Netra™ 440 Server Product Overview

Sun Microsystems, Inc.
www.sun.com

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Preface

The *Netra 440 Server Product Overview* describes the basic hardware and software components for the Netra 440 server.

How This Book Is Organized

This guide is organized into two chapters and one appendix.

Chapter 1 describes the basic hardware components in the Netra 440 server.

Chapter 2 describes the reliability, availability, and serviceability features in the Netra 440 server.

Appendix A gives the specifications for the Netra 440 server.

Using UNIX Commands

This document might not contain information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices. See the following for this information:

- Software documentation that you received with your system
- Solaris™ operating environment documentation, which is at

  `http://docs.sun.com`

Shell Prompts

Shell	Prompt
C shell	*machine-name*`%`
C shell superuser	*machine-name*`#`
Bourne shell and Korn shell	`$`
Bourne shell and Korn shell superuser	`#`

Typographic Conventions

Typeface[1]	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. Replace command-line variables with real names or values.	Read Chapter 6 in the *User's Guide*. These are called *class* options. You *must* be superuser to do this. To delete a file, type `rm` *filename*.

1 The settings on your browser might differ from these settings.

Related Documentation

Application	Title	Part Number
Late-breaking product information	*Netra 440 Server Release Notes*	817-3885-xx
Installation instructions	*Netra 440 Server Installation Guide*	817-3882-xx
Administration	*Netra 440 Server System Administration Guide*	817-3884-xx
Parts installation and removal	*Netra 440 Server Service Manual*	817-3883-xx
Diagnostics and troubleshooting	*Netra 440 Server Diagnostics and Troubleshooting Guide*	817-3886-xx
Advanced Lights Out Manager (ALOM) system controller	*Advanced Lights Out Manager User's Guide*	817-5481-xx

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CHAPTER 1

System Overview

The Netra 440 server is a high-performance, shared memory, symmetric multiprocessing server that supports up to four UltraSPARC® IIIi processors. The UltraSPARC IIIi processor implements the SPARC® V9 Instruction Set Architecture (ISA) and the Visual Instruction Set extensions (Sun VIS™ software) that accelerate multimedia, networking, encryption, and Java™ software processing.

System reliability, availability, and serviceability (RAS) are enhanced by features that include hot-swappable hard drives and redundant, hot-swappable power supplies. A full list of RAS features is in Chapter 2.

FIGURE 1-1 shows the system features that you can access from the front panel. In the illustration, the system door is open.

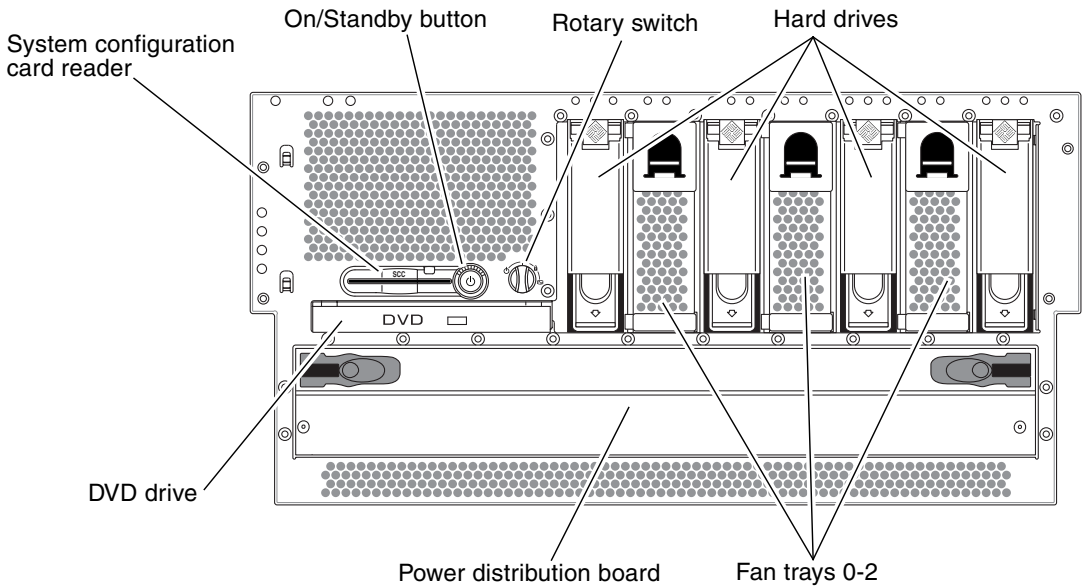

FIGURE 1-1 Front Panel Features

FIGURE 1-2 shows the back panel features for the DC version of the Netra 440 server, and FIGURE 1-3 shows the back panel features for the AC version of the Netra 440 server.

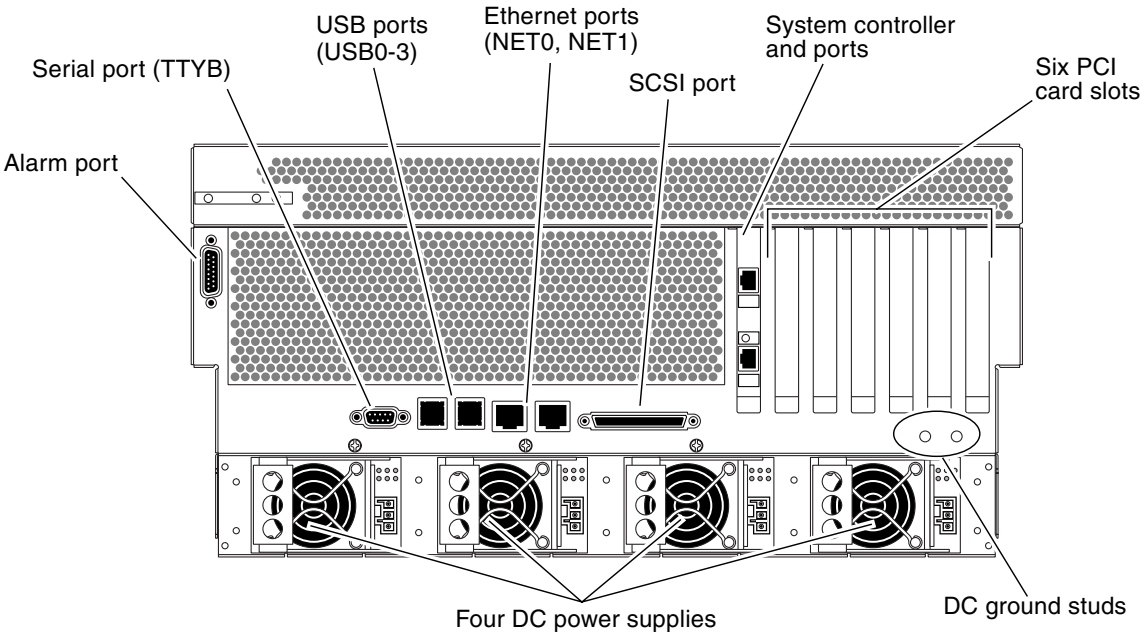

FIGURE 1-2 Back Panel Features (DC Version)

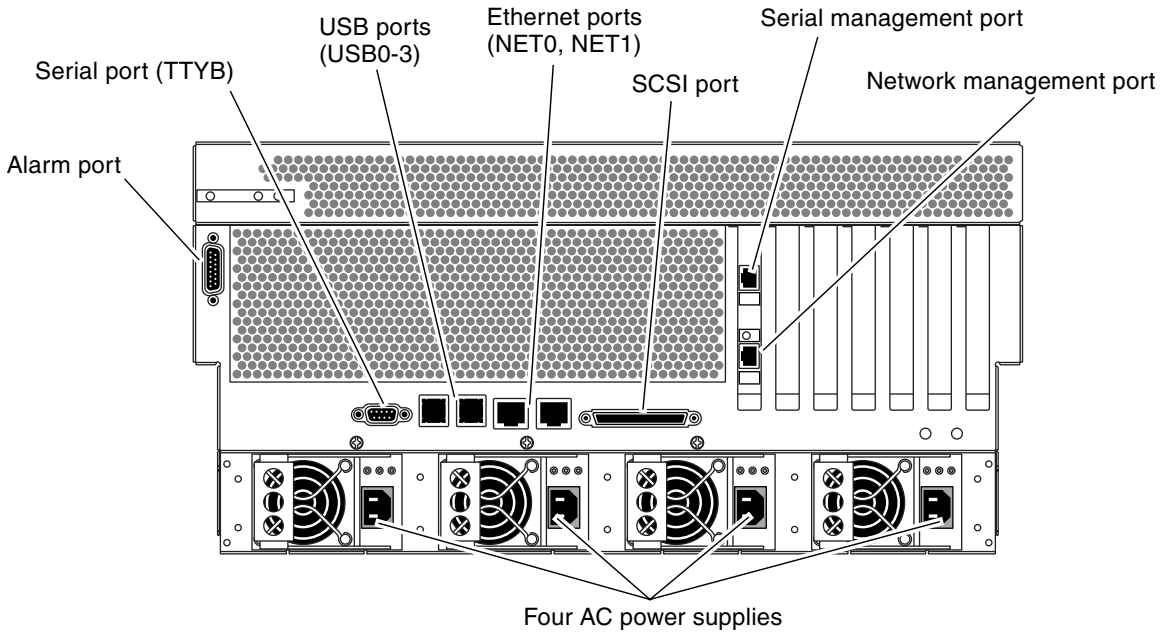

FIGURE 1-3 Back Panel Features (AC Version)

Following are the components described in this chapter:

- "LED Status Indicators" on page 4
- "System Configuration Card" on page 14
- "System Configuration Card Reader" on page 15
- "Hard Drives" on page 17
- "Fan Trays" on page 19
- "Power Distribution Board" on page 20
- "DVD Drive" on page 21
- "Rear Panel Ports" on page 21
- "ALOM System Controller Card and Ports" on page 23
- "PCI Cards and Buses" on page 25
- "Power Supplies" on page 26
- "CPU/Memory Modules" on page 28
- "Ultra-4 SCSI Controller" on page 31
- "Ultra-4 SCSI Backplane" on page 31

LED Status Indicators

Several LED status indicators on both the front and back panels provide general enclosure status, alert you to system problems, and help you to determine the location of system faults.

