Netra™ ct Server Product Overview

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Preface

The *Netra ct Server Product Overview* describes the basic hardware components of the Netra ct server. It is a companion to the *Netra ct Server Installation Guide*, which describes how to install the Netra ct server, and the *Netra ct Server Service Manual*, which describes the removing and replacing of the server's field-replaceable units (FRUs).

The procedures described in the *Netra ct Server Product Overview* are limited mostly to the use of the Solaris™ operating environment. These detailed instructions are a supplement to the Solaris documentation (printed or online) that accompanies the Netra ct server.

The intended reader of this manual is an experienced system administrator who has experience with the Solaris operating environment. The reader should be comfortable with LAN fundamentals and with networking in general.

Safety and Compliance

All Netra ct servers are shipped with the *Netra ct Server Safety and Compliance Manual*, which specifies the environmental and electrical safety requirements for the product and contains compliance certification for various countries.

How This Book Is Organized

Chapter 1 introduces you to the Netra ct server and offers examples of its use.

Chapter 2 defines RAS and explains how the Netra ct server conforms to those standards.

Glossary is a list of words, phrases, and acronyms and their definitions.

Using UNIX Commands

This document contains only limited information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- *Solaris Handbook for Sun Peripherals* (shipped in AnswerBook™ form, available in printed form as an at-cost option.)
- AnswerBook online documentation for the Solaris™ software environment
- Other software documentation that you received with your system

Typographic Conventions

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

Shell Prompts

Shell	Prompt
C shell	*machine_name*%
C shell superuser	*machine_name*#
Bourne shell and Korn shell	$
Bourne shell and Korn shell superuser	#

Related Documentation

In addition to this *Netra ct Server Product Overview*, the Netra ct server is accompanied by the following manuals:

Title	Part Number
Netra ct Server Start Here	806-5161
Netra ct Server Product Notes	806-3299
Netra ct Server Safety and Compliance Manual	806-3295
Netra ct Server Installation Guide	806-3294
Netra ct Server Service Manual	806-3296
Sun Remote System Control (RSC) User's Guide for the Netra ct Server Alarm Card	806-3301

Depending on the options you might have purchased for your machine, you might have also received manuals for network interface cards.

As mentioned above, as a Netra ct server purchaser, you receive a suite of online documentation for the Solaris operating environment.

Accessing Sun Documentation Online

Documentation and product information for the Netra product line is available at:

`http://www.sun.com/products-n-solutions/hw/networking`

The `docs.sun.com`[sm] web site enables you to access Sun technical documentation for the Solaris operating environment on the Web. You can browse the `docs.sun.com` archive or search for a specific book title or subject at:

`http://docs.sun.com`

Ordering Sun Documentation

Fatbrain.com, an Internet professional bookstore, stocks select product documentation from Sun Microsystems, Inc.

For a list of documents and how to order them, visit the Sun Documentation Center on Fatbrain.com at:

```
http://www.fatbrain.com/documentation/sun
```

