



Netra™ 440 Server System Administration Guide

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www.sun.com

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Preface

The *Netra 440 Server System Administration Guide* is written for experienced system administrators. It includes general descriptive information about the Netra™ 440 server and detailed instructions for configuring and administering the server. To use the information in this manual, you must have working knowledge of computer network concepts and terms, and advanced familiarity with the Solaris™ Operating System (Solaris OS).

How This Book Is Organized

The *Netra 440 Server System Administration Guide* is divided into the following chapters:

- [Chapter 1](#) describes the system console and how to access it.
- [Chapter 2](#) describes the tools used to configure system firmware, including Sun™ Advanced Lights Out Manager (ALOM) system controller environmental monitoring, automatic system recovery (ASR), hardware watchdog mechanism, and multipathing software. In addition, it describes how to unconfigure and reconfigure a device manually.
- [Chapter 3](#) describes how to manage internal disk volumes and devices.

This manual also includes the following reference appendices:

- [Appendix A](#) provides a list of all OpenBoot configuration variables, and a short description of each.
- [Appendix B](#) provides a sample program that illustrates how to get/set the status of the alarms.

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 OS documentation, which is at

<http://docs.sun.com>

Shell Prompts

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

Typographic Conventions

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

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

Related Documentation

Application	Title	Part Number
Late-breaking product information	<i>Netra 440 Server Release Notes</i>	817-3885-xx
Product description	<i>Netra 440 Server Product Overview</i>	817-3881-xx
Installation instructions	<i>Netra 440 Server Installation Guide</i>	817-3882-xx
Administration	<i>Netra 440 Server System Administration Guide</i>	817-3884-xx
Parts installation and removal	<i>Netra 440 Server Service Manual</i>	817-3883-xx
Diagnostics and troubleshooting	<i>Netra 440 Server Diagnostics and Troubleshooting Guide</i>	817-3886-xx
Advanced Lights Out Manager (ALOM) system controller	<i>Advanced Lights Out Manager User's Guide</i>	817-5481-xx

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Netra 440 Server System Administration Guide, part number 817-3884-11

Configuring the System Console

This chapter explains what the system console is, describes the different ways of configuring it on a Netra 440 server, and helps you understand its relation to the system controller.

Tasks covered in this chapter include:

- [“Getting to the ok Prompt” on page 13](#)
- [“Accessing the System Controller” on page 16](#)
- [“Activating the Network Management Port” on page 17](#)
- [“Accessing the System Console Through a Terminal Server” on page 19](#)
- [“Accessing the System Console Through a TIP Connection” on page 22](#)
- [“Modifying the /etc/remote File” on page 25](#)
- [“Accessing the System Console Through an Alphanumeric Terminal” on page 26](#)
- [“Verifying Serial Port Settings on TTYB” on page 28](#)
- [“Accessing the System Console Through a Local Graphics Monitor” on page 29](#)

Other information in this chapter includes:

- [“Communicating With the System” on page 1](#)
- [“About the sc> Prompt” on page 8](#)
- [“OpenBoot ok Prompt” on page 9](#)
- [“Switching Between the ALOM System Controller and the System Console” on page 15](#)
- [“System Console OpenBoot Configuration Variable Settings” on page 31](#)

Communicating With the System

To install your system software or to diagnose problems, you need some way to interact at a low level with the system. The *system console* is Sun’s facility for doing this. You use the system console to view messages and issue commands. There can be only one system console per computer.

The serial management port (SERIAL MGT) is the default port for accessing the system console upon initial system installation. After installation, you can configure the system console to accept input from and send output to different devices. [TABLE 1-1](#) lists these devices and where they are discussed in the document.