Front Panel LEDs

Following are the LED status indicators available on the front of the system:

- "Enclosure Status LEDs" on page 5
- "Alarm LEDs" on page 7
- "Hard Drive LEDs" on page 10
- "Fan Tray LEDs (0-2)" on page 11

Further details about the diagnostic use of LEDs are discussed in the *Netra 440 Server Diagnostics and Troubleshooting Guide*.

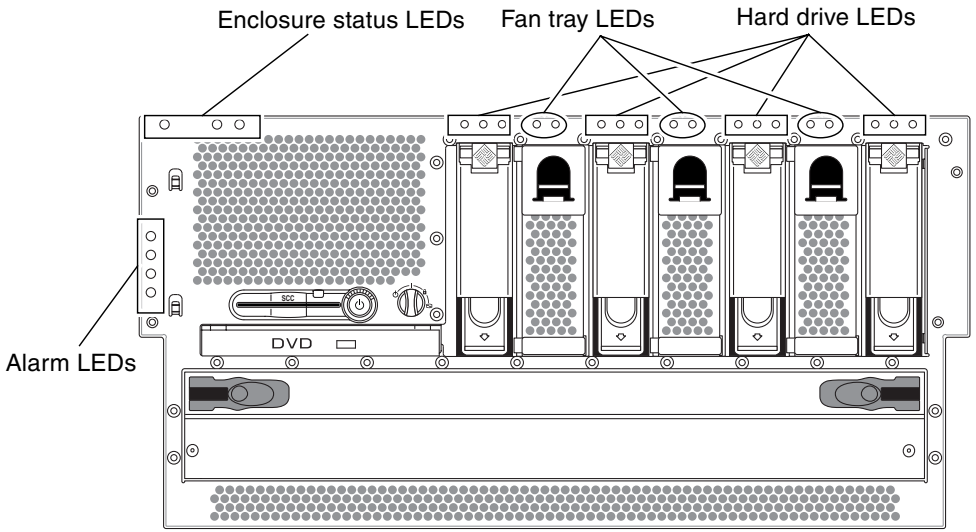

FIGURE 1-4 Front Panel LEDs

Enclosure Status LEDs

At the top left of the system as you look at its front are three general enclosure status LEDs. Two of these LEDs, the system *Service Required* LED and the *System Active LED*, provide a snapshot of the overall enclosure status. A third LED, the *Locator* LED, helps you to locate a specific system quickly, even though it might be one of numerous systems in a room. FIGURE 1-5 shows the location of the enclosure status LEDs.

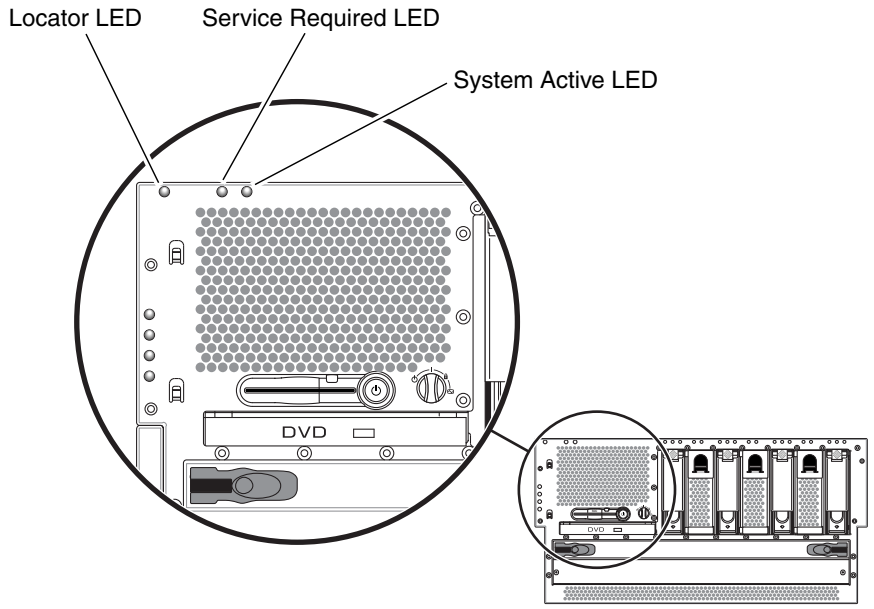

FIGURE 1-5 Enclosure Status LEDs

Locator, Service Required, and System Active LEDs are also found at the upper-left corner of the back panel.

The system Service Required LEDs work in conjunction with specific fault LEDs. For example, a power supply fault illuminates the associated power supply Service Required LED, as well as the system Service Required LED. Fault LEDs remain lit for any fault condition that results in a system shutdown.

The enclosure status LEDs operate as described in the following table.

TABLE 1-1 Enclosure Status LEDs

Name	Icon	Description
Locator		This white LED is lit by Solaris OS command or by Sun Advanced Lights Out Manager (ALOM) system controller software to locate a system. See the *Netra 440 Server System Administration Guide* for more information
Service Required		This amber LED lights when system hardware or software has detected a system fault. This LED lights for any faults or failures detected in the following areas: • Motherboard • CPU/memory module • DIMM • Hard drive • Fan trays • Power supply In addition to the system Service Required LED, other fault LEDs might also be lit, depending on the nature of the fault. If the system Service Required LED is lit, check the status of other fault LEDs on the front panel to determine the nature of the fault. See the *Netra 440 Server Diagnostics and Troubleshooting Guide* for more information.
System Active		This green LED lights when the ALOM system controller detects that Solaris OS is running.

Alarm LEDs

The alarm LEDs are located at the front of the system, along the left side of the front cover.

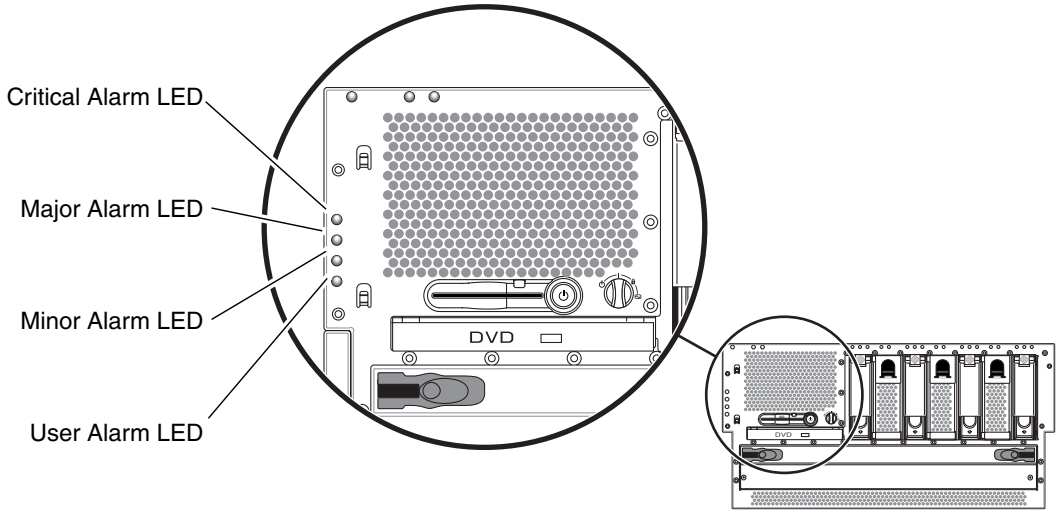

FIGURE 1-6 Alarm LEDs

The dry contact alarm card has four LED status indicators that are supported by ALOM. Information about the alarm LEDs and dry contact alarm states is provided in TABLE 1-2. For more information about alarm LEDs, refer to the *Sun Advanced Lights Out Manager Software User's Guide for the Netra 440 Server* (part number 817-5481-xx). For more information about an API to control the alarm LEDs, refer to the *Netra 440 Server System Administration Guide* (part number 817-3884-xx).

TABLE 1-2 Alarm LEDs and Dry Contact Alarm States

Indicator and Relay Labels	Indicator Color	Application or Server State	Condition or Action	System Indicator State	Alarm Indicator State	Relay NC‡ State	Relay NO§ State	Comments
Critical (Alarm0)	Red	Server state (Power on/off and Solaris OS functional/ not functional)	No power input.	Off	Off	Closed	Open	Default state
			System power off.	Off	On	Closed	Open	Input power connected
			System power turns on; Solaris OS not fully loaded.	Off	On	Closed	Open	Transient state
			Solaris OS successfully loaded.	On	Off	Open	Closed	Normal operating state
			Watchdog timeout.	Off	On	Closed	Open	Transient state; reboot Solaris OS
			Solaris OS shutdown initiated by user.*	Off	On	Closed	Open	Transient state
			Lost input power.	Off	Off	Closed	Open	Default state
			System power shutdown initiated by user.	Off	On	Closed	Open	Transient state
		Application state	User sets Critical alarm on.†	—	On	Closed	Open	Critical fault detected
			User sets Critical alarm off.†	—	Off	Open	Closed	Critical fault cleared
Major (Alarm1)	Red	Application state	User sets Major alarm on.†	—	On	Open	Closed	Major fault detected
			User sets Major alarm off.†	—	Off	Closed	Open	Major fault cleared

TABLE 1-2 Alarm LEDs and Dry Contact Alarm States *(Continued)*

Indicator and Relay Labels	Indicator Color	Application or Server State	Condition or Action	System Indicator State	Alarm Indicator State	Relay NC‡ State	Relay NO§ State	Comments
Minor (Alarm2)	Amber	Application state	User sets Minor alarm on.†	—	On	Open	Closed	Minor fault detected
			User sets Minor alarm off.†	—	Off	Closed	Open	Minor fault cleared
User (Alarm3)	Amber	Application state	User sets User alarm on.†	—	On	Open	Closed	User fault detected
			User sets User alarm off.†	—	Off	Closed	Open	User fault cleared

* The user can shut down the system using commands such as `init0` and `init6`. This does not include the system power shutdown.

† Based on a determination of the fault conditions, the user can turn the alarm on using the Solaris platform alarm API or ALOM CLI. For more information about the alarm API, see the *Netra 440 Server System Administration Guide* and for more information about ALOM CLI, see the *Sun Advanced Lights Out Manager Software User's Guide for the Netra 440 Server*.