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```
docfeedback@sun.com
```

Please include the part number (806-3298-11) of your document in the subject line of your email.

Product Overview

This chapter provides an overview of the Netra ct server's basic hardware components and describes the different models available for the server. Contact Bellcore Labs to get the compliance and NEBS testing information for the Netra ct server.

The Netra ct server is a *CompactPCI*-based, *NEBS* (level 3)-certified, ETSI compliant, rack mountable server. The Netra ct server is highly configurable. Within the Netra ct chassis, you can have one to two Netra ct 800 servers or one to four Netra ct 400 servers. In addition, depending on the configuration, you can have from five to six I/O slots in a Netra ct 800 server or from two to three I/O slots in a Netra ct 400 server. The Netra ct server runs the standard Solaris operating environment, so that your Solaris applications can run on the machine with no modifications.

FIGURE 1-1 shows a Netra ct 800 server and its components and FIGURE 1-2 shows a Netra ct 400 server and its components.
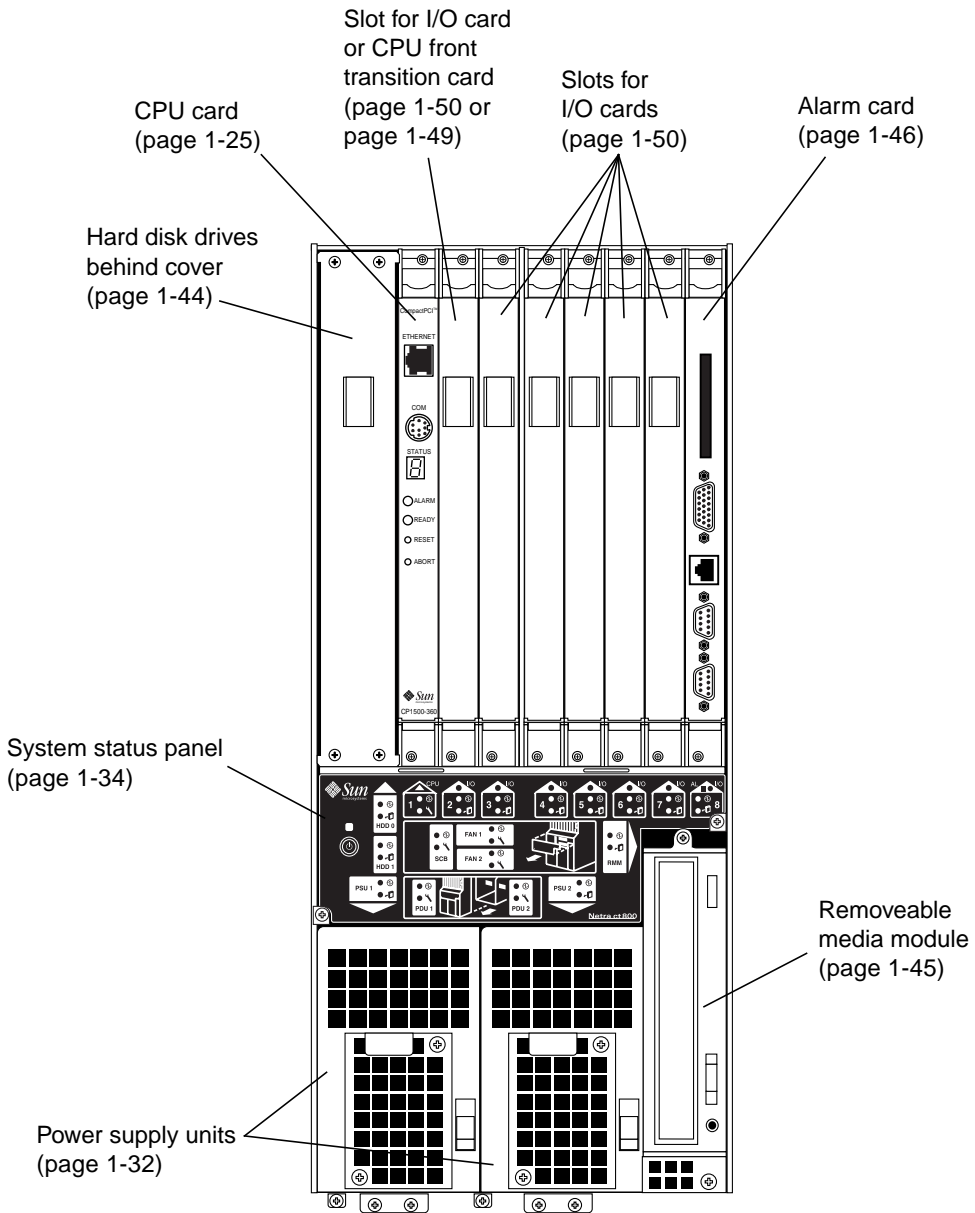
FIGURE 1-1   Components Within a Netra ct 800 Server

CPU card
(page 1-25)

Slots for
I/O cards
(page 1-50)

Hard disk drive
behind cover
(page 1-44)

HDD0

CompactPCI™

ETHERNET

COM

STATUS

ALARM
READY
RESET
ABORT

Alarm card
(page 1-46)

◆Sun
CP1500-360

System status panel
(page 1-34)

I/O   I/O   CPU   I/O   I/O
1   2   3   4   5

Sun   HDD 0   SCB   FAN 1
                       FAN 2

FTC   PDU 1   PSU 1

Netra ct 400

CPU front
transition card
(page 1-49)

Power supply unit
(page 1-32)
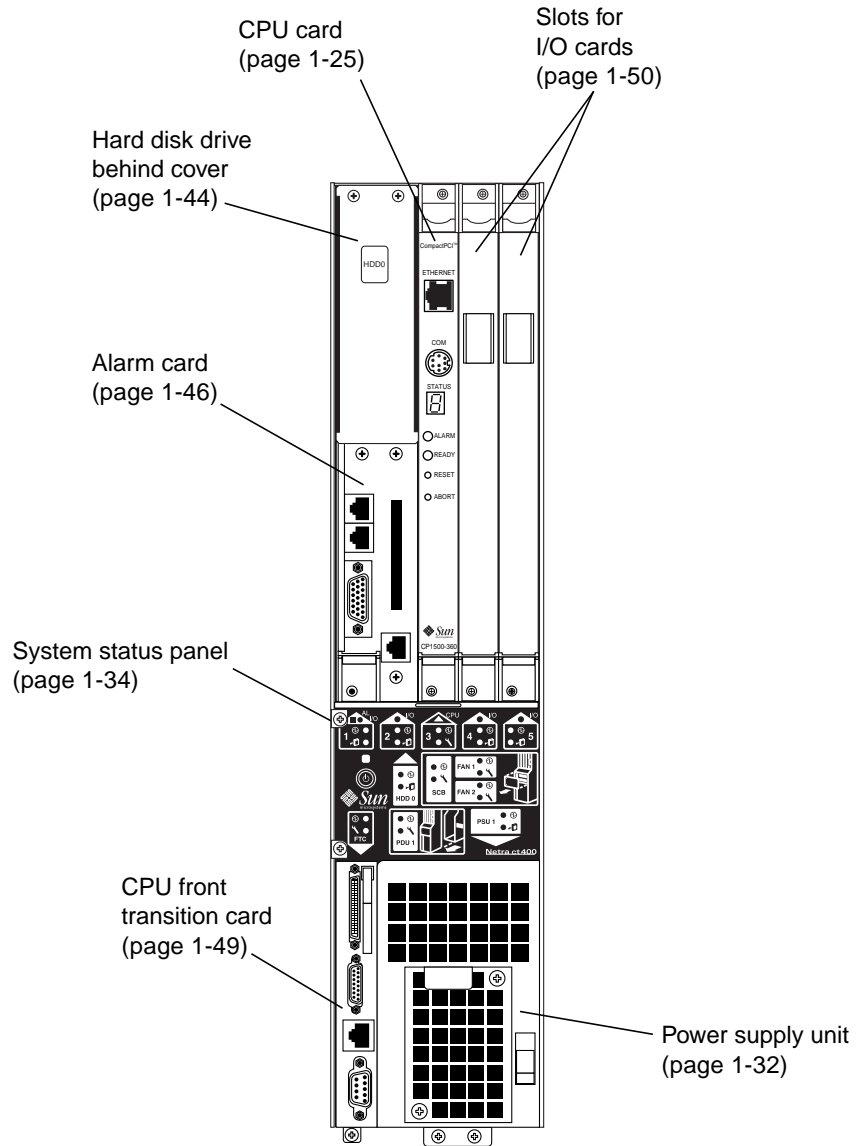
FIGURE 1-2   Components Within a Netra ct 400 Server

The hardware components for the Netra ct server can be broken down into three
sections:

■ The chassis
■ The servers that go into the chassis
■ The components that go into the servers

1.1 Netra ct Chassis

The Netra ct chassis is designed to be mounted in a 19-inch rack. You can purchase optional adaptors that enable you to mount the chassis in a 21-inch, 23-inch, or 600-mm rack.

The Netra ct chassis is rugged enough to withstand environmental hazards—such as excessive heat, earthquakes, and smoke—to which a server in a telco central office might be subjected. It houses the following Netra ct server components:

- Card cage for the rear transition cards
- Four power distribution units

The card cage houses the I/O cards. The power distribution units connect directly into the midplane and are located on the chassis, not the server. A DC input power cable is plugged into the power distribution unit, then the power distribution unit supplies power to the accompanying power supply unit in the Netra ct server (see FIGURE 1-3).

Power distribution units
(in chassis)

Power supply units
(in Netra ct servers)
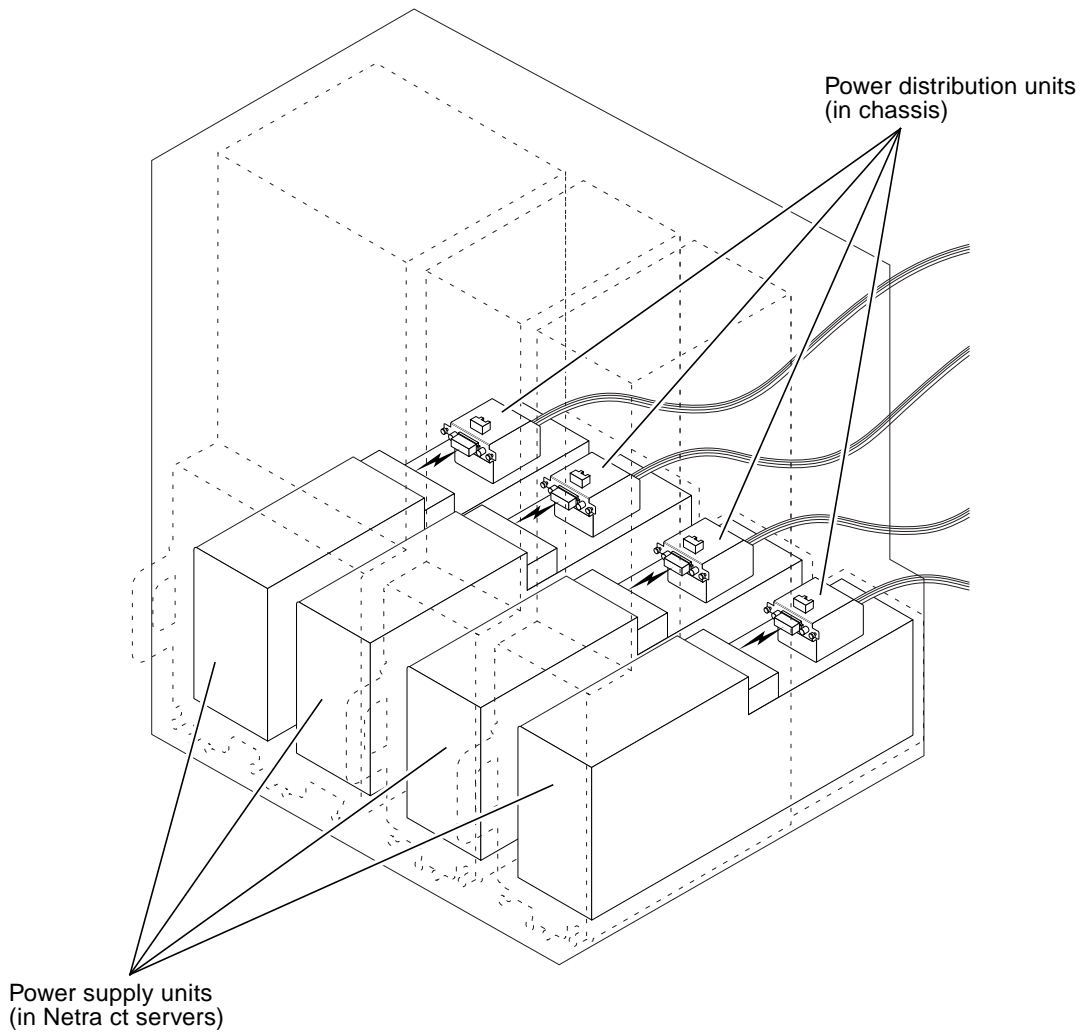
FIGURE 1-3   Power Distribution Units and Power Supply Units

TABLE 1-1 gives the physical specifications for the chassis. FIGURE 1-4 shows the chassis from the front, which shows the power distribution units. FIGURE 1-5 shows the chassis from the rear, which shows the card cage for the rear transition cards.

TABLE 1-1   Physical Specifications, Netra ct Chassis

	English	Metric
Width	17.5 inches	444.5 mm
Depth (default configuration, with rack mount brackets extended as shown in FIGURE 1-4)	15.75 inches	400 mm
Depth (with rack mount brackets flush against the bottom of the chassis)	13.78 inches	350 mm
Height	20.97 inches	533.64 mm
Weight, empty	74 lbs	33.56 kg
Weight, fully-loaded	150 lbs	68.04 kg
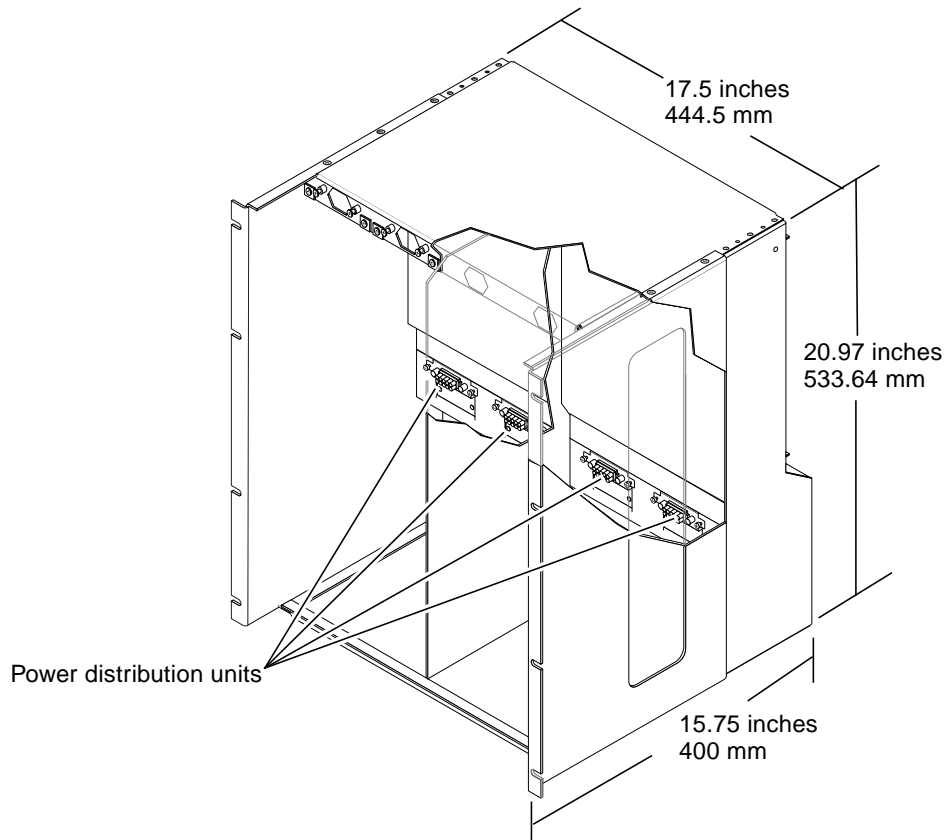
FIGURE 1-4   Netra ct Chassis (Front View)

Power distribution units
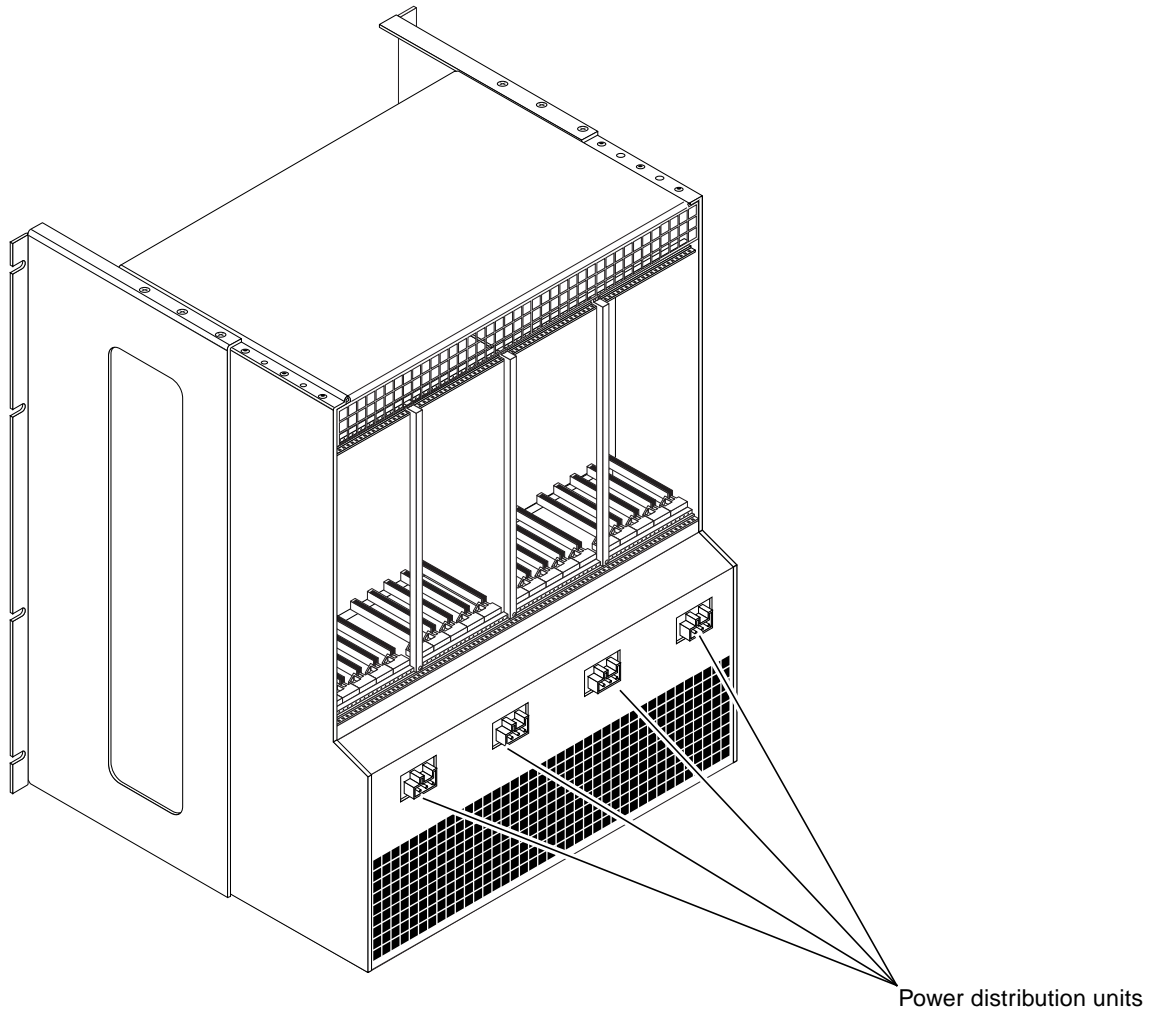
FIGURE 1-5   Netra ct Chassis (Rear View)

The power distribution units mount in the Netra ct chassis and plug directly into the midplane of a server when the server is installed in the chassis. Each power distribution unit is field-replaceable; however, you must remove the server before you can replace a power distribution unit.

1.2 Netra ct Servers

The Netra ct servers slide into the chassis and are secured to the chassis using captive screws at the top and base of the server. Each Netra ct server is an independent computer, with its own CPU card, midplane, I/O slots, and, in some cases, storage devices and removeable media.

1.2.1 Midplanes

Each Netra ct server has a *midplane*. A midplane is the functional equivalent of a backplane. The CPU card, storage devices, and I/O cards all plug into the midplane from the front of the chassis, and the rear transition cards plug into the midplane from the rear. The midplane for each server is secured to the back of the server unit.

The midplanes for the Netra ct 800 server and the Netra ct 400 server are CompactPCI PICMG 2.0 R3.0 compliant. They support the 5V CompactPCI bus. Although the CPU card will only support the 32-bit CompactPCI bus, the midplanes in both Netra ct servers will allow 64-bit peer-to-peer transactions. The midplanes will also support the H.110 telephony bus on all *but* these slots:

- Slots 1 and 8 in the Netra ct 800 server
- Slots 1 and 3 in the Netra ct 400 server

Slot 1 in the Netra ct 800 server and slot 3 in the Netra ct 400 server are reserved for the CPU card. Slot 8 in the Netra ct 800 server and slot 1 in the Netra ct 400 server are proprietary I/O slots, intended solely for alarm cards. The Netra ct servers support basic and full hot swap as specified in the PICMG 2.0 R3.0 Hot Swap Specification.

FIGURE 1-6 shows the different buses on the Netra ct 800 server and FIGURE 1-7 shows the different buses on the Netra ct 400 server.
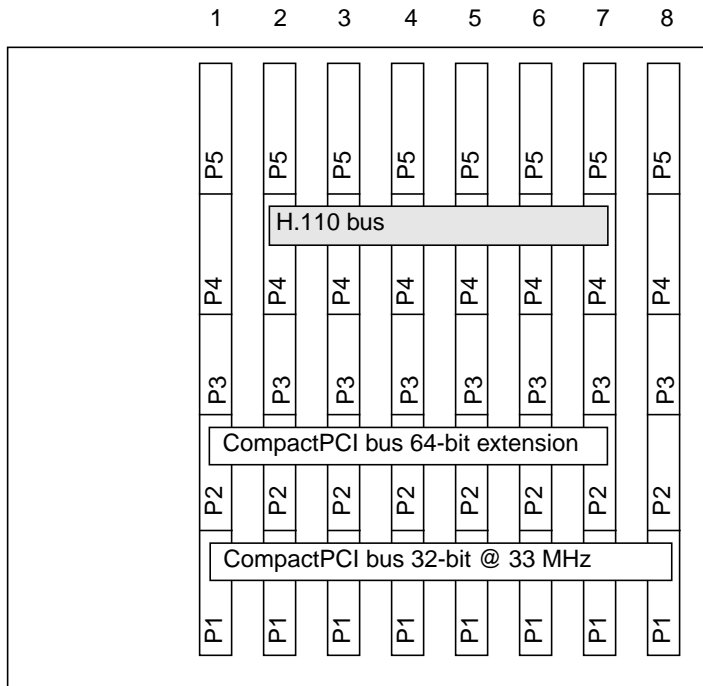
FIGURE 1-6   Buses in a Netra ct 800 Server (Front View)
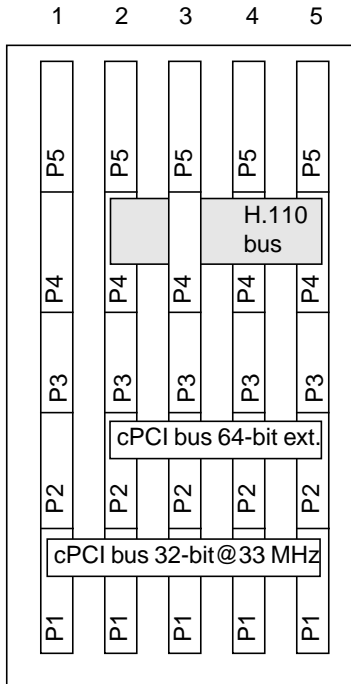
FIGURE 1-7 Buses in a Netra ct 400 Server (Front View)

1.2.2 Server Types

The Netra ct chassis supports two types of Netra ct server:

- Netra ct 800 server
- Netra ct 400 server

1.2.2.1 Netra ct 800 Server

TABLE 1-2 gives the physical specifications for the Netra ct 800 server, and FIGURE 1-8 shows the Netra ct 800 server.

TABLE 1-2   Physical Specifications, Netra ct 800 Server

Measure	English	Metric
Width	8.56 inches	217.5 mm
Depth	14.89 inches	378.3 mm
Height	20.18 inches	512.67 mm
Weight, fully-loaded	38 lbs	17.24 kg
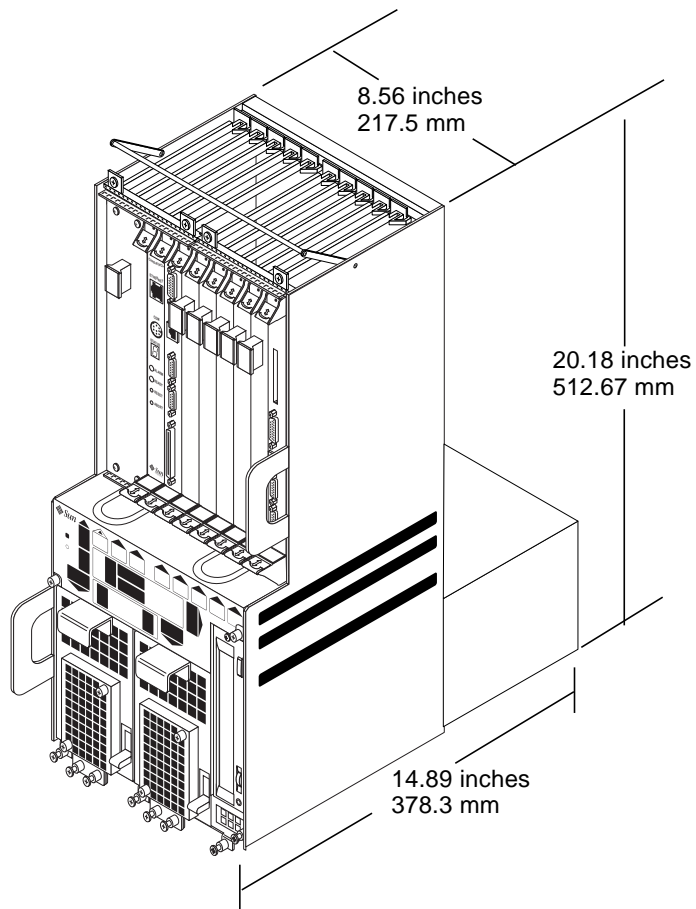
FIGURE 1-8   Netra ct 800 Server

1.2.2.2 Netra ct 400 Server

TABLE 1-3 gives the physical specifications for the Netra ct 400 server, and FIGURE 1-9 shows the Netra ct 400 server.

TABLE 1-3   Physical Specifications, Netra ct 400 Server

Measure	English	Metric
Width	4.25 inches	108 mm
Depth	14.91 inches	378.68 mm
Height	20.18 inches	512.67 mm
Weight, fully-loaded	22 lbs	9.98 kg
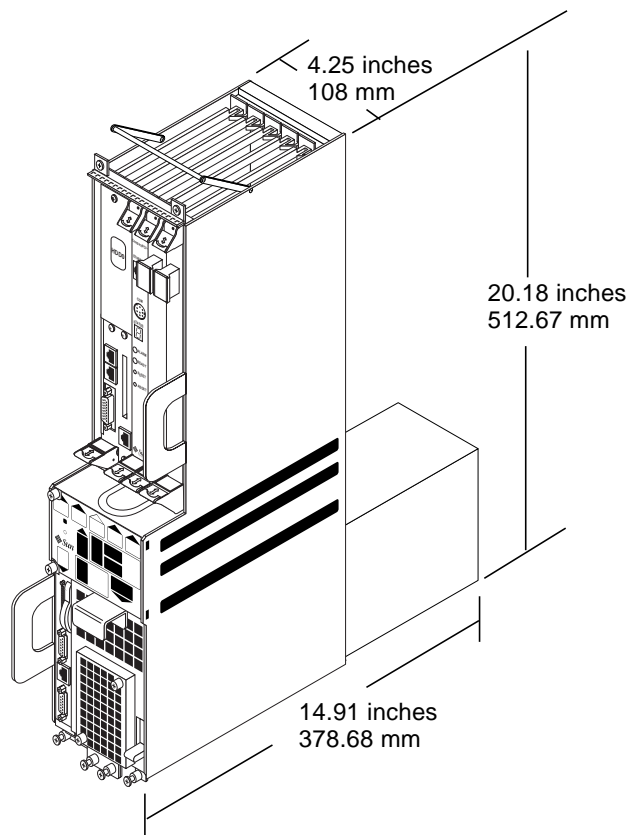
FIGURE 1-9   Netra ct 400 Server

The following combinations of the two server types are supported in a Netra ct chassis:

- One or two Netra ct 800 servers (FIGURE 1-10)
- One to four Netra ct 400 servers (FIGURE 1-11)
- One Netra ct 800 server and one or two Netra ct 400 servers (FIGURE 1-12)
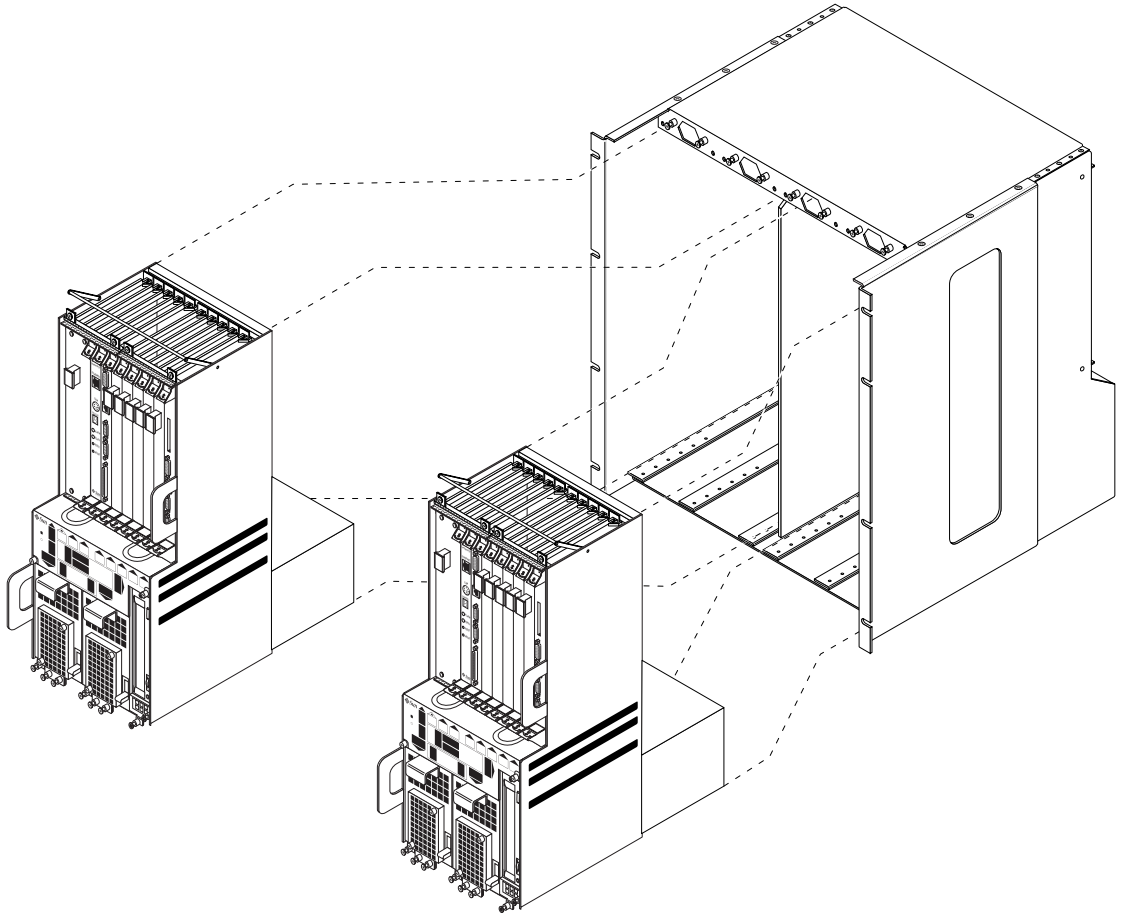
FIGURE 1-10 Two Netra ct 800 Servers in a Chassis
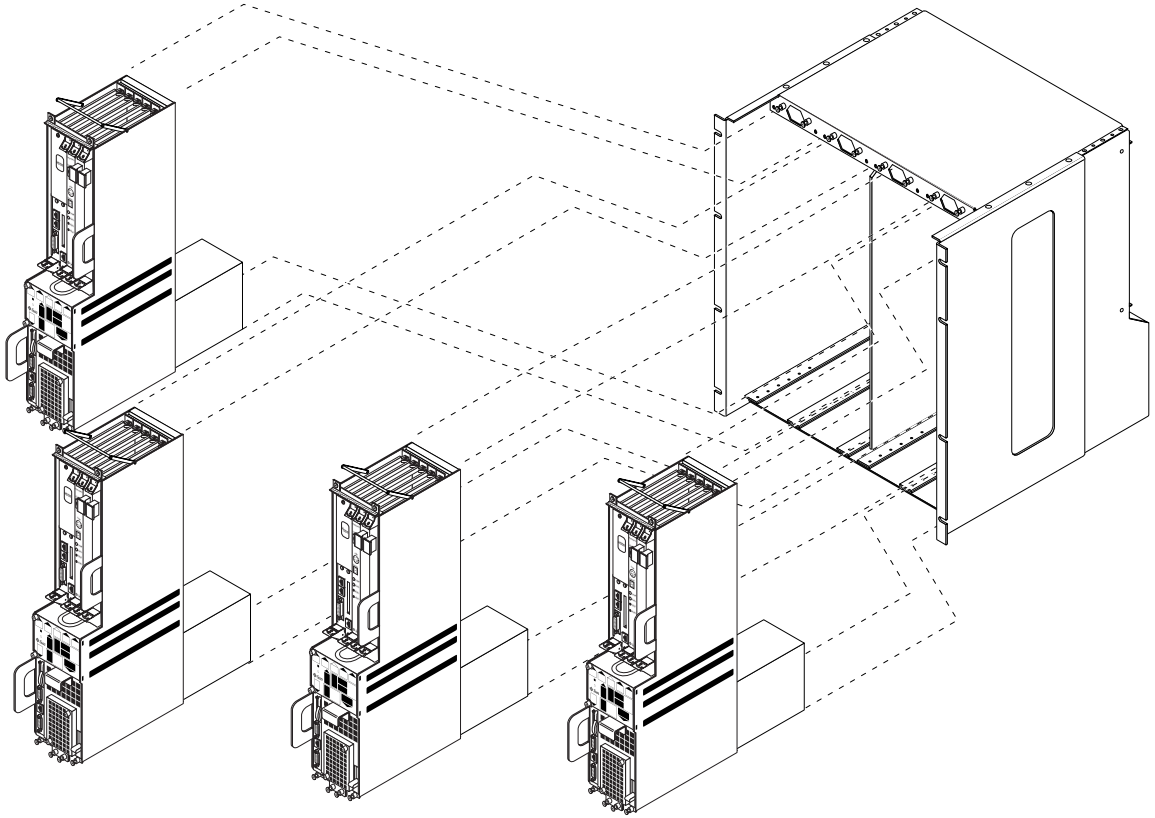
FIGURE 1-11 Four Netra ct 400 Servers in a Chassis
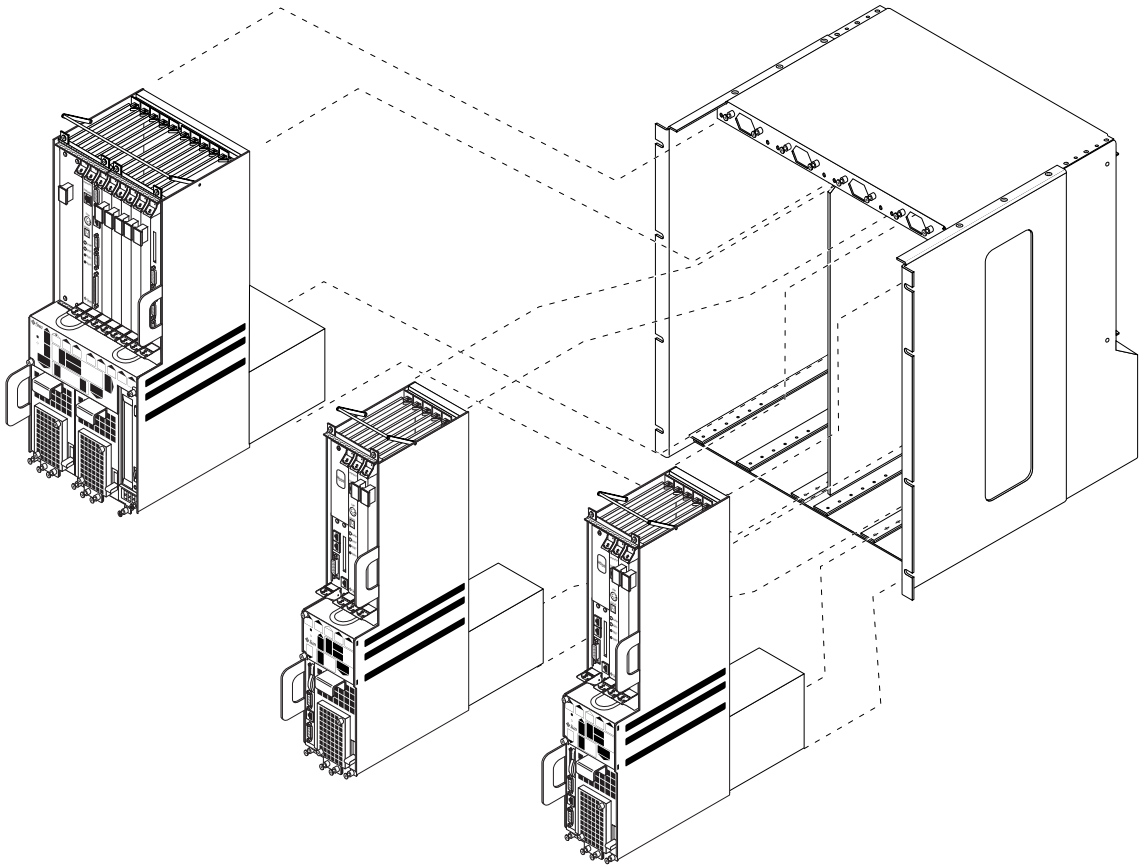
FIGURE 1-12 One Netra ct 800 Server, Two Netra ct 400 Servers in a Chassis

1.2.3 Front-Access and Rear-Access Models

Both Netra ct 400 servers and Netra ct 800 servers can be either front-access or rear-access models. A *front-access* model is a server that is designed so that all the cables to the CompactPCI cards are connected from the front of the chassis, and a *rear-access* model is designed so that all the cables to the CompactPCI cards are connected from the rear of the chassis. The front and rear-access models are mechanically different from one another. All models of servers in a chassis—whether it is a Netra ct 400 server or a Netra ct 800 server—must have the same type of cable access, all front or all rear; you cannot have both front and rear-access model servers in the same chassis.

Note – The internal wiring and mechanical layout differ greatly between the rear-access and front-access models of the Netra ct server. Because of this, you *cannot* change a rear-access model of a Netra ct server to a front-access model (or vice versa) after the Netra ct server has been shipped from the factory.

1.2.3.1   Front-Access Models

For the front-access models of both the Netra ct 800 server and the Netra ct 400 server, all of the CompactPCI cards installed in the servers are installed from the front of the server and the cables are connected from the front. There are no cards installed or cabling from the rear of the server, so the back of the Netra ct server chassis is closed for front-access models. FIGURE 1-13 shows the top view of the front-access model of an Netra ct 800 server and FIGURE 1-14 shows the top view of the front-access model of a Netra ct 400 server.