TABLE 1-1 Ways of Communicating With the System

Devices Available for Accessing the System Console	During Installation*	After Installation
A terminal server attached to the serial management port (SERIAL MGT) or <code>ttyb</code> . See the following:		
• “Accessing the System Controller” on page 16	✓	✓
• “Accessing the System Console Through a Terminal Server” on page 19	✓	✓
• “Verifying Serial Port Settings on TTYB” on page 28		✓
• “System Console OpenBoot Configuration Variable Settings” on page 31	✓	✓
An alphanumeric terminal or similar device attached to the serial management port (SERIAL MGT) or <code>ttyb</code> . See the following:		
• “Accessing the System Controller” on page 16	✓	✓
• “Accessing the System Console Through an Alphanumeric Terminal” on page 26	✓	✓
• “Verifying Serial Port Settings on TTYB” on page 28		✓
• “System Console OpenBoot Configuration Variable Settings” on page 31	✓	✓
A TIP line attached to the serial management port (SERIAL MGT) or <code>ttyb</code> . See the following:		
• “Accessing the System Controller” on page 16	✓	✓
• “Accessing the System Console Through a TIP Connection” on page 22	✓	✓
• “Modifying the <code>/etc/remote</code> File” on page 25		✓
• “Verifying Serial Port Settings on TTYB” on page 28		✓
• “System Console OpenBoot Configuration Variable Settings” on page 31	✓	✓
An Ethernet line connected to the network management port (NET MGT). See the following:		
• “Activating the Network Management Port” on page 17		✓

TABLE 1-1 Ways of Communicating With the System (Continued)

Devices Available for Accessing the System Console	During Installation*	After Installation
A local graphics monitor (frame buffer card, graphics monitor, mouse, and so forth). See the following:		
• “Accessing the System Console Through a Local Graphics Monitor” on page 29		✓
• “System Console OpenBoot Configuration Variable Settings” on page 31		✓

* After initial system installation, you can redirect the system console to take its input from and send its output to the serial port TTYB.

What the System Console Does

The system console displays status and error messages generated by firmware-based tests during system startup. After those tests have been run, you can enter special commands that affect the firmware and alter system behavior. For more information about tests that run during the boot process, refer to the *Netra 440 Server Diagnostics and Troubleshooting Guide*.

Once the operating system is booted, the system console displays UNIX system messages and accepts UNIX commands.

Using the System Console

To use the system console, you need some means of getting data in to and out of the system, which means attaching some kind of hardware to the system. Initially, you might have to configure that hardware, and load and configure appropriate software as well.

You must also ensure that the system console is directed to the appropriate port on the Netra 440 server's back panel—generally, the one to which your hardware console device is attached (see [FIGURE 1-1](#)). You do this by setting the `input-device` and `output-device` OpenBoot configuration variables.

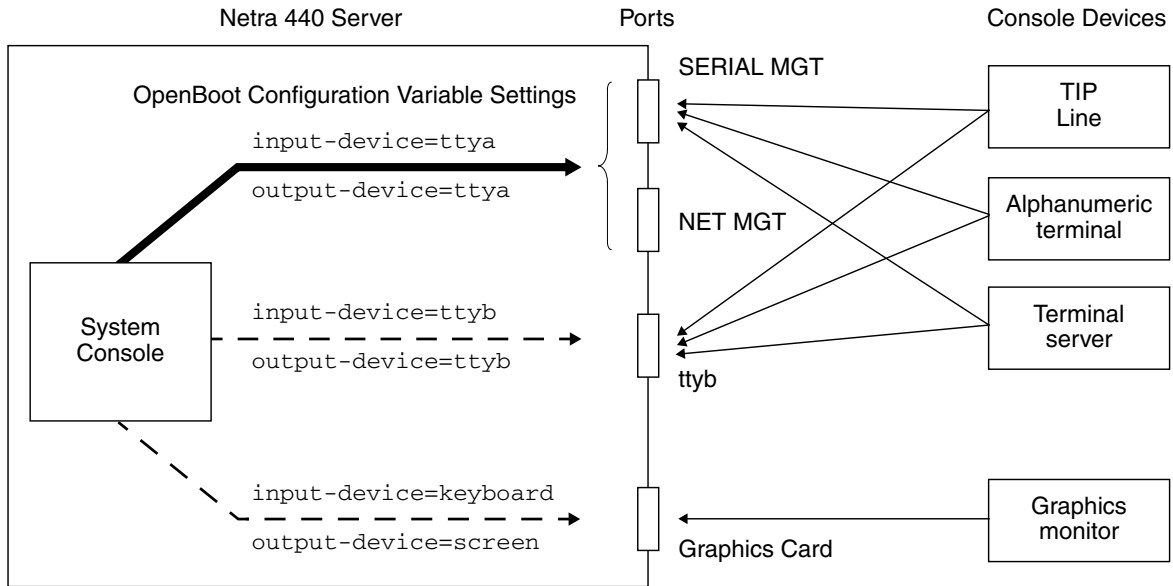


FIGURE 1-1 Directing the System Console to Different Ports and Different Devices

Default System Console Connection Through the Serial Management and Network Management Ports

On Netra 440 servers, the system console comes preconfigured to allow input and output only by means of hardware devices connected to the serial or network management ports. However, because the network management port is not available until you assign it an IP address, your first connection must be to the serial management port (SERIAL MGT).