‡ NC state is the normally closed state. This state represents the default mode of the relay contacts in the normally closed state.

§ NO state is the normally open state. This state represents the default mode of the relay contacts in the normally open state.

In all cases when the user sets an alarm, a message is displayed on the console. For example, when the critical alarm is set, the following message is displayed on the console:

```
SC Alert: CRITICAL ALARM is set
```

Note that in some instances, when the critical alarm is set, the associated alarm indicator is not lit.

Hard Drive LEDs

The hard drive LEDs are located behind the front cover, above each hard drive.

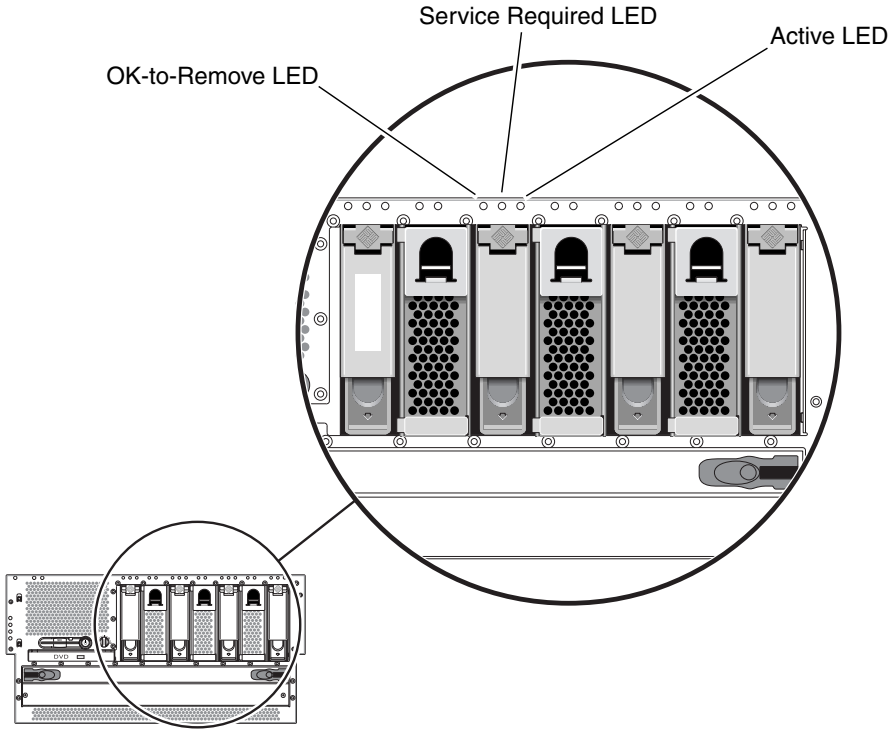

FIGURE 1-7 Hard Drive Status LEDs

The following table describes the hard drive LEDs.

TABLE 1-3 Hard Drive LEDs

Name	Icon	Description
OK-to-Remove		This blue LED lights when the hard drive has been taken offline and is safe to remove from the system.
Service Required		Reserved for future use.
Active		This green LED lights when the system is powered on and a drive is present in the monitored drive slot. This LED flashes slowly during the hard drive hot-swap procedure. It flashes rapidly when the drive is spinning up or down, or during read/write activity.

Fan Tray LEDs (0-2)

The fan tray LEDs are located behind the front cover, directly above each fan tray. Note that these LEDs give information only for fan trays 0-2; they do not give information on fan tray 3, located inside the system.

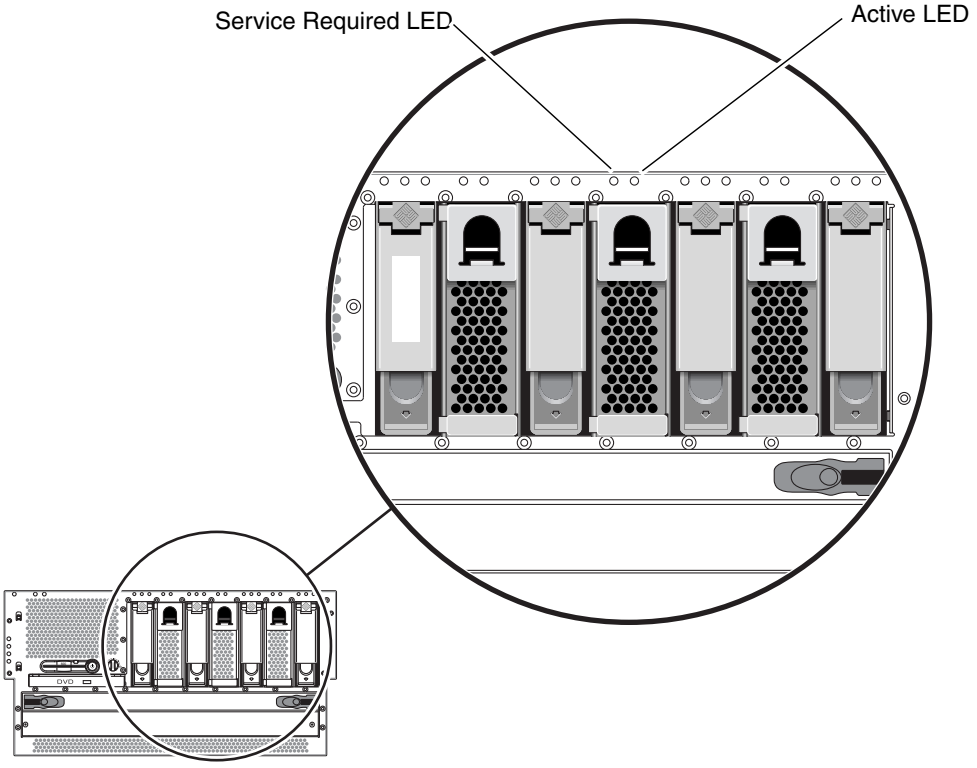

FIGURE 1-8 Fan Tray Status LEDs

The following table describes the fan tray LEDs.

TABLE 1-4 Fan Tray LEDs

Name	Description
Service Required	This amber LED lights when there is a fault detected with the fan tray. Note that the Service Required LEDs on the front and back panels also light when this occurs.
Active	This green LED lights when the fan tray is on and operating normally.

Back Panel LEDs

Following are the LED status indicators available at the back of the system:

- "Enclosure Status LEDs" on page 13
- "Ethernet Connection LEDs" on page 12
- "Power Supply LEDs" on page 13
- "Network Management Port LED" on page 13

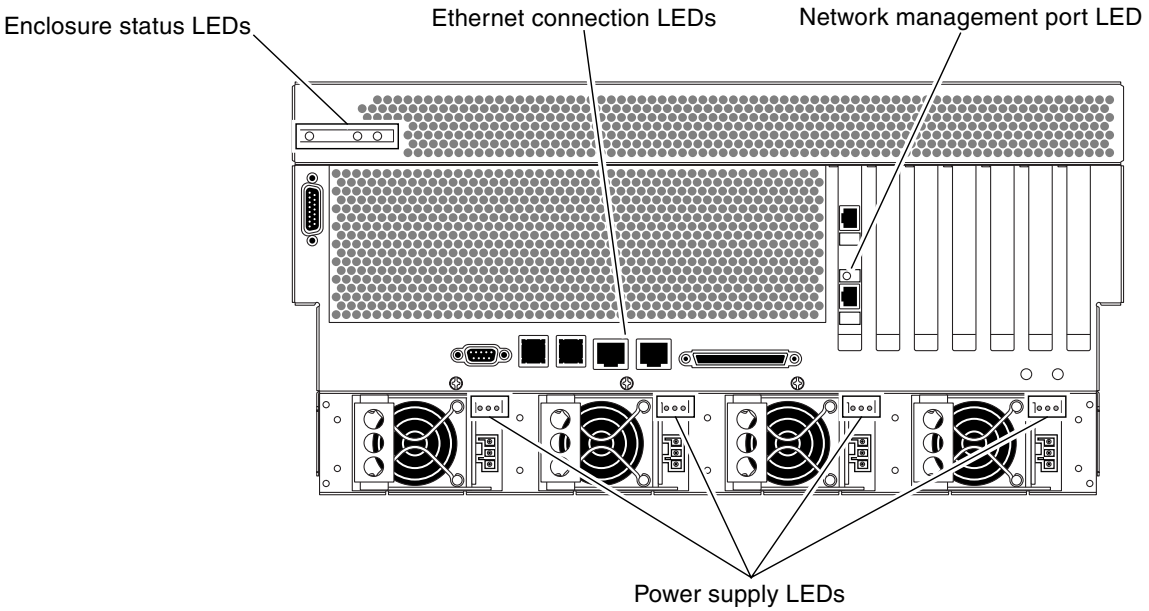

FIGURE 1-9 Back Panel LEDs

Ethernet Connection LEDs

A set of Ethernet LEDs is located on each Ethernet port. The Ethernet LEDs operate as described in the following table.

TABLE 1-5 Ethernet LEDs

Name	Description
Link/Activity	This green LED lights when a link is established at the particular port with its link partner, and blinks to indicate activity.
Speed	This amber LED lights when a Gigabit Ethernet connection is established, and is off when a 10/100-Mbps Ethernet connection is established.

Enclosure Status LEDs

The back panel enclosure status LEDs consist of the System Active LED, the system Service Required LED, and the Locator LED. These LEDs are located in the top-left corner of the back panel, and operate as described in TABLE 1-1.

Network Management Port LED

The network management port has a Link LED that operates as described in TABLE 1-6.

TABLE 1-6 Network Management Port LED

Name	Description
Link	This green LED is lit when an Ethernet connection is present.

Power Supply LEDs

There are three LEDs on each power supply. These LEDs operate as described in TABLE 1-7.

TABLE 1-7 Power Supply LEDs

Name	Icon	Description
OK-to-Remove		This blue LED lights when it is safe to remove the power supply from the system. This LED is controlled by the software only.
Service Required		This amber LED lights when the power supply's internal circuitry detects a fault. Note that the Service Required LEDs on the front and back panels also light when this occurs.
Power OK		This green LED lights when the power supply is in standby mode or when it is on and outputting regulated power within specified limits.