Front of chassis   Midplane   Rear of chassis

Hard disk drives

CPU card (slot 1)

CPU FTC (slot 2)

I/O card (slot 3)   CPU shunt card

I/O card (slot 4)

I/O card (slot 5)

I/O card (slot 6)

I/O card (slot 7)

Alarm card (slot 8)

Cables
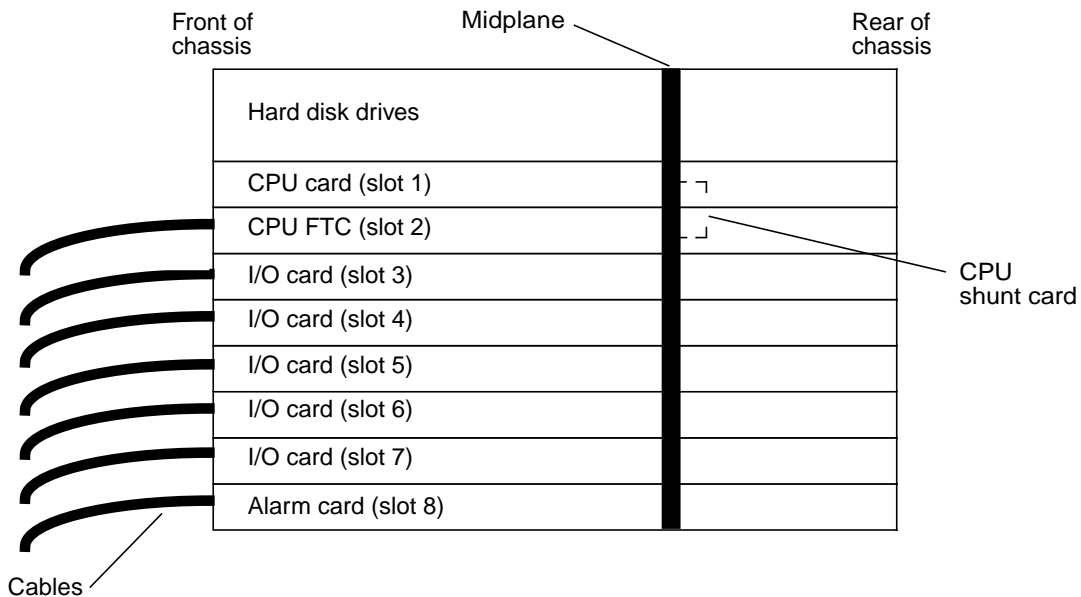
FIGURE 1-13 Front-Access Model of an Netra ct 800 Server (Top View)

Front of
chassis

Rear of
chassis

CPU FTC

Double-wide 3U
alarm card

Hard disk drive

CPU card (slot 3)

I/O card (slot 4)

I/O card (slot 5)

Midplane

Cables
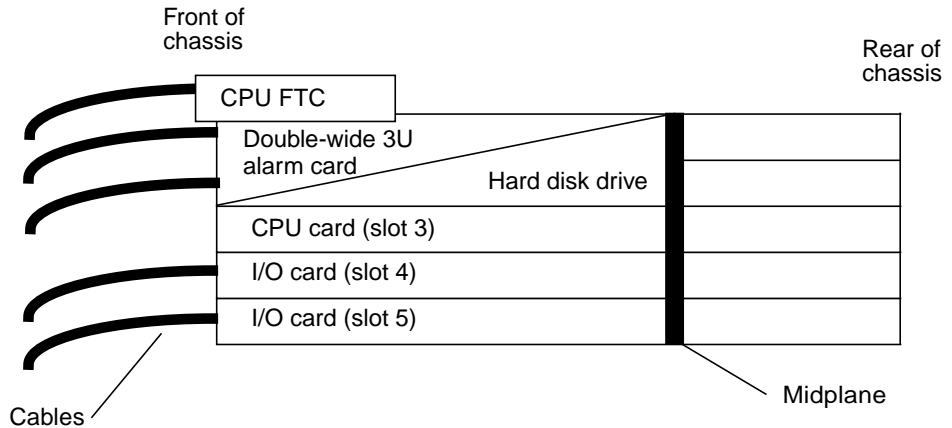
FIGURE 1-14 Front-Access Model of a Netra ct 400 Server (Top View)

There is a front transition card (FTC) for the CPU for the Netra ct 800 servers and
Netra ct 400 servers. The CPU front transition module is required to provide
connections from the CPU card to standard I/O connectors on the front.

For a complete description of all the components available for the front-access
models, refer to "Netra ct Server Components" on page 1-23.

1.2.3.2   Rear-Access Model

For the rear-access models of both the Netra ct 800 server and the Netra ct 400
server, all the cables are connected to *rear transition cards* installed at the rear of the
Netra ct server. The rear transition cards, in effect, extend the CompactPCI cards
installed in each I/O slot from the midplane to the rear of the chassis. The rear-panel
I/O transition cards are "in-line" with the front CompactPCI cards as illustrated in
the following diagram.
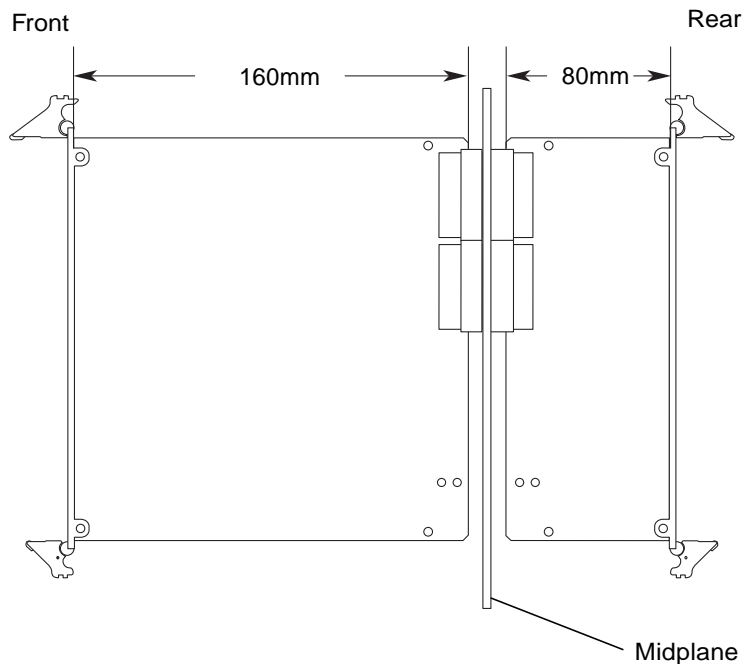
FIGURE 1-15 Rear Transition Cards, Side View

Each rear transition card installed in a rear-access model must have an accompanying card installed in the front card cage of the server; however, the type of card installed in the front card cage varies:

- CPU card—A CPU card must be installed in the *front* card cage in the appropriate slot (slot 1 in the Netra ct 800 server and slot 3 in the Netra ct 400 server). In addition, a CPU rear transition card must be installed in the *rear* card cage in the same slot, viewed from the rear. The CPU rear transition card provides connections from the CPU card to standard I/O connectors at the rear of the system.

- I/O card—A front I/O card must be installed in the *front* card cage in one of the I/O slots. It contains the hot swap LED that tells you when an I/O card is ready for removal. In addition, an I/O rear transition card must be installed in the *rear* card cage in the same slot, viewed from the rear. The I/O rear transition card provides connections from the front I/O card to standard I/O connectors at the rear of the system.

- Alarm card—An alarm card must be installed in the *front* card cage in slot 8 in the Netra ct 800 server (there is no alarm rear transition card available for the Netra ct 400 server). In addition, an alarm rear transition card must be installed in the *rear* card cage in the same slot, viewed from the rear. The alarm card installed in the front card cage is the same alarm card installed in a front-access model; however,

when a Netra ct server system detects an alarm rear transition card, it automatically reroutes the signals directly to the alarm rear transition card, so cabling is done to the alarm rear transition card, not the alarm card installed in the front card cage.

FIGURE 1-16 shows the top view of the rear-access model of a Netra ct 800 server with an alarm card installed, and FIGURE 1-17 shows the top view of the rear-access model of a Netra ct 400 server.
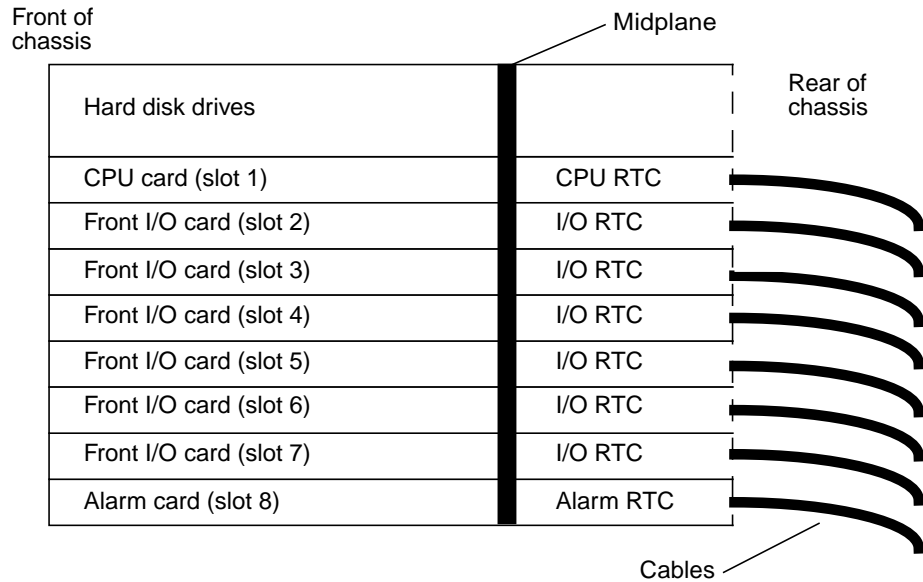
FIGURE 1-16 Rear-Access Model of an Netra ct 800 Server (Top View)
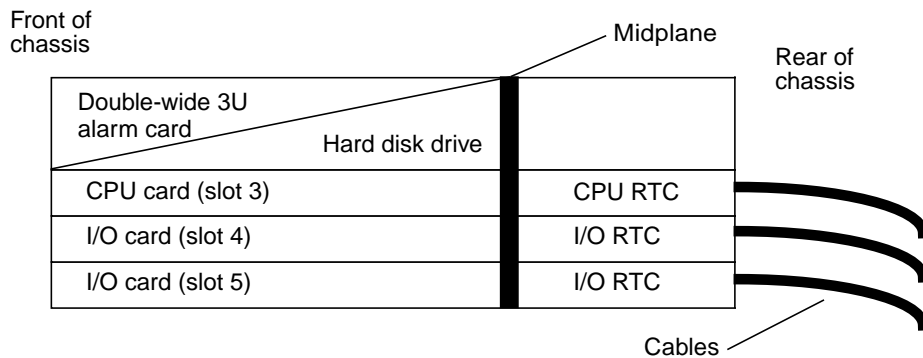
FIGURE 1-17 Rear-Access Model of a Netra ct 400 Server (Top View)

Note that there is a slot to the left of the power supply in the Netra ct 400 server that is reserved for the CPU front transition card (FTC). The CPU front transition card is not needed for the rear-access model of the Netra ct 400 server, so a filler panel is installed over this slot for the rear-access model (see "Front-Access Models" on page 1-16 for more information on the front transition card). Also note that the back of the Netra ct server chassis is open on rear-access models to allow the cables to come out from the rear of the chassis.

1.2.3.3 Determining If You Have a Front-Access or Rear-Access Model

If you are not sure whether you have a front-access or a rear-access model, go to the front of the chassis and look at the top part of the chassis.

■ If you see the DC connectors at the front of the chassis, then you have a *front*-access model (FIGURE 1-18).

■ If you do not see DC connectors at the front of the chassis, and metal filler plates fill the gaps where the DC connectors would normally be, then you have a *rear*-access model (FIGURE 1-18). The DC connectors are at the rear of the chassis for the rear-access model.

Front-access model
DC connectors

Rear-access model
Filler panels
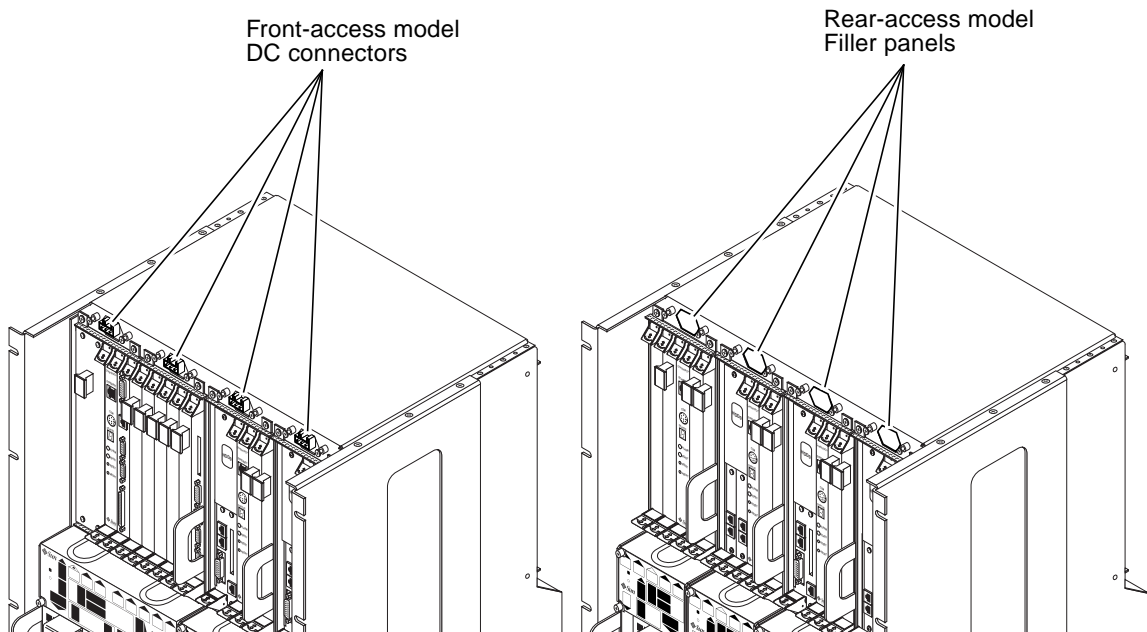
FIGURE 1-18 Front-Access and Rear-Access Models

1.2.3.4 Determining If You Have a Netra ct 800 Server or Netra ct 400 Server

If you are not sure whether you have a Netra ct 800 server or a Netra ct 400 server, go to the front of the chassis and locate the system status panel (FIGURE 1-19).

System status panels
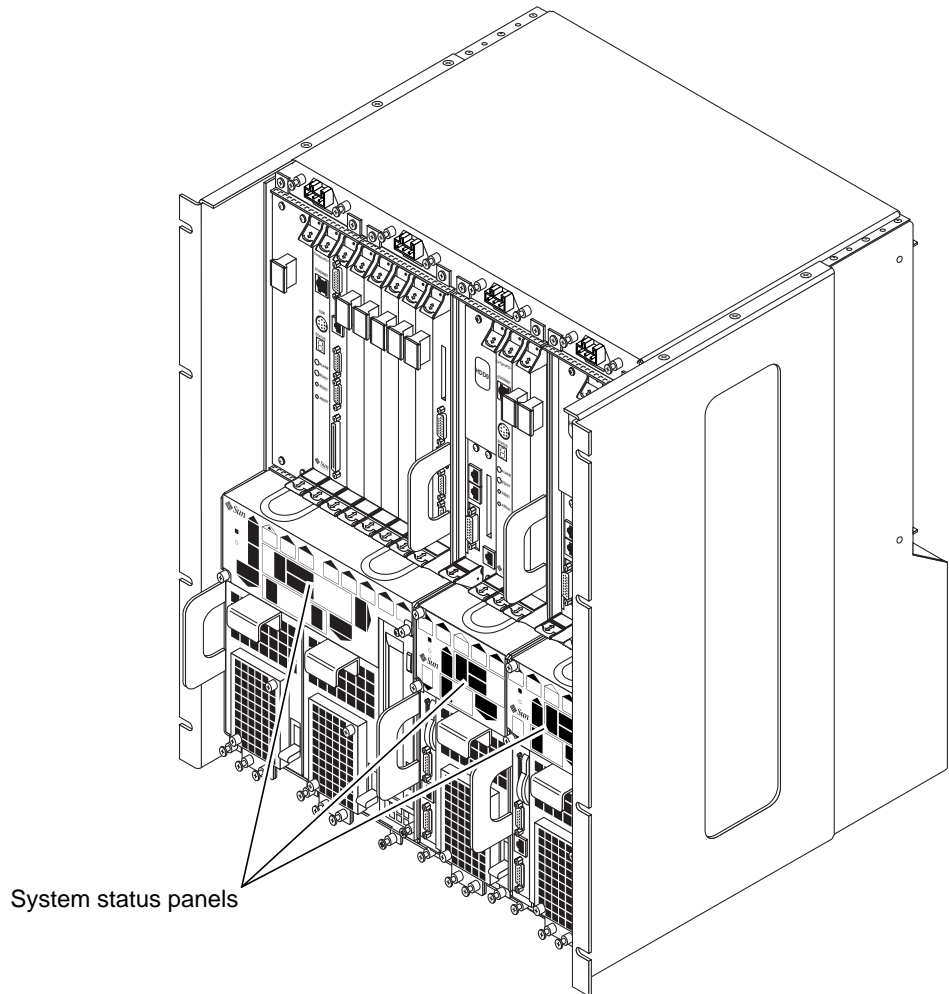
FIGURE 1-19 System Status Panel Locations

The server identifier at the bottom right corner of the system status panel tells you if you have a Netra ct 800 server or a Netra ct 400 server (FIGURE 1-20).

Server identifiers
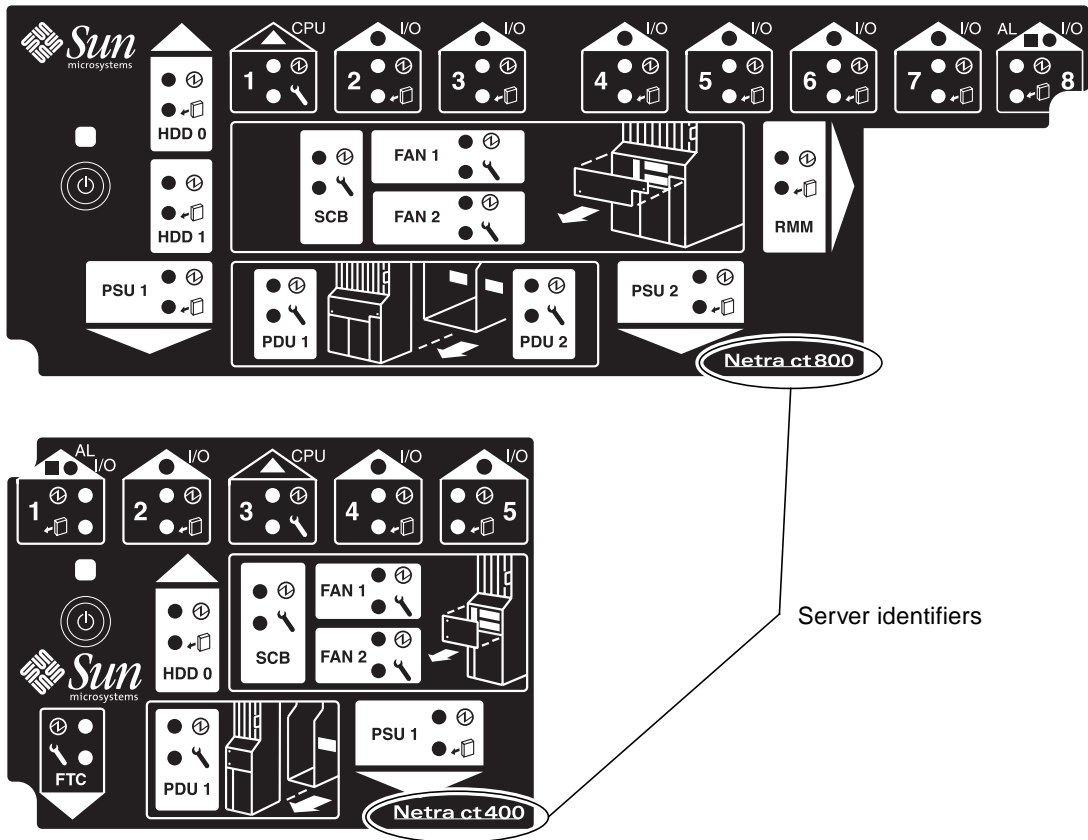
FIGURE 1-20 Locating the Server Identifiers

1.3 Netra ct Server Components

Components within the Netra ct servers can be broken down into three categories:

- Components available for both front and rear-access model servers
- Components available only for the front-access model servers
- Components available only for the rear-access model servers

In addition, some components are available only for the Netra ct 800 server, some are available only for the Netra ct 400 server, and some are available for both types of servers.

Finally, components can be further broken down into either hot-swappable or cold-swappable components:

- A *hot-swappable* component is a component that you can install or remove and replace while the server is running, without interrupting the operation of the server. You may have to enter software commands before and after an installation or a removal/replacement of a hot-swappable component to incorporate the new component in the system correctly.

- A non-hot swappable or *cold-swappable* component is a component that requires that you halt (and, in some cases, also power down) the server before installing or removing and replacing the component.

Refer to TABLE 1-4 for a list of components available for the different models of the Netra ct server. All information applies to both the Netra ct 800 server and the Netra ct 400 server unless otherwise noted.

TABLE 1-4 Components Available for the Netra ct Server

	Front-Access Models	Rear-Access Models
Air filters, main	A *hot-swappable* component. Refer to "Main Air Filters" on page 1-40.	A *hot-swappable* component. Refer to "Main Air Filters" on page 1-40.
Air filters, power supply	A *hot-swappable* component. Refer to "Power Supply Unit Air Filters" on page 1-41.	A *hot-swappable* component. Refer to "Power Supply Unit Air Filters" on page 1-41.
Alarm card	A *hot-swappable* component. Refer to "Alarm Card" on page 1-46.	• Netra ct 800 server: A *hot-swappable* component. Must be installed along with alarm rear transition card. Refer to "Alarm Card" on page 1-46 and "Alarm Rear Transition Card" on page 1-58. • Netra ct 400 server: Not applicable.

TABLE 1-4   Components Available for the Netra ct Server *(Continued)*

	Front-Access Models	Rear-Access Models
Alarm rear transition card	Not applicable.	• Netra ct 800 server: A *hot-swappable* component. Must be installed along with alarm card. Refer to "Alarm Card" on page 1-46 and "Alarm Rear Transition Card" on page 1-58. • Netra ct 400 server: Not applicable.
CPU card	A *cold-swappable* component. Must be installed along with CPU front transition card. Refer to "CPU Card" on page 1-25 and "CPU Front Transition Card" on page 1-49.	A *cold-swappable* component. Must be installed along with CPU rear transition card. Refer to "CPU Card" on page 1-25 and "CPU Rear Transition Card" on page 1-55.
CPU front transition card	A *cold-swappable* component. Must be installed along with CPU card. Refer to "CPU Card" on page 1-25 and "CPU Front Transition Card" on page 1-49.	Not applicable.
