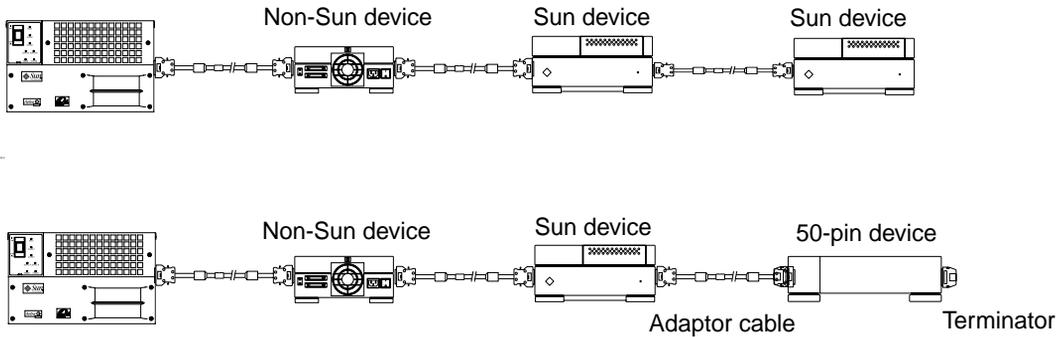


FIGURE 10-6 Connecting External Mass Storage Devices

10.6 Alarms Ports

The alarms service port connector (male DB-15) and LOM port connector (RJ45) are located on the alarms card. TABLE 10-7 lists each connector pinout.

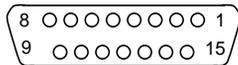


FIGURE 10-7 DB-15 (Male) Alarms Service Port Connector

TABLE 10-7 Alarms Service Port Connector Pinout

Pin	Signal Name	Pin	Signal Name
1	Not connected	9	ALARM1_NC
2	Not connected	10	ALARM1_COM
3	Not connected	11	ALARM2_NO
4	Not connected	12	ALARM2_NC
5	SYSTEM_NO	13	ALARM2_COM
6	SYSTEM_NC	14	Not connected
7	SYSTEM_COM	15	Not connected
8	ALARM1_NO	Shell	CHGND

The remote Lights Out Management serial port is located below the alarms port. The connector is a shielded RJ45 and TABLE 10-8 lists the connector pin assignments.

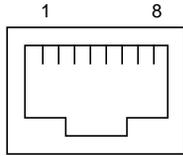


FIGURE 10-8 RJ45 Lights Out Management Serial Connector

TABLE 10-8 Lights Out Management Serial Connector Pinout

Pin	Signal Name	Pin	Signal Name
1	RTS	5	REF (0V)
2	DTR	6	RXD
3	TXD	7	DSR
4	REF (0V)	8	CTS
Shell	CHGND		

Modem Setup

Any modem compatible with CCITT V.24 can be connected to the Netra t 1400/1405 serial ports. Modems can be set up to function in one of three ways:

- Dial out only
- Dial in only
- Bidirectional calls.

11.1 To Set Up the Modem

To set up your modem:

- 1. Become root and type `admintool`.**

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

- 2. Click on Serial Port Manager.**
- 3. Select Port a or Port b for your modem connection.**
- 4. Click on 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:
 - a. Modem – Dial-Out only
 - b. Modem – Dial-In only
 - c. Modem – Bidirectional
7. Click on Apply.
8. Set your modem auto-answer switch to one of the following:
 - Off – Dial-Out Only
 - On – Dial-In Only
 - On – Bidirectional

11.2 Serial Port Speed Change

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

1. Become super user, 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.

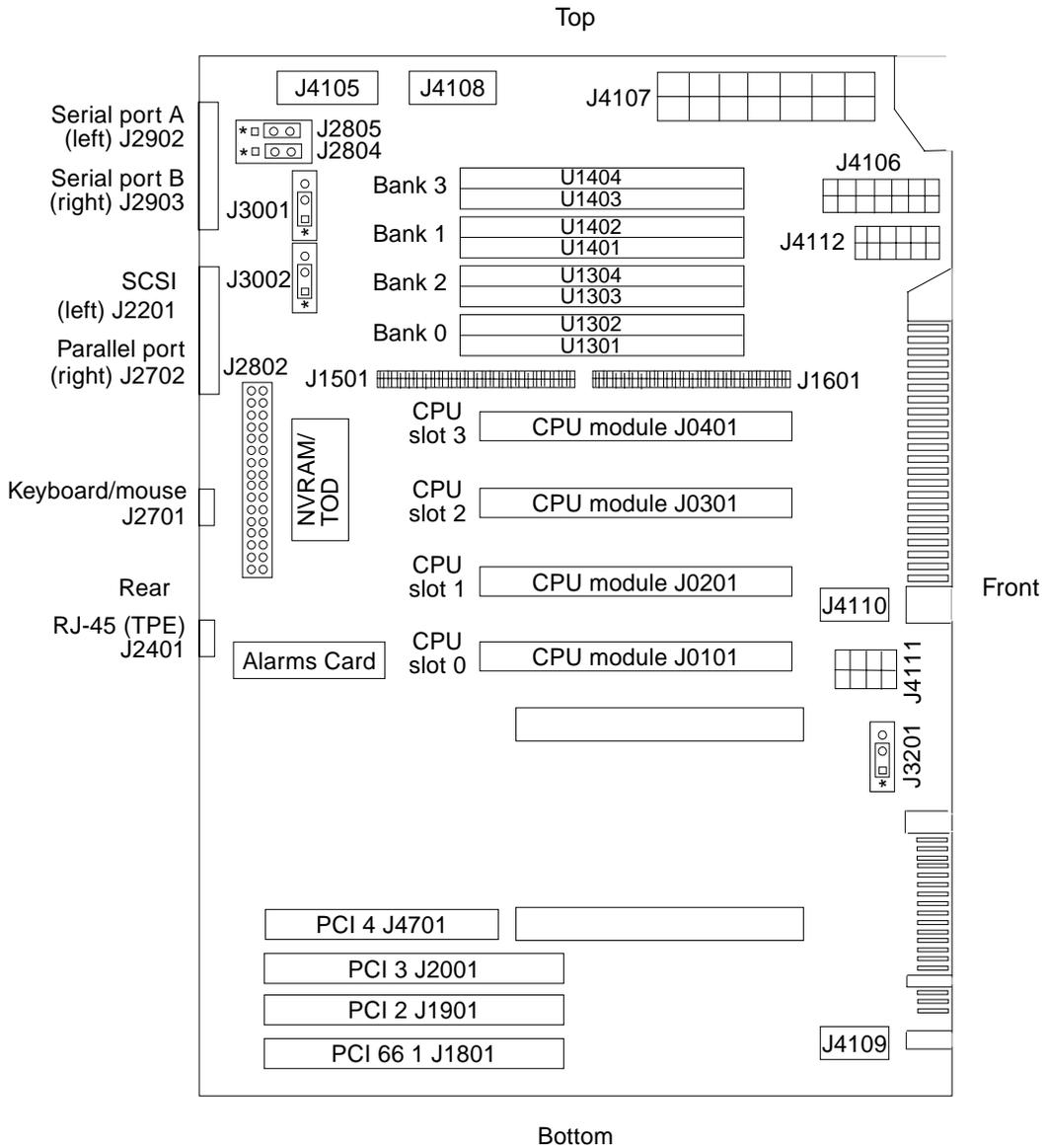
11.3 Recommendations

For a modem-to-host (system) connection, use an RS423/RS232 straight-through cable with DB-25 male connectors at both ends.

Motherboard Jumpers

This chapter describes how to set the motherboard jumpers for:

- Serial ports
- Flash PROM



J2805+J2804=RS423/RS232, J3001=FPROM R/W, J3002=FPROM Select

FIGURE 12-1 System Motherboard Block Diagram

12.1 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.

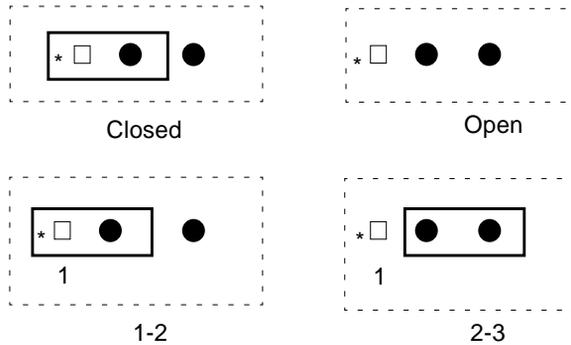


FIGURE 12-2 Selected Jumper Settings

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 (FIGURE 12-3). Ensure that the serial port jumpers are set correctly.

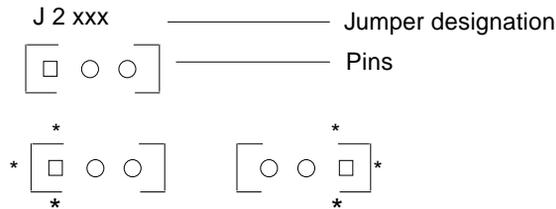


FIGURE 12-3 Identifying Jumper Pins

12.1.1 Serial Port Jumpers

Serial port jumpers J2804 and J2805 can be set to either the RS-423 or RS-232 serial interface. The jumpers are preset for RS-423. RS-232 is required for digital telecommunication within the European Community. TABLE 12-2 on page 12-6 identifies serial port jumper settings. If the system is being connected to a public X.25 network, the serial port mode jumper setting may need to change from RS-423 to RS-232 mode.

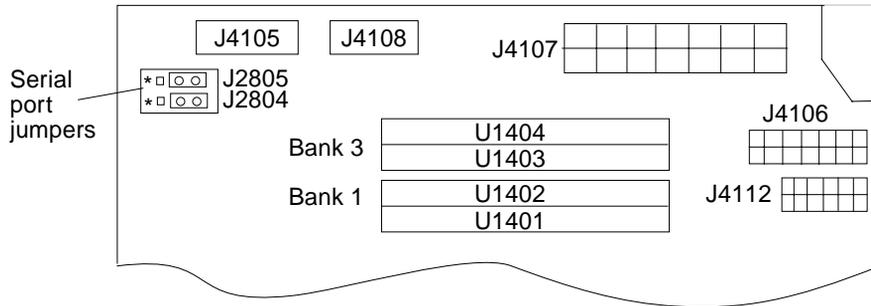


FIGURE 12-4 Serial Port Jumpers

To change the serial port mode jumper setting:

- 1. Power off the system and remove the access panel.**

See "To Power Off the System" on page 6-2.



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

- 2. Attach the wrist strap.**

See "To Attach the Antistatic Wrist Strap" on page 6-5.

- 3. Remove the top access cover.**

See "To Remove the Top Access Cover" on page 6-7.

- 4. Remove the DC-to-DC converter.**

See "To Remove the DC-to-DC Converter" on page 9-22.

5. **Locate the jumpers on the motherboard. Change the J2804 and J2805 jumper selection.**

TABLE 12-1 Serial Port Jumper Settings

Jumper	Pins 1 + 2 Select	Pins 2 + 3 Select	Default Jumper on Pins
J2804	RS-232	RS-423	2 + 3
J2805	RS-232	RS-423	2 + 3

6. **Replace the DC-to-DC converter.**

See "To Replace the DC-to-DC Converter" on page 9-23.

7. **Replace the top access cover.**

See "To Replace the Top Access Cover" on page 6-7.

8. **Detach the wrist strap.**

9. **Power on the system.**

See "To Power On the System" on page 6-1.

12.1.2 Flash PROM Jumpers

Flash PROM jumpers J3001 and J3002 are for reprogramming specific code blocks and remote programming of the flash PROM. TABLE 12-2 on page 12-6 identifies the flash PROM jumper settings.

For easier access to the jumpers, remove the DC-toDC converter as described in Section 12.1.1 "Serial Port Jumpers" on page 12-4".