System Configuration Card

The system configuration card (SCC) contains unique network identity information, including the Ethernet MAC addresses and host ID (stored in `idprom`), the OpenBoot firmware configuration (stored in `nvram`), and ALOM system controller user and configuration data. It supplants the NVRAM module used on previous Sun systems. The SCC is housed in a slot in the system controller card reader, behind the system door (FIGURE 1-10).

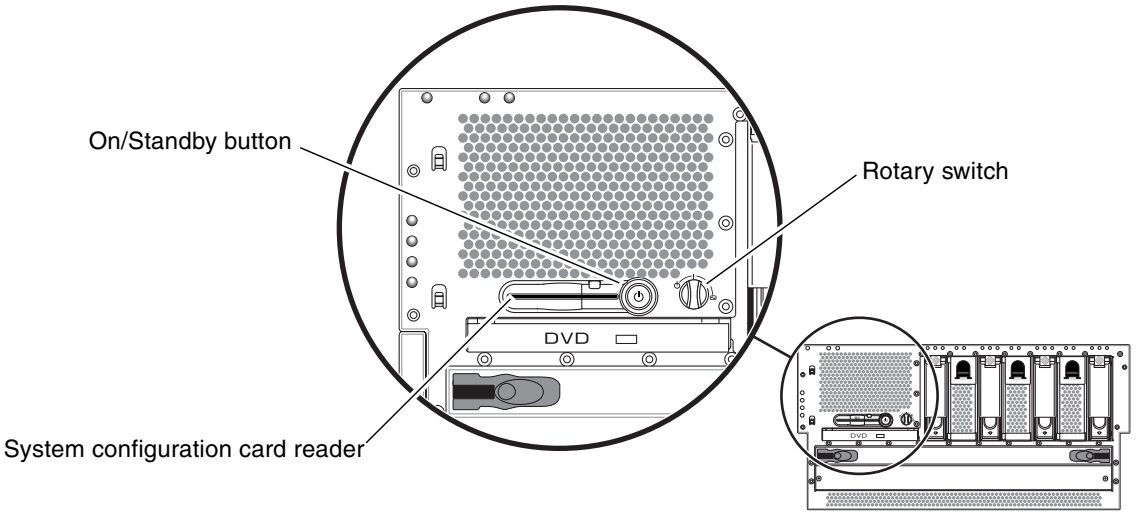

FIGURE 1-10 Four-Position Rotary Switch

A new system on the network can inherit an old system's host ID and Ethernet MAC addresses through the old system's SCC. Thus, migrating a SCC from one Netra 440 server to another can smooth the transitions to a new or upgraded system, or quickly bring up a backup system if a primary system becomes unavailable, without disrupting the system's identity on the network.

For instructions on migrating a SCC from one system to another, refer to the *Netra 440 Server Service Manual*.

System Configuration Card Reader

The system configuration card reader holds the system configuration card (discussed in "System Configuration Card" on page 14). It also has the On/Standby button and the rotary switch for the system.

On/Standby Button

The system On/Standby button is recessed to prevent accidentally turning the system on or off. The ability of the On/Standby button to turn the system on or off is controlled by the rotary switch. The ALOM system controller can also control the power-on and power-off functions if environmental conditions are out of specification or if the ALOM system controller detects that the system configuration card (SCC) is missing or invalid. See "System Control Rotary Switch" on page 15.

If the operating system is running, pressing and releasing the On/Standby button initiates a graceful software system shutdown. Pressing and holding in the On/Standby button for four seconds causes an immediate hardware shutdown.

Caution – When possible, use the graceful shutdown method. Forcing an immediate hardware shutdown can cause hard drive corruption and loss of data.

System Control Rotary Switch

The four-position rotary switch on the front panel controls the power-on modes of the system. The rotary switch also prevents unauthorized users from powering off the system or reprogramming system firmware.

The following table describes the function of each rotary switch setting.

TABLE 1-8 Rotary Switch Settings

Position	Icon	Description
Standby		This setting forces the system to power off immediately and to enter standby mode. It also disables the system On/Standby button. This setting is useful when AC/DC power is interrupted and you do not want the system to restart automatically when power is restored. With the rotary switch in any other position, if the system were running prior to losing power and the power state memory is enabled in the ALOM system controller, the system restarts automatically once power is restored. The Standby setting also prevents anyone from restarting the system during an ALOM system controller session. However, the ALOM system controller card continues to operate using the system's standby power.
Normal		This setting enables the system On/Standby button, allowing you to power the system on or off. If the operating system is running, pressing and releasing the On/Standby button initiates a graceful software system shutdown. Pressing and holding the On/Standby button in for four seconds causes an immediate hardware power off.
Locked		This setting disables the system On/Standby button to prevent unauthorized users from powering the system on or off. It also disables the keyboard L1-A (Stop-A) command, terminal Break key command, and `~# tip` window command, preventing users from suspending system operation to access the system `ok` prompt. The Locked setting is recommended for normal day-to-day operations, and prevents unauthorized programming by write-protecting system firmware. The ALOM system controller can still affect the system power state through a password-secured ALOM session, even when the rotary switch is in the Locked position. This capability provides remote management of the system.
Diagnostics		This setting forces the power-on self-test (POST) and OpenBoot Diagnostics software to run firmware diagnostic tests at power on or during reset events. The On/Standby button functions the same as when the rotary switch is in the Normal position.

Hard Drives

The Netra 440 server supports up to four internal, hot-swappable Ultra-4 Small Computer System Interface (SCSI) hard drives, attached to a backplane. Drives are 3.5-inches wide and 1-inch high (8.89-cm x 2.54-cm). The system also includes an external Ultra-4 SCSI port. See "Ultra-4 SCSI Port" on page 22.

The following figure shows the system's four internal hard disk drives (HDDs). Hard disk drives are numbered 0, 1, 2, and 3, with HDD0 being the default system drive.

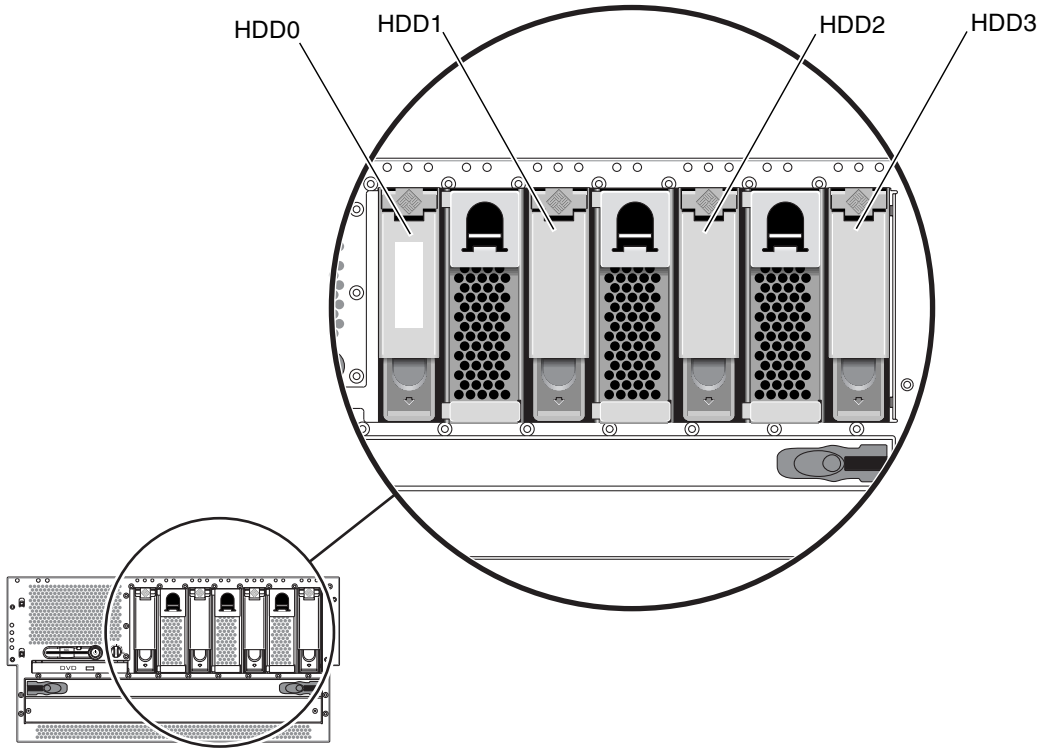

FIGURE 1-11 Internal Drive Bay Locations

Internal drives have a storage capacity of up to 73 Gbytes each, with a rotation speed of 15,000 revolutions per minute. The maximum internal storage capacity is 292 Gbytes (using four 73-Gbyte drives), with larger capacities possible as drive storage capacities continue to grow.

The drives are supported by the 320-Mbyte per second Ultra-4 SCSI interface to the internal Ultra-4 SCSI controller on the system's motherboard. The drives connect to the four-drive Ultra-4 SCSI backplane.

Three LEDs are associated with each drive, indicating the drive's operating status, hot-swap readiness, and any fault conditions associated with the drive. See "LED Status Indicators" on page 4 for a description of these LEDs.

The hot-swap feature of the system's internal hard drives allows you to add, remove, or replace drives while the system continues to operate. This capability significantly reduces system downtime associated with hard drive replacement. However, certain software preparations are required prior to removing or installing a drive. To perform hard drive hot-swap operations, you use the Solaris `cfgadm` utility. The `cfgadm` utility is a command-line tool for managing hot-swap operations on Netra 440 internal hard drives and external storage arrays. For more information about `cfgadm`, see the `cfgadm` man page.

Hard drive hot-swap procedures involve software commands for preparing the system prior to removing a hard drive and for reconfiguring the operating environment after installing a drive. For detailed instructions, see the *Netra 440 Server Service Manual.*

The Solaris Volume Manager software supplied as part of the Solaris OS lets you use internal hard drives in four software RAID configurations: RAID 0 (striping), RAID 1 (mirroring), RAID 0+1 (striping plus mirroring) and RAID 5 (striping with parity). You can also configure drives as *hot-spares*, drives installed and ready to operate if other drives fail. In addition, you can configure hardware mirroring using the system's Ultra-4 SCSI controller. For more information about all supported RAID configurations and configuring hardware mirroring, refer to the *Netra 440 Server System Administration Guide*.