Typically, you connect one of the following hardware devices to the serial management port:

- Terminal server
- Alphanumeric terminal or similar device
- TIP line connected to another Sun computer

This provides for secure access at the installation site.

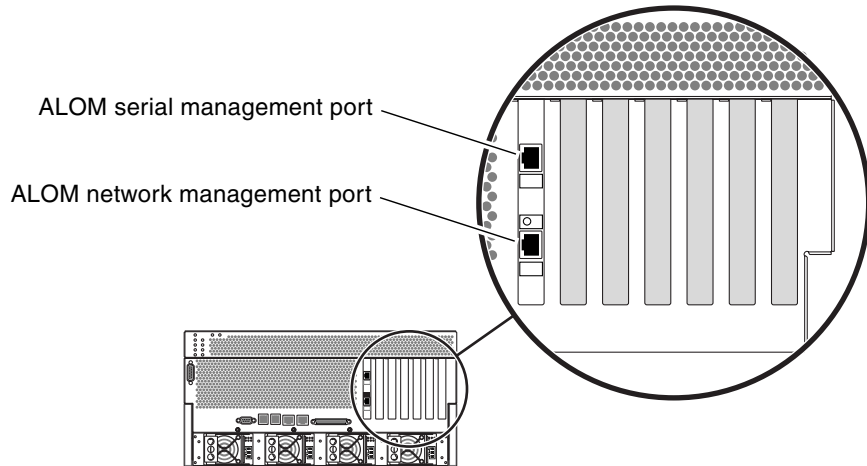


FIGURE 1-2 Serial Management Port on the ALOM System Controller Card—Default Console Connection

Using a TIP line might be preferable to connecting an alphanumeric terminal, since TIP lets you use windowing and operating system features on the machine being used to make the connection to the Netra 440 server.

Although the Solaris OS sees the serial management port as `ttya`, the serial management port is not a general-purpose serial port. If you want to use a general-purpose serial port with your server—to connect a serial printer, for instance—use the regular 9-pin serial port on the back panel of the Netra 440. The Solaris OS sees this port as `ttyb`.

- For instructions on accessing the system console through a terminal server, see [“Accessing the System Console Through a Terminal Server”](#) on page 19.
- For instructions on accessing the system console through an alphanumeric terminal, see [“Accessing the System Console Through an Alphanumeric Terminal”](#) on page 26.
- For instructions on accessing the system console through a TIP line, see [“Accessing the System Console Through a TIP Connection”](#) on page 22.

Once you have assigned an IP address to the network management port (NET MGT), you can connect an Ethernet-capable device to the system console through your network. This provides for remote monitoring and control. In addition, up to four simultaneous connections to the system controller `sc>` prompt are available through the network management port. For more information, see [“Activating the Network Management Port” on page 17](#).

Alternative System Console Configuration

In the default configuration, system controller alerts and system console output appear interspersed in the same window. *After initial system installation*, you can redirect the system console to take its input from and send its output to the serial port `ttyb`, or to a graphics card’s port.