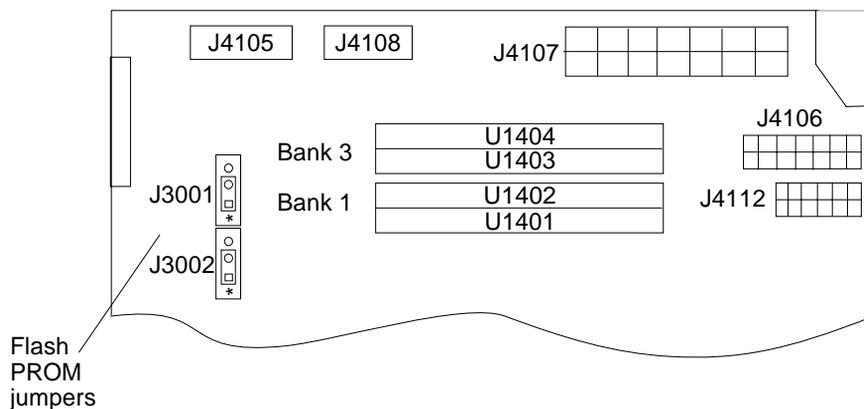


FIGURE 12-5 Flash PROM Jumpers

TABLE 12-2 Flash PROM Jumper Settings

Jumper	Pins 1 + 2 Select	Pins 2 +3 Select	Default Jumper on Pins	Signal Controlled
J3001	Write protect	Write Enable	1 + 2	FLASH PROM PROG ENABLE
J3002	Select	No select	1 + 2	XOR LOGIC SET

Functional Description

This appendix provides an overview of the hardware and software of the Netra t 1400/1405 system. It provides information about the hardware of the system and of the hardware resources visible to the software.

A.1 System

The system is an UltraSPARC port architecture (UPA) based machine that uses peripheral component interconnect (PCI) as the I/O expansion bus. The CPU modules and UPA-to-PCI bridge (U2P) ASIC communicate with each other using the UPA protocol. The CPU modules and the U2P ASIC are UPA master-slave devices. The QSC ASIC routes UPA requests packets through the UPA address bus and controls the flow of data using the XB9++ ASIC and the CBT switching network.

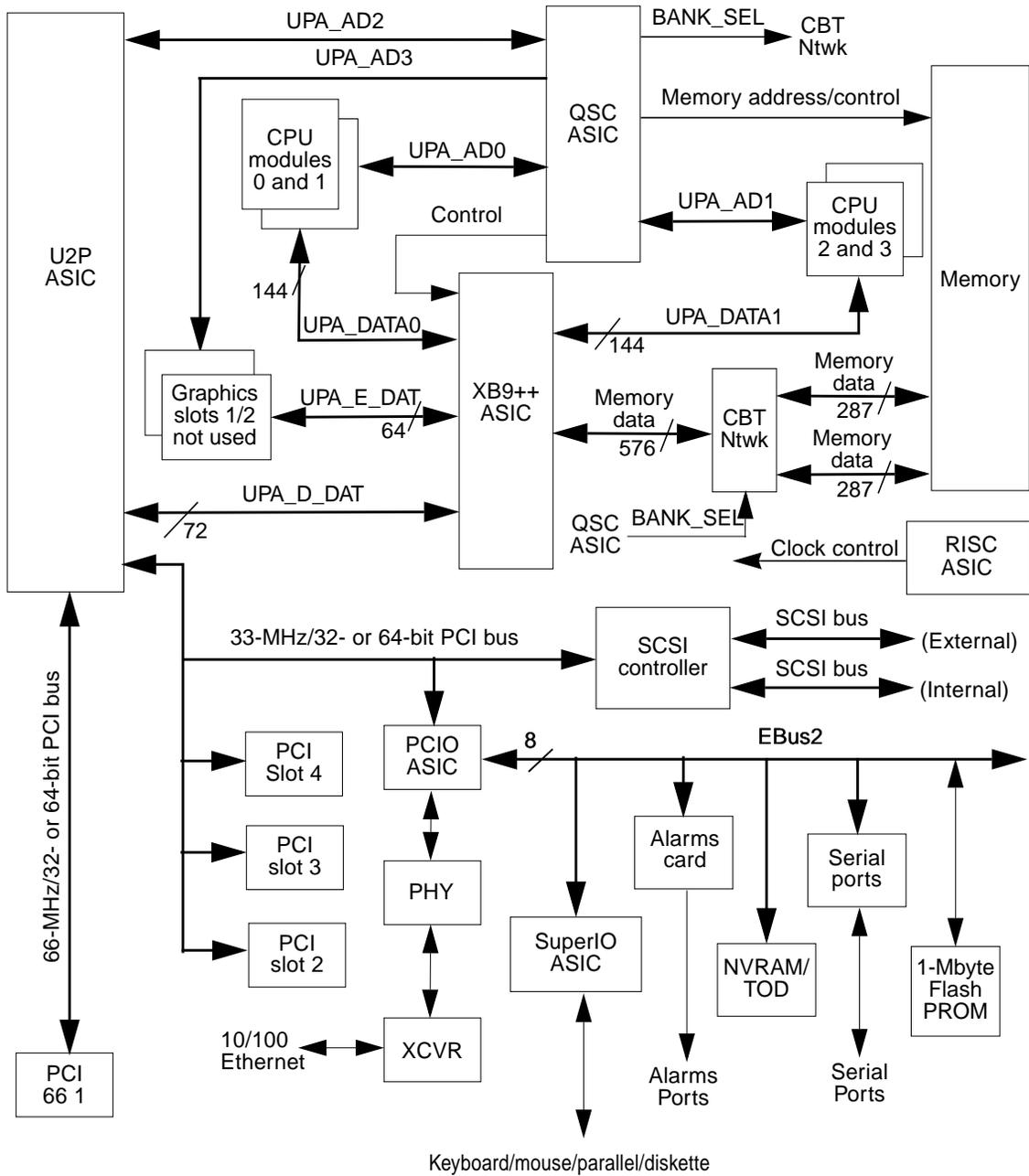


FIGURE A-1 Block Diagram of the Netra t 1400/1405 System

A.1.1 UltraSPARC Port Architecture

The UPA provides a packet-based interconnection between the UPA clients, that is, the CPU modules and U2P ASIC. Electrical interconnection is provided through four address buses and four data buses.

TABLE A-1 UPA Interconnects

Bus Name	Bus Designation	Function
UPA address bus 0	UPA_AD0	A full 36-bit bidirectional bus that connects the QSC ASIC to CPU modules 0 and 1
UPA address bus 1	UPA_AD1	A full 36-bit bidirectional bus that connects the QSC ASIC to CPU modules 2 and 3
UPA address bus 2	UPA_AD2	A full 36-bit bidirectional bus that connects the QSC ASIC to the U2P ASIC
UPA address bus 3	UPA_AD3	Not used
UPA data bus 0	UPA_DATA0	A bidirectional 144-bit data bus (128 bits of data and 16 bits of ECC) that connects CPU modules 0 and 1 to the XB9++ ASIC
UPA data bus 1	UPA_DATA1	A bidirectional 144-bit data bus (128 bits of data and 16 bits of ECC) that connects CPU modules 2 and 3 to the XB9++ ASIC
UPA data bus 2	UPA_D_DAT	A bidirectional 72-bit data bus (64 bits of data and 8 bits of ECC) that connects the U2P ASIC to the XB9++ ASIC
UPA data bus 3	UPA_E_DAT	Not used

TABLE A-1 lists the interconnections between the UPA and UPA clients, TABLE A-2 lists the UPA port identification assignments, and FIGURE A-2 illustrates how the UPA address and data buses are connected between the UPA and the UPA clients.

TABLE A-2 UPA Port Identification Assignments

UPA Slot Number	UPA Port ID <4:0>
CPU module slot 0	0x0
CPU module slot 1	0x1
CPU module slot 2	0x2
CPU module slot 3	03
U2P ASIC	0x1F

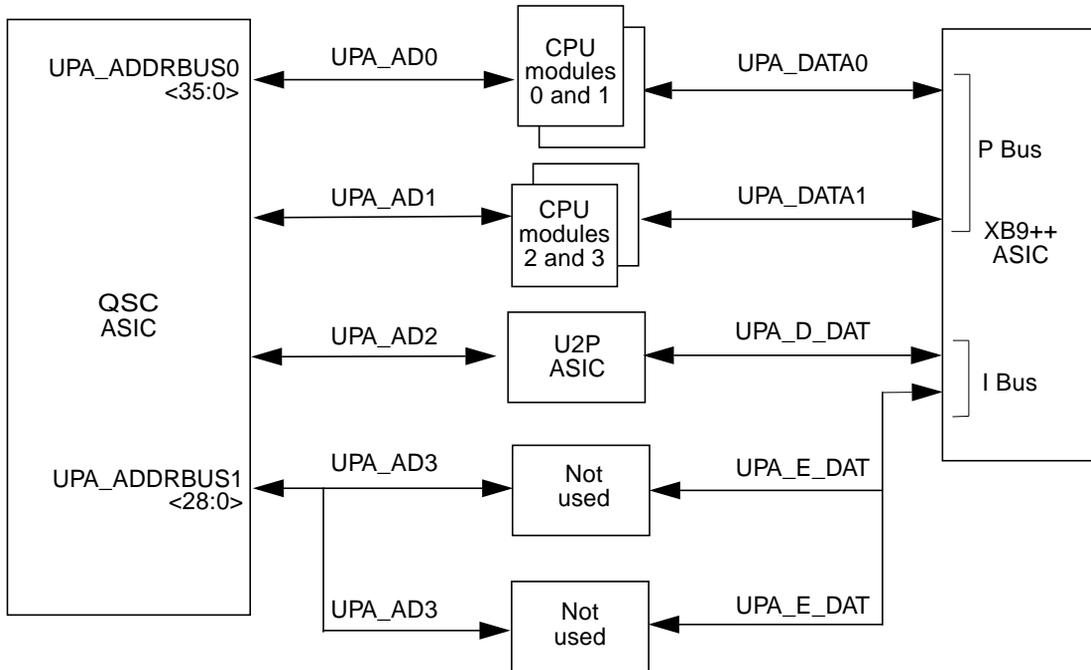


FIGURE A-2 UPA Address and Data Buses Functional Block Diagram

A.1.2 PCI Bus

The PCI bus is a high-performance 32-bit or 64-bit bus with multiplexed address and data lines. The PCI bus provides electrical interconnection between highly integrated peripheral controller components, peripheral add-on devices, and the processor-memory system.

There are two PCI buses (FIGURE A-1):

- a one-slot, 3.3Vdc, 64-bit or 32-bit, 66MHz or 33MHz bus
- a three-slot, 5.0Vcd, 64-bit or 32-bit, 33MHz bus (one slot is 32-bit only)

Both buses are controlled by the U2P ASIC. There are also two on-board controllers, the Symbios 53C876 SCSI controller and the PCI to Ebus/Ethernet controller (PCIO) ASIC, on the 33MHz PCI bus.

A.1.2.1 PCI Cards

PCI cards have a variety of configurations. Not all cards will fit or operate in all PCI slots, so it is important to know the specifications of your PCI cards and the types of cards supported by each PCI slot in the system.

PCI cards can be as short as 6.875 in. (17.46 cm) in length and are designated as *short*. The maximum length of PCI card that can be accommodated is 12.28 in. (31.19 cm) and cards of this type are designated *long*. Each PCI slot can accommodate either a short or long card.

Older PCI cards communicate over 32-bit PCI buses, while many newer cards communicate over wider, 64-bit buses. PCI slot 1 accepts 32-bit PCI cards only and PCI slots 2, 3 and 4 accept either 32-bit or 64-bit cards.

Older PCI cards operate at 5VDC while newer cards operate at 3.3VDC. These cards must be used in slots that are designed to operate at the correct voltage. In addition, PCI cards designated as *universal* will operate at either 3.3V or 5V and so can be used in either type of slot. The system provides three slots for 5-volt cards and one slot for a 3.3-volt card. All four PCI slots accept universal. cards.

Most PCI operate a clock speeds of 33MHz, while some newer cards operate at 66MHz. All four PCI slots will accept 33MHz cards, A 66MHz card can be used only in PCI slot 4.

TABLE A-3 lists the mapping of the PCI slots to the two PCI buses, and the types of PCI cards supported in each slot.