Fan Trays

In addition to the power supply fans, the system is equipped with three fan trays (fan trays 0-2), which are installed between the hard drives to provide front-to-rear cooling of the hard drives and the system, and another fan tray (fan tray 3) for cooling hard drives and PCI cards. Each fan tray houses a single fan. All fans and fan trays must be present and operating to provide adequate cooling.

Fan trays 0-2 are hot-swappable, and are accessible from the front of the system without having to remove the top cover. Fan tray 3 is cold-swappable, and is accessible from the top of the server. If fan tray 3 fails, the Netra 440 server will automatically go through a soft shutdown. Power supplies are cooled separately, each power supply with its own internal fan.

FIGURE 1-12 shows the fan trays.

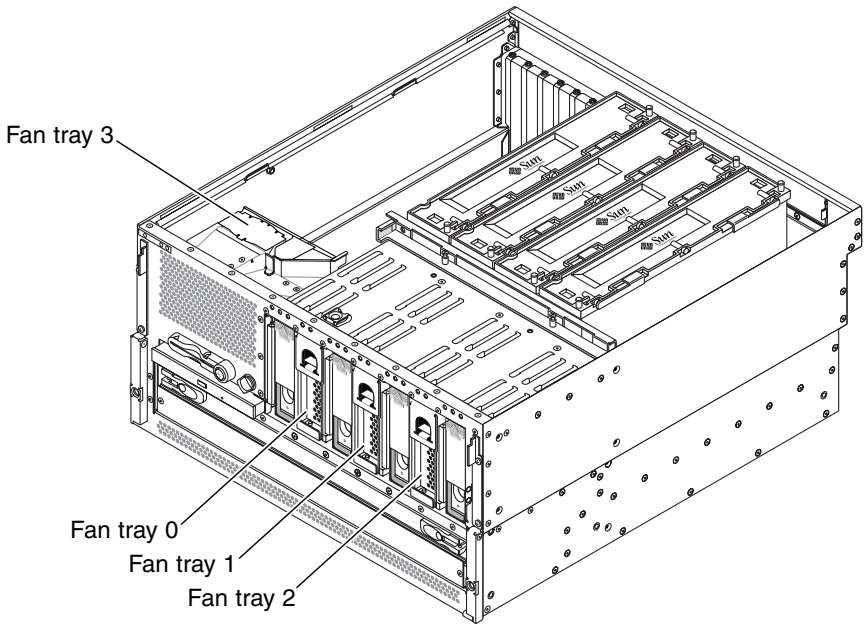

FIGURE 1-12 Fan Trays

The system Service Required LED lights when a fault is detected in fan tray 3. Above fan trays 0-2, the amber fault LED light when a fault is detected in a fan installed in a fan tray. The environmental subsystem monitors the fan trays in the system, and prints a warning and lights the system Service Required LED if a fan in a fan tray falls below its nominal operating speed. This provides an early warning to an impending fan failure, allowing you to schedule downtime for replacement before an overtemperature condition shuts down the system unexpectedly.

In addition, the environmental subsystem prints a warning and lights the system Service Required LED if internal temperature rises above a predetermined threshold, either due to fan failure or external environmental conditions. For additional details, see the *Netra 440 Server Diagnostics and Troubleshooting Guide*.

Power Distribution Board

The power distribution board takes the DC power from the four power supplies located at the rear of the system and provides power to the motherboard through two connectors. The power distribution board is accessible from the front of the system, behind the front door.

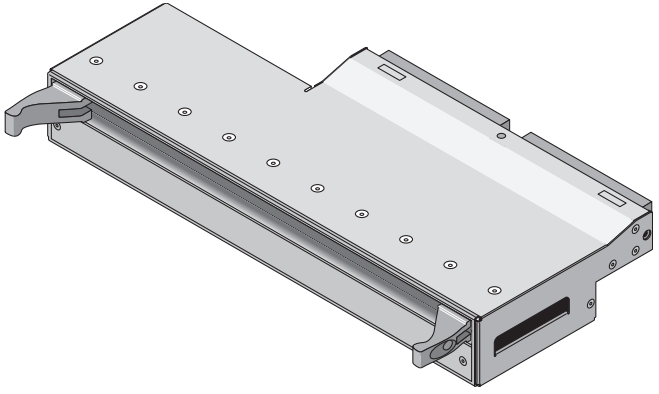

FIGURE 1-13 Power Distribution Board

DVD Drive

Both DVD-ROM drives and DVD-RW drives are supported in the Netra 440 server (both are referred to as the DVD drive in this document). The DVD drive is not a hot-swappable component; you must power down the server before you can remove or install a DVD drive into the system. The DVD drive does not come standard with the Netra 440 server, so you must order it separately. Refer to the *Netra 440 Server Installation Guide* or the *Netra 440 Server Service Manual* for information on ordering and installing a DVD drive.

Rear Panel Ports

Ethernet Ports

The system provides two on-board Gigabit Ethernet ports, which support several modes of operations at 10, 100, and 1000 megabits per second (Mbps). Additional Ethernet interfaces or connections to other network types can be provided by installing the appropriate PCI interface cards. Multiple network interfaces can be combined with Solaris Internet Protocol (IP) network multipathing software to provide hardware redundancy and failover capability, as well as load balancing on outbound traffic. Should one of the interfaces fail, the software can automatically switch all network traffic to an alternate interface to maintain network availability. For more information about network connections, refer to the *Netra 440 Server Installation Guide*.

Serial Ports

The system also provides a standard serial communication port through a DB-9 port (labeled 10101) located on the back panel. This port corresponds to `TTYB`, and supports baud rates of 50, 75, 110, 134, 150, 200, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 153600, 230400, 307200, and 460800. The port is accessible by connecting a serial cable to the back panel serial port connector.

USB Ports

The system back panel provides four external Universal Serial Bus (USB) ports on two independent controllers to connect USB peripheral devices such as:

- Sun Type-6 USB keyboard
- Sun opto-mechanical three-button USB mouse
- Modems
- Printers
- Scanners
- Digital cameras

The USB ports are compliant with the Open Host Controller Interface (Open HCI) specification for USB Revision 1.0. The ports support isochronous and asynchronous modes, and enable data transmission at speeds of 1.5 Mbps and 12 Mbps. Note that the USB data transmission speed is significantly faster than that of the standard serial ports, which operate at a maximum rate of 460.8 Kbaud.

The system console device can be either a standard alphanumeric terminal, terminal server, TIP connection from another Sun system, or a local graphics monitor. The default connection is through the serial management port (labeled SERIAL MGT) on the back of the ALOM system controller card. You can also connect an alphanumeric terminal to the serial (DB-9) connector (as `TTYB`) on the system back panel. A local graphics monitor requires installation of a PCI graphics card, monitor, USB keyboard, and mouse. You can also access the system console through a network connection by means of the network management port.

The USB ports are accessible by connecting a USB cable to a back panel USB connector. The connectors at each end of a USB cable are keyed so that you cannot connect them incorrectly. One connector plugs in to the system or USB hub. The other connector plugs in to the peripheral device. Up to 126 USB devices can be connected to each controller simultaneously, through the use of USB hubs. The USB ports provide power for smaller USB devices such as modems. Larger USB devices, such as scanners, require their own power source.

Ultra-4 SCSI Port

The system includes a dedicated external Ultra-4 SCSI port. The port provides a standard 68-pin, alternative 2 shielded connection, located on the back panel. The port is accessible by connecting a SCSI cable to the Ultra-4 SCSI connector. The port supports external storage devices capable of data transfer rates up to 320 Mbytes per second.

Alarm Port

The system includes a DB-15 alarm port located on the back panel. In a telecommunications environment, use this port to connect to the central office alarming system.

ALOM System Controller Card and Ports

The Sun Advanced Lights Out Manager (ALOM) system controller card enables access, monitoring, and control of the Netra 440 server from a remote location. It is a fully independent processor card with its own resident firmware, self-diagnostics, and operating system. FIGURE 1-14 shows the ALOM system controller card and its ports.

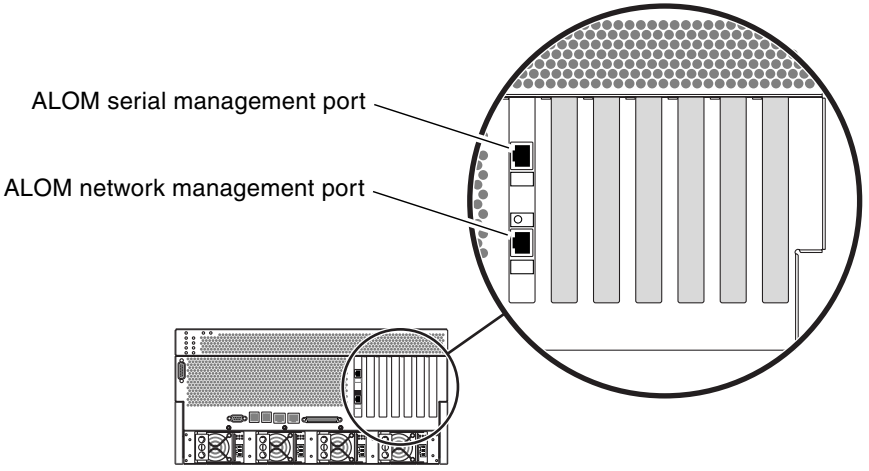

FIGURE 1-14 System Controller Card

The default console connection to the Netra 440 server is through the RJ-45 serial management port (labeled SERIAL MGT) on the back panel of the ALOM system controller card. This port operates only at 9600 baud.

Note – The serial management port is not a standard serial port. For standard serial functionality, use the DB-9 port on the system back panel, which corresponds to TTYB.

The ALOM system controller card features serial and 10BASE-T Ethernet interfaces that provide multiple ALOM system controller software users with simultaneous access to the Netra 440 server. ALOM system controller software users are provided secure password-protected access to the system's Solaris OS and OpenBoot console functions. ALOM system controller users also have full control over power-on self-test (POST) and OpenBoot Diagnostics tests.

The ALOM system controller card runs independently of the host server, and operates off of standby power from the server power supplies. The card features on-board devices that interface with the server environmental monitoring subsystem and can automatically alert administrators to system problems. Together, these features enable the ALOM system controller card and ALOM system controller software to serve as a lights out management tool that continues to function even when the server operating system goes offline or when the server is powered off.