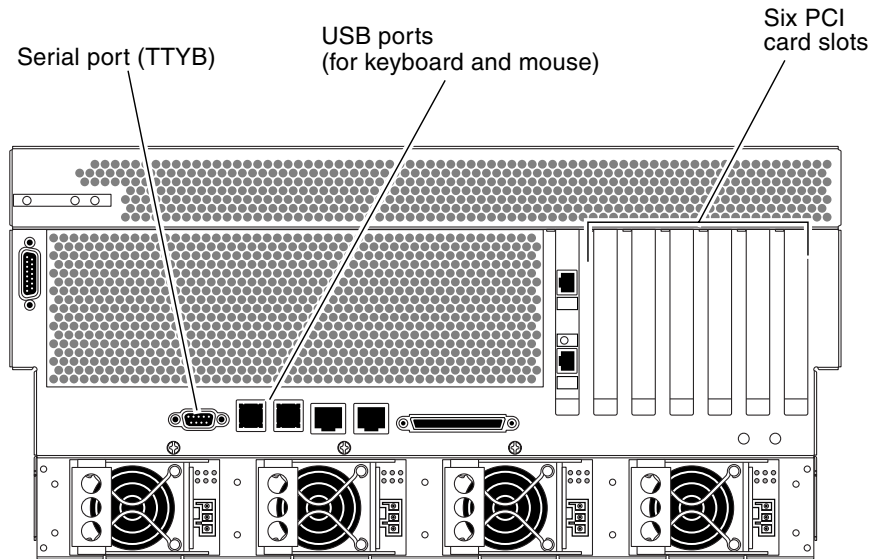


FIGURE 1-3 Alternative Console Ports (Require Additional Configuration)

The chief advantage of redirecting the system console to another port is that it allows you to divide system controller alerts and system console output into two separate windows.

However, there are some serious disadvantages to alternative console configuration:

- Power-on self-text (POST) output can only be directed to the serial management and network management ports. It cannot be directed to `ttyb` or to a graphics card’s port.

- If you have directed the system console to `ttyb`, you cannot use this port for any other serial device.
- In a default configuration, the serial management and network management ports allow you to open up to four additional windows through which you can view, but not affect, system console activity. You cannot open these windows if the system console is redirected to `ttyb` or to a graphics card's port.
- In a default configuration, the serial management and network management ports allow you to switch between viewing system console and system controller output on the same device by typing a simple escape sequence or command. The escape sequence and command do not work if the system console is redirected to `ttyb` or to a graphics card's port.
- The system controller keeps a log of console messages, but some messages are not logged if the system console is redirected to `ttyb` or to a graphic card's port. The omitted information could be important if you need to contact Sun customer service with a problem.

For all the preceding reasons, the best practice is to leave the system console in its default configuration.

You change the system console configuration by setting OpenBoot configuration variables. See [“System Console OpenBoot Configuration Variable Settings” on page 31](#).

You can also set OpenBoot configuration variables using the ALOM system controller. For details, refer to the *Advanced Lights Out Manager User's Guide* (817-5481-xx).

Accessing the System Console Through a Graphics Monitor

The Netra 440 server is shipped without a mouse, keyboard, monitor, or frame buffer for the display of bitmapped graphics. To install a graphics monitor on the server, you must install a frame buffer card into a PCI slot, and attach a monitor, mouse, and keyboard to the appropriate back panel ports.

After starting the system, you might need to install the correct software driver for the PCI card you have installed. For detailed hardware instructions, see [“Accessing the System Console Through a Local Graphics Monitor” on page 29](#).

Note – POST diagnostics cannot display status and error messages to a local graphics monitor.

About the `sc>` Prompt

The ALOM system controller runs independently of the Netra 440 server and regardless of system power state. When you connect a Netra 440 server to AC power, the ALOM system controller immediately starts up, and begins monitoring the system.

Note – To view ALOM system controller boot messages, you must connect an alphanumeric terminal to the serial management port *before* connecting the AC power cords to the Netra 440 server.

You can log in to the ALOM system controller at any time, regardless of system power state, as long as AC power is connected to the system and you have a way of interacting with the system. You can also access the ALOM system controller prompt (`sc>`) from the OpenBoot `ok` prompt or from the Solaris `#` or `%` prompt, provided the system console is configured to be accessible through the serial management and network management ports. For more information, see the following:

- [“Getting to the `ok` Prompt” on page 13](#)
- [“Switching Between the ALOM System Controller and the System Console” on page 15](#)

The `sc>` prompt indicates that you are interacting with the ALOM system controller directly. It is the first prompt you see when you log in to the system through the serial management port or network management port, regardless of system power state.

Note – When you access the ALOM system controller for the first time, it forces you to create a user name and password for subsequent access. After this initial configuration, you will be prompted to enter a user name and password every time you access the ALOM system controller.