TABLE A-3 PCI Slot-to-Bus Mapping

	PCI 4	PCI 3	PCI 2	PCI 66 1
PCI Bus	0	0	0	1
Slot Width (bits)	32	64	64	64
Card Type (bits)	32	32 or 64	32 or 64	32 or 64
Clock Rates (MHz)	33	33	33	66
DC Voltage (VDC)	5.0 ¹	5.0 ¹	5.0 ¹	3.3 ¹
Card Size	Short or Long	Short or Long	Short or Long	Short or Long

1. A universal PCI card can be used in any slot.

A.1.2.2 UPA-to-PCI Bridge ASIC

The U2P ASIC controls the PCI buses. It forms the bridge from the UPA bus to the PCI buses. For a brief description of the U2P ASIC, see Section A.10.4 “U2P” on page A-29.

A.1.3 SCSI Controller

The SCSI controller provides electrical connection between the mother board and separate internal and external SCSI buses. The controller also provides the SCSI bus control.

SCSI channel A is used to interface to internal devices. SCSI channel B is used to interface to external devices.

A.1.4 PCI-to-EBus/Ethernet Controller ASIC

The PCIO ASIC connects the PCI bus to the EBus. This enables communication between the PCI bus and all miscellaneous I/O functions, as well as the connection to slower, on-board functions. The PCIO ASIC also embeds the Ethernet controller. For a brief description of the PCIO ASIC, see Section A.10.3 “PCIO” on page A-29.

A.2 UltraSPARC II Processor

The UltraSPARC II processor is a high-performance, highly-integrated super-scalar processor implementing the SPARC-V9 64-bit RISC architecture. The UltraSPARC II processor 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 UltraSPARC II processor module provides 4Mbyte Ecache.

UltraSPARC II processor characteristics and associated features include:

- SPARC-V9 architecture compliance
- Binary compatibility with all SPARC application code:
- Multi-processing support
- Snooping or directory-based protocol support
- Four-way superscalar design with nine execution units
- Four integer execution units
- Three floating-point execution units
- 64-bit address pointers
- 16-Kbyte non-blocking data cache
- 16-Kbyte instruction cache
- Single cycle branch following
- Power management
- Software prefetch instruction support
- Multiple outstanding requests

A.3 Memory System

The system's motherboard provides sixteen slots for high-capacity, dual inline memory modules (DIMMs). Eight of the sixteen slots are located on the motherboard and the other eight are located on the memory riser assembly. The system supports standard 168-pin, 5-volt, 60-nanosecond DIMMs of 64 and 256-Mbyte capacities. Total system memory capacity ranges from 256 Mbytes to 4 Gbytes.

Memory slots are organized into four banks (bank 0 through bank 3), with each bank comprising four slots. Each bank is divided between the motherboard and the memory riser assembly. Consequently, the DIMMs must be installed in groups of four (bank), with two DIMMs being installed in a motherboard bank and two DIMMs being installed in the associated memory riser assembly bank. Individual DIMMs within a bank should be of equal capacity. The system reads from, or writes to, all four DIMMs in a bank simultaneously.



Caution – Failure to populate a DIMM bank with DIMMs of equal capacity will result in inefficient use of memory resource or system failure.

The memory system (FIGURE A-3) consists of four components:

- QSC ASIC
- XB9++ ASIC
- CBT switching network
- Memory module

The QSC ASIC generates memory addresses and control signals to the memory module. The QSC ASIC also coordinates the two 288-bit wide data bus (MEM_DATA0 and MEM_DATA1) data transfers between the XB9++ and the memory module. Co-ordination is provided by the BANK_SEL control signal to the CBT switching network.

The XB9++ ASIC exchanges

- 144-bit wide bus data with the two CPU data buses, UPA_DATA0 and UPA_DATA1
- 72-bit wide bus data (UPA_D_DAT) with the U2P ASIC

This data is placed on a 576-bit wide bus and exchanged with the CBT switching network where it is divided onto two 276-bit wide data buses and exchanged with the memory module.

FIGURE A-3 is a functional block diagram of the memory system. FIGURE A-4 illustrates the memory module arranged in four banks, 0, 1, 2 and 3. FIGURE A-5 shows the motherboard DIMM slot mapping, and FIGURE A-6 shows the riser board DIMM slot mapping.

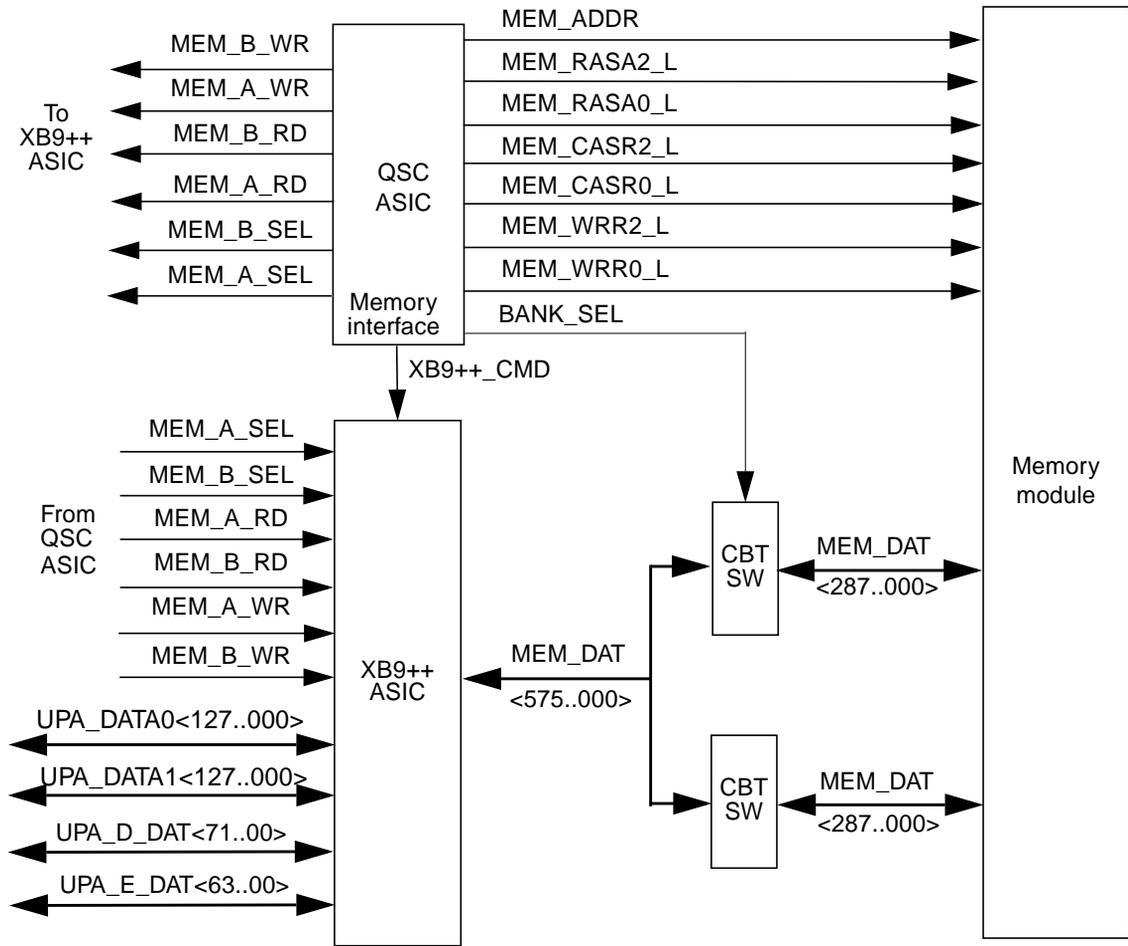


FIGURE A-3 Memory System Functional Block Diagram

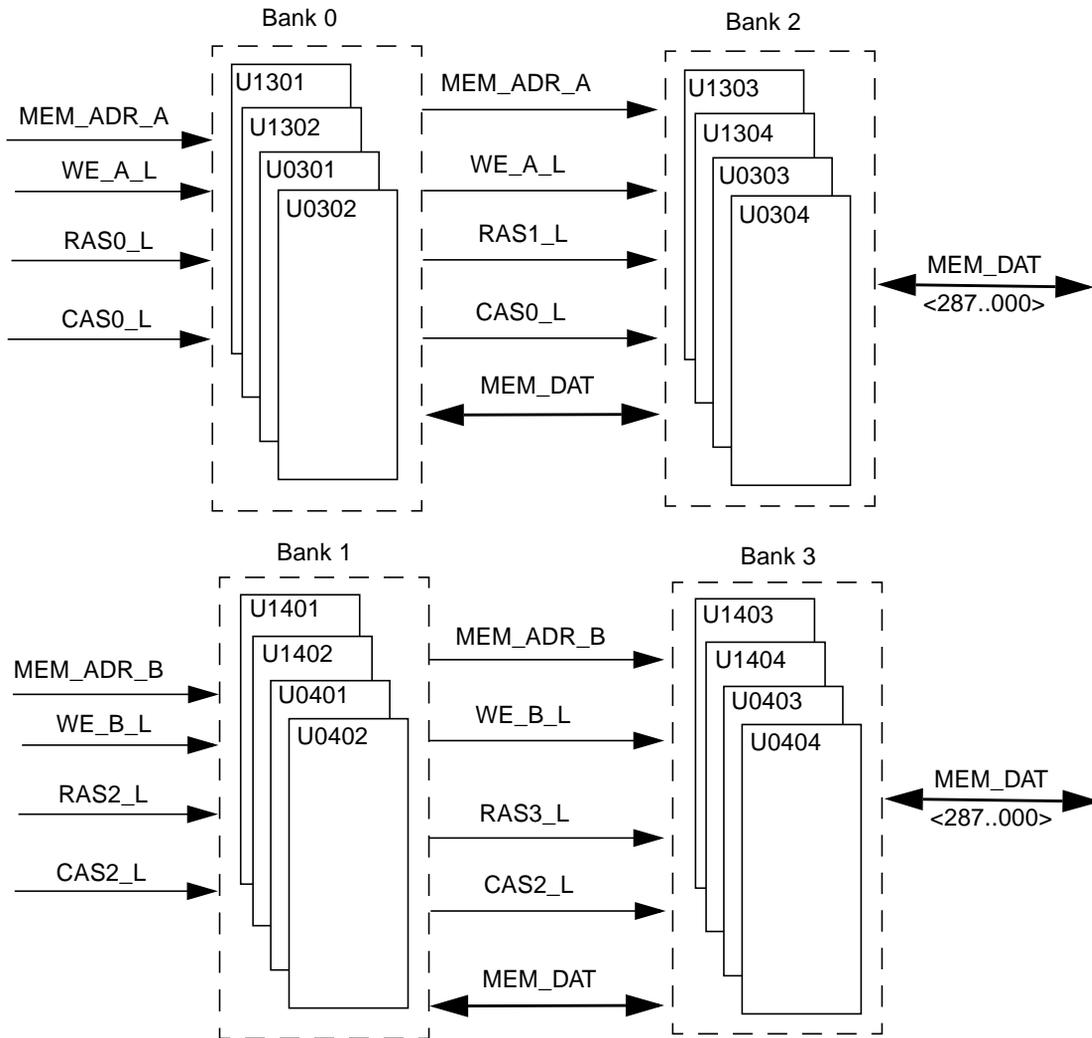


FIGURE A-4 Memory Module Functional Block Diagram

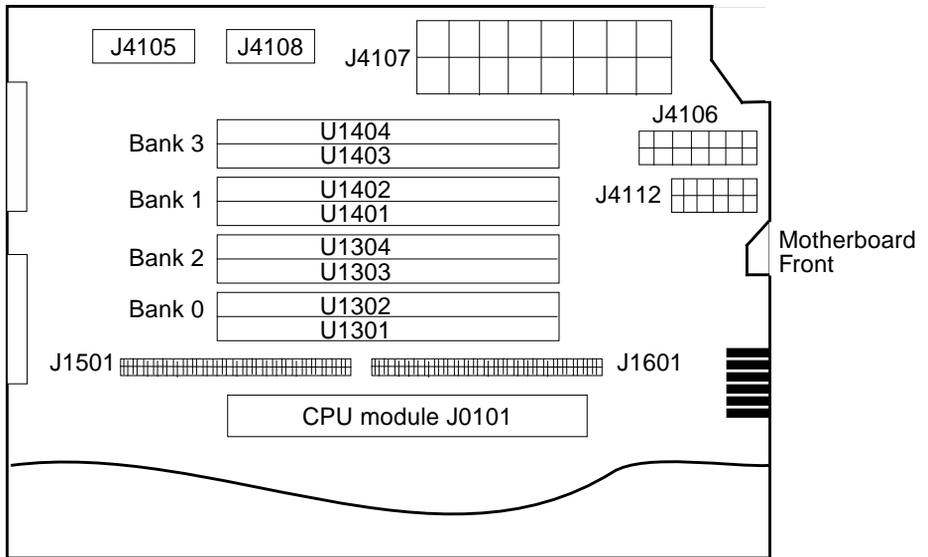


FIGURE A-5 DIMM Mapping (Motherboard)