The ALOM system controller card connects to a dedicated slot on the motherboard and provides the following ports (as shown in FIGURE 1-14) through an opening in the system's back panel:

- Serial communication port by means of an RJ-45 connector (serial management port, labeled SERIAL MGT)
- 10-Mbps Ethernet port by means of an RJ-45 twisted-pair Ethernet (TPE) connector (network management port, labeled NET MGT) with green Link/Activity LED

Serial Management Port

The serial management port (SERIAL MGT) enables you to set up a system console device, without requiring you to configure an existing port. All power-on self-test (POST) and ALOM system controller messages are directed to the serial management port by default.

Network Management Port

The network management port (NET MGT) provides you with direct network access to the ALOM system controller card and its firmware, as well as access to the system console, power-on self-test (POST) output messages, and ALOM system controller messages. You can use the network management port to perform remote administration, including externally initiated resets (XIR).

For more information about the ALOM system controller card, refer to the *Netra 440 Server System Administration Guide* (817-3884-xx).

PCI Cards and Buses

All system communication with storage peripherals and network interface devices is mediated by four buses, using two Peripheral Component Interconnect (PCI) bridge chips on the system motherboard. Each I/O bridge chip manages communication between the system main interconnect bus and two PCI buses, giving the system a total of four separate PCI buses. The four PCI buses support up to six PCI interface cards and four motherboard devices.

FIGURE 1-15 shows the PCI card slots on the motherboard.

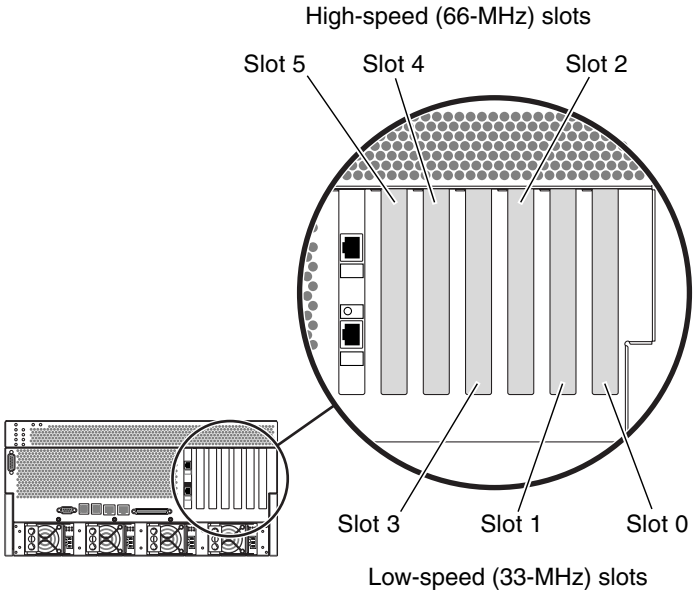

FIGURE 1-15 PCI Slots

TABLE 1-9 describes the PCI bus characteristics and maps each bus to its associated bridge chip, integrated devices, and PCI card slots. All slots comply with PCI Local Bus Specification Revision 2.2.

Note – PCI cards in a Netra 440 server are *not* hot-swappable.

TABLE 1-9 PCI Bus Characteristics, Associated Bridge Chips, Motherboard Devices, and PCI Slots

PCI Bridge	PCI Bus	Clock Rate (MHz)/ Bandwidth (bits)/ Voltage (V)	Integrated Devices	PCI Slot Number
0	PCI-1A	33 MHz/66 MHz* 64 bits 3.3V	Sun Gigabit Ethernet 1.0 (NET0)	5
0	PCI-1B	33 MHz/66 MHz 64 bits 3.3V	None	2, 4
1	PCI-2A	33 MHz 64 bits 5V	SouthBridge M1535D+ (DVD-ROM, SCC reader, USB ports, serial port (TTYB), I^2C bus, system PROM)	0, 1, 3
1	PCI-2B	33 MHz/66 MHz 64 bits 3.3V	Sun Gigabit Ethernet 1.0 (NET1) LSI1030 Ultra-4 SCSI Controller	None

* Installing a 33-MHz PCI card into a 66-MHz bus causes the bus to operate at 33 MHz

Power Supplies

The motherboard distributes power from the power supplies to all internal system components. The system's four standard power supplies plug in directly to the power distribution board, which then provides power to the motherboard through two connectors. All four power supplies share the power demands of the system equally.

The Netra 440 server's power supplies are hot-swappable units. They are designed for fast, easy installation or removal by qualified service personnel, even while the system is fully operational. Power supplies (PS) are installed in bays at the rear of the system, as shown in FIGURE 1-16.

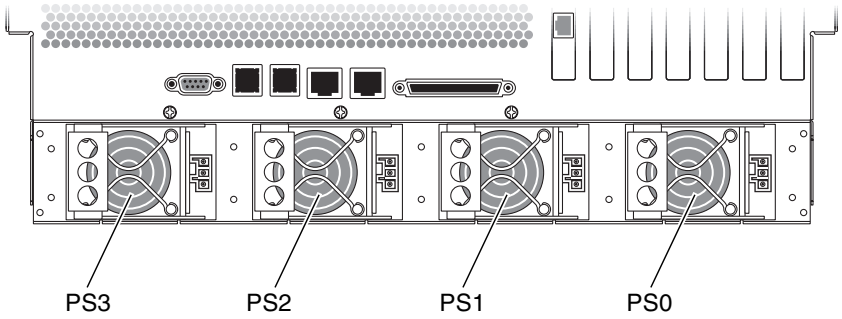

FIGURE 1-16 Power Supply Locations

The DC power supplies operate over an input range of -40 to -75 VDC, and the AC power supplies operate over an input range of 90 to 264 VAC. Each power supply is capable of providing up to 400W of DC power. The basic system configuration comes with four power supplies installed. The system will continue to operate even if a single power supply fails (known as a 3+1 configuration) or if two power supplies fail (known as a 2+2 configuration). A 2+2 configuration is possible because any two power supplies will satisfy the entire load of a fully-configured system.

The system can operate from either a single or a dual power source. If you operate the system from a dual power source, each power feed would provide input to two power supplies. In a dual-power source system, if a single power feed fails, the system continues to receive power from the two power supplies powered from the healthy feed. If one or two power supplies fail, the system continues to receive adequate power from the healthy power supplies.

The power supplies provide +3.3V, +5V, +12V, -12V, and 5V standby outputs to the system. Total system current load is shared equally between all supplies through active current-sharing circuitry.

Each power supply has separate status LEDs to provide power and fault status information, and to indicate hot-swap readiness. See "Power Supply LEDs" on page 13 for a description of power supply LEDs.

Power supplies in a redundant configuration feature a hot-swap capability. You can remove and replace a faulty power supply without shutting down the operating system or turning off the system power. A power supply can be hot-swapped only when at least two other power supplies are online and working properly.

In addition, the cooling fans in each power supply operate even if the power supply fails by drawing power from the other power supplies through the motherboard to provide adequate cooling to the system.

Note – You must issue a software command to prepare the power supply for removal. This allows the system to verify that the remaining power supplies are online and working properly, before lighting the OK-to-Remove LED. For more information, refer to the *Netra 440 Server Service Manual* (817-3883-xx).

CPU/Memory Modules

The system motherboard provides slots for up to four CPU/memory modules. Each CPU/memory module incorporates one UltraSPARC IIIi processor, and slots for up to four dual inline memory modules (DIMMs). The CPUs in the system are numbered from 0 to 3, depending on the slot where each CPU resides.

Note – CPU/memory modules on a Netra 440 server are *not* hot-swappable.

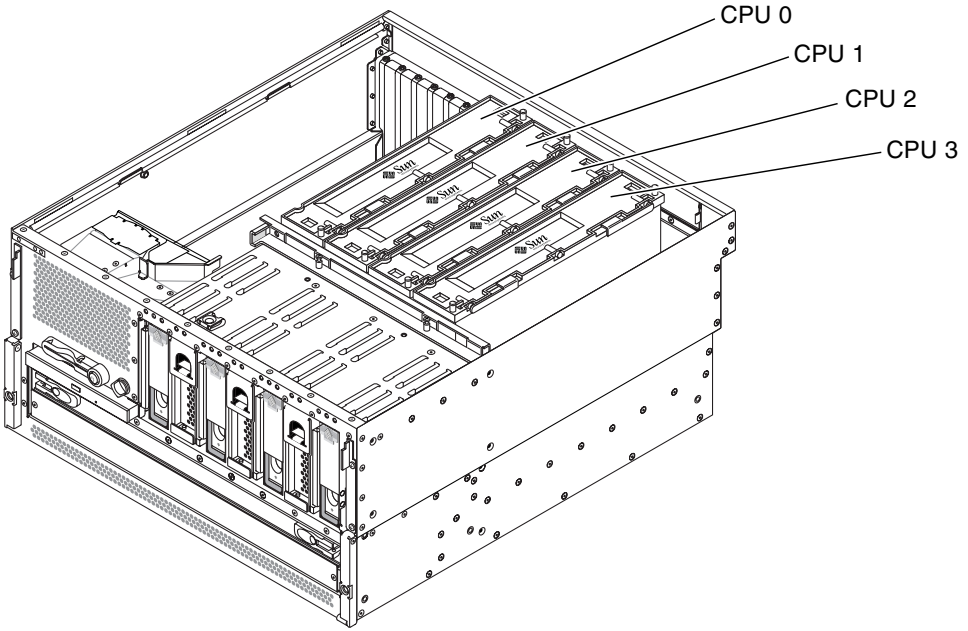

FIGURE 1-17 CPU Locations

The UltraSPARC IIIi processor is a high-performance, highly integrated superscalar processor implementing the SPARC V9 64-bit architecture. The UltraSPARC IIIi processor can support both 2D and 3D graphics, as well as image processing, video compression and decompression, and video effects through the sophisticated Visual Instruction Set extension (Sun VIS software). The VIS software provides high levels of multimedia performance, including two streams of MPEG-2 decompression at full broadcast quality with no additional hardware support.