CPU rear transition card	Not applicable.	A *cold-swappable* component. Must be installed along with CPU card. Refer to "CPU Card" on page 1-25 and "CPU Rear Transition Card" on page 1-55.
Fans and fan tray	A *hot-swappable* component. Refer to "Fan Tray and Fans" on page 1-42.	A *hot-swappable* component. Refer to "Fan Tray and Fans" on page 1-42.
Hard disk drive	A *hot-swappable* component. Refer to "Hard Disk Drive" on page 1-44.	A *hot-swappable* component. Refer to "Hard Disk Drive" on page 1-44.
I/O card	A *hot-swappable* component. Refer to "Front-Access Model I/O Cards" on page 1-50.	*Hot-swappable* components. Both the front I/O card and the I/O rear transition card must be installed. Refer to "Rear-Access Model I/O Cards" on page 1-59.
Power supply unit	• Netra ct 800 server: A *hot-swappable* component, as long as it is not the lone power supply unit. Refer to "Power Supply Units" on page 1-32. • Netra ct 400 server: A *cold-swappable* component. Refer to "Power Supply Units" on page 1-32.	• Netra ct 800 server: A *hot-swappable* component, as long as it is not the lone power supply unit. Refer to "Power Supply Units" on page 1-32. • Netra ct 400 server: A *cold-swappable* component. Refer to "Power Supply Units" on page 1-32.
Removeable media module	• Netra ct 800 server: A *hot-swappable* component. Refer to "Removeable Media Module" on page 1-45. • Netra ct 400 server: Not applicable.	• Netra ct 800 server: A *hot-swappable* component. Refer to "Removeable Media Module" on page 1-45. • Netra ct 400 server: Not applicable.
System controller board	A *hot-swappable* component. Refer to "System Controller Board" on page 1-39.	A *hot-swappable* component. Refer to "System Controller Board" on page 1-39.

TABLE 1-4   Components Available for the Netra ct Server *(Continued)*

Front-Access Models	Rear-Access Models
System status panel — A *hot-swappable* component. Refer to "System Status Panel" on page 1-34.	A *hot-swappable* component. Refer to "System Status Panel" on page 1-34.

1.3.1   Components Available for Both the Front-Access and Rear-Access Models

Following are components that are available for both front and rear-access model servers:

- "CPU Card" on page 1-25
- "Power Supply Units" on page 1-32
- "System Status Panel" on page 1-34
- "System Controller Board" on page 1-39
- "Main Air Filters" on page 1-40
- "Power Supply Unit Air Filters" on page 1-41
- "Fan Tray and Fans" on page 1-42
- "Hard Disk Drive" on page 1-44
- "Removeable Media Module" on page 1-45
- "Alarm Card" on page 1-46

1.3.1.1   CPU Card

Each Netra ct server contains one CPU card. There is no difference between the CPU cards used in the Netra ct 800 servers and the Netra ct 400 servers. A specific slot is reserved for the CPU card in both the Netra ct 800 server (slot 1) and the Netra ct 400 server (slot 3), indicated by a red card cage slot. FIGURE 1-21 shows where the CPU card must be installed in both types of servers.
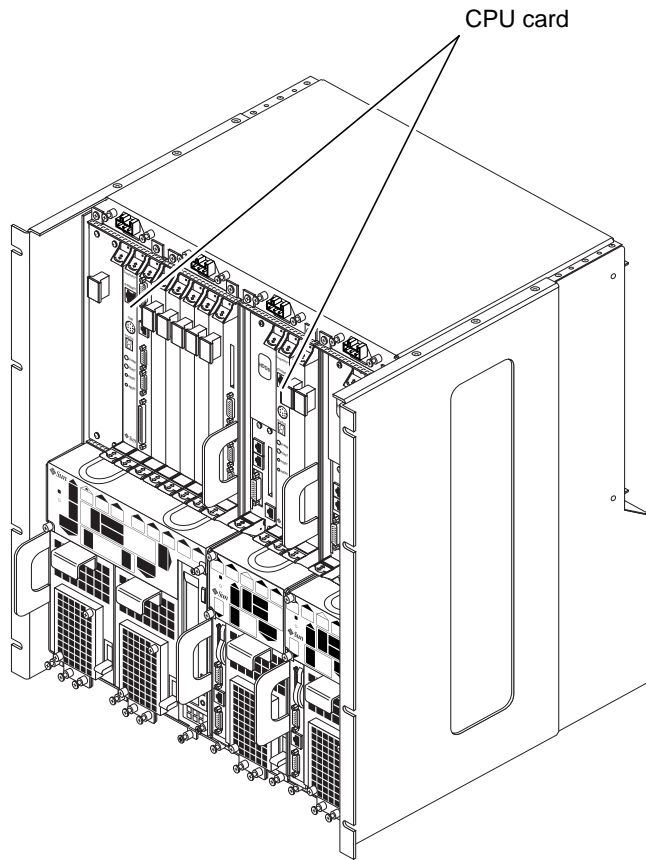
FIGURE 1-21 CPU Card Locations

On-Board Components

FIGURE 1-22 through FIGURE 1-23 show the layout of CPU card. Major components of the CPU card include:

- UltraSPARC IIi, the primary processor for the CPU card that runs at 360MHz or 440MHz.

- SuperIO, a major I/O device for the CPU card that supply units the interface for many of the connectors on the board.

- PCIO that provides an interface between the Peripheral Component Interconnect (PCI) interface and an Ethernet and EBus interface for many of the on-board components.

- Advanced PCI bridge (APB) that creates two separate PCI buses (from the PCI bus module on the UltraSPARC IIi) to help enhance overall system I/O throughput.
- NVRAM, the non-volatile memory device that provides time-of-day (TOD) and stores the media access control (MAC) address of the CPU card.

Note – The MAC (media address control) on the CPU card is located on a removable I2C PROM card which contains the host ID. If you replace the CPU card, keep the old PROM card for the new board and install it on the new CPU card.

- User flash memory, 2MB (8-bit) x 2.
- SCSI controller that provides a fast, Ultrawide SCSI port for single-ended interfaces.
- PLD, the programmable logic device that provides several functions such as watch-dog timer monitoring, power management aid, and address space decoding for the flash EPROM and 7-segment display.
- Serial EPROM, the removable device that stores the configuration data for the PLD.
- Memory module board (see FIGURE 1-23). The CPU card can support up to two memory module boards. These boards come in configurations of 64 MByte, 128 MByte, 256 MByte, or 512 MByte.
- System flash memory (see FIGURE 1-24) - This 1 MB (8-bit) device contains boot-up and self-test code for OpenBoot PROM (OBP) and POST (power-on self-tests).
- The minimum main memory requirement is 64 MBytes (using 1 x 64 MByte module). The maximum possible memory configuration for the CPU card is one gigabyte (using 2 x 512 MBytes memory modules). The CPU card does not have on-board memory.
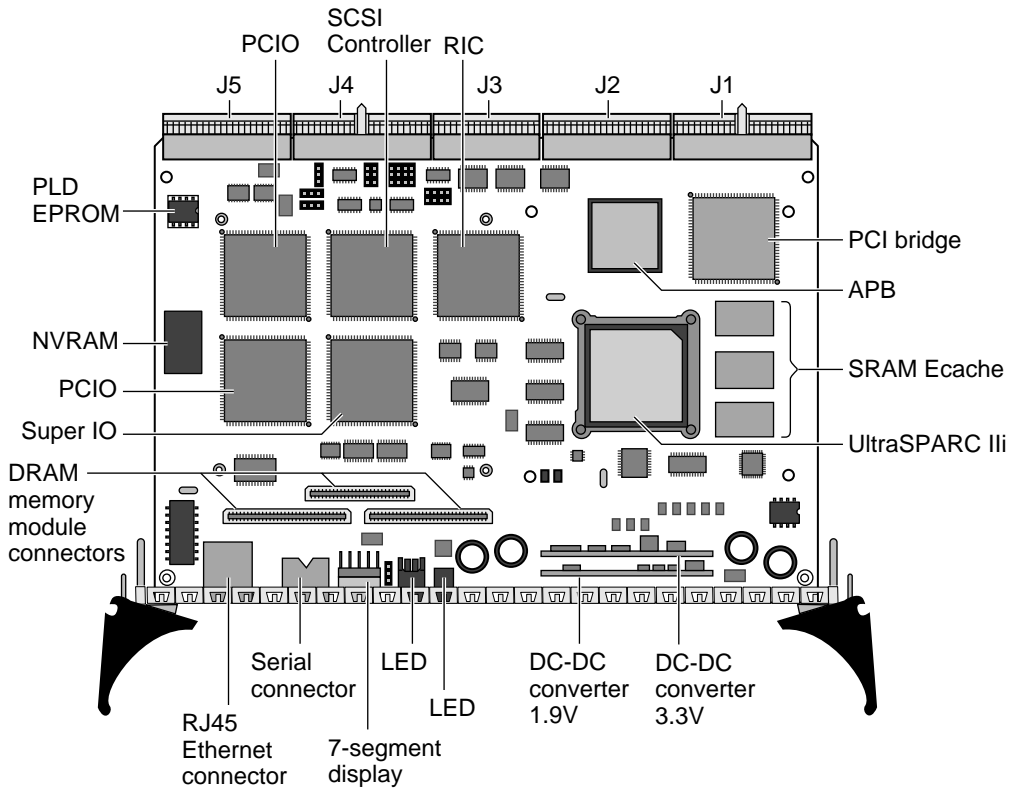
FIGURE 1-22 CPU Card (Without Memory Module)
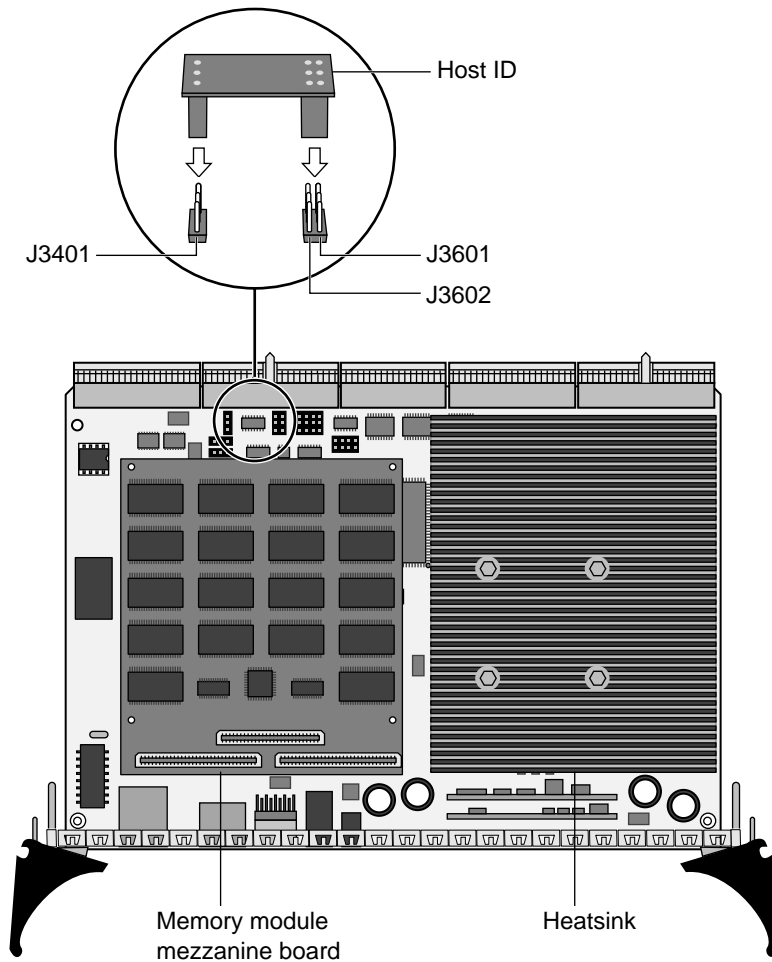
FIGURE 1-23 CPU Card and Major Components (with Memory Module and Heatsink)
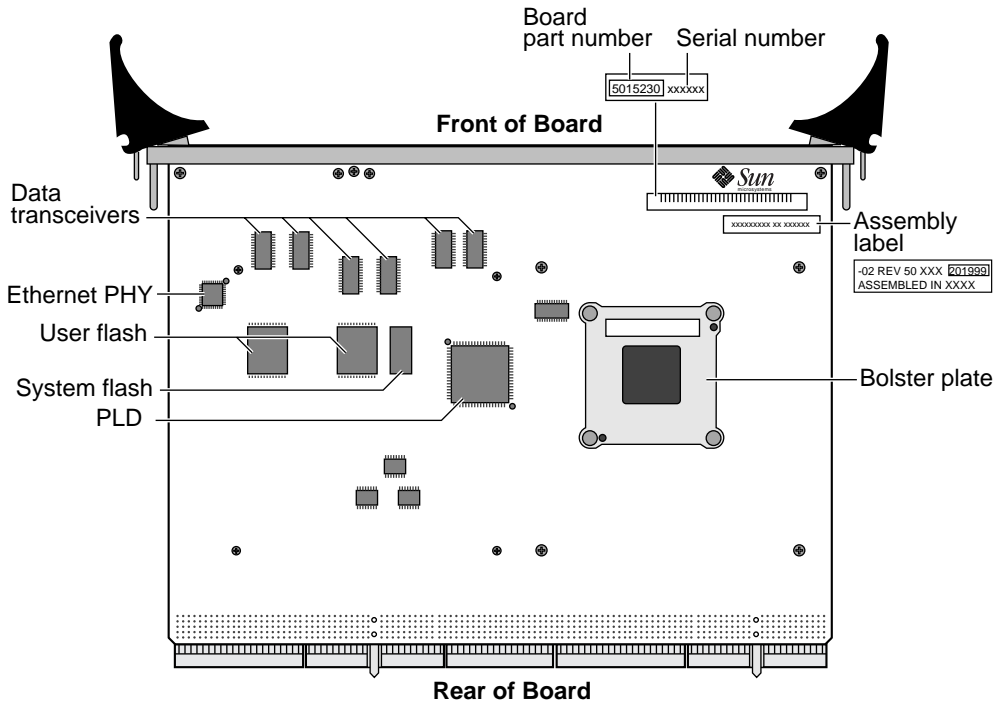
FIGURE 1-24 Back (Solder side) of CPU Card

TABLE 1-5 CPU Card Front Panel Functions

Indicator/Connector/ Switch	Description
ETHERNET	RJ-45 Ethernet (10/100 Mbit)
COM	8-pin DIN RS-232C serial I/O port
STATUS	7-segment display. Provides checkpoint and diagnostic information represented by OBP/POST as a single digit.
ALARM	Power supply monitor as well as a software programmable LED. READY Power-on LED (set by low-level software to either on or off). When on, the LED is green and indicates that the low-level system code is executing normally. (Note that this is not a true diagnostic status.) When off, the LED is not lit and indicates that the system is not ready.
RESET	Used to perform a power-on initialization of the board.
ABORT	Used to break out of a system lock-up condition.

FIGURE 1-25 shows the ports on a CPU card. The COM port on the CPU card is used as the TTY A port on the front-access model of the Netra ct 400 server because the CPU front transition card for the Netra ct 400 server does not have a TTY A port (see "CPU Front Transition Card" on page 1-49 for more information on the CPU front transition card for the Netra ct 400 server). The COM port on the CPU card is *not* used as the TTY A port on the front-access model of the Netra ct 800 server or the rear-access models of the Netra ct 800 server or Netra ct 400 server because the CPU transition cards for those models all have a TTY A port.

Ethernet port

COM port
TTY A (DIN-8)
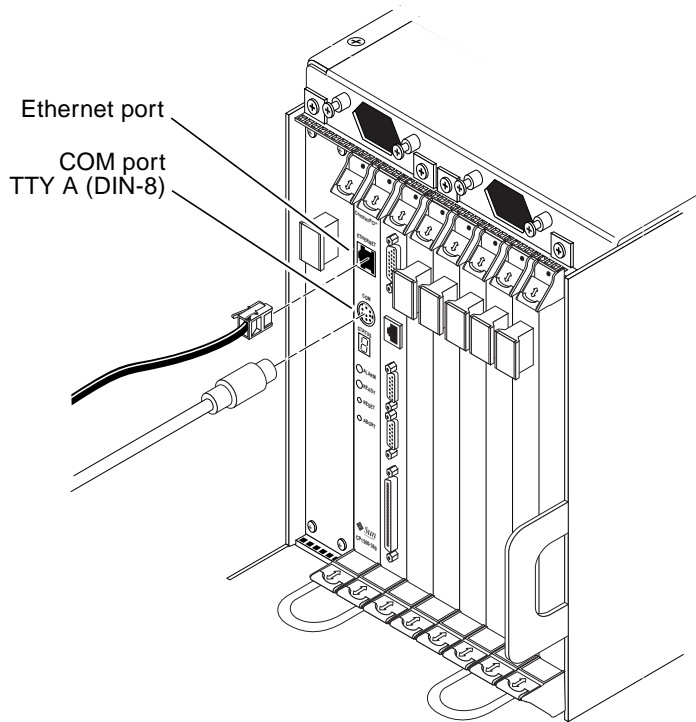
FIGURE 1-25 CPU Card

1.3.1.2 Power Supply Units

Every Netra ct 800 server contains two power supply units, and every Netra ct 400 server contains one power supply unit. There is no difference between the power supply units used in the Netra ct 800 servers and Netra ct 400 servers.

For the Netra ct 800 server, one power supply unit is redundant of the other. Feeds are supplied to each of the power supply units through the power distribution units (see "Netra ct Chassis" on page 1-4 for more information). Because there are two power supply units for each Netra ct 800 server, each Netra ct 800 server can get DC power from two power sources (DC power source A and DC power source B), so that if one power source fails, the Netra ct 800 server can still get DC power from the second power source. Note that this is not the case for the Netra ct 400 server because it has only one power supply unit (FIGURE 1-26).
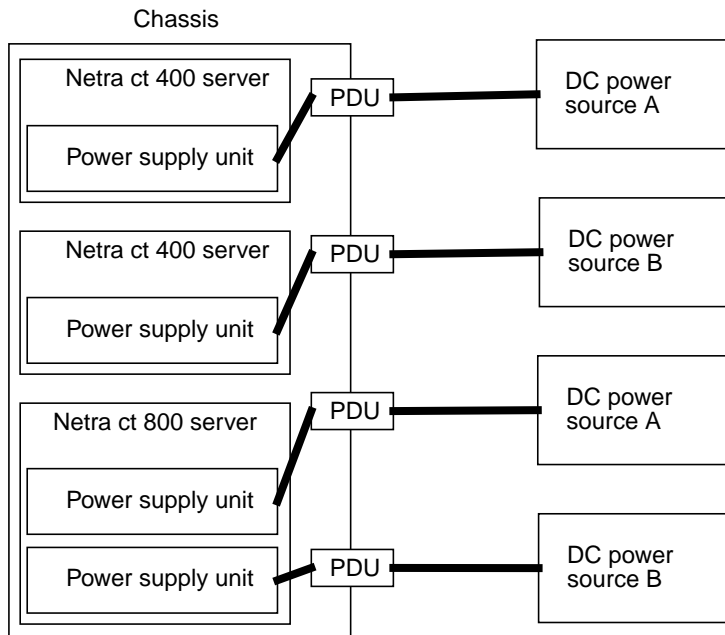
FIGURE 1-26 Power Supply Units and Power Distribution Units (PDUs)

The power supply unit has a cooling fan separate from the chassis cooling system. There is a wall dividing the power supply from the card cage above and the removable media module on the side for the Netra ct 800 server, and the card cage above and the CPU front transition card on the side for the Netra ct 400 server.

The locations of the power supply units in the Netra ct 800 server are illustrated in FIGURE 1-26 and the location of the power supply unit in the Netra ct 400 server is illustrated in FIGURE 1-27.
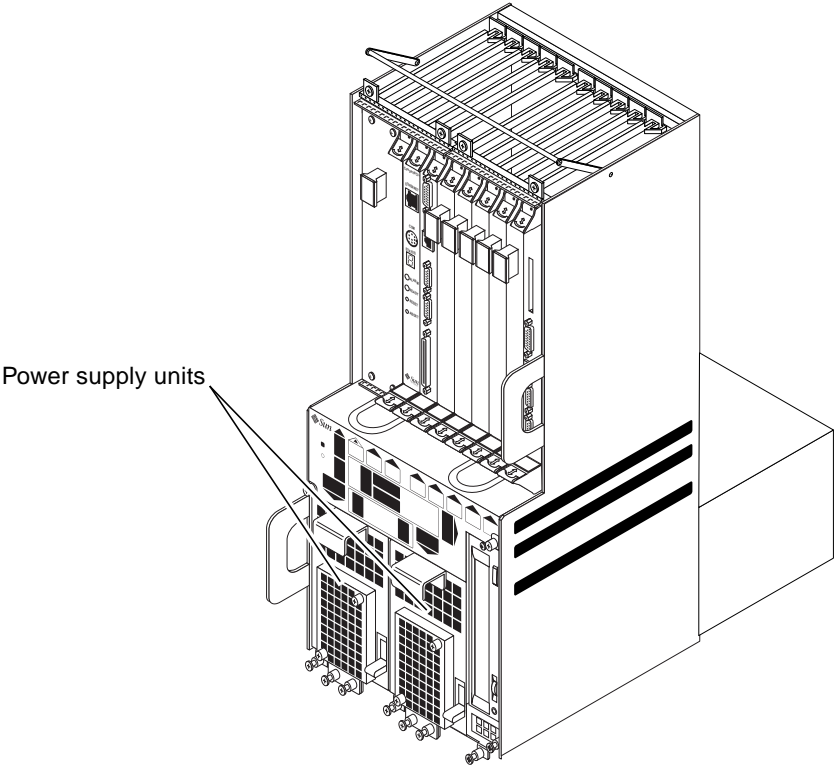
Power supply units

FIGURE 1-27 Power Supply Unit Locations (Netra ct 800 Server)
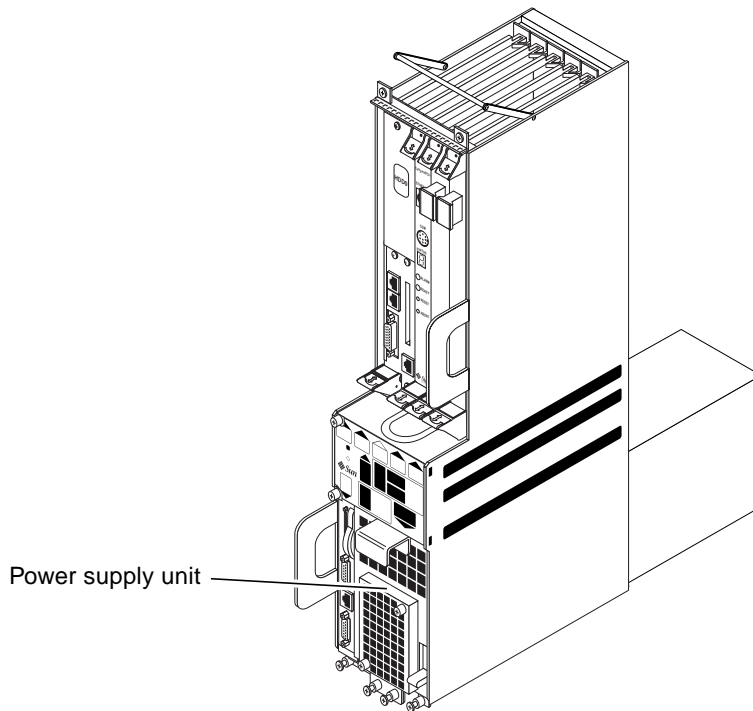
Power supply unit

FIGURE 1-28 Power Supply Unit Location (Netra ct 400 Server)

1.3.1.3   System Status Panel

The system status panel is a module designed to give feedback on the status of the key components within the Netra ct servers. The location of the system status panel in the Netra ct 800 servers and Netra ct 400 servers is illustrated in FIGURE 1-29.