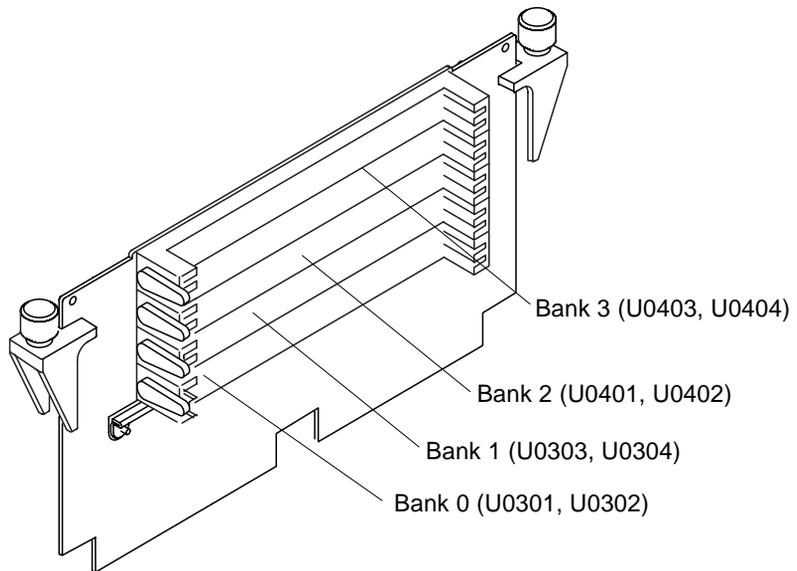


FIGURE A-6 DIMM Mapping (Memory Riser Assembly)

A.3.1 DIMM

The memory module is a 60ns, fast-page-mode DIMM. Two DIMM densities are supported in the system: 64- and 256-Mbyte. The minimum memory capacity is 256Mbyte (four 64-Mbyte DIMMs) and the maximum memory capacity is 4Gbytes (sixteen 256-Mbyte DIMMs).

A block of data (64bytes) always comes from one bank of DIMMs. An error code, containing the address of where a failure occurred as well as the associated syndrome, is logged when an ECC error occurs.

There are a total of four DIMM banks in the system. TABLE A-4 matches DIMM banks to DIMM U numbers. FIGURE A-5 on page A-11 and FIGURE A-6 on page A-11 illustrate the bank numbering schemes for the motherboard and riser card, respectively.

TABLE A-4 DIMM Bank-to-U-Number Mapping

Bank	U Number (Motherboard)	U Number (Riser Card)
0	U1301 and U1302	U0301 and U0302
2	U1303 and U1304	U0303 and U0304
1	U1401 and U1402	U0401 and U0402
3	U1403 and U1404	U0403 and U0404

TABLE A-5 Memory Addressing

DIMM Size/Quantity	Memory Bank	Addressing
64 Mbyte/4	0	0 x 0000.0000 to 0 x 3fff.ff00
64 Mbyte/4	1	0 x 0000.0040 to 0 x 3fff.ff40
64 Mbyte/4	2	0 x 0000.0080 to 0 x 3fff.ff80
64 Mbyte/4	3	0 x 0000.00c0 to 0 x 3fff.ffc0
256 Mbyte/4	0	0 x 0000.0000 to 0 x ffff.ff00
256 Mbyte/4	1	0 x 0000.0040 to 0 x ffff.ff40
256 Mbyte/4	2	0 x 0000.0080 to 0 x ffff.ff80
256 Mbyte/4	3	0 x 0000.00c0 to 0 x ffff.ffc0

A.3.1.1 Memory System Timing

The QSC ASIC generates the memory address and control signals to the memory system. The UPA clock is the clock source for the QSC ASIC and operates at up to 120MHz.

A.4 Peripherals

The following peripherals are supported by the system:

- Hard Disk Drive
- CD-ROM Drive (optional)
- Tape Drive (optional)

The system unit supports up to four fixed disk drives. An optional CD-ROM drive and 4mm tape drive are also supported.

A.4.1 Hard Disk Drives

The system unit supports four UltraSCSI disk drives with a capacity of 18 Gbyte.

All disk drives have a 3.5in form factor and a single connector configuration.

A spud bracket is used to mount the drive in its own dedicated slot in the front of the system. TABLE A-6 lists the supported disk drives.

- The *18Gb Disk Drive Specifications* (part number 806-1057-10), provides installation instructions, power requirements and performance data for the 18Gbyte disk drive.

TABLE A-6 Supported Disk Drive

Form Factor Dimension	Disk Drive Capacity	Wide	RPM	Seek Time
3.5in (88.9mm)	18Gbyte	Yes	10,000	8.5ms

A.4.2 Optional CD-ROM Drive

The CD-ROM drive is a standard device with multimedia features. This includes multi-session capability and fast access (32x) for image and video data. The CD-ROM drive dimensions are 149.5mm (5.94in.) x 196mm (7.78in.) x 43mm (1.71in.) and the drive slot is a standard 1.6-in (40.64-mm) bay that uses industry standard bezels.

A.4.3 Optional 4mm Tape Drive

The 4mm tape drive is equipped with a single-ended SCSI controller and a 1Mbyte on-drive buffer. The *DDS-3 Tape Drive Specifications*, part number 802-7791, provides cleaning, jumper setting and tape cartridge instructions for the 4mm DDS-3 tape drive.

A.5 Parallel Port

The parallel port is supported by an IEEE 1284-compatible parallel port controller located on the SuperIO ASIC. The parallel port controller is an industry standard controller that supports the ECP protocol and achieves a 2Mbps data transfer rate. The parallel port controller interface also supports:

- **Centronics** – Provides a widely accepted parallel port interface
- **Compatibility** – Provides an asynchronous, byte-wide forward (host to peripheral) channel with data and status lines used according to their original definitions
- **Nibble mode** – Provides an asynchronous, reverse (peripheral-to-host) channel, under control of the host. Data bytes are transmitted as two sequential, four-bit nibbles using four peripheral-to-host status lines

A.5.1 Parallel Port Cables

The parallel port cable is IEEE1284 compliant and consists of 18 pairs of signal wires that are double shielded with braid and foil. The maximum length of the parallel port cable is 2meters.

A.5.2 Electrical Characteristics

Drivers operate at a nominal 5VDC transistor-transistor logic (TTL) levels. The maximum open circuit voltage is 5.5VDC and the minimum is -0.5VDC. A logic high-level signal is at least 2.4VDC at a source current of 0.32mA and a logic low-level signal is no more than 0.4VDC at a sink current of 14mA.

Receivers also operate at a nominal -5VDC TTL levels and can withstand peak voltage transients between -2VDC and 7VDC without damage or improper operation. The high-level threshold is less than or equal to 2.0VDC and the low-level threshold is at least 0.8VDC. Sink current is less than or equal to 0.32mA at 2.0VDC and source current is less than or equal to 12mA at 0.8VDC.

A.6 Serial Ports

The system unit incorporates two serial ports, each of which is synchronous and asynchronous with full modem controls. All serial port functions are controlled by a serial port controller that is electrically connected to the system through the EBus. Line drivers and line receivers control the serial port signal levels and provide RS232 and RS423 compatibility. Each serial port interfaces through its own DB-25 connector.

The major features of each serial port include:

- Two fully-functional synchronous and asynchronous serial ports
- DB-25 connectors
- Increased baud (to 384Kbaud synchronous, 460.8Kbaud asynchronous)
- Variable edge rate for greater performance
- EBus interface

FIGURE A-7 shows a functional block diagram of the serial ports.

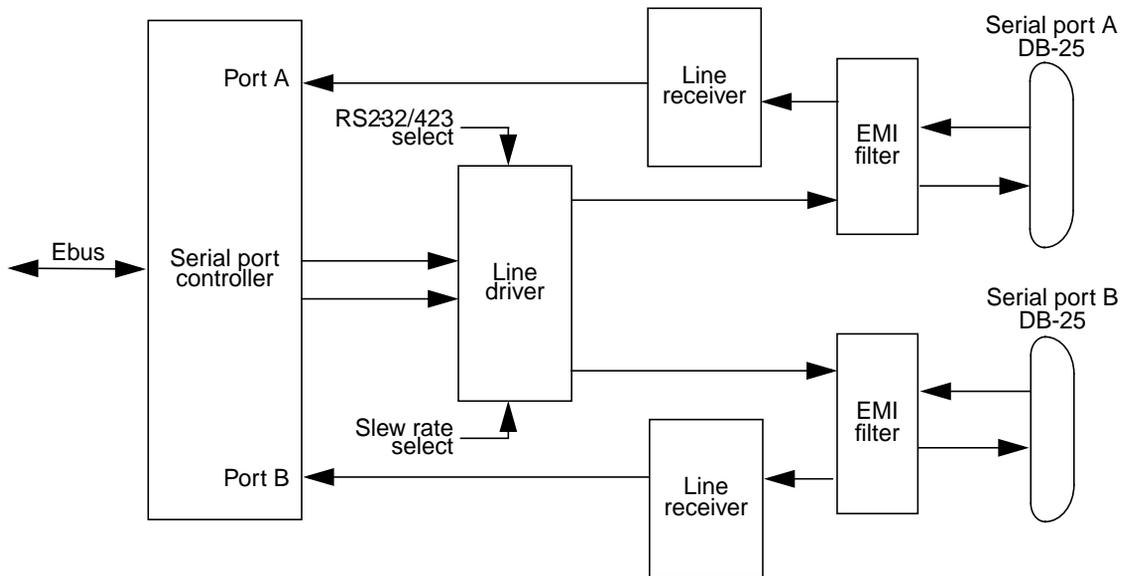


FIGURE A-7 Serial Port Functional Block Diagram

A.6.1 Serial Port Components

Serial port components include a serial port controller, line drivers and the line receivers.

The serial port controller contains 64-byte buffers on both the input and output. This enables the serial port to require less CPU bandwidth. Interrupts are generated when the buffer reaches 32 bytes or half full. The serial port controller contains its own crystal oscillator that supports up to 921.6Kbaud.

The line drivers and line receivers are compatible with both RS232 and RS423. Two system board jumpers are used to set the line drivers and line receivers to either RS232 or RS423 protocols. The line driver slew rate is also programmable. At 100Kbaud or more, the slew rate is set to 10VDC/ μ s. At less than 100Kbaud, the slew rate is set to 5VDC/ μ s.

A.6.2 Serial Port Functions

The serial port provides a variety of functions. Modem connection to the serial port enables access to the internet. Synchronous X.25 modems are used for telecommunications in Europe. An ASCII text window is accessible through the serial port on non-graphic systems.

Low speed printers, buttonboxes (for CAD/CAM applications), and devices that function like a mouse are also accessible through the serial port.

The additional speed of the serial port can be used to execute communications with a CSU/DSU for a partial T1 line to the internet at 384Kbaud.