Access Through Multiple Controller Sessions

Up to five ALOM system controller sessions can be active concurrently, one session through the serial management port and up to four sessions through the network management port. Users of each of these sessions can issue commands at the `sc>` prompt. However, only one user at a time can access the system console, and then only if the system console is configured to be accessible through the serial and network management ports. For more information, see:

- [“Accessing the System Controller” on page 16](#)
- [“Activating the Network Management Port” on page 17](#)

Any additional ALOM system controller sessions afford passive views of system console activity, until the active user of the system console logs out. However, the `console -f` command, if you enable it, allows users to seize access to the system console from one another. For more information, see the *Advanced Lights Out Manager User's Guide* (817-5481-xx).

Reaching the `sc>` Prompt

There are several ways to get to the `sc>` prompt:

- If the system console is directed to the serial management and network management ports, you can type the ALOM system controller escape sequence (`#.`).
- You can log in directly to the ALOM system controller from a device connected to the serial management port. See [“Accessing the System Controller” on page 16](#).
- You can log in directly to the ALOM system controller using a connection through the network management port. See [“Activating the Network Management Port” on page 17](#).

OpenBoot `ok` Prompt

A Netra 440 server with the Solaris OS installed is capable of operating at different *run levels*. A synopsis of run levels follows. For a full description, refer to the Solaris system administration documentation.

Most of the time, you operate a Netra 440 server at run level 2 or run level 3, which are multiuser states with access to full system and network resources. Occasionally, you might operate the system at run level 1, which is a single-user administrative state. However, the lowest operational state is run level 0. At this state, it is safe to turn off power to the system.

When a Netra 440 server is at run level 0, the `ok` prompt appears. This prompt indicates that the OpenBoot firmware is in control of the system.

There are a number of scenarios under which OpenBoot firmware control can occur.

- By default, the system comes up under OpenBoot firmware control before the operating system is installed.
- The system boots to the `ok` prompt when the `auto-boot? OpenBoot` configuration variable is set to `false`.
- The system transitions to run level 0 in an orderly way when the operating system is halted.
- The system reverts to OpenBoot firmware control when the operating system crashes.
- During the boot process, when there is a serious hardware problem that prevents the operating system from running, the system reverts to OpenBoot firmware control.
- When a serious hardware problem develops while the system is running, the operating system transitions smoothly to run level 0.
- You deliberately place the system under firmware control in order to execute firmware-based commands or to run diagnostic tests.

It is the last of these scenarios which most often concerns you as an administrator, since there will be times when you need to reach the `ok` prompt. Several ways to do this are outlined in [“Reaching the `ok` Prompt” on page 10](#). For detailed instructions, see [“Getting to the `ok` Prompt” on page 13](#).

Reaching the `ok` Prompt

There are several ways to reach the `ok` prompt, depending on the state of the system and the means by which you are accessing the system console. In order of desirability, these are:

- Graceful shutdown
- ALOM system controller `break` or `console` command
- L1-A (Stop-A) keys or Break key
- Externally initiated reset (XIR)
- Manual system reset

A discussion of each method follows. For step-by-step instructions, see [“Getting to the `ok` Prompt” on page 13](#).

Graceful Shutdown

The preferred method of reaching the `ok` prompt is to shut down the operating system by issuing an appropriate command (for example, the `shutdown`, `init`, or `uadmin` command) as described in Solaris system administration documentation. You can also use the system Power button to initiate a graceful system shutdown.

Gracefully shutting down the system prevents data loss, enables you to warn users beforehand, and causes minimal disruption. You can usually perform a graceful shutdown, provided the Solaris OS is running and the hardware has not experienced serious failure.

You can also perform a graceful system shutdown from the ALOM system controller command prompt.

ALOM System Controller `break` or `console` Command

Typing `break` from the `sc>` prompt forces a running Netra 440 server to drop into OpenBoot firmware control. If the operating system is already halted, you can use the `console` command instead of `break` to reach the `ok` prompt.

After forcing the system into OpenBoot firmware control, be aware that issuing certain OpenBoot commands (like `probe-scsi`, `probe-scsi-all`, or `probe-ide`) might hang the system.

L1-A (Stop-A) Keys or Break Key

When it is impossible or impractical to shut down the system gracefully, you can get to the `ok` prompt by typing the L1-A (Stop-A) key sequence from a Sun keyboard. If you have an alphanumeric terminal attached to the Netra 440 server, press the Break key.

After forcing the system into OpenBoot firmware control, be aware that issuing certain OpenBoot commands (like `probe-scsi`, `probe-scsi-all`, or `probe-ide`) might hang the system.