System status panel,
Netra ct 800 server

System status panels,
Netra ct 400 servers
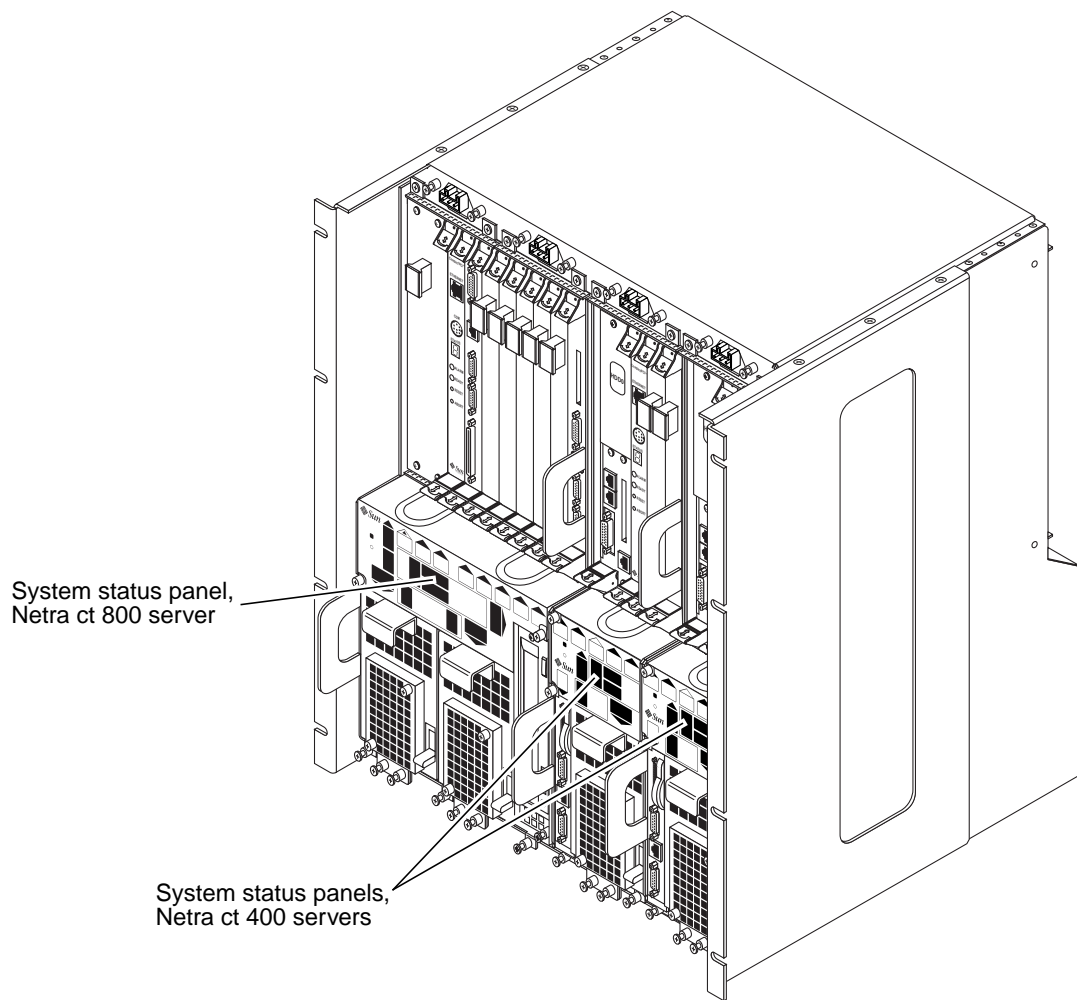
FIGURE 1-29 System Status Panel Locations

The system status panel has one set of LEDs for each component within that particular server. FIGURE 1-30 shows the LEDs on the system status panel for the Netra ct 800 server, and FIGURE 1-31 shows the LEDs on the system status panel for the Netra ct 400 server.
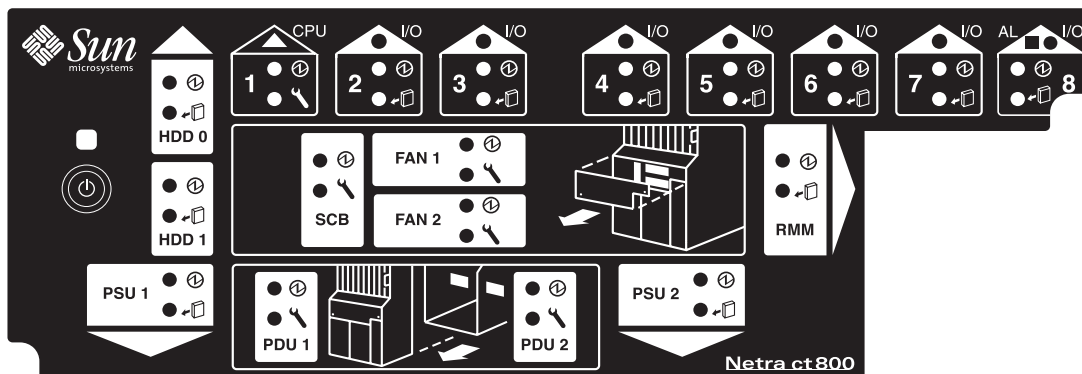
FIGURE 1-30 System Status Panel (Netra ct 800 Server)

TABLE 1-6   System Status Panel LEDs for the Netra ct 800 Server

LED	LEDs Available	Component
HDD 0	Power and Okay to Remove	Upper hard disk drive
HDD 1	Power and Okay to Remove	Lower hard disk drive
Slot 1	Power and Fault	CPU card (▲) installed in slot 1
Slot 2	Power and Okay to Remove	I/O card (●) or CPU front transition card installed in slot 2
Slots 3–7	Power and Okay to Remove	I/O cards (●) installed in slots 3–7
Slot 8	Power and Okay to Remove	Alarm card (■) installed in slot 8
SCB	Power and Fault	System controller board (behind the system status panel)
FAN 1	Power and Fault	Upper fan tray (behind the system status panel)
FAN 2	Power and Fault	Lower fan tray (behind the system status panel)
RMM	Power and Okay to Remove	Removeable media module
PDU 1	Power and Fault	Leftmost power distribution unit (behind the server)
PDU 2	Power and Fault	Rightmost power distribution unit (behind the server)
PSU 1	Power and Okay to Remove	Leftmost power supply unit
PSU 2	Power and Okay to Remove	Rightmost power supply unit

FIGURE 1-31 System Status Panel (Netra ct 400 Server)

TABLE 1-7 System Status Panel LEDs for the Netra ct 400 Server

LED	LEDs Available	Component
Slot 1	Power and Okay to Remove	Double-wide alarm card(■) installed in slot 1 and 2
Slot 2	Power and Okay to Remove	Single-wide I/O card installed in slot 2 (only if alarm card is not installed)
Slot 3	Power and Fault	CPU card (▲) installed in slot 3
Slot 4 and 5	Power and Okay to Remove	I/O cards (●) installed in slot 4 and 5
HDD 0	Power and Okay to Remove	Hard disk drive
SCB	Power and Fault	System controller board (behind the system status panel)
FAN 1	Power and Fault	Upper fan tray (behind the system status panel)
FAN 2	Power and Fault	Lower fan tray (behind the system status panel)
FTC	Power and Fault	CPU front transition card
PDU 1	Power and Fault	Power distribution unit (behind the server)
PSU 1	Power and Okay to Remove	Power supply

Each major component in the Netra ct 800 server or Netra ct 400 server has a set of LEDs on the system status panel that gives the status on that particular component. Each component will have either the green Power and the amber Okay to Remove LEDs (FIGURE 1-32) or the green Power and amber Fault LEDs (FIGURE 1-33). Note that the components in the Netra ct servers all have the green Power LED, and they will have either the amber Okay to Remove LED *or* the amber Fault LED, but not both.

Green Power LED   Amber Okay to Remove LED
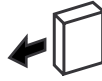
FIGURE 1-32 Power and Okay to Remove LEDs

Green Power LED   Amber Fault LED

FIGURE 1-33 Power and Fault LEDs

- If the component has the green Power and amber Okay to Remove LEDs, see TABLE 1-8.
- If the component has the green Power and amber Fault LEDs, see TABLE 1-9.

TABLE 1-8 Meanings of Power and Okay to Remove LEDs

LED State	Power LED	Okay to Remove LED
On, Solid	Component is installed and configured.	Component is Okay to Remove. You can remove the component from the system, if necessary.
On, Flashing	Component is installed but is unconfigured or is going through the configuration process.	Not applicable.
Off	Component was not recognized by the system or is not installed in the slot.	Component is *not* Okay to Remove. Do *not* remove the component while the system is running.

TABLE 1-9   Meanings of Power and Fault LEDs

LED State	Power LED ⊘	Fault LED ⊐
On, Solid	Component is installed and configured.	Component has failed. Replace the component.
On, Flashing	Component is installed but is unconfigured or is going through the configuration process.	Not applicable.
Off	Component was not recognized by the system or is not installed in the slot.	Component is functioning properly.

There is also a green system power LED and power on/off button located on the system status panel. When the system is off, the system power LED will be unlit. Pressing the system power button when the system is off will start the power-up sequence. Once the system is completely powered up, the system power LED remains on.

When the system is powered on, pressing the system power button for less than 4 seconds will start the orderly power-down sequence—in a manner that no persistent operating system data structures are corrupted—indicated by a blinking LED. In the orderly power-down, applications in service may be abnormally terminated and no further services will be invoked by the CPU. Once the CPU has reached a quiescent state (run level-0, as if `init 0` had been invoked), then the power supply(s) will turn off, indicated by the LED changing from a blinking state to the off state.

If the button is held down for 4 seconds or longer, the power supply(s) are turned off without any intervention of the CPU; that is, the "emergency" power-down sequence occurs.

1.3.1.4   System Controller Board

The system controller board is a hot-swappable component located behind the system status panel. It feeds system status information to the system status panel, where LEDs give feedback on the status of the key components within the Netra ct servers.

1.3.1.5   Main Air Filters

Both the Netra ct 800 servers and the Netra ct 400 servers have a main air filter, which is located directly beneath the system card cage. You can remove an air filter from the server using the loop(s) attached to the front of the air filter. The main air filter should be replaced every three to six months. If your server environment is especially dirty, you may have to replace it more frequently. FIGURE 1-34 shows the location of the main air filter for the Netra ct 800 server and FIGURE 1-35 shows the location of the main air filter for the Netra ct 400 server.
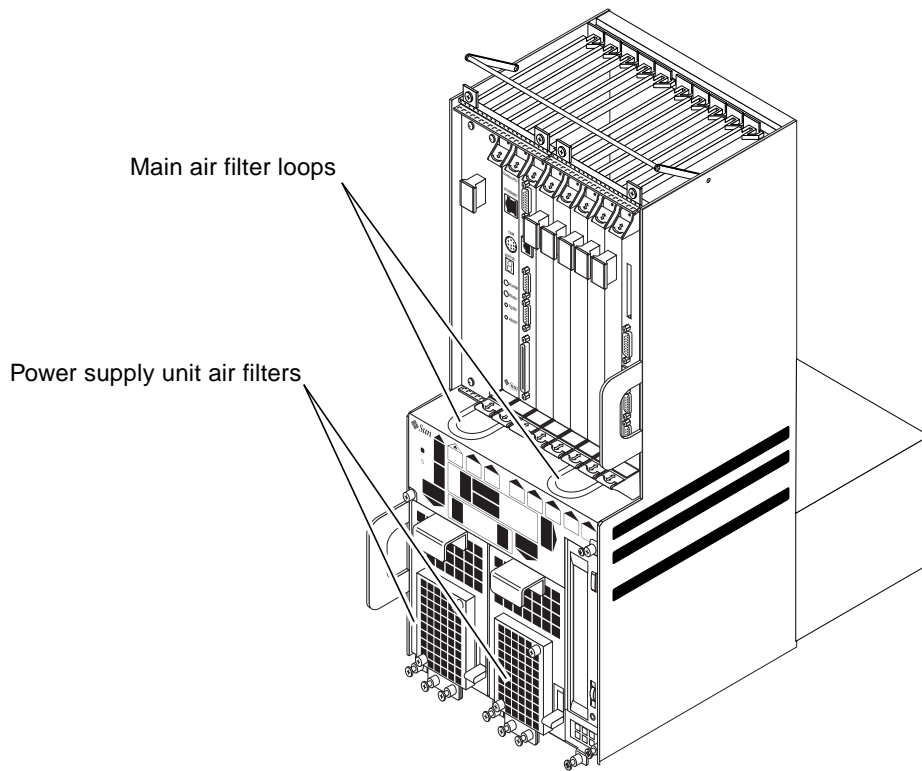
FIGURE 1-34 Main Air Filter and Power Supply Unit Air Filter (Netra ct 800 Server)

Main air filter loop

Power supply unit air filter
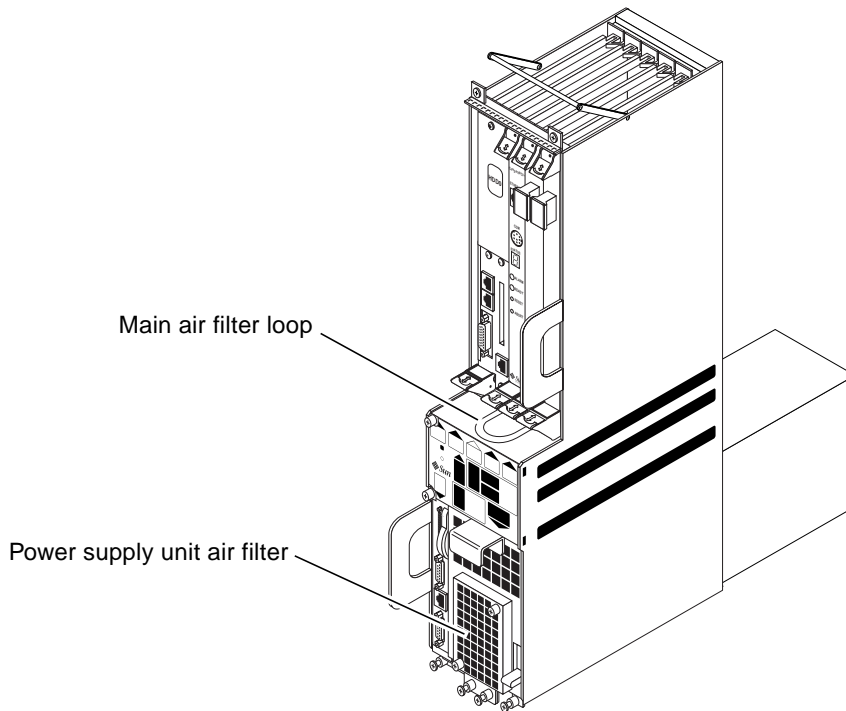
FIGURE 1-35 Main Air Filter and Power Supply Unit Air Filter (Netra ct 400 Server)

1.3.1.6   Power Supply Unit Air Filters

Every power supply in either the Netra ct 800 server or the Netra ct 400 server has an air filter located in the front of the power supply. The power supply air filter is held in place behind a metal screen, which is secured to the power supply unit using two captive screws. The power supply unit air filter should be replaced every three to six months. If your server environment is especially dirty, you may have to replace it more frequently. The power supply unit air filter must be in place for safe operation. FIGURE 1-34 shows the location of the power supply air filters for the Netra ct 800 server and FIGURE 1-35 shows the location of the power supply air filter for the Netra ct 400 server.

⚠ **Caution –** There is an energy hazard present if the power supply unit air filter is not installed. If you remove the power supply unit air filter, you must replace the filter immediately and replace the outer cover for the safe operation of your system. Refer to the instructions in the *Netra ct Server Service Manual* for more information.

1.3.1.7 Fan Tray and Fans

Both the Netra ct 800 servers and the Netra ct 400 servers have two fan trays, and each fan tray has two fans. The fan tray is designed to be hot-swappable. The fans are placed in the top of the system behind the system status panel (see "System Status Panel" on page 1-34 for the location of the system status panel). They are recessed into the operations card cage to maximize the air flow across the CompactPCI cards. There is no difference between the fan trays or fans used in the Netra ct 800 servers and the Netra ct 400 servers.

When the server is first powered on, if the temperature is below 111˚F (44˚C), the CPU card brings the fan speeds of both fan trays up to 75%. If the temperature rises above 133˚F (56˚C), then the CPU card increases the fan speeds of both fan trays to 100%. If the temperature rises above 158˚F (70˚C), the CPU card sends out a warning that the system is overheating. If the temperature rises above 167˚F (75˚C), then the system shuts down automatically.