The Netra 440 server employs a shared-memory multiprocessor architecture with all processors sharing the same physical address space. The system processors, main memory, and I/O subsystem communicate by means of a high-speed system interconnect bus. In a system configured with multiple CPU/memory modules, all main memory is accessible from any processor over the system bus. The main memory is logically shared by all processors and I/O devices in the system. However, memory is controlled and allocated by the CPU on its host module, that is, the DIMMs on CPU/memory module 0 are managed by CPU 0.

Memory Modules

The Netra 440 server uses 2.5-volt, high-capacity double data rate dual inline memory modules (DDR DIMMs) with error-correcting code (ECC). The system supports DIMMs with 512-Mbyte and 1-Gbyte capacities. Each CPU/memory module contains slots for four DIMMs. Total system memory ranges from a minimum of 2 Gbytes (one CPU/memory module with four 512-Mbyte DIMMs) to a maximum of 16 Gbytes (four modules fully populated with 1-Gbyte DIMMs).

Within each CPU/memory module, the four DIMM slots are organized into groups of two. The system reads from, or writes to, both DIMMs in a group simultaneously. Therefore, DIMMs must be added in pairs. FIGURE 1-18 shows the DIMM slots and DIMM groups on a Netra 440 server CPU/memory module. Adjacent slots belong to the same DIMM group. The two groups are designated 0 and 1.

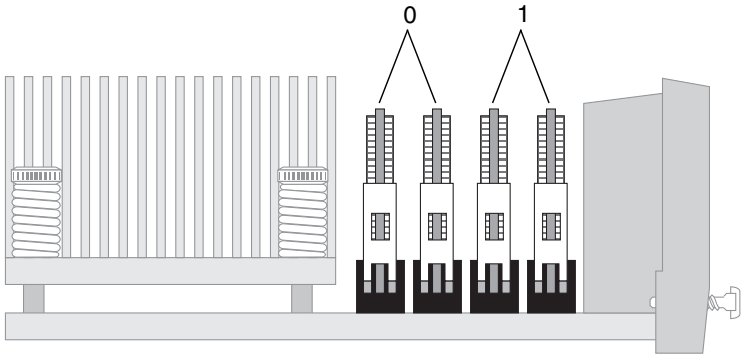

FIGURE 1-18 Memory Module Groups 0 and 1

TABLE 1-10 lists the DIMMs on the CPU/memory module, and to which group each DIMM belongs.

TABLE 1-10 Memory Module Groups 0 and 1

Label	Group	Physical Group
B1/D1	B1	1 (must be installed as a pair)
B1/D0		
B0/D1	B0	0 (must be installed as a pair)
B0/D0		

You must physically remove a CPU/memory module from the system before you can install or remove DIMMs. The DIMMs must be added in pairs within the same DIMM group, and each pair used must have two identical DIMMs installed—that is, both DIMMs in each group must be from the same manufacturer and must have the same density and capacity (for example, two 512-Mbyte DIMMs or two 1-Gbyte DIMMs).

Note – Each CPU/memory module must be populated with a minimum of two DIMMs, installed in either Group 0 or Group 1.

For guidelines and complete instructions on how to install DIMMs in a CPU/memory module, refer to the *Netra 440 Server Service Manual* (817-3883-xx).

For more information about identifying the physical DIMMs referenced in system console messages, refer to the *Netra 440 Server Diagnostics and Troubleshooting Guide* (817-3886-xx).

Memory Interleaving

You can maximize the system's memory bandwidth by taking advantage of its memory interleaving capabilities. The Netra 440 server supports two-way interleaving. In most cases, higher interleaving results in improved system performance. However, actual performance results can vary depending on the system application. Two-way interleaving occurs automatically in any DIMM group where the DIMM capacities do not match the capacities used in any other group. For optimum performance, install identical DIMMs in all four slots of a CPU/memory module.

Independent Memory Subsystems

Each Netra 440 server CPU/memory module contains an independent memory subsystem. Memory controller logic incorporated into the UltraSPARC IIIi CPU allows each CPU to control its own memory subsystem.

The Netra 440 server uses a shared memory architecture. During normal system operations, the total system memory is shared by all CPUs in the system.

Ultra-4 SCSI Controller

The Netra 440 server uses an intelligent, two-channel 320-Mbyte per second Ultra-4 SCSI controller. Integrated into the motherboard, the controller resides on PCI Bus 2B and supports a 64-bit, 66-MHz PCI interface.

The on-board Ultra-4 SCSI controller provides hardware RAID mirroring (RAID 1) capability with higher performance than conventional software RAID mirroring. One pair of hard drives can be mirrored using the on-board Ultra-4 SCSI controller.

For more information about RAID configurations and configuring hardware mirroring using the Ultra-4 SCSI controller, refer to the *Netra 440 Server System Administration Guide* (817-3884-xx).

Ultra-4 SCSI Backplane

The Netra 440 server includes a single Ultra-4 SCSI backplane with connections for up to four internal hard drives, all of which are hot-swappable.

The Ultra-4 SCSI backplane accepts four, low-profile (1.0-inch, 2.54-cm), UltraSCSI hard drives capable of up to 320-Mbyte per second throughput. Each hard drive is connected to the backplane through a standard 80-pin single connector attachment (SCA) interface. Incorporating all power and signal connections into a single connector, SCA technology makes it easy to add or remove hard drives from the system. Drives using SCA connectors provide better serviceability than drives using other types of connectors.

For information about installing or removing an UltraSCSI drive or drive backplane, refer to the *Netra 440 Server Service Manual* (817-3883-xx).

CHAPTER 2

Reliability, Availability, and Serviceability Features

Reliability, availability, and serviceability (RAS) are aspects of a system's design that affect its ability to operate continuously and to minimize the time necessary to service the system. Reliability refers to a system's ability to operate continuously without failures and to maintain data integrity. System availability refers to the ability of a system to recover to an operational state after a failure, with minimal impact. Serviceability relates to the time it takes to restore a system to service following a system failure. Together, reliability, availability, and serviceability features provide for near continuous system operation.

To deliver high levels of reliability, availability, and serviceability, the Netra 440 server offers the following features:

- Hot-swappable hard drives and fan trays
- Redundant, hot-swappable power supplies
- Sun Advanced Lights Out Manager (ALOM) system controller
- Environmental monitoring and fault protection
- Automatic system recovery (ASR) capabilities for PCI cards and system memory
- ALOM watchdog mechanism and externally initiated reset (XIR) capability
- Internal hardware drive mirroring (RAID 1)
- Support for drive and network multipathing with automatic failover
- Error correction and parity checking for improved data integrity
- Easy access to all internal replaceable components
- Full in-rack serviceability for nearly all components

For more information about using RAS features, refer to the *Netra 440 Server System Administration Guide* (817-3884-xx).

Hot-Swappable Components

Netra 440 hardware is designed to support hot-swapping of internal hard drives and power supplies. By using the proper software commands, you can install or remove these components while the system is running. Hot-swap technology significantly increases the system's serviceability and availability, by providing you with the ability to do the following:

- Increase storage capacity dynamically to handle larger work loads and to improve system performance
- Replace hard drives, fan trays, and power supplies without service disruption

3+1 or 2+2 Power Supply Redundancy

The system features four hot-swappable power supplies, two of which are capable of handling the system's entire load. Thus, the four power supplies provide "3+1" or "2+2" redundancy, enabling the system to continue operating should one of the power supplies fail (3+1 redundancy) or its DC power source fail (2+2 redundancy).

Note – Four power supplies must be present at all times to ensure proper system cooling. Even if one power supply has failed, its fans obtain power from the other power supply and through the motherboard to maintain proper system cooling.

For more information about power supplies, redundancy, and configuration rules, see "Power Supplies" on page 26. For instructions on performing a power supply hot-swap operation, see the *Netra 440 Server Service Manual* (817-3883-xx).

System Controller

Sun Advanced Lights Out Manager (ALOM) system controller is a secure server management tool that comes preinstalled on the Netra 440 server, in the form of a module with preinstalled firmware. It lets you monitor and control your server over a serial line or over a network. The ALOM system controller provides remote system administration for geographically distributed or physically inaccessible systems. You can connect to the ALOM system controller card using a local alphanumeric terminal, a terminal server, or a modem connected to its serial management port, or over a network using its 10BASE-T network management port.

When you first power on the system, the ALOM system controller card provides a default connection to the system console through its serial management port. After initial setup, you can assign an IP address to the network management port and connect the network management port to a network. You can run diagnostic tests, view diagnostic and error messages, reboot your server, and display environmental status information using the ALOM system controller software. Even if the operating system is down or the system is powered off, the ALOM system controller can send an e-mail alert about hardware failures, or other important events that can occur on the server.

The ALOM system controller provides the following features:

- Default system console connection through its serial management port to an alphanumeric terminal, terminal server, or modem
- Network management port for remote monitoring and control over a network, after initial setup
- Remote system monitoring and error reporting, including diagnostic output
- Remote reboot, power-on, power-off, and reset functions
- Ability to monitor system environmental conditions remotely
- Ability to run diagnostic tests using a remote connection
- Ability to remotely capture and store boot and run logs, which you can review or replay later
- Remote event notification for overtemperature conditions, power supply faults, system shutdown, or system resets
- Remote access to detailed event logs

For more details about the ALOM system controller hardware, see "ALOM System Controller Card and Ports" on page 23.

For information about configuring and using the ALOM system controller, refer to the *Netra 440 Server System Administration Guide* (817-3884-xx).

Environmental Monitoring and Control

The Netra 440 server features an environmental monitoring subsystem designed to protect the server and its components against:

- Extreme temperatures
- Lack of adequate airflow through the system
- Operating with missing or misconfigured components
- Power supply failures
- Internal hardware faults

Monitoring and control capabilities are handled by the ALOM system controller firmware. This ensures that monitoring capabilities remain operational even if the system has halted or is unable to boot, and without requiring the system to dedicate CPU and memory resources to monitor itself. If the ALOM system controller fails, the operating system reports the failure and takes over limited environmental monitoring and control functions.

The environmental monitoring subsystem uses an industry-standard I^2C bus. The I^2C bus is a simple two-wire serial bus used throughout the system to allow the monitoring and control of temperature sensors, fans, power supplies, status LEDs, and the front panel rotary switch.