A.6.3 EIA Levels

Each serial port supports both RS-232 and RS-423 protocols. RS-232 signaling levels are between -3VDC and -15VDC and +3VDC and +15VDC. A binary 1 (001_2) is anything greater than +3VDC and a binary 0 (000_2) is anything less than -3VDC. The signal is undefined in the transition area between -3VDC and +3VDC. The line driver switches at -10VDC and +10VDC with a maximum of -12VDC and +12VDC in RS-232 mode.

RS-423 is similar except that signaling levels are between -4VDC and -6VDC and +4VDC and +6VDC. The line driver switches at -5.3VDC and +5.3VDC with a maximum of -6VDC and +6VDC.

Switching from RS-232 to RS-423 protocol is accomplished by changing jumpers J2604 and J2605. Jumper positions 1 and 2 are for RS-232 and jumper positions 2 and 3 are for RS-423 (see Chapter 12 "Motherboard Jumpers").

The preferred signaling protocol is RS-423. The higher voltages of RS-232 make it difficult to switch at the higher baud rate. The maximum rate for RS232 is approximately 64Kbaud while the maximum rate for RS423 is 460.8Kbaud.

The system default is set to RS-232.

A.6.3.1 Synchronous Rates

The serial synchronous ports operate between 50Kbaud and 256Kbaud when the clock is generated from the serial port controller. When the clock is generated from an external source, the synchronous ports operate at up to 384Kbaud. Clock generation is accurate within 1 percent for any rate that is generated between 50Kbaud and 256Kbaud.

A.6.3.2 Asynchronous Rates

The serial asynchronous ports support twenty rates that are all exact divisors of the crystal frequency (with exception of 110, which is off by less than 1 percent). Rates include 50, 75, 110, 200, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200, 153600, 230400, 307200 and 460800 baud.

A.6.3.3 Slew Rate and Cable Length

The maximum RS-423 cable length is 118feet (30meters) and the maximum RS-232 cable length is 50feet (15.24meters). The slew rate changes depending on the speed. For speeds less than 100Kbaud, the slew rate is set at 5VDC/ μ s. For speeds greater than 100Kbaud, the slew rate is increased to 10VDC/ μ s. This allows maximum performance for the greater baud rate and better signal quality at the lesser baud rate.

A.7 Ethernet

The system unit supports 10Mbps, 10BASE-T, twisted-pair Ethernet and 100Mbps, 100BASE-T. Twisted-pair Ethernet is provided through an 8-pin RJ45 connector.

The Ethernet circuitry design is based on a Quality Semiconductor PHY.

The PHY chip integrates a 100BASE-T physical coding sub-layer (PCS) and a complete 10BASE-T module in a single chip.

The 100BASE-X portion of the PHY IC consists of the following functional blocks:

- Transmitter
- Receiver
- Clock generation module
- Clock recovery module

The 10BASE-T section of the PHY IC consists of the 10Mbps transceiver module with filters.

The 100BASE-X and 10BASE-T sections share the following functional characteristics:

- PCS control
- IEEE 802.3u auto negotiation

The following sections provide brief descriptions of the following:

- Automatic negotiation
- Connectors

A.7.1 Automatic Negotiation

Automatic negotiation controls the cable when a connection is established to a network device. It detects the various modes that exist in the linked partner and advertises its own abilities to configure automatically the highest performance mode of inter-operation, namely, 10BASE-T, 100BASE-TX, or 100BASE-T4 in half- and full-duplex modes.

The Ethernet port supports automatic negotiation. At power up, an on-board transceiver advertises 100BASE-TX in half-duplex mode, which is configured by the automatic negotiation to the highest common denominator based on the linked partner.

A.7.1.1 External Cables

The RJ45 Ethernet port supports a Category 5 UTP cable for the 100BASE-T, and a Category 3, 4, or 5 UTP cable for the 10BASE-T operation.

Note – The maximum cable segment lengths for the 100BASE-TX and 10BASE-TX are 109yards (100meters) and 1094yards (1000meters), respectively.

A.8 Alarms Subsystem

The Alarms subsystem comprises:

- Alarms Card, incorporating a LOMlite lights out management module
- LED printed circuit board

A.8.1 Alarms Functionality

The Alarms Card interfaces with the motherboard through an EBus edge connector slot. A PCI-style bracket attached to one edge provides the external interfaces at the rear of the chassis. Internal interfaces provide connections to the power supply assembly and to the LED pcb on the front panel.

The alarms subsystem provides the following functionality:

- Serial interface
- Host watchdog
- Status inputs
 - Power inlet and output rail monitoring for three PSUs
- Front panel indicators
 - Front panel fault indicator
 - Three configurable alarm relays with front panel indicators
 - Two power inlet front panel indicators
- Power control
 - On and standby outputs
- Fan monitors
 - Speed monitoring of four fans

A.8.1.1 Light-Out Management Module

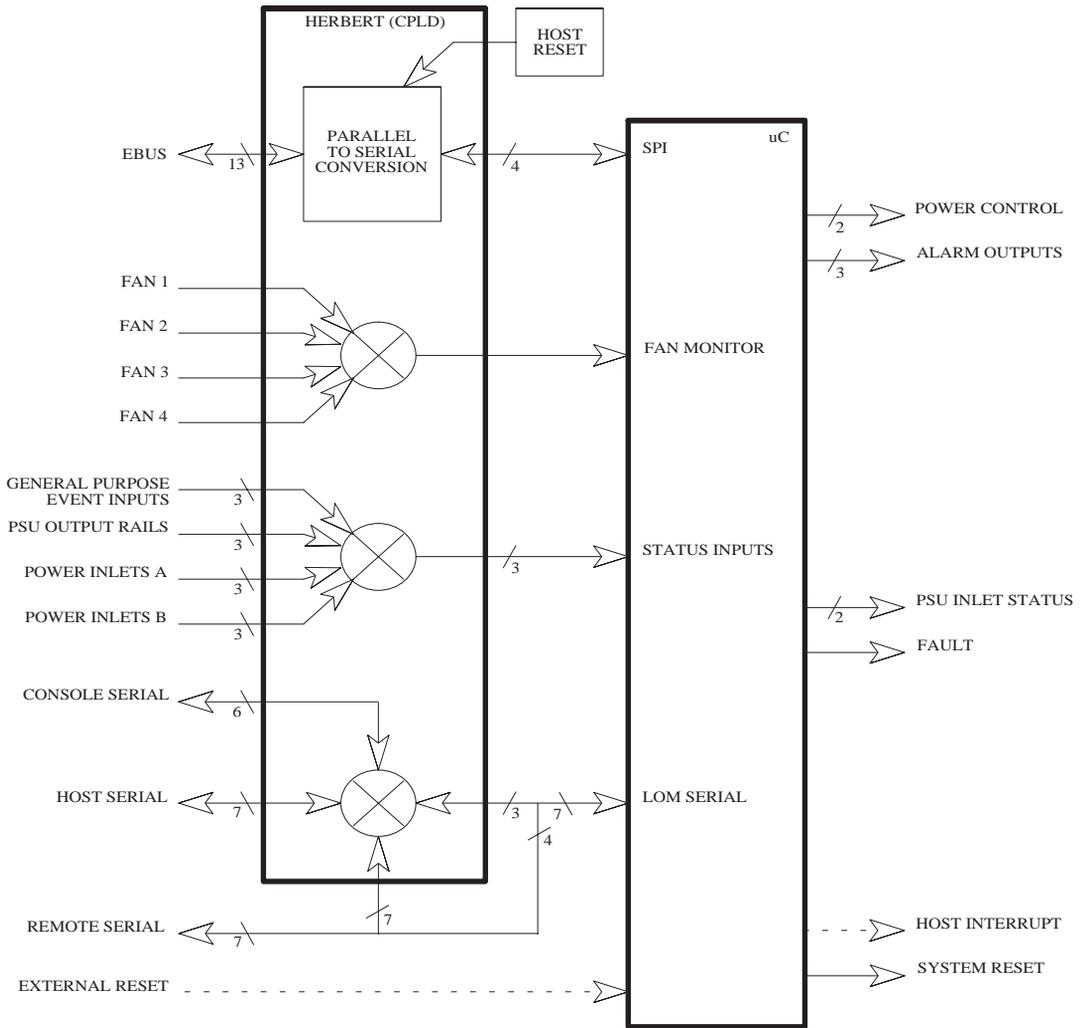


FIGURE A-8 LOMlite Functional Block Diagram

A.8.1.2 EBus Connector

The Alarms Card interfaces with the motherboard through an EBus edge connector (AMP Connector Assembly, Dual Position, 0.050 Series, Standard Edge. Amp Part No. 650090-7). TABLE A-7 lists the Ebus Connector pinout.

TABLE A-7 Ebus Connector Pinout

Pin	Signal Name	I/O	Description
1	GND		0V return
2	GND		0V return
3-5			Not used
6	GND		0V return
7	GND		Ground
8-11			Not used
12	GND		Ground
13			Not used
14	GND		0V return
15	EB_ADR6	Input	EBus address bit 6
16	EB_ADR7	Input	EBus address bit 7
17	GND		0V return
18	EB_ADR5	Input	EBus address bit 5
19	EB_ADR4	Input	EBus address bit 4
20	EB_ADR3	Input	EBus address bit 3
21	EB_ADR2	Input	EBus address bit 2
22	EB_ADR1	Input	EBus address bit 1
23	EB_ADR0	Input	EBus address bit 0
24	VCC		Host + 5V supply rail
25	PROM_CS	Input	EBus Fcode PROM chip select
26			Not used
27	LOM_CS	Input	EBus LOM chip select
28			Not used
29	GND		0V return
30	EB_WR	Input	EBus write strobe
31	EB_DAT6	Bidirectional	EBus data bit 6

TABLE A-7 Ebus Connector Pinout (Continued)

Pin	Signal Name	I/O	Description
32	EB_RD	Input	Ebus read strobe
33	EB_DAT4	Bidirectional	Ebus data bit 4
34	EB_DAT7	Bidirectional	Ebus data bit 7
35	EB_DATA2	Bidirectional	Ebus data bit 2
36	EB_DAT5	Bidirectional	Ebus data bit 5
37	EB_DAT0	Bidirectional	Ebus data bit 0
38	EB_DAT3	Bidirectional	Ebus data bit 3
39	GND		0V return
40	EB_DAT1	Bidirectional	Ebus data bit 1
41			Not used
42	GND		0V return
43			Not used
44	CFRQ		Not used (grounded)
45			Not used
46	PDRQ		Not used (grounded)

A.8.1.3 Power Supply Interface

The power supply interface supplies the Alarms Card with the standby supply rail together with power supply status information, system fan monitoring signals and access to power control signals. TABLE A-8 lists the connector pinout:

TABLE A-8 Power Supply Interface Connector Pinout

Pin	Signal Name	I/O	Description
1	FAN1	Input	Fan1 tachometer
2	FAN2	Input	Fan2 tachometer
3	FAN3	Input	Fan3 tachometer
4	FAN4	Input	Fan4 tachometer
5	INA3	Input	PSU 3 inlet A present
6	INB3	Input	PSU 3 inlet B present
7	OUT3	Input	PSU 3 outputs present

TABLE A-8 Power Supply Interface Connector Pinout (*Continued*)

Pin	Signal Name	I/O	Description
8	INA2	Input	PSU 2 inlet A present
9	INB2	Input	PSU 2 inlet A present
10	OUT2	Input	PSU 2 outputs present
11	INA1	Input	PSU 1 inlet A present
12	INB1	Input	PSU 1 inlet A present
13	OUT1	Input	PSU 1 outputs present
14	AVCC		Standby +5V supply rail
15	GND		0V return
16	RST	Bidirectional	PSU/system reset
17	STBY	Bidirectional	Host power-down
18	ON	Bidirectional	Host power-up

A.8.1.4 LED Card Interface

The Alarms Card provides the system interface to the LED card which comprises outputs to front panel indicators and inputs from the front panel switch. TABLE A-9 lists the pinout.