Note that the temperatures above are not ambient air temperatures, but rather the CPU temperatures that are monitored by a thermistor located under the heatsink on the CPU card. Also, the envmond daemon controls the speed of the fans, so you must have the envmond daemon installed and running.

If one fan tray fails, the other fan tray will kick up to 100%, regardless of the temperature. If one fan tray fails, you must replace the failed fan tray as soon as possible. Even though the system can run on one fan tray, if the temperature rises, a single fan tray may not be able to cool the system properly.

FIGURE 1-36 shows the locations of the fan trays in a Netra ct 800 server and FIGURE 1-37 shows the locations of the fan trays in a Netra ct 400 server. Note that the system status panel has been removed in both figures.

Upper fan tray

Lower fan tray
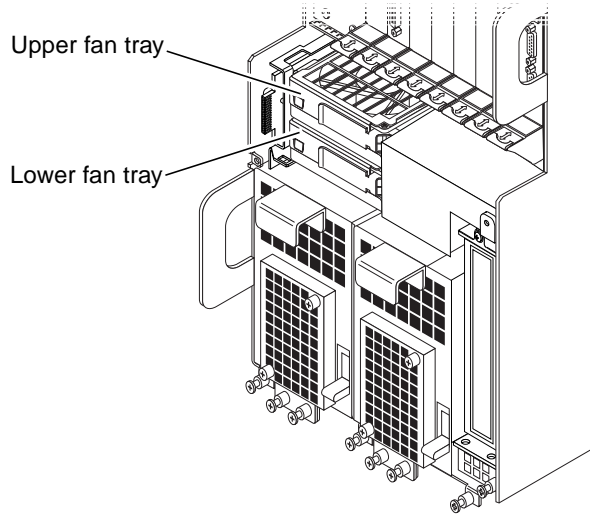
FIGURE 1-36 Locating the Fan Trays in a Netra ct 800 Server

Upper fan tray

Lower fan tray
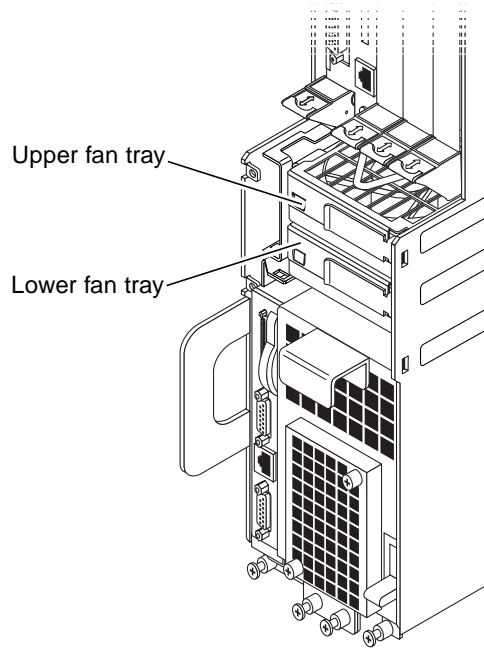
FIGURE 1-37 Locating the Fan Trays in a Netra ct 400 Server

1.3.1.8   Hard Disk Drive

Hard disk drives are fully hot-swappable. Each hard disk drive has its own latching mechanism to ensure a positive lock with the chassis. You can have a maximum of two hard disk drives in the Netra ct 800 server and one hard disk drive in the Netra ct 400 server. There is no difference between the hard disk drives used in the Netra ct 800 servers and the Netra ct 400 servers.

A specific slot is reserved for the hard disk drives in both the Netra ct 800 servers and the Netra ct 400 servers. The hard disk drives will be behind the drive bay cover on your system. There would be a maximum of two hard disk drives behind the drive bay cover in a Netra ct 800 server and one behind the drive bay cover in a Netra ct 400 server.

Following are the SCSI IDs for the hard disk drives:

- Netra ct 800 server
  - Upper hard disk drive—SCSI ID 0
  - Lower hard disk drive—SCSI ID 1
- Netra ct 400 server
  - Hard disk drive—SCSI ID 0

Drive bay cover, Netra ct 800 server

Drive bay cover, Netra ct 400 server
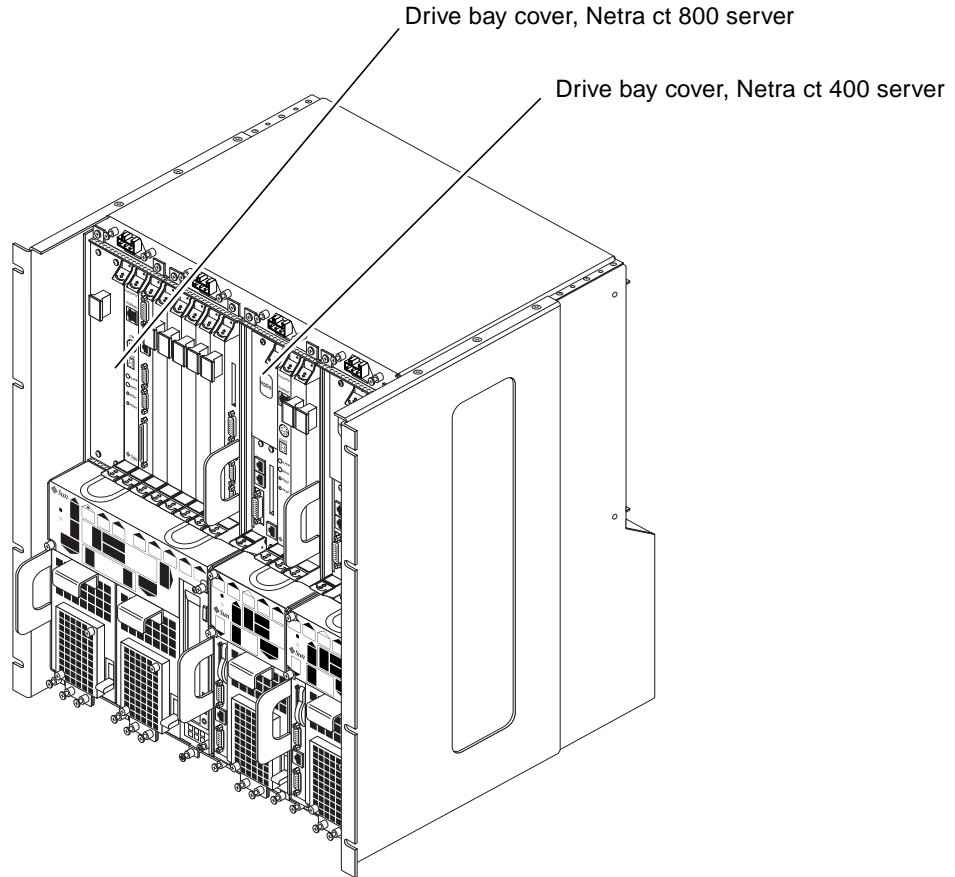
FIGURE 1-38 Drive Bay Cover Locations

1.3.1.9   Removeable Media Module

The removeable media module consists of either a CD-ROM/DVD or a 4-mm digital audio tape (DAT) drive, either of which is placed into the system from the front. The removeable media module is available only for the Netra ct 800 server.

Following are the SCSI IDs for the devices used in the removeable media module:

- CD-ROM/DVD—SCSI ID 6
- DAT—SCSI ID 5
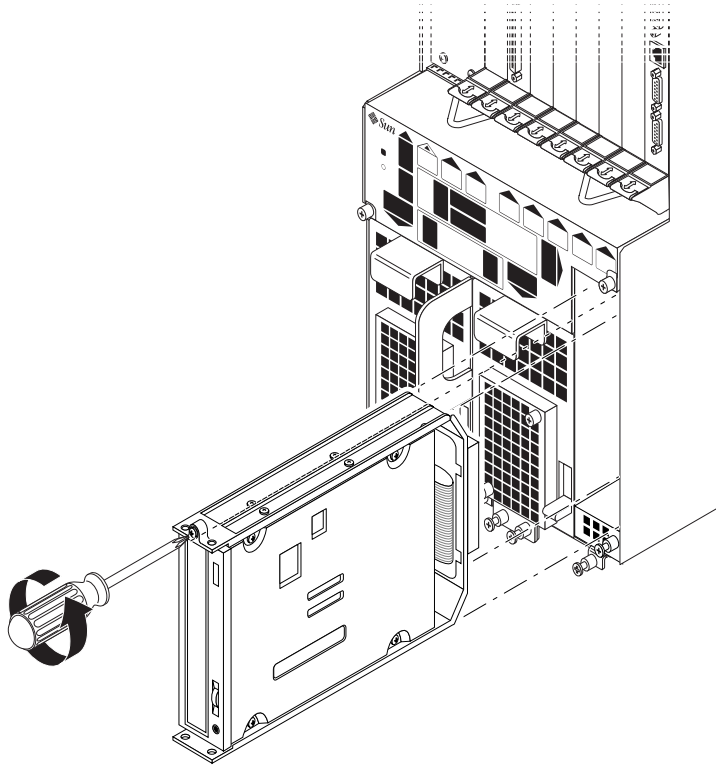
FIGURE 1-39 Removeable Media Module Location

1.3.1.10   Alarm Card

The alarm card is a feature for both the Netra ct 400 servers and Netra ct 800 servers. The alarm card for the Netra ct 800 server is different from the alarm card used in the Netra ct 400 server, so the alarm cards are not interchangeable between the two types of servers. In the Netra ct 800 server, the alarm card is a single-wide 6U card (a *U* is a unit of measure equal to 1.75 inches or 44.45 mm); in the Netra ct 400 server, the alarm card is a double-wide 3U card.

Significant *Reliability, Availability, Serviceability (RAS)* functions are provided by the *alarm card.* The alarm card has its own CPU, a Motorola MPC850 processor, plus its own real-time operating system and application software.

The alarm card and its accompanying software perform the following functions on the Netra ct server:

- Enables you to power on and off the Netra ct server from a remote console
- Notifies an administrator in the event of a component failure
- Gives a hard or soft reset of the CPU board
- Interacts with the network management software on the server to indicate changes in system state

The alarm card has the following interfaces:

- Remote interfaces:
  - Two isolated RS-232 interfaces
  - One 10 Mbyte/s Ethernet port

A specific slot is reserved for the alarm card in both the Netra ct 800 server and the Netra ct 400 server. FIGURE 1-40 shows the alarm card for a Netra ct 800 server and FIGURE 1-41 shows the alarm card for a Netra ct 400 server.
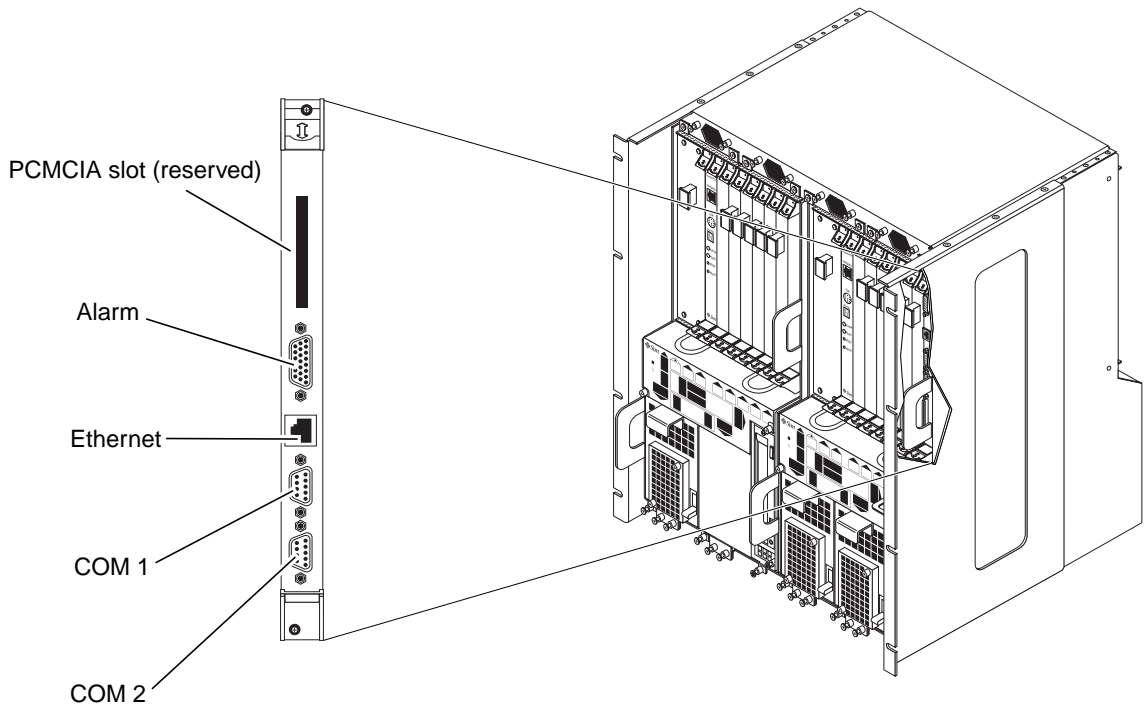
FIGURE 1-40 Alarm Card (Netra ct 800 Server)
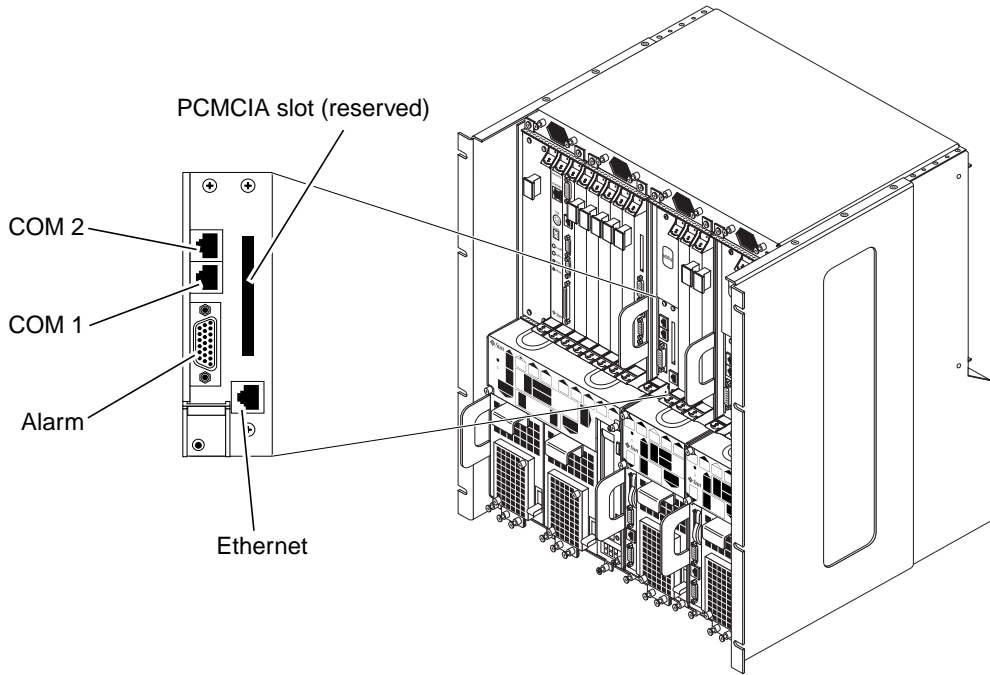
FIGURE 1-41 Alarm Card (Netra ct 400 Server)

There is also an alarm rear transition card available only for the rear-access model Netra ct 800 server. The alarm card shown in FIGURE 1-40 must be used in conjunction with alarm rear transition card for rear-access models. Refer to "Alarm Rear Transition Card" on page 1-58 for more information.

1.3.2   Components Available Only for the Front-Access Models

Following are components that are available only for front-access model servers:

- "CPU Front Transition Card" on page 1-49
- "Front-Access Model I/O Cards" on page 1-50

1.3.2.1 CPU Front Transition Card

The CPU front transition card is required to provide connections from the CPU card to standard I/O connectors on the front. The CPU front transition card for the Netra ct 800 server is 6U (a *U* is a unit of measure equal to 1.75 inches) and takes up the CompactPCI I/O slot next to the CPU, while the CPU front transition card for the Netra ct 400 server is 3U and is installed in the slot next to the power supply. The CPU front transition card for the Netra ct 800 server is therefore different from the CPU front transition card for the Netra ct 400 server, so the CPU front transition cards are not interchangeable between the two types of servers.

FIGURE 1-42 shows the location of the CPU front transition card in a Netra ct 800 server and FIGURE 1-43 shows the location of the CPU front transition card in a Netra ct 400 server. Note that the CPU front transition card for the Netra ct 400 server does not have a TTY A port, so you must use the COM port on the CPU card as the TTY A port for the front-access model of the Netra ct 400 server (see "CPU Card" on page 1-25 for more information on the COM port on the CPU card).
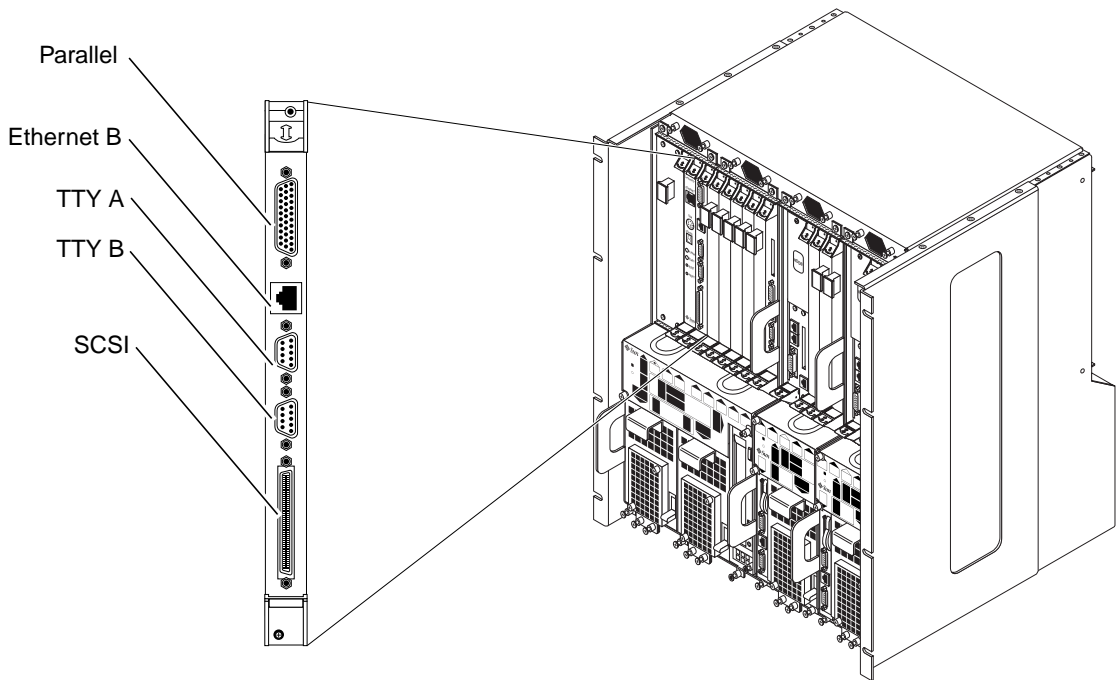
FIGURE 1-42 CPU Front Transition Card Location in an Netra ct 800 Server
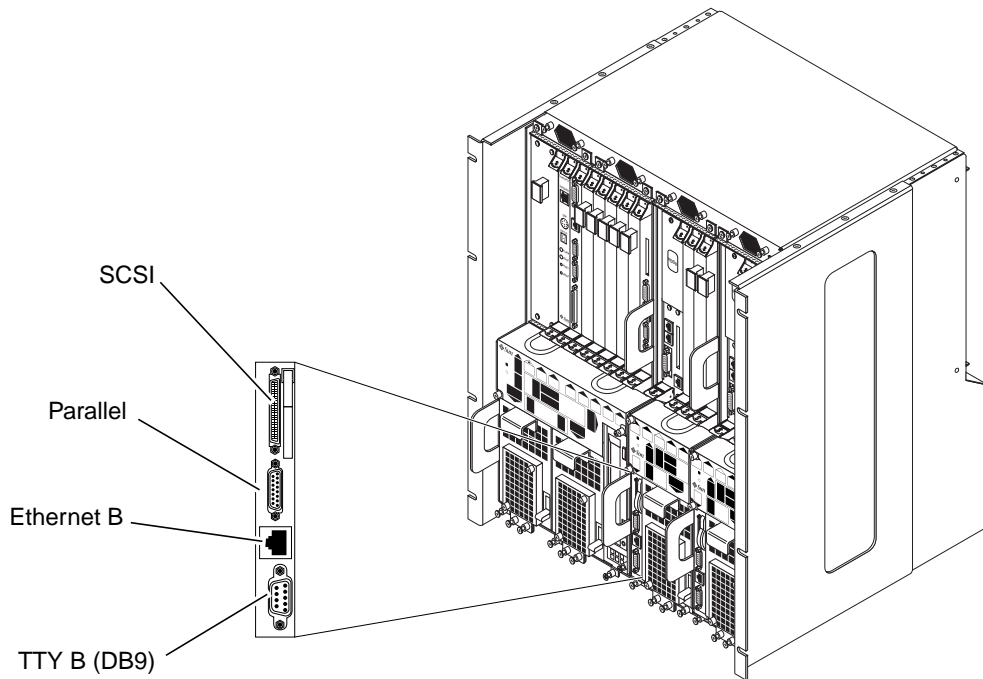
FIGURE 1-43 CPU Front Transition Card Location in a Netra ct 400 Server

1.3.2.2   Front-Access Model I/O Cards

The Netra ct server supports several types of CompactPCI I/O cards, such as the Sun QuadFastEthernet™ card. Card slots designed for I/O cards have black rails; card slots with red rails are reserved for the CPU card.

- FIGURE 1-44 shows the I/O card slots in a Netra ct 800 server.
- FIGURE 1-46 shows the I/O card slots in a Netra ct 400 server.

An I/O card *cannot* be installed in the slot meant for the CPU card or alarm card. All the slots for I/O cards in the Netra ct server support hot swap. The front-access model I/O cards are installed and cabled from the front of the chassis.

FIGURE 1-44 shows the card slots in a Netra ct 800 server.
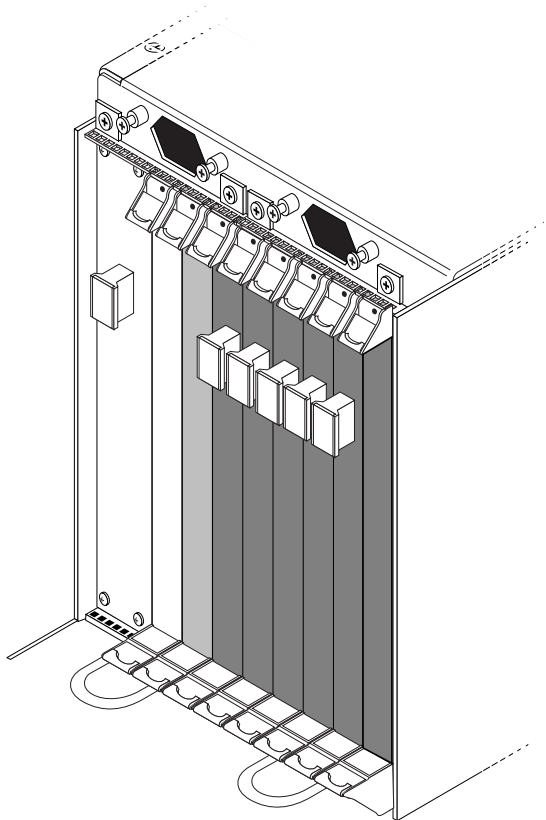
Legend:
☐ CPU front transition or I/O card

☐ I/O cards only

☐ Alarm card only

FIGURE 1-44 I/O Card Slots (Netra ct 800 Server)

FIGURE 1-45 shows the buses on a Netra ct 800 server.
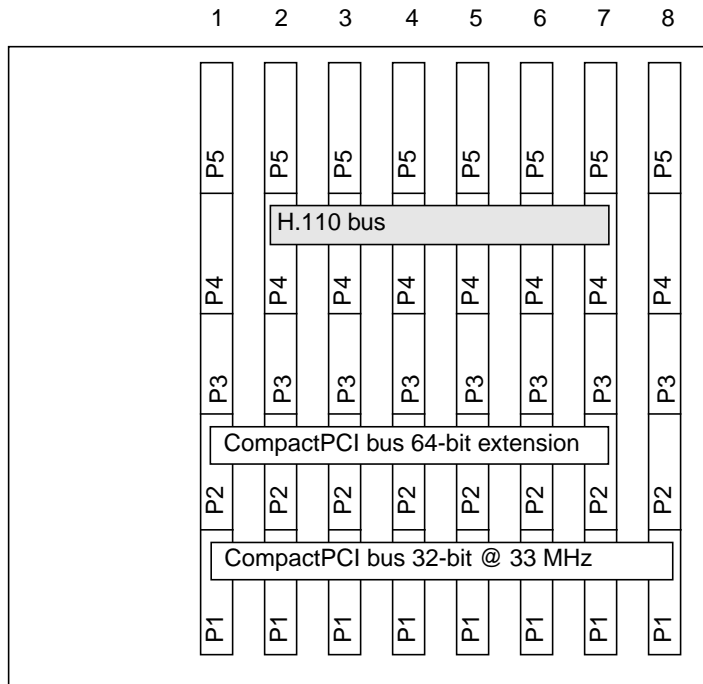
FIGURE 1-45 Buses for the Netra ct 800 Server (Front View)

FIGURE 1-46 shows the card slots in a Netra ct 400 server.
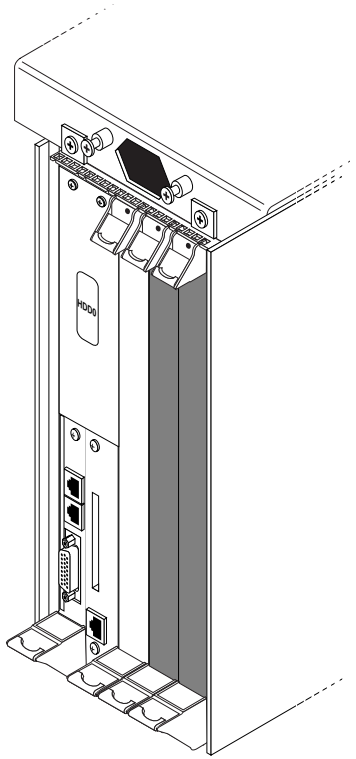
Legend: ▓ I/O cards only

FIGURE 1-46 I/O Card Slots (Netra ct 400 Server)

FIGURE 1-47 shows the buses on a Netra ct 400 server.
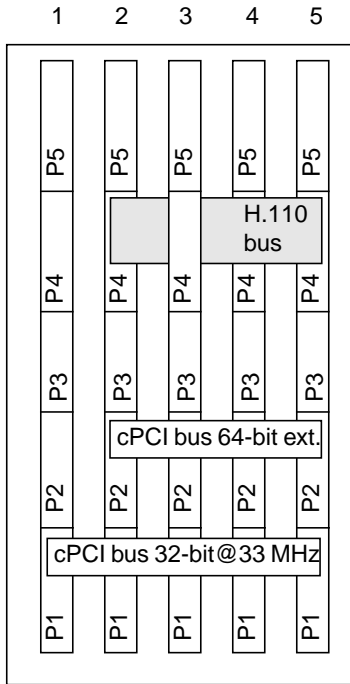
FIGURE 1-47 Buses for the Netra ct 400 Server (Front View)

1.3.3 Components Available Only for the Rear-Access Models

Following are components that are available only for rear-access model servers:

- "CPU Rear Transition Card" on page 1-55
- "Alarm Rear Transition Card" on page 1-58
- "Rear-Access Model I/O Cards" on page 1-59

1.3.3.1 CPU Rear Transition Card

The CPU rear transition card is required to provide connections from the CPU card to standard I/O connectors on the rear. In addition, the CPU rear transition card provides two MIIs to two 10/100 twisted-pair Ethernet connections. The CPU card must be installed in the front of the server in order for the CPU rear transition card to work (refer to "Rear-Access Model" on page 1-17 for more information).

FIGURE 1-48 shows the connectors on the CPU rear transition card for the Netra ct 800 server and FIGURE 1-49 shows the connectors on the CPU rear transition card for the Netra ct 400 server.
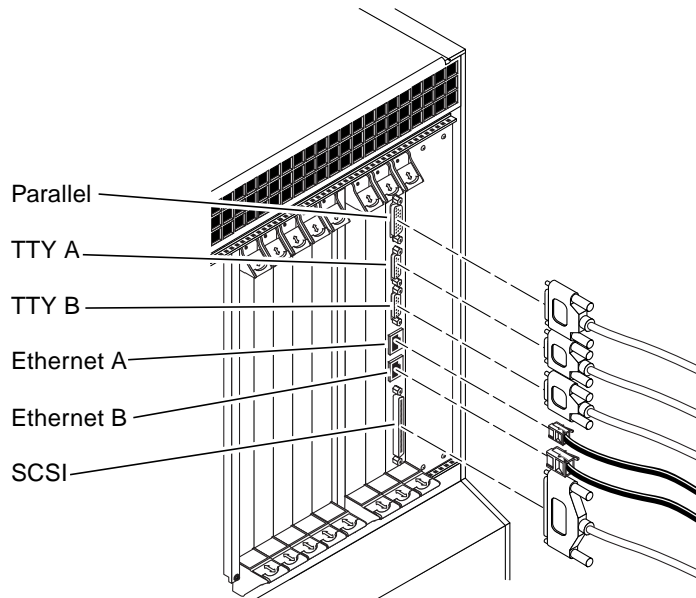
FIGURE 1-48 Connectors on the CPU Rear Transition Card (Netra ct 800 Server)
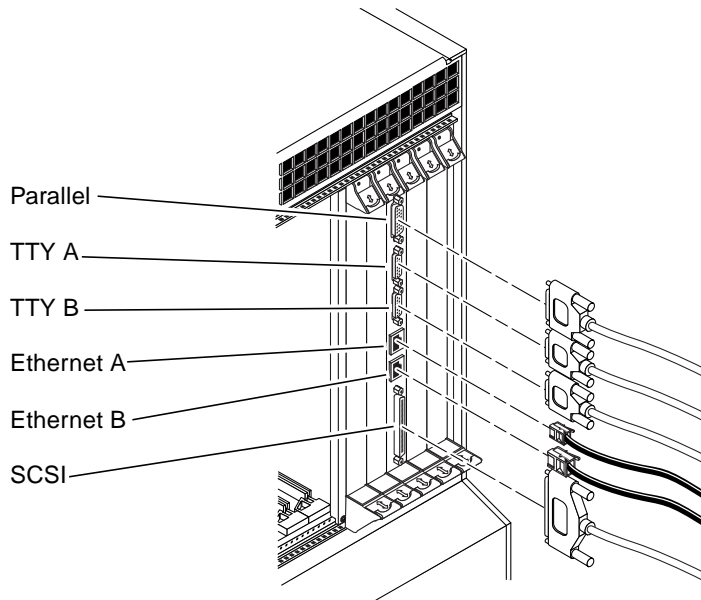
FIGURE 1-49 Connectors on the CPU Rear Transition Card (Netra ct 400 Server)

FIGURE 1-50 shows the location of the CPU rear transition card on the Netra ct 800 server, and FIGURE 1-51 shows the location of the CPU rear transition card on the Netra ct 400 server.