Temperature sensors are located throughout the system to monitor the ambient temperature of the system, the CPUs, and the CPU die temperature. The monitoring subsystem polls each sensor and uses the sampled temperatures to report and respond to any overtemperature or undertemperature conditions. Additional I^2C sensors detect component presence and component faults.

The hardware and software together ensure that the temperatures within the enclosure do not exceed predetermined “safe operation” ranges. If the temperature observed by a sensor falls below a low-temperature warning threshold or rises above a high-temperature warning threshold, the monitoring subsystem software lights the system Service Required LEDs on the front and back panels. If the temperature condition persists and reaches a critical threshold, the system initiates a graceful system shutdown. In the event of a failure of the ALOM system controller, backup sensors are used to protect the system from serious damage, by initiating a forced hardware shutdown.

All error and warning messages are sent to the system console and logged in the `/var/adm/messages` file. Service Required LEDs remain lit after an automatic system shutdown to aid in problem diagnosis.

The power subsystem is monitored in a similar fashion. Polling the power supply status periodically, the monitoring subsystem indicates the status of each supply’s outputs, inputs, and presence.

If a power supply problem is detected, an error message is sent to the system console and logged in the `/var/adm/messages` file. Additionally, LEDs located on each power supply light to indicate failures. The system Service Required LED lights to indicate a system fault.

Automatic System Recovery

The system provides automatic system recovery (ASR) from component failures in memory modules and PCI cards.

The ASR features enable the system to resume operation after experiencing certain nonfatal hardware faults or failures. Automatic self-test features enable the system to detect failed hardware components. An auto-configuring capability designed into the system's boot firmware enables the system to unconfigure failed components and to restore system operation. As long as the system can operate without the failed component, the ASR features enable the system to reboot automatically, without operator intervention.

During the power-on sequence, if a faulty component is detected, the component is marked as failed and, if the system can function, the boot sequence continues. In a running system, some types of failures can bring down the system. If this happens, the ASR functionality enables the system to reboot immediately if it is possible for the system to detect the failed component and operate without it. This prevents a faulty hardware component from keeping the entire system down or causing the system to crash repeatedly.

Note – ASR functionality is not enabled until you activate it. Control over the system ASR functionality is provided by several OpenBoot commands and configuration variables. For additional information, refer to the *Netra 440 Server System Administration Guide.*

Sun StorEdge Traffic Manager

Sun StorEdge™ Traffic Manager, a feature found in Solaris 8 and later operating systems, is a native multipathing solution for storage devices such as Sun StorEdge™ drive arrays. Sun StorEdge Traffic Manager provides the following features:

- Host-level multipathing
- Physical host controller interface (pHCI) support
- Sun StorEdge T3, Sun StorEdge 3510, and Sun StorEdge A5x00 support
- Load balancing

For more information, refer to the *Netra 440 Server System Administration Guide* (817-3884-xx).

ALOM Watchdog Mechanism and XIR

To detect and respond to a system hang, should one ever occur, the Netra 440 server features an ALOM "watchdog" mechanism, which is a timer that is continually reset as long as the operating system and user application are running. In the event of a system hang, the operating system is no longer able to reset the timer. The timer will then expire and cause an automatic externally initiated reset (XIR), eliminating the need for operator intervention. When the ALOM watchdog mechanism issues the XIR, debug information is displayed on the system console.

The XIR feature is also available for you to invoke manually at the ALOM system controller prompt. You use the ALOM system controller `reset -x` command manually when the system is unresponsive and an L1-A (Stop-A) keyboard command or alphanumeric terminal Break key does not work. When you issue the `reset -x` command manually, the system is immediately returned to the OpenBoot `ok` prompt. From there, you can use OpenBoot commands to debug the system.

For more information, refer to the *Netra 440 Server System Administration Guide* (817-3884-xx) and the *Netra 440 Server Diagnostics and Troubleshooting Guide* (817-3886-xx).

Support for RAID Storage Configurations

By attaching one or more external storage devices to the Netra 440 server, you can use a redundant array of independent drives (RAID) software application such as Solstice DiskSuite™ or VERITAS Volume Manager to configure system drive storage in a variety of different RAID levels. Configuration options include RAID 0 (striping), RAID 1 (mirroring), RAID 0+1 (striping plus mirroring), RAID 1+0 (mirroring plus striping), and RAID 5 (striping with interleaved parity). You choose the appropriate RAID configuration based on the price, performance, reliability, and availability goals for your system. You can also configure one or more hard drives to serve as "hot spares" to fill in automatically in the event of a hard drive failure.

In addition to software RAID configurations, you can set up a hardware RAID 1 (mirroring) configuration for any pair of internal hard drives using the on-board Ultra-4 SCSI controller, providing a high-performance solution for hard drive mirroring.

For more information, refer to the *Netra 440 Server System Administration Guide* (817-3884-xx).

Error Correction and Parity Checking

DIMMs employ error-correcting code (ECC) to ensure high levels of data integrity. The system reports and logs correctable ECC errors. (A correctable ECC error is any single-bit error in a 128-bit field.) Such errors are corrected as soon as they are detected. The ECC implementation can also detect double-bit errors in the same 128-bit field and multiple-bit errors in the same nibble (4 bits). In addition to providing ECC protection for data, parity protection is also used on the PCI and UltraSCSI buses, and in the UltraSPARC IIIi CPU internal caches.

Sun Java System Cluster Software

Sun Java System Cluster software lets you connect up to eight Sun servers in a cluster configuration. A *cluster* is a group of nodes that are interconnected to work as a single, highly available and scalable system. A *node* is a single instance of Solaris software. The software can be running on a standalone server or on a domain within a standalone server. With Sun Java System Cluster software, you can add or remove nodes while online, and mix and match servers to meet your specific needs.

Sun Java System Cluster software delivers high availability through automatic fault detection and recovery, and scalability, ensuring that mission-critical applications and services are always available when needed.

With Sun Java System Cluster software installed, other nodes in the cluster automatically take over and assume the workload when a node goes down. The software delivers predictability and fast recovery capabilities through features such as local application restart, individual application failover, and local network adapter failover. Sun Java System Cluster software significantly reduces downtime and increases productivity by helping to ensure continuous service to all users.

The software lets you run both standard and parallel applications on the same cluster. It supports the dynamic addition or removal of nodes, and enables Sun servers and storage products to be clustered together in a variety of configurations. Existing resources are used more efficiently, resulting in additional cost savings.

Sun Java System Cluster software allows nodes to be separated by up to 10 kilometers. This way, in the event of a disaster in one location, all mission-critical data and services remain available from the other unaffected locations.

For more information, see the documentation supplied with the Sun Java System Cluster software.

APPENDIX **A**

System Specifications

This appendix provides the following specifications for the Netra 440 server:

- "Physical Specifications" on page 41
- "Electrical Specifications" on page 42
- "Environmental Specifications" on page 44
- "Clearance and Service Access Specifications" on page 44

Physical Specifications

TABLE A-1 Physical Specifications, Netra 440 Server

Measure	U.S.	Metric
Width	17.32 inches	440.0 mm
Depth	19.5 inches	495 mm
Height	8.75 inches (5 rack units)	222 mm
Weight (without PCI cards or rack mounts)	79.4 lbs	36 kg
Weight (fully configured with 19-inch 4-post hardmount rack option)	81.6 lbs	37 kg

Electrical Specifications

AC Operating Power Limits and Ranges

The information in this section applies to the AC version of the Netra 440 server. TABLE A-2 gives AC power source requirements for each power supply in the Netra 440 server, and TABLE A-3 gives AC power source requirements for the Netra 440 server as a whole.

TABLE A-2 AC Operating Power Limits and Ranges for Each Power Supply in the Netra 440 Server

Description	Limit or Range
Operating input voltage range	90 - 264 VAC
Operating frequency range	47 - 63 Hz
Maximum operating input current	5.5 A @ 90 VAC
Maximum operating input power	500 W

TABLE A-3 AC Operating Power Limits and Ranges for the Netra 440 Server

Description	Limit or Range
Operating input voltage range	90 - 264 VAC
Operating frequency range	47 - 63 Hz
Maximum operating input current	11 A @ 90 VAC
Maximum operating input power	1000 W

Note – The figures for the maximum operating current are provided to help you specify the fusing and cabling you need to deliver power to your equipment. However, these figures represent worst-case scenarios.

DC Power Source Requirements

The information in this section applies to the DC version of the Netra 440 server. TABLE A-4 gives DC power source requirements for each power supply in the Netra 440 server, and TABLE A-5 gives DC power source requirements for the Netra 440 server as a whole.

TABLE A-4 DC Operating Power Limits and Ranges for Each Power Supply in the Netra 440 Server

Description	Limit or Range
Operating input voltage range	-40 VDC to -75 VDC
Maximum operating input current	11.5 A
Maximum operating input power	450 W

TABLE A-5 DC Operating Power Limits and Ranges for the Netra 440 Server

Description	Limit or Range
Operating input voltage range	-40 VDC to -75 VDC
Maximum operating input current	23 A
Maximum operating input power	900 W

Environmental Specifications

You can operate and store the Netra 440 server safely in the conditions detailed in TABLE A-6.

TABLE A-6 Netra 440 Server Operating and Storage Specifications

Specification	Operating	Storage
Ambient temperature	5˚C (41˚F) to 40˚C (104˚F) Short term[1]: -5˚C (23˚F) to 55˚C (131˚F)	-40˚C (-40˚F) to 70˚C (158˚F)
Relative humidity	5% to 85% relative humidity, noncondensing Short term*: 5% to 90% relative humidity, noncondensing, but not to exceed 0.024 kg water/kg dry air (0.053 lbs. water/2.205 lb. dry air)	Up to 93% relative humidity noncondensing, 38˚C (100.4˚F) max wet bulb
Altitude	Up to 3000 m (9842.4 ft.)	Up to 12000 m (39369.6 ft.)

1 Short term (no more than 96 hours) temperature and humidity limits apply to servers with altitudes up to 1800 m (5905.44 ft.).

Clearance and Service Access Specifications

Minimum clearances needed for servicing the system are as follows.

Blockage	Required Clearance
Front of system	36 in (91.4 cm)
Back of system	36 in (91.4 cm)

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