TABLE A-9 LED Card Interface Connector Pinout

Pins	Signal Name	I/O	Description
1	VCC		Host +5V supply rail
2	FAULT	Output	Fault output
3	LED1	Output	Alarm 1 indicator
4	LED3	Output	System alarm indicator
5	LED2	Output	Alarm 2 indicator
6	GND		0V return
7	SUPA	Output	Supply active indicator
8	STBY	Bidirectional	Host power-down
9	SUPB	Output	Supply B active indicator
10	ON	Bidirectional	Host power-up

A.8.1.5 External Ports

For details of the pinout for the external LOM serial port and the alarms service port, see Section 10.6 “Alarms Ports” on page 10-10.

A.9 SCSI

The system unit implements a small computer system interface (SCSI) UltraSCSI (Fast-20) parallel interface bus. The UltraSCSI is based on the SCSI-3 parallel interface and provides the following:

- Efficient peer-to-peer I/O bus devices
- Definition of the mechanical, electrical, and timing specification to support transfer rates of 20, 40, or 80Mbyte/s corresponding to the data path width of an 8-, 16-, or 32-bit bus, respectively
- Peak bandwidth of 40Mbyte/s (with implemented 16-bit bus width)

UltraSCSI is also called Fast-20 SCSI and the two names are used synonymously.

The SCSI subsystem is based upon single-ended UltraSCSI using a 16-bit-wide bus. UltraSCSI, having an implemented 16-bit bus width, supports a peak bandwidth of 40Mbps.

The maximum cumulative signal path length between terminators is 3meters when connecting up to four external devices (one host initiator and three targets). The maximum cumulative signal path length between terminators is 1.5meters when using from five to eight external devices (one host initiator and four to seven targets).

The system incorporates a dual-channel host adapter. One channel is used exclusively to provide an internal SCSI bus, and the second provides the external SCSI bus. The internal bus is terminated at one end on the motherboard and at the other on the CD-ROM adapter. The external bus is terminated at the host adapter and at the 68-pin external connector. Connecting an external device disables the on-board terminators near the 68-pin connector to extend the bus and allowing the last external device to provide the termination. FIGURE A-9 shows the SCSI bus configuration.

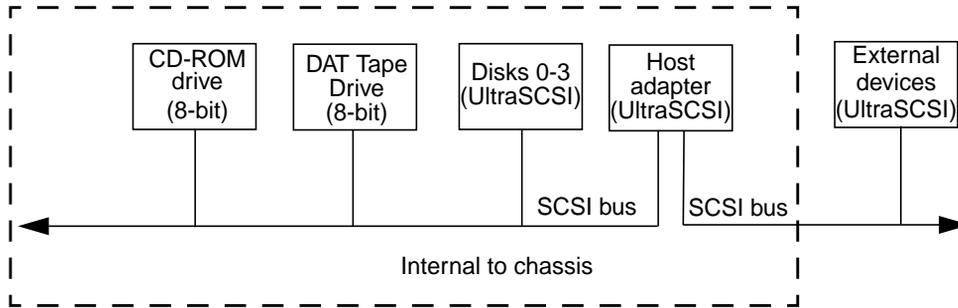


FIGURE A-9 Configuration of the SCSI Bus

A.9.1 Host Adapter

The host adapter is a dual-channel Symbios 53C876 PCI-SCSI I/O processor IC. The host adapter and all target devices comply with the UltraSCSI single-ended drivers and receivers characteristics. The electrical characteristics of the output buffers include:

- V_{OL} (output low) equals 0 to 0.5VDC with I_{ol} at 48mA (signal asserted)
- V_{OH} (output high) equals 2.5 to 3.7VDC (signal negated)
- t_{rise} (rising slew rate) equals 520 mV/nanosecond maximum (0.7 to 2.3VDC)
- t_{fall} (falling slew rate) equals 520mV/nanosecond maximum (2.3 to 0.7VDC).

The UltraSCSI electrical characteristics for the host adapter and target device include:

- V_{IL} (input low) equals 1.0VDC maximum (signal true)
- V_{IH} (input high) equals 1.9VDC minimum (signal false)
- I_{IL} (input low current) equals $\pm 20\mu A$ at V_i equals 0.5VDC
- I_{IH} (input high current) equals $\pm 20\mu A$ at V_i equals 2.7VDC
- Minimum input hysteresis equals 0.3VDC

A.9.2 Supported Target Devices

The SCSI subsystem supports a maximum of four internal devices, including the host adapter. A unipack with one drive or a six-pack, accommodating six drives, can be used as external devices.

A.9.3 External Cables

External UltraSCSI compliant SCSI cables are an extension of the existing shielded cables but have a impedance of 90Ω ($\pm 6\Omega$). UltraSCSI requires that the total SCSI bus length be limited to 3 meters for less than five devices and 1.5 meters for five to eight devices.

A.9.4 Internal SCSI Subassembly

The internal SCSI subassembly consists of two cable assemblies and two SCSI cards. The SCSI subassembly is attached to the motherboard using an insulation displacement connector (IDC) receptacle attached to an 80-conductor cable. The IDC receptacle mates with a right angle plug mounted on the motherboard in close proximity to the test edge connector.

The other end of the 80-conductor cable is hard-wired to the SCSI backplane. The SCSI backplane incorporates four SCA-2 connectors for mounting the hard drives and a four-circuit power connector to supply 5VDC and 12VDC power to the hard drives.

A 68-conductor cable exits the SCSI backplane carrying 27 SCSI signals and the Termpower to the internal SCSI adaptor card. The upper nine bits are terminated at the SCSI adapter and the lower 18 bits are carried to the CD-ROM and DAT Tape drives. The signals then return to the SCSI adaptor where the lower 9 bits and 9 control bits are terminated.

A.9.5 SCSI ID Selection

The SCSI devices are allocated ID addresses according to the following table:

TABLE A-10 SCSI ID Allocation

SCSI Device	ID
Controller	7
Disk 0	0
Disk 1	1
Disk 2	2
Disk 3	3
Tape	4
CD-ROM	6

A.10 ASICs

The system unit achieves a high level of integration through application-specific integrated circuits (ASICs). All ASICs are 1149.1 (JTAG) compliant. The ASICs are:

- QSC
- XB9++
- PCI-to Ebus/Ethernet controller (PCIO)
- UPA-to-PCI bridge (U2P)
- Reset, interrupt, scan and clock (RISC)

Also included in this section is a brief discussions of the SuperIO component.

A.10.1 QSC

The QSC ASIC provides system control. It controls the UPA interconnect between the major system unit components and main memory. The QSC ASIC provides the following:

- Interconnect packet receive
- Memory arbiter
- Non-cached arbiter
- Memory controller
- Snoop interface
- Coherence controller
- S_register dispatcher
- Internet packet send
- Datapatch scheduler
- EBus interface

A.10.2 XB9++

The XB9++ ASIC is a buffered memory crossbar device that acts as the bridge between the six system unit buses. The six system unit buses include two processor buses, a memory data bus and two I/O buses. The XB9++ ASIC provides the following:

Note – Referred data formats are as follows: a byte is 8bits, a halfword is 16bits, a word is 32bits, and a doubleword is 64bits.

- Six-port crossbar
- Decoupled memory port; loading and unloading of memory data can take place in parallel with other operations
- Burst transfers operate on a doubleword of data per slice
- A total of eight two-entry first-in-first-out (FIFO) devices for read data storage
- Power-up safe buses (tristated)

A.10.3 PCIO

The PCI-to-Ebus/Ethernet controller (PCIO) ASIC performs dual roles: PCI bus-to-Ebus bridging and Ethernet control. The PCIO ASIC provides the electrical connection between the PCI bus and all other I/O functions. In addition, the PCIO ASIC also contains an embedded Ethernet controller that manages Ethernet transactions and provides the electrical connection to slower on-board functions, such as the Flash PROM and the alarms module.

A.10.4 U2P

The UPA-to-PCI bridge (U2P) ASIC provides an I/O connection between the UPA bus and the two PCI buses. The U2P ASIC features include:

- Full master and slave port connection to the high-speed UPA interconnect. The UPA is a split address/data packet-switched bus that has a potential data throughput rate greater than 1 Gbyte per second. UPA data is ECC protected.
- Two physically separate PCI bus segments with full master and slave support:
 - 66MHz PCI bus segment (PCI bus A): 3.3VDC signalling, 64-bit data bus, compatible with the PCI 66MHz extensions, support for up to four master devices (at 33MHz only)
 - 33MHz PCI bus segment (PCI bus B): 5.0VDC signaling, 64-bit data bus, support for up to six master devices
- Two separate 16-entry streaming caches, one for each bus segment, for accelerating some kinds of PCI DVMA activity. Single IOMMU with 16-entry TLB for mapping DVMA addresses for both bus (IOMMU used to translate 32- or 64-bit PCI addresses into 41-bit UPA addresses)
- A mono-vector dispatch unit for delivering interrupt requests to the CPU module, including support for PCI interrupts from up to six slots, as well as interrupts from on-board I/O devices

A.10.5 RISC

The reset, interrupt, scan, and clock (RISC) ASIC implements those four functions. Generation and stretching of the reset pulse is performed in this ASIC. Interrupt logic concentrates 42 different interrupt sources into a 6-bit code that communicates with the U2P ASIC. It also integrates a JTAG controller.

The RISC ASIC features include:

- Determination of system clock frequency
- Control of reset generation
- Provision of JTAG
- Performance of PCI bus and miscellaneous interrupt concentration for U2P
- Control of flash PROM programming, frequency margining and lab console operation
- 33-MHz operation
- 160-pin MQFP package
- 3.3VDC and 5VDC supply voltage

A.10.6 SuperIO

The SuperIO is a commercial off-the-shelf component that contains two serial port controllers for keyboard and mouse, an IEEE 1284 parallel port interface and an IDE disk interface (not used). The SuperIO drives the various ports directly with some EMI filtering on the keyboard and parallel port signals. Support for mixed voltage modes and power management features are also included.

A.11 Power Subsystem

The Power subsystem comprises the three (n+1 redundancy) Power Supply Units (PSU) and the Power Distribution Assembly (PDA).

The PDA consists of a cage that houses the PSUs and the Power Distribution Board (PDB).

A.11.1 Netra t 1400

The Netra t 1400 uses 330W DC-DC power supplies that operate in the range -40VDC to -75VDC. The maximum input current at -40VDC is 17.1A and the inrush current is limited to $20A_{\text{peak}}$.

Each PSU has dual dc inputs and current is shared between the two inputs via a diode commoning arrangement

The power supply continues to regulate all outputs for approximately 5ms after removal of the dc input. Power supply output voltages are listed in TABLE A-11.

TABLE A-11 DC PSU Power Supply Output Voltages

Output	Voltage (VDC)	Max. Current (A)	Regulation Band
1	3.3	49.5	3.23 to 3.43
2	5.0	38.5	4.85 to 5.25
3	12	6.6	11.65 to 12.60
4	-12	0.4	-12.6 to -11.4
5	5.0	1.0	4.75 to 5.25

Note – The combined power of output 1 and output 2 does not exceed 300W.

A.11.2 Netra t 1405

The Netra t 1405 uses 330W AC-DC power supplies that operate within the following input voltage and frequency range:

TABLE A-12 AC PSU Operating Voltage and Frequency Range

	Minimum	Maximum
Voltage	90 V _{rms}	264 V _{rms}
Frequency	47Hz	63Hz

The maximum inrush current is limited to 80 A_{peak} on restart or after the power has been removed for 60s or longer.

The power supply continues to regulate all outputs for approximately 10ms after ac power is removed. Power supply output voltages are listed in TABLE A-13.

TABLE A-13 AC PSU Power Supply Output Voltages

Output	Voltage (VDC)	Max. Current (A)	Regulation Band
1	3.3	49.5	3.23 to 3.43
2	5.0	38.5	4.85 to 5.25
3	12	6.6	11.65 to 12.60
4	-12	0.4	-12.6 to -11.4
5	5.0	0.25	4.75 to 5.25

Note – The combined power of output 1 and output 2 does not exceed 300W.

A.11.3 Power Distribution Board

The power distribution board (PDB) distributes power between the power supplies and the rest of the system and enables hot-plugging of the PSUs.