Note – These methods of reaching the `ok` prompt will only work if the system console has been redirected to the appropriate port. For details, see [“System Console OpenBoot Configuration Variable Settings”](#) on page 31.

Externally Initiated Reset (XIR)

Use the ALOM system controller `reset -x` command to execute an externally initiated reset (XIR). Forcing an XIR might be effective in breaking the deadlock that is hanging up the system. However, an XIR also precludes the orderly shutdown of applications, and so it is not the preferred method of reaching the `ok` prompt, unless you are troubleshooting these types of system hangs. Generating an XIR has the advantage of allowing you to issue the `sync` command to produce a dump file of the current system state for diagnostic purposes.

For more information, refer to:

- *Netra 440 Server Diagnostics and Troubleshooting Guide (817-3886-xx)*
- *Advanced Lights Out Manager User's Guide (817-5481-xx)*



Caution – Because an XIR precludes an orderly shutdown of applications, it should only be attempted if previously described methods do not work.

Manual System Reset

Use the ALOM system controller `reset` command, or `poweron` and `poweroff` commands, to reset the server. Reaching the `ok` prompt by performing a manual system reset or by power-cycling the system should be the method of last resort. Doing this results in the loss of all system coherence and state information. A manual system reset could corrupt the server's file systems, although the `fsck` command usually restores them. Use this method only when nothing else works.



Caution – Forcing a manual system reset results in loss of system state data, and should be attempted only as a last resort. After a manual system reset, all state information is lost, which inhibits troubleshooting the cause of the problem until the problem reoccurs.



Caution – Accessing the `ok` prompt suspends the Solaris OS.

When you access the `ok` prompt from a functioning Netra 440 server, you are suspending the Solaris OS and placing the system under firmware control. Any processes that were running under the operating system are also suspended, and *the state of such processes might not be recoverable.*

The diagnostic tests and commands you run from the `ok` prompt have the potential to affect the state of the system. This means that it is not always possible to resume execution of the operating system from the point at which it was suspended.

Although the `go` command will resume execution in most circumstances, in general, each time you drop the system down to the `ok` prompt, you should expect to have to reboot the system to get back to the operating system.

As a rule, before suspending the operating system, you should back up files, warn users of the impending shutdown, and halt the system in an orderly manner. However, it is not always possible to take such precautions, especially if the system is malfunctioning.

For More Information

For more information about the OpenBoot firmware, refer to the *OpenBoot 4.x Command Reference Manual*. An online version of the manual is included with the *OpenBoot Collection AnswerBook* that ships with Solaris software.

Getting to the `ok` Prompt

This procedure provides several ways of reaching the `ok` prompt. The methods are not equally desirable. For details about when to use each method, see [“OpenBoot `ok` Prompt” on page 9](#).



Caution – Dropping the Netra 440 server to the `ok` prompt suspends all application and operating system software. After you issue firmware commands and run firmware-based tests from the `ok` prompt, the system might not be able to resume where it left off.

If at all possible, back up system data before starting this procedure. Also exit or stop all applications and warn users of the impending loss of service. For information about the appropriate backup and shutdown procedures, see Solaris system administration documentation.

▼ To Get to the ok Prompt

1. **Decide which method you need to use to reach the ok prompt.**
See [“OpenBoot ok Prompt” on page 9](#) for details.
2. **Follow the appropriate instructions in TABLE 1-2.**

TABLE 1-2 Ways of Accessing the ok Prompt

Access Method	What to Do
Graceful shutdown of the Solaris OS	<ul style="list-style-type: none">• From a shell or command tool window, issue an appropriate command (for example, the <code>shutdown</code> or <code>init</code> command) as described in Solaris system administration documentation.
L1-A (Stop-A) keys or Break key	<ul style="list-style-type: none">• From a Sun keyboard connected directly to the Netra 440 server, press the Stop and A keys simultaneously.*–or–• From an alphanumeric terminal configured to access the system console, press the Break key.
ALOM system controller <code>console</code> or <code>break</code> command	<ul style="list-style-type: none">• From the <code>sc></code> prompt, type the <code>break</code> command. The <code>console</code> command also works, provided the operating environment software is not running and the server is already under OpenBoot firmware control.
Externally initiated reset (XIR)	<ul style="list-style-type: none">• From the <code>sc></code> prompt, type the <code>reset -x</code> command.
Manual system reset	<ul style="list-style-type: none">• From the <code>sc></code> prompt, type the <code>reset</code> command.