```
                                                                    Midplane

Front of          ┌──────────────────────────┬─┬──────────────────┐      Rear of
chassis           │  Hard disk drives         │ │                  │      chassis
                  ├──────────────────────────┤ ├──────────────────┤
                  │  CPU card (slot 1)        │ │  CPU RTC         ├───╮
                  ├──────────────────────────┤ ├──────────────────┤   ╲
                  │  I/O card (slot 2)        │ │  I/O RTC         ├───╮ ╲
                  ├──────────────────────────┤ ├──────────────────┤   ╲ ╲
                  │  I/O card (slot 3)        │ │  I/O RTC         ├───╮ ╲ ╲
                  ├──────────────────────────┤ ├──────────────────┤   ╲ ╲ ╲
                  │  I/O card (slot 4)        │ │  I/O RTC         ├───╮ ╲ ╲
                  ├──────────────────────────┤ ├──────────────────┤
                  │  I/O card (slot 5)        │ │  I/O RTC         ├───
                  ├──────────────────────────┤ ├──────────────────┤
                  │  I/O card (slot 6)        │ │  I/O RTC         ├───
                  ├──────────────────────────┤ ├──────────────────┤
                  │  I/O card (slot 7)        │ │  I/O RTC         ├───
                  ├──────────────────────────┤ ├──────────────────┤
                  │  Alarm card (slot 8)      │ │  Alarm RTC       ├───
                  └──────────────────────────┴─┴──────────────────┘
                                                                    Cables
```

FIGURE 1-50 Locating the CPU Rear Transition Card in a Netra ct 800 Server (Top View)