A.11.3.1 PDB Connectors

TABLE A-14 to TABLE A-19 give the pinout for the PDB connectors.

TABLE A-14 PDB Interface Connector (P1, P2 and P3) Pinout

Pin	Signal	Pin	Signal
1	3.3V	25	
2	3.3V	26	
3	3.3V	27	5V share
4	3.3V	28	
5	3.3V	29	3.3V share
6	RTN	30	+12V
7	RTN	31	+12V
8	RTN	32	+12V
9	RTN	33	12V

TABLE A-14 PDB Interface Connector (P1, P2 and P3) Pinout (*Continued*)

Pin	Signal	Pin	Signal
10	RTN	34	
11	RTN	35	5V sbs
12	RTN	36	5V sense
13	RTN	37	PSU _n ¹ ON/L
14	RTN	38	12V
15	+5V	39	PSU _n ¹ OK
16	RTN	40	Reset /L
17	+5V	41	IN A _n ¹ OK
18	+5V	42	Fault/
19	+5V	43	12V share
20	+5V	44	IN B _n ¹ OK
21	3.3V sen RTN	45	
22	PSU <i>n</i> Con ¹	46	
23	3.3V sense	47	
24	5V sen RTN		

1. *n* = 1, 2 or 3, corresponding to P1, P2 or P3.

TABLE A-15 Motherboard Power Services Interface Connector (J4) Pinout

Pin	Signal	Pin	Signal
1	ON	8	POR/L
2	-12V	9	
3	+5V sen rtn	10	+5V sen
4	+3.3V sen rtn	11	+3.3V sen
5	RTN	12	+12V
6	RTN	13	+12V
7	not used	14	+5V sbs

TABLE A-16 Motherboard Power Supply Interface Connector (J5) Pinout

Pin	Signal	Pin	Signal
1	+3.3V	8	+3.3V RTN
2	+3.3V	9	+3.3V RTN
3	+3.3V	10	+3.3V RTN
4	+3.3V	11	+3.3V RTN
5	+5V	12	+5V RTN
6	+5V	13	+5V RTN
7	+5V	14	+5V RTN

TABLE A-17 Alarms Card Interface Connector (J6) Pinout

Pin	Signal	I/O	Description
1	FAN1	Output	Fan 1 tachometer
2	FAN2	Output	Fan 2 tachometer
3	FAN3	Output	Fan 3 tachometer
4	FAN4	Output	Fan 4 tachometer
5	INA3	Output	PSU 3 input A present
6	INB3	Output	PSU 3 input B present
7	OUT3	Output	PSU 3 outputs present
8	INA2	Output	PSU 2 input A present
9	INB2	Output	PSU 2 input B present
10	OUT2	Output	PSU 2 outputs present
11	INA1	Output	PSU 1 input A present
12	INB1	Output	PSU 1 input B present
13	OUT1	Output	PSU 1 outputs present
14	AVCC		Standby +5V supply rail
15	GND		0V return
16	RST	Bidirectional	PSU/system reset
17	STBY	Bidirectional	Host power-down
18	ON	Bidirectional	Host power-up

TABLE A-18 SCSI Subassembly Interface Connector (J10) Pinout

Pin	Signal	Pin	Signal
1	+12V	3	RTN
2	RTN	4	+5V

TABLE A-19 Fans Control Board Interface Connector (J11) Pinout

Pin	Signal	Pin	Signal
1	+12V	5	Fan T1
2	+12V	6	Fan T3
3	RTN	7	Fan T2
4	RTN	8	Fan T4

Illustrated Parts List

This appendix lists the authorized replaceable parts for the Netra t 1400/1405 system unit. FIGURE B-1 is an exploded view of the system unit with numerical references correlating to the replaceable components listed in TABLE B-1 and TABLE B-2. A brief description of each listed component is also given.

The part numbers listed in TABLE B-1 and TABLE B-2 are correct at the time of publication of this manual, but are subject to change without notice. Consult your authorized Sun sales representative or service provider to confirm a part number before ordering the replacement part.

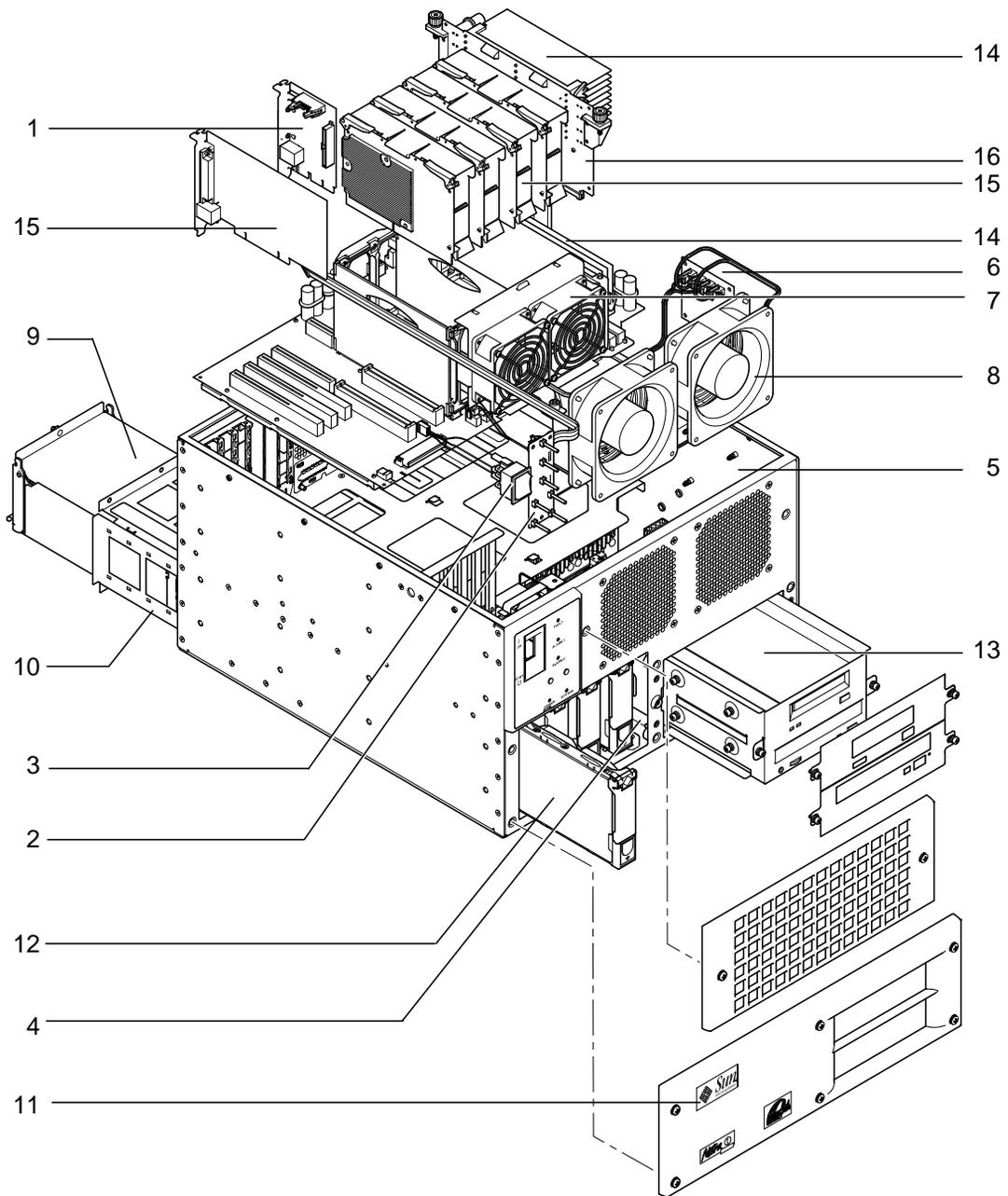


FIGURE B-1 Exploded View of the Netra t 1400/1405 System Unit

TABLE B-1 Netra t 1400/1405 Field Replaceable Components

Ref	FRU Number	Description
1	F501-5437	Alarms card
2	F501-5560	LED card with alarms card and motherboard cables
3	F530-2514	Switch and integral cable
4	F540-4311	Disk-bay assembly with SCSI backplane, cables and screws
5	F501-5125	SCSI adapter for removable media bay, with power and SCSI cables
6	F501-5561	Fan control board
7	F540-4262	CPU fan assembly with integral cables
8	F370-3976	Front system fan with integral cable (two required)
9	F300-1434	AC PSU for Netra t 1405
9	F300-1435	DC PSU for Netra t 1400
10	F370-3920	Power subframe and power distribution board assembly
	F565-1639	Set of five cables
16	F501-5218	Memory riser card
	F501-5168	Motherboard
	F300-1407	DC-to-DC Converter

TABLE B-2 Netra t 1400/1405 Optional Components

Ref	Component Number	Description
11	X7076A	Fascia kit for Netra t 1400/1405, including AC and DC badges
12	X-5237A	18GByte 10K hard disk drive
13	X-6911A	32x CD-ROM drive (lower)
13	X6912A	DDS-3 tape drive (upper)
14	X-7003A	Memory (2 x 64Mbyte DIMM)
14	X-7005A	Memory (2 x 256Mbyte DIMM)
15	X-1197A	440MHz CPU
	X7075A	Air filter pack for Netra t 1400/1405
	X7077A	LOMlite CD with alarms driver, utilities and VTS extension

TABLE B-2 Netra t 1400/1405 Optional Components *(Continued)*

Ref	Component Number	Description
X7071A		19-in. rack mounting kit comprising four flanges (340-5904), two handles and screws
X7072A		23-in. rack mounting kit four flanges (340-5905), two handles and screws
X7073A		24-in. rack mounting kit comprising four flanges (340-5906), two handles and screws
X7074A		600-mm rack mounting kit comprising four flanges (340-5907), two handles and screws
X6914A		Rack mount slide adapter kit comprising two slides, adapter for use in Sun rack and screws
X949A		Pack of 10 Wago connectors and strain reliefs

Product Specifications

This appendix provides information concerning the physical and electrical requirements for installing the Netra t 1400 and Netra t 1405 systems.

C.1 Physical Specifications

C.1.1 Dimensions

- Height: 264mm (10.39in.) 6U nominal
- Width: 431.8mm (17.00in.)
- Depth: 477.3mm (18.79in.)
- Weight (unpackaged): maximum 38kg (84lb.)

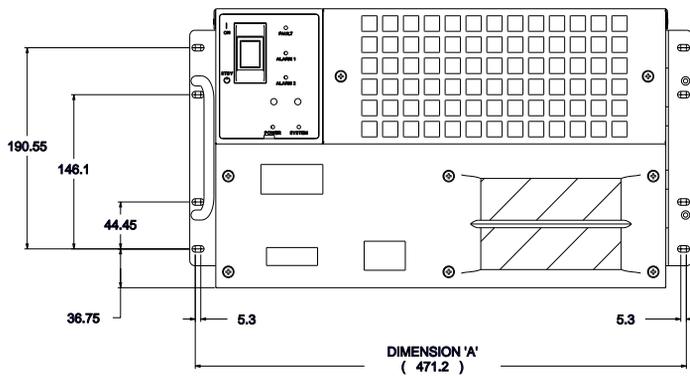
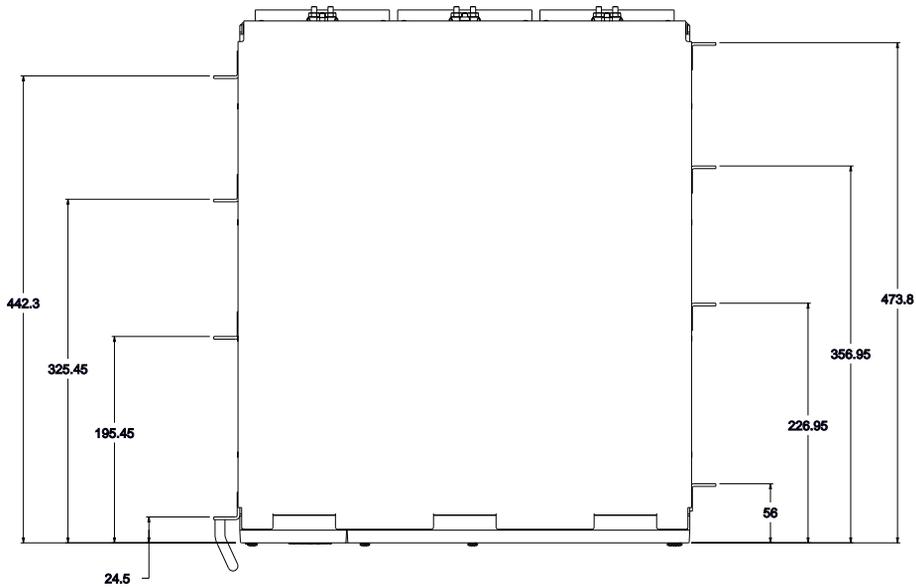
Flanges can be fitted to accommodate the equipment in 19-inch, 23-inch, 24 inch and 600-mm racks (see FIGURE C-1 on page C-2).



Caution – The Netra t 1400/1405 system, when fully loaded, can weigh up to 38kg (84lb.); hence mechanical assistance may be required if installing a fully-loaded unit.

C.1.2 Mounting Flanges

The Netra t 1400/1405 chassis has been designed for a wide variety of mounting options and rack sizes. One set of 19-inch flanges (four) and handles (two) is included with each system. Mounting flanges to suit 23-inch, 24-inch or 600-mm nominal frame widths can be ordered as required:



DIMENSION 'A'	
19" FLANGES	471.2
23" FLANGES	572.1
24" FLANGES	596.6
600mm FLANGES	519

FIGURE C-1 Netra t 1400/1405 Flange Options and Dimensions

Optional Components

TABLE C-1 Optional Mounting Flange Kits

Mounting Option	Part Number
19-inch configuration	X7071A
23-inch configuration	X7072A
24-inch configuration	X7073A
600-mm configuration	X7074A

FIGURE C-2 on page C-4 shows how to connect the Flange Mount assembly to the Netra t 1400/1405 system.

The system can also be mounted on telescopic slides.

An adaptor kit (part number X6914A) is available for mounting the system in a Sun 72-inch rack.

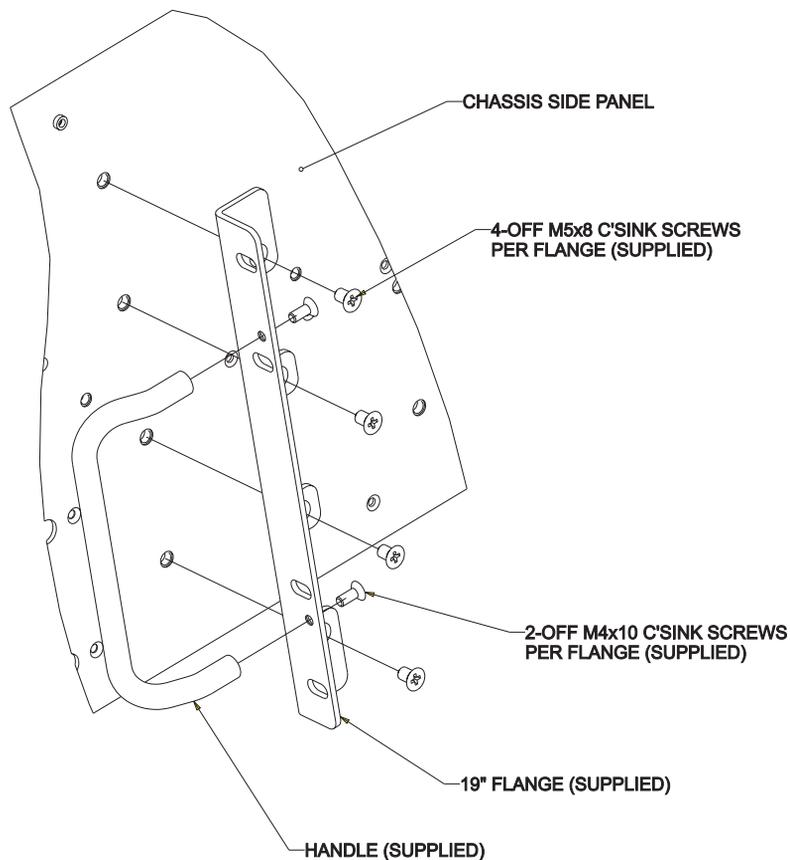


FIGURE C-2 Flange Mount Assembly

The chassis must be secured within the rack frame using screws suitable for the equipment frame. They must be a minimum size of M5 (10/32) depending on the frame requirement. All screws must be fitted; there are positions provided for a total of 16 screws (four per flange). The recommended tightening torque value for M5 recess head screws is 4.0Nm (3.0lbf-ft).



Caution – For flange mounted installations, always fit four flanges.

C.2 Electrical Specifications

This section provides information about electrical supply installation.

Note – All supply connections, wiring, wire protection, and wire routing must be made in accordance with applicable sections and requirements of national electrical code and local electrical authorities.

C.2.1 Netra t 1400 DC Source Site Requirements

TABLE C-2 DC Power Requirements¹

Electrical Element	Requirement
Voltage	-48VDC / -60VDC
Max. operating current	10 A @ -48VDC / 12 A @ -60VDC
Max. inrush current	24 A @ -48VDC / 30 A @ -60VDC

1. The DC power supply range is -40VDC to -75VDC.

The DC source must be:

- -48VDC or -60VDC nominal centralized DC power system
- electrically isolated from any AC power source
- reliably connected to earth (that is, the battery room positive bus is connected to the grounding electrode)
- capable of providing up to 15W of continuous power per feed pair

Note – The DC version of your system must be installed in a *restricted access location*. Per the intent of the National Electrical Code, a restricted access location, is an area intended for qualified or trained personnel only and has access controlled by a locking mechanism, such as a key lock or an access card system.

C.2.2 Overcurrent Protection Requirements

- Overcurrent protection devices must be provided as part of each host equipment rack.
- Circuit breakers must be located between the DC power source and the Netra t 1400 system.
 - Two 15 A maximum single-pole fast trip DC rated circuit breakers (one per ungrounded supply conductor) in the negative supply conductor.
- Circuit breakers must not trip when presented with inrush current of 20 A lasting 500 ms.

Note – Overcurrent devices must meet applicable national and local electrical safety codes and be approved for the intended application.

C.2.3 Required Connection Materials

C.2.3.1 DC Branch Circuits

- Two Wago 3-position connectors with strain relief housings, one per feed pair with strain relief housings, are supplied in the shipkit with each system.

C.2.3.2 Grounding

- One Thomas & Betts two-hole lug (part number: 54204-UB) suitable for 8AWG conductor or UL/CSA approved equivalent having 5/8-inch pitch. Torque value: 3.5Nm maximum. Two M5 studs and cupwasher nuts are supplied on the rear of the chassis for connection.
- A Thomas & Betts crimping tool (part number: TBM 5-S), or approved equivalent is required to secure the lug on to the cable.
- An earthing bus bar that is near the equipment and easily accessible.



Caution – External filtering and/or surge suppression devices may be required on the power feeds where branch circuit electromagnetic characteristics are unknown.

C.2.3.3 DC Supply and Ground Conductor

The requirements are:

- suitable conductor material: tinned copper only
- conductors: 14AWG maximum (between the Netra t 1400 and circuit breaker).
There are three conductors:
 - -48VDC/-60VDC Supply (pin 1)
 - Ground connection to power supply (pin 2)
 - -48VDC/-60VDC Return (pin 3)
- system ground conductor: 8AWG
- cable insulation rating: minimum 75°C, low smoke fume (LSF), flame retardant
- cable must conform to GR63CORE fire resistance requirements
- branch circuit cable insulation color: per applicable National Electrical Codes
- grounding cable insulation color: green/yellow

C.2.4 Netra t 1405 AC Source Requirements

Note – As part of the installation, overcurrent devices meeting applicable national and local electrical safety codes shall be provided.

The disconnect device for servicing is defined as any one of the following:

- the appliance inlet on the rear of the system
- the circuit breakers in the rack in which the system is mounted
- the mains plug

It must be ensured that these remain accessible after installation.



Caution – External filtering and/or surge suppression devices may be required on the power feeds where branch circuit electromagnetic characteristics are unknown.

C.2.4.1 Chassis Enclosure Grounding

- One Thomas & Betts two-hole lug (part number: 54204-UB) suitable for 8AWG conductor or UL/CSA approved equivalent having 5/8-inch pitch. Torque value: 3.5Nm maximum. Two M5 studs and cupwasher nuts are supplied on the rear of the chassis for connection.
- A Thomas & Betts crimping tool (part number: TBM 5-S), or approved equivalent is required to secure the lug on to the cable.
- An earthing bus bar that is near the equipment and easily accessible.

The safety earth path is established by the connection of the grounding conductor within the AC power cord to a *reliably* earthed socket outlet located near the equipment.

C.3 Environmental Requirements

The system can be installed in an environment with the following specific parameter ranges:

- Ambient temperature
 - operating: 5° to 40°C
 - exceptional operating limit: -5° to 55°C^{1, 2}
 - storage: -40° to 70°C
- Relative humidity
 - operating: 5 to 85% non-condensing³
 - storage: 10 to 95% non-condensing
- Elevation
 - operating: -300 to +3000m
 - storage: -300 to +12000m

C.3.1 Forced Air Cooling Requirements

1. Adequate airflow through the host equipment frame must be ensured.
2. The air is drawn through the front of the Netra t 1400/1405 enclosure and expelled from the rear of the enclosure.
3. The inlet and exhaust ventilation areas must be a minimum of 200sq. cm each.

1. Error-free operation of the removable media devices is from 0° to 40°C.
2. No more than 96 hours duration at extremes and at elevations less than 1800m.
3. Subject to a maximum absolute humidity of 0.024kg of water per kg of dry air.

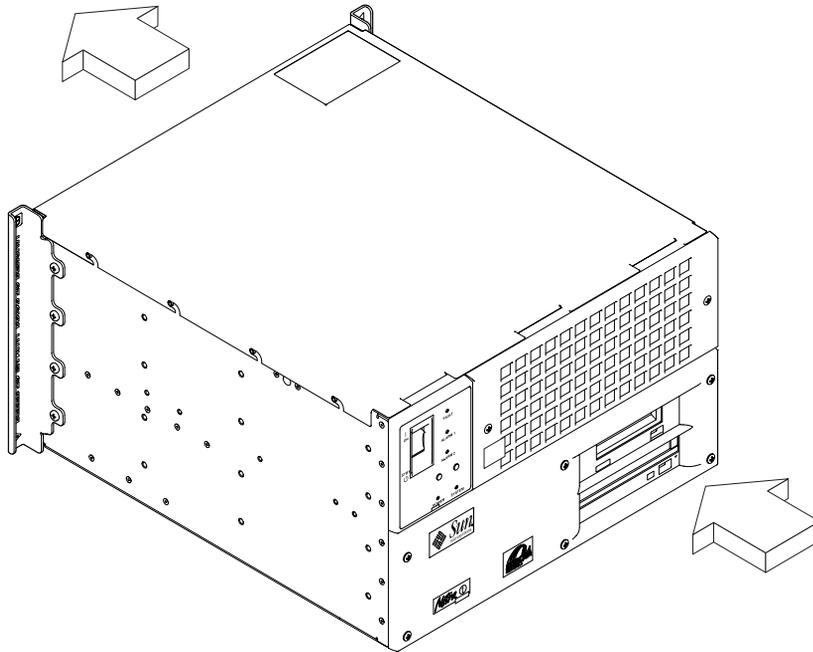


FIGURE C-3 Netra t 1400/1405 Airflow (front and rear)

4. To maintain adequate airflow we strongly recommend that you inspect and, if necessary, replace or clean the air filter on a regular basis. See *the Netra t 1400/1405 Installation and User Guide* for further information.
5. If the Netra t 1400/1405 computer system is fully enclosed by its host equipment rack, the host rack must have ventilation openings in the front door. This permits unrestricted access to an external air source.

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