```
Front of                                           Midplane
chassis                                                         Rear of
                  ┌──────────────────────┬─┬──────────────────┐ chassis
                  │ Double-wide 3U       │ │                  │
                  │ alarm card           │ │                  │
                  │           Hard disk drive                 │
                  ├──────────────────────┤ ├──────────────────┤
                  │ CPU card (slot 3)    │ │  CPU RTC         ├───
                  ├──────────────────────┤ ├──────────────────┤
                  │ I/O card (slot 4)    │ │  I/O RTC         ├───
                  ├──────────────────────┤ ├──────────────────┤
                  │ I/O card (slot 5)    │ │  I/O RTC         ├───
                  └──────────────────────┴─┴──────────────────┘
                                                    Cables
```
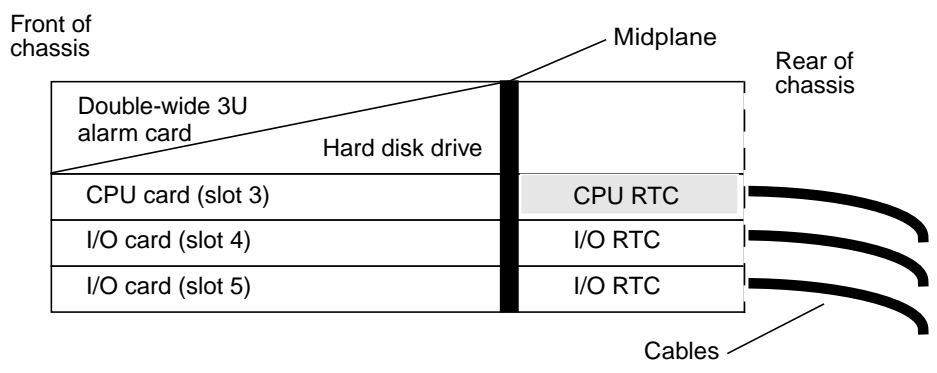
FIGURE 1-51 Locating the CPU Rear Transition Card in a Netra ct 400 Server (Top View)

1.3.3.2   Alarm Rear Transition Card

The alarm rear transition card extends the ports on the alarm card installed at the front of the server to the alarm rear transition card installed at the rear of the server. The alarm rear transition card is available only for the rear-access model of the Netra ct 800 server; there is no alarm rear transition card for the rear-access model of the Netra ct 400 server. The alarm card must be installed in the front of the server in order for the alarm rear transition card to work (refer to "Rear-Access Model" on page 1-17 for more information). FIGURE 1-52 shows the alarm rear transition card for the Netra ct 800 server.

FIGURE 1-52 Alarm Rear Transition Card

Front of
chassis

Midplane

Rear of
chassis

	Hard disk drives		
Slot 1	CPU card	CPU RTC	Slot 1
Slot 2	Front I/O card	I/O RTC	Slot 2
Slot 3	Front I/O card	I/O RTC	Slot 3
Slot 4	Front I/O card	I/O RTC	Slot 4
Slot 5	Front I/O card	I/O RTC	Slot 5
Slot 6	Front I/O card	I/O RTC	Slot 6
Slot 7	Front I/O card	I/O RTC	Slot 7
Slot 8	Alarm card	Alarm RTC	Slot 8
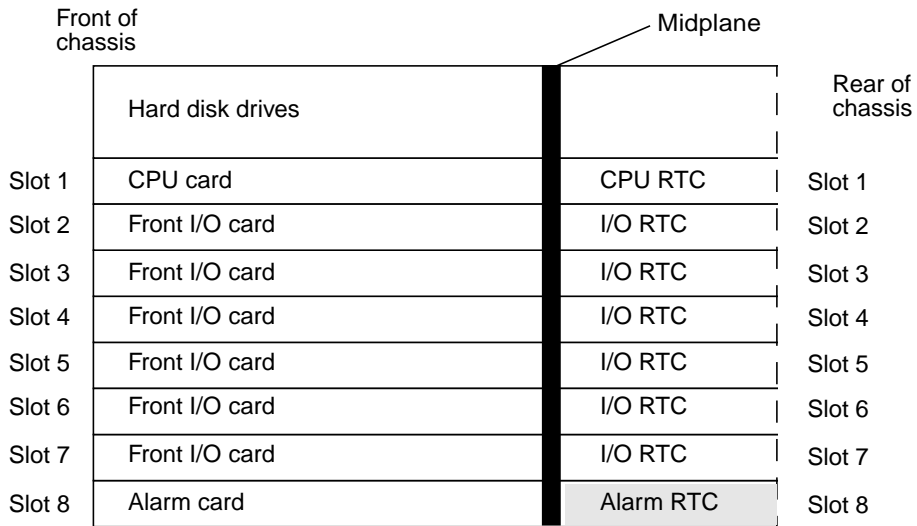
FIGURE 1-53 Locating the Alarm Rear Transition Card in the Rear-Access Model of an
Netra ct 800 Server (Top View)

1.3.3.3   Rear-Access Model I/O Cards

The rear-access model cards are:

■ The front I/O card
■ The I/O rear transition card

The front I/O card contains the ASICs for the associated I/O card and is installed
from the front of the server; however, no cables are connected to the front I/O card.
It contains the hot swap LED that tells you when it and its associated I/O rear
transition card are ready for removal.

The I/O rear transition card brings the ports for a particular front I/O card to the
rear of the server. The front I/O card must be installed in the front of the server in
order for the I/O rear transition card to work (refer to "Rear-Access Model" on
page 1-17 for more information).
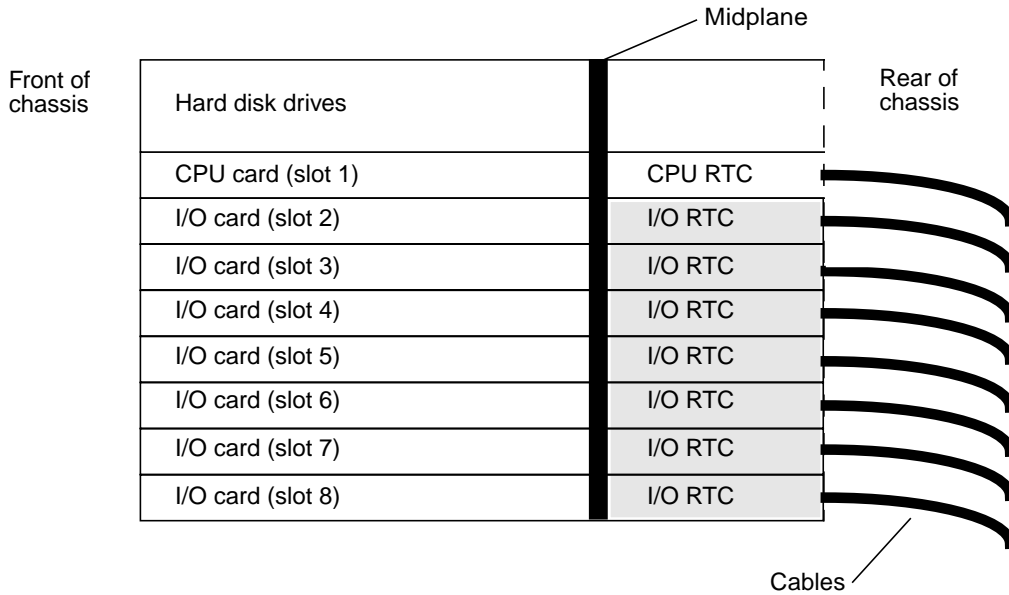
FIGURE 1-54 Locating the I/O Rear Transition Cards in a Netra ct 800 Server (Top View)
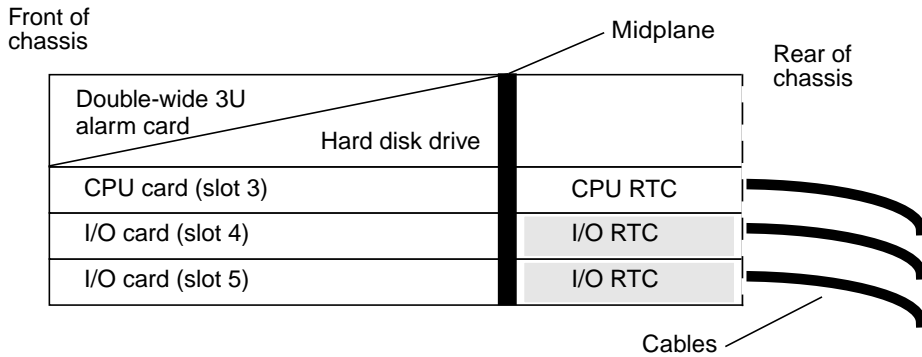
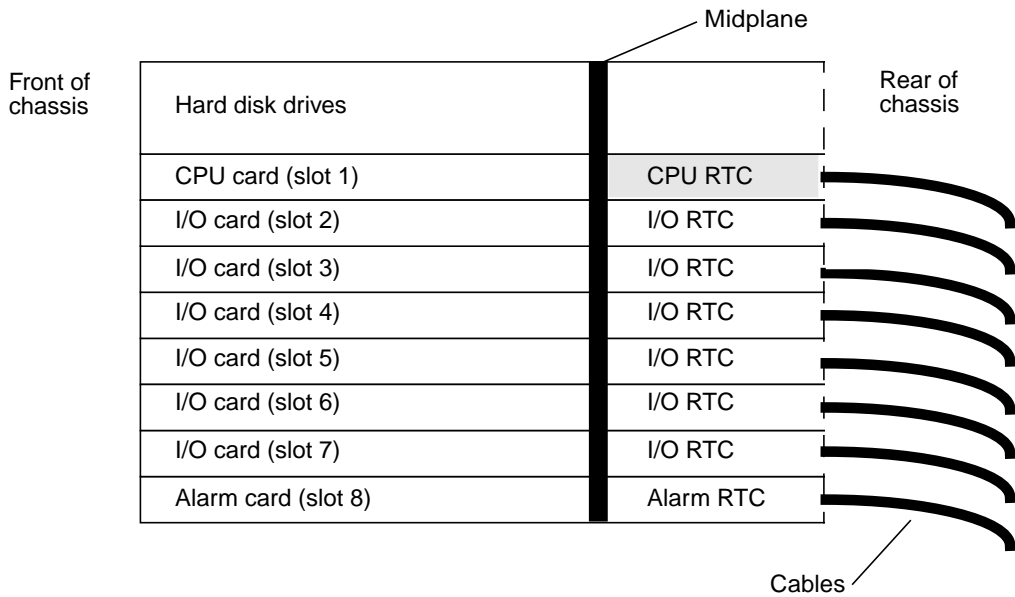**FIGURE 1-55** Locating the I/O Rear Transition Cards in a Netra ct 400 Server (Top View)
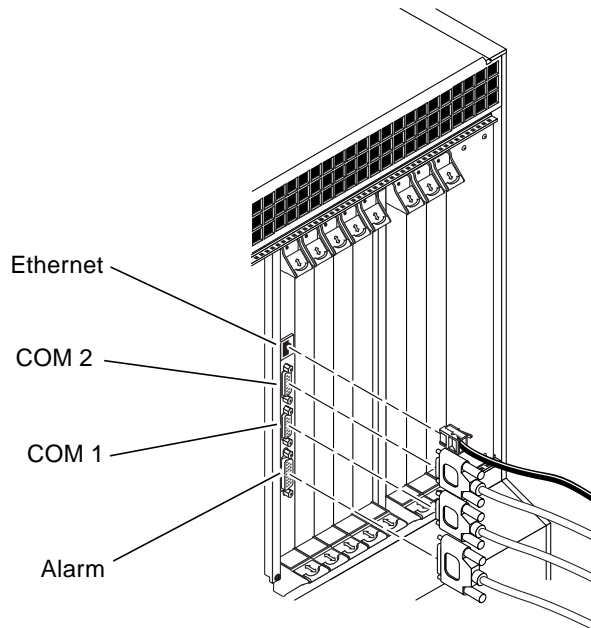
1.4   Server Configurations

1.4.1   Netra ct 800 Server Configurations

The Netra ct 800 server supports the 6U CompactPCI cards in its I/O slots. (A *U* is a unit of measure equal to 1.75 inches.) The following devices are supported in a Netra ct 800 server:

- One Netra ct CPU card
- One or two hard disk drives
- One single-wide 6U alarm card
- One CPU front transition card (front-access model only)
- One to seven Netra ct-supported CompactPCI I/O cards

Note that if you have the front-access model of the Netra ct server, the front transition card takes up one of the slots normally used by a CompactPCI I/O card (slot 2), reducing by one the number of CompactPCI I/O cards that you could install in the Netra ct 800 server. (Refer to "Front-Access and Rear-Access Models" on page 1-15 for more information on front-access and rear-access models of the Netra ct server.)

Each Netra ct 800 server also houses:

- Two power supply units
- One removeable media module, which contains either a CD-ROM/DVD drive or a 4mm DAT drive
- Two fan trays, with two fans per tray
- One system controller board
- An LED system status panel
- One air filter

You can house one or two Netra ct 800 servers with different configurations in the same Netra ct server chassis, as long as they are all the same model (front-access or rear-access).

For the most part, devices used in the Netra ct 800 servers and Netra ct 400 servers are interchangeable. See "Netra ct Server Components" on page 1-23 for a more detailed description of each device supported in the Netra ct 800 server.

1.4.2   Netra ct 400 Server Configurations

- One Netra ct CPU card
- One hard disk drive
- One or two Netra ct-supported 6U CompactPCI I/O cards
- One double-wide 3U alarm card
- One power supply
- One CPU front transition card (front-access model only)
- Two fan trays, with two fans per tray
- One system controller board
- An LED system status panel
- One air filter

You can house up to four Netra ct 400 servers with different configurations in the same Netra ct server chassis, as long as they are all the same model (front-access or rear-access).

For the most part, devices used in the Netra ct 800 servers and Netra ct 400 servers are interchangeable. See "Netra ct Server Components" on page 1-23 for a more detailed description of each device supported in the Netra ct 800 server.

1.5   System Schematics

Following are the system schematics for the different models of Netra ct server:

System Schematics for the Front-Access Netra ct
800 Server

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

P5

H.110 bus — P4

P3

CompactPCI bus 64-bit extension — P2

CompactPCI bus 32-bit @ 33 MHz — P1

Hard disk
drive 1

Hard disk
drive 2

Removeable
media module

CPU card

CPU front
tran. card

Alarm card

SCSI bus
@ 80Mb/s

PWR ON

+5V
+12V
-12V
STDBY 5V

I^2C bus

System
status
panel

System
controller
board

Fan tray 1

Fan tray 2

Power supply unit 1

Power supply unit 2

-48V feed

Power distribution unit

-48V feed

Power distribution unit

System Schematics for the Rear-Access Netra ct 800 Server

	1	2	3	4	5	6	7	8	
									P5
			H.110 bus						P4
									P3
		CompactPCI bus 64-bit extension							P2
		CompactPCI bus 32-bit @ 33 MHz							P1

Hard disk drive 1

Hard disk drive 2

Removeable media module

CPU card

CPU rear tran. card

Alarm card

Alarm rear tran. card

SCSI bus @ 80Mb/s

PWR ON

+5V

+12V

-12V

STDBY 5V

I^2C bus

System status panel

System controller board

Fan tray 1

Fan tray 2

Power supply unit 1

Power supply unit 2

-48V feed

Power distribution unit

-48V feed

Power distribution unit

PWR ON

+5V

+12V

-12V

STDBY 5V

Hard disk drive

| 1 | 2 | 3 | 4 | 5 |

P5

H.110 bus   P4

P3

cPCI bus 64-bit ext.   P2

cPCI bus 32-bit @ 33 MHz   P1

Alarm card

SCSI bus @ 80Mb/s

CPU front tran. card   CPU card

I^2C bus

Power supply unit

System status panel

System controller board

Fan tray   Fan tray

-48V feed

Power distribution unit

1.5.4   System Schematics for the Rear-Access Netra ct 400 Server

1   2   3   4   5

P5

P4   H.110 bus

P3

P2   cPCI bus 64-bit ext.

P1   cPCI bus 32-bit @ 33 MHz

Hard disk drive

PWR ON

+5V

+12V

-12V

STDBY 5V

Alarm card

SCSI bus @ 80Mb/s

CPU rear tran. card

CPU card

I^{2}C bus

Power supply unit

System status panel

System controller board

Fan tray

Fan tray

-48V feed

Power distribution unit
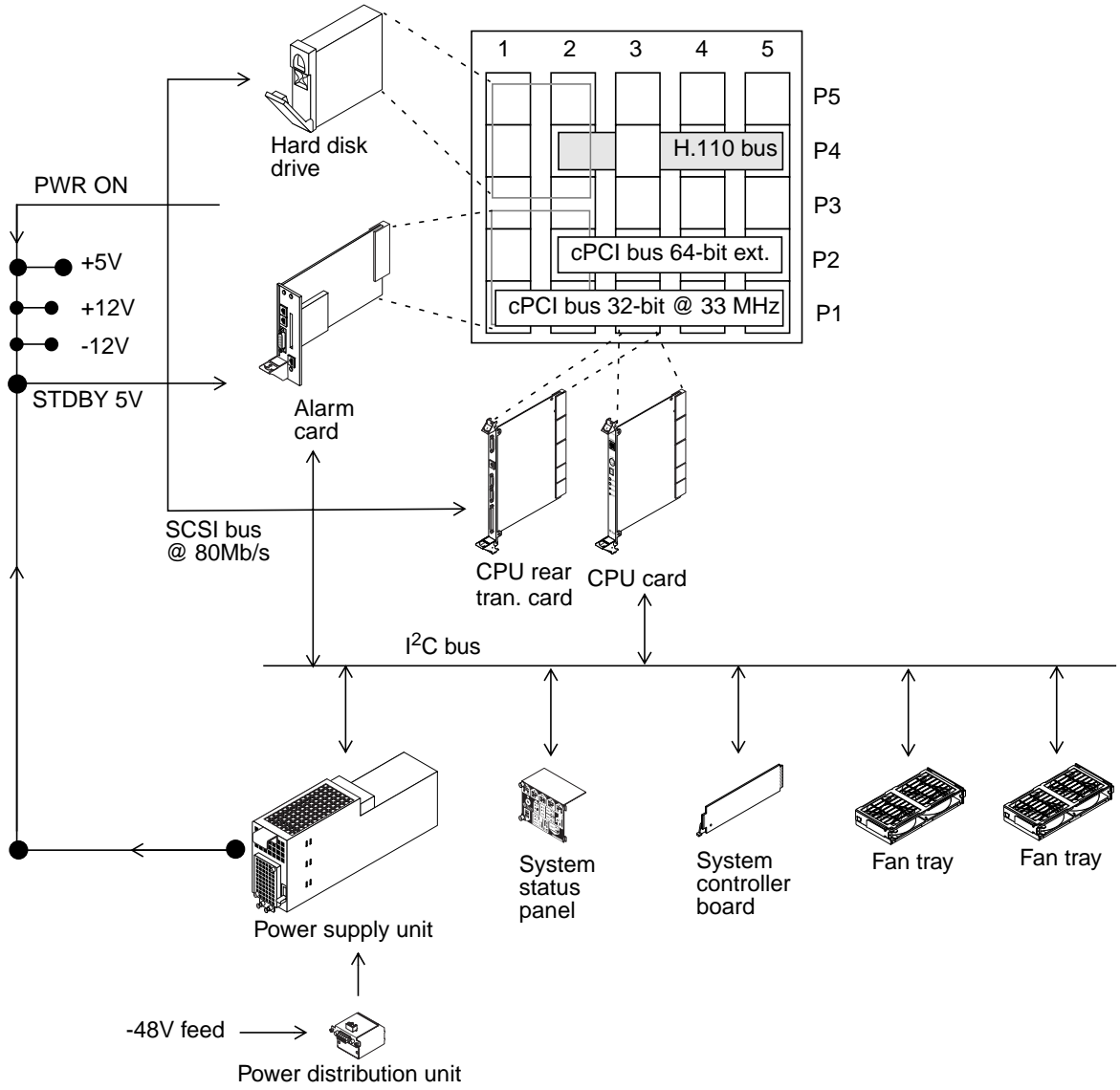
Reliability, Availability, and Serviceability (RAS) Features

2.1 Understanding RAS

Reliability, Availability, and Serviceability (RAS) are general terms used to measure and assess a system's ability to operate continuously and recover from failures quickly:

■ The *reliability* of a system is the probability of the system to operate properly without failures for a given period of time. A commonly used reliability measure is Mean Time Between Failures (MTBF).

■ The *availability* of a system is the proportion of time in which the system functions properly. An availability of 99.999% translates to an average yearly system downtime of 5 minutes.

■ The *serviceability* of a system measures the ability of the system to resume normal operations after planned and unplanned interruptions caused by system or component failures and maintenance actions. The typical serviceability measure is Mean Time To Repair (MTTR), which is determined by the logistic time (time to service), diagnostic time, component replacement time, and system restart (reboot) time.

System availability can be derived from reliability and serviceability measures. To improve availability, the reliability and serviceability of a system must be improved. Typical approaches to improving reliability are reducing component failure rates and including redundant components in the design. Approaches to improving serviceability include improving system diagnostics, minimizing the impact of component replacement on system operation (for example, using hot swap), and reducing system reboot time. All of these contribute to the reduction of MTTR.

2.2 RAS Features in the Netra ct Server

The Netra ct server incorporates the following RAS features:

- Redundant components to increase their Mean Time Between Failures.
- Hot swap capability of most components to minimize impact of component replacement on availability.
- Extensive monitoring of component status to improve diagnosability.
- Optional clustering software for high availability.

2.2.1 Redundant Components

Redundant components increase a system's Mean Time Between Failures by eliminating certain single points of failure, thereby allowing the system to continue operating even though one of these components has failed.

Some versions of the Netra ct 800 server have redundant hard disk drives and power supplies. If a Netra ct 800 server with two disk drives uses the mirroring feature offered in the Solstice DiskSuite or Sun Enterprise Volume Manager disk management software packages, then data would be written to and read from both disks, and if one disk drive fails, the system would be able to continue to run using the date stored on the second disk drive. A Netra ct 800 server with two power supplies would have redundant system power. Should one of the power supplies in the drawer fail, the drawer would continue to operate normally because the remaining power supply would continue to supply power to the drawer. Two power supplies are redundantly parallel with load sharing. The estimated load is 50% for both at nominal operation and 100% load on the surviving supply upon failure of one power supply. Since there is no component switching during a failure event, there is no single point of failure due to a switching scheme.

In the Netra ct 800 server and the Netra ct 400 server, the fan trays are redundant. When the server is first powered on, if the temperature is below 111˚ Fahrenheit (44˚ Celsius), the CPU card will bring the fan speeds of both fan trays up to 75%. If the temperature rises above 133˚ Fahrenheit (56˚ Celsius), then the CPU card will increase the fan speeds of both fan trays to 100%. If the temperature rises above 158˚ Fahrenheit (70˚ Celsius), then the CPU card will send out a warning that the system is overheating. If the temperature rises above 167˚ Fahrenheit (75˚ Celsius), then the system will shut down automatically.

If one fan tray fails, the other fan tray will kick up to 100%, regardless of the temperature. If one fan tray fails, you must replace the failed fan tray as soon as possible. Even though the system can run on one fan tray, if the temperature rises, a single fan tray may not be able to cool the system properly.

2.2.2 Hot Swap Capability

Some components in the Netra ct 800 server and Netra ct 400 server are *hot-swappable.* A hot-swappable component is a component that you can install or remove and replace while the server is running, without interrupting the operation of the server. You must enter software commands before and after an installation or after a removal/replacement of a hot-swappable component to incorporate the new component in the system correctly.

Following are the hot-swappable components in the Netra ct 800 server and Netra ct 400 server:

- I/O cards, front access and rear access models
- Alarm cards
- Alarm rear transition card (Netra ct 800 server)
- Hard disk drives
- CD-ROM/DVD or DAT drives occupying the removable media module and the removable media module itself
- Fan trays
- System status panels
- System controller boards
- Second power supply in a Netra ct 800 server
- Power supply unit air filters
- Main air filters

Refer to "Netra ct Server Components" on page 1-23 for complete descriptions of each hot-swappable component.

2.2.3   System Component Monitoring

You can get diagnostic feedback on certain key components within the Netra ct 800 server and Netra ct 400 server through the system status panel. Each major component in the Netra ct 800 server or Netra ct 400 server has a set of LEDs on the system status panel that gives the status on that particular component. Each component will have either the green Power and the amber Okay to Remove LEDs (FIGURE 2-1) or the green Power and amber Fault LEDs (FIGURE 2-2).
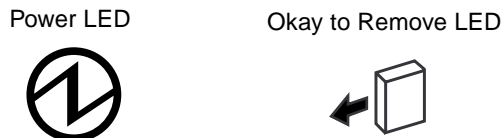
Power LED   Okay to Remove LED

FIGURE 2-1   Power and Okay to Remove LEDs

Power LED   Fault LED

FIGURE 2-2   Power and Fault LEDs

FIGURE 2-3 shows the LEDs on the system status panel for the Netra ct 800 server, and FIGURE 2-4 shows the LEDs on the system status panel for the Netra ct 400 server.
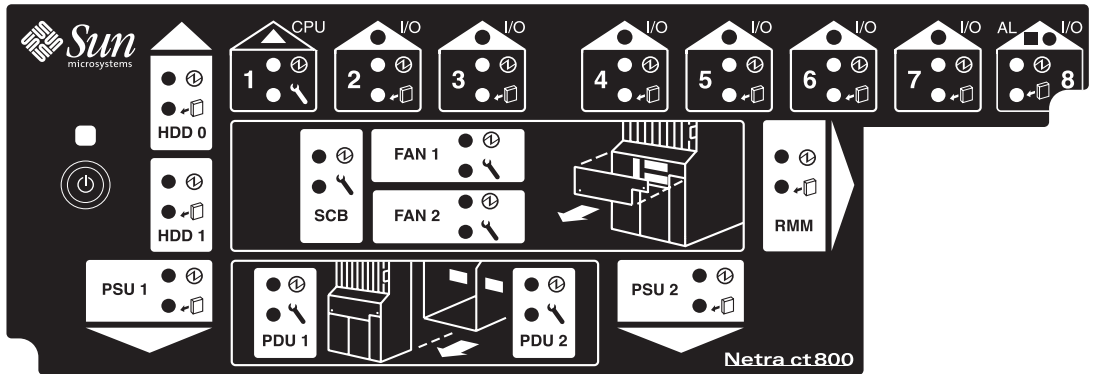
FIGURE 2-3   System Status Panel (Netra ct 800 Server)

TABLE 2-1   System Status Panel LEDs for the Netra ct 800 Server

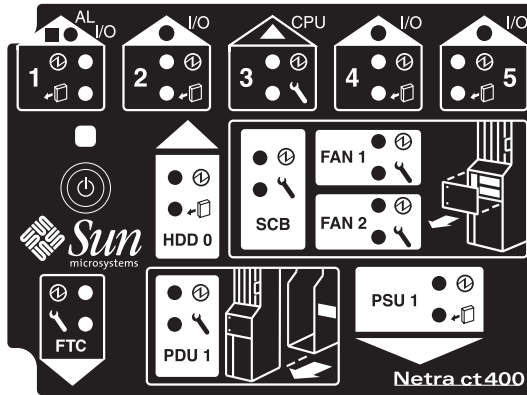| LED	LEDs Available	Component
HDD 0	Power and Okay to Remove	Upper hard disk drive
HDD 1	Power and Okay to Remove	Lower hard disk drive
Slot 1	Power and Fault	CPU card (▲) installed in slot 1
Slot 2	Power and Okay to Remove	I/O card (●) or CPU front transition card installed in slot 2
Slots 3–7	Power and Okay to Remove	I/O cards (●) installed in slots 3–7
Slot 8	Power and Okay to Remove	Alarm card (■) installed in slot 8
SCB	Power and Fault	System controller board (behind the system status panel)
FAN 1	Power and Fault	Upper fan tray (behind the system status panel)
FAN 2	Power and Fault	Lower fan tray (behind the system status panel)
RMM	Power and Okay to Remove	Removeable media module
PDU 1	Power and Fault	Leftmost power distribution unit (behind the server)
PDU 2	Power and Fault	Rightmost power distribution unit (behind the server)
PSU 1	Power and Okay to Remove	Leftmost power supply unit
PSU 2	Power and Okay to Remove	Rightmost power supply unit

FIGURE 2-4 System Status Panel (Netra ct 400 Server)

TABLE 2-2 System Status Panel LEDs for the Netra ct 400 Server

LED	LEDs Available	Component
Slot 1	Power and Okay to Remove	Double-wide alarm card(■) installed in slot 1 and 2
Slot 2	Power and Okay to Remove	Single-wide I/O card installed in slot 2 (only if alarm card is not installed)
Slot 3	Power and Fault	CPU card (▲) installed in slot 3
Slot 4 and 5	Power and Okay to Remove	I/O cards (●) installed in slot 4 and 5
HDD 0	Power and Okay to Remove	Hard disk drive
SCB	Power and Fault	System controller board (behind the system status panel)
FAN 1	Power and Fault	Upper fan tray (behind the system status panel)
FAN 2	Power and Fault	Lower fan tray (behind the system status panel)
FTC	Power and Fault	CPU front transition card
PDU 1	Power and Fault	Power distribution unit (behind the server)
PSU 1	Power and Okay to Remove	Power supply

- If the component has the green Power and amber Okay to Remove LEDs, refer to TABLE 2-3.
- If the component has the green Power and amber Fault LEDs, refer to TABLE 2-4.

TABLE 2-3   Meanings of Power and Okay to Remove LEDs

	Power LED	Okay to Remove LED
On, Solid	Component is installed and configured.	Component is Okay to Remove. You can remove the component from the system, if necessary.
On, Flashing	Component is installed but is unconfigured or is going through the configuration process.	Not applicable.
Off	Component was not recognized by the system or is not installed in the slot.	Component is *not* Okay to Remove. Do *not* remove the component while the system is running.

TABLE 2-4   Meanings of Power and Fault LEDs

	Power LED	Fault LED
On, Solid	Component is installed and configured.	Component has failed. Replace the component.
On, Flashing	Component is installed but is unconfigured or is going through the configuration process.	Not applicable.
Off	Component was not recognized by the system or is not installed in the slot.	Component is functioning properly.

2.3 System Availability Estimates

The Netra ct server server availability can be estimated from widely accepted statistical availability models (reliability block diagrams and Markov chains) based on component level MTBFs and MTTRs.

The MTBFs of most Sun designed components were calculated using the MIL-HDBK-217 method with multipliers derived from field failure data of previous Sun products. An exception is the CPU card MTBF which was calculated using the Telcordia TR-NWT-000332 method. The MTBFs of OEM components (hard disk, power supply and fan) were provided by the thirty party producers.

The component MTTR parameters and other parameters used in availability estimation were determined based upon experience on other Sun products or conservative assumptions:

- Logistic time—2 hours (Sun Platinum Service Plan)
- Diagnostic time—15 minutes
- Component swap time—15 minutes (to be refined based on future measurements)
- System reboot time—5 minutes
- Cluster failover time—5 minutes

In addition, it is assumed that Netra ct 800 servers with two hard disk drives would set up the disks in a mirrored configuration using the Solstice DiskSuite or Veritas disk management software. The following results were generated by RAScad, an availability modeling tool developed at Sun for use in the system design:

TABLE 2-5 RAScad Results

System Configuration	Hardware Availability	Yearly Downtime
Single Netra ct 800 server	0.999976	12.3 min.
Single Netra ct 400 server	0.999967	16.9 min.
Cluster of two Netra ct 800 servers	0.999998	0.8 min.
Cluster of four Netra ct 400 servers	0.999995	2.2 min.

Note that the availability numbers listed above did not take software failures into account. If Solaris and application software failure rates are known, they can be included in the availability model and the overall system availability should be lower than the numbers listed above.

Glossary

Knowledge of the following terms and acronyms is useful in the administration of the Netra ct server.

A

alarm card   An optional card that occupies a slot in the Netra ct server. The alarm card responds to events, such as I/O card failures or excessive heat. Software that resides on the card can take action in response to such events.

alarms feature   A set of features implemented in software and hardware that provide the operator of the Netra ct server with notifications when hardware and/or software failures occur (or when failure thresholds are being approached).

B

basic hot swap   One of the hot swap states. In the basic hot swap model, the hardware connection process can be performed automatically by the hardware, while the software connection process requires operator assistance. See *hot swap*, *full hot swap*

C

CompactPCI   A standard for computer boards and buses. CompactPCI is adapted from the *Peripheral Component Interconnect (PCI) Specification* for industrial and/or embedded applications requiring a more robust mechanical form factor than desktop PCI. CompactPCI is supported by the PCI Industrial Computer Manufacturers Group (PICMG), a consortium that uses PCI for embedded applications.

F

field replaceable unit (FRU)   From a service point of view, the smallest irreducible elements of a server, such as the Netra ct server. Examples of FRUs are disk drives, I/O cards, and power supplies. Note that a server, with all of its cards and other components, is not a FRU. However, an empty server is.

front-access   The model of the Netra ct server that is configured so that all of the cables come out from the front of the chassis.

front transition module   Used only for the CPU in the front access models of the Netra ct server. The CPU front transition module allows for CPU cabling from the front of the chassis.

full hot swap   One of the hot swap states. In the full hot swap model, both the hardware and the software connection process are performed automatically.

See *hot swap*, *basic hot swap*

H

hot swap   Implies the ability to remove and replace cards from and in a running computer. See *full hot swap*, *basic hot swap*

M

midplane The functional equivalent of a backplane. The midplane is secured to the back of the server. The CPU card, I/O cards and storage devices plug into the midplane from the front, and the rear transition cards plug into the midplane from the rear.

N

NEBS An acronym for Network Equipment/Building System. A set of requirements for equipment installed in telco offices. These requirements cover personnel safety, protection of property, and operational continuity. "NEBS testing" involves subjecting equipment to shaking (for earthquakes), fire, and other environmental insults. There are three levels of NEBS compliance, each a superset of the preceding. NEBS level 3, the highest level, certifies that a piece of equipment can be safely deployed in an "extreme environment." A telco central office is considered an extreme environment.

The NEBS standards are maintained by Telcordia Technologies, Inc., formerly Bellcore.

P

PICMG Acronym for the PCI Inductrial Computer Manufacturers Group. (PCI stands for Peripheral Component Interconnect.) PICMG is the group that promulgates the CompactPCI standard.

See *CompactPCI*.

R

rear-access The model of the Netra ct server that is configured so that all of the cables come out from the rear of the chassis.

rear transition card Used only on the rear access models of the Netra ct server. The rear transition cards extend the connectors from the midplane to the rear of the chassis.

**Reliability, Availability,
Serviceability (RAS)**   Refers to hardware or software features that implement or improve the reliability, availability and serviceability of a server. For example, the Netra ct server has a watchdog reset that prevents endless operating system "hangs". If the operating system enters a hung state, the watchdog reset initiates a system reset upon the expiration of a timer. This feature is said to increase the server's availability. Much of the Netra ct server's RAS functions are provided by the *alarm card* and the firmware that resides on that card.

S

system status panel   A module designed to give feedback on the status of the key components within the Netra ct servers. The system status panel has one set of LEDs for each component within that particular server.

system controller board   A hot-swappable component located behind the system status panel. It feeds system status information to the system status panel, where LEDs give feedback on the status of the key components within the Netra ct servers.

U

U   A unit of measure equal to 1.75 inches.

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