* Requires the OpenBoot configuration variable `input-device=keyboard`. For more information, see [“Accessing the System Console Through a Local Graphics Monitor” on page 29](#) and [“System Console OpenBoot Configuration Variable Settings” on page 31](#).

Switching Between the ALOM System Controller and the System Console

The Netra 440 server features two management ports, labeled SERIAL MGT and NET MGT, located on the server's back panel. If the system console is directed to use the serial management and network management ports (its default configuration), these ports provide access to both the system console and the ALOM system controller, each on a separate "channel" (see [FIGURE 1-4](#)).

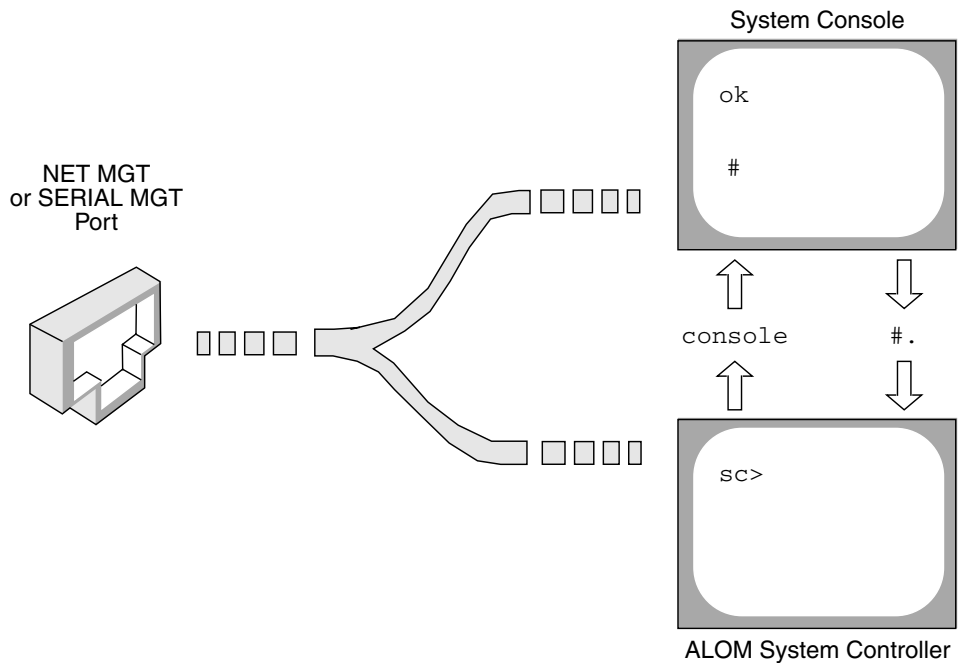


FIGURE 1-4 Separate System Console and System Controller "Channels"

If the system console is configured to be accessible from the serial management and network management ports, when you connect through one of these ports you can access either the ALOM command-line interface or the system console. You can switch between the ALOM system controller and the system console at any time, but you cannot access both at the same time from a single terminal or shell tool.

The prompt displayed on the terminal or shell tool tells you which “channel” you are accessing:

- The # or % prompt indicates that you are at the system console and that the Solaris OS is running.
- The ok prompt indicates that you are at the system console and that the server is running under OpenBoot firmware control.
- The sc> prompt indicates that you are at the ALOM system controller.

Note – If no text or prompt appears, it may be the case that no console messages were recently generated by the system. If this happens, pressing the terminal’s Enter or Return key should produce a prompt.

To reach the system console from the ALOM system controller, type the `console` command at the `sc>` prompt. To reach the ALOM system controller from the system console, type the system controller escape sequence, which by default is #. (pound period).

For more information, see the following:

- [“Communicating With the System” on page 1](#)
- [“About the sc> Prompt” on page 8](#)
- [“OpenBoot ok Prompt” on page 9](#)
- [“Accessing the System Controller” on page 16](#)
- *Advanced Lights Out Manager User’s Guide*

Accessing the System Controller

The following sections describe ways of accessing the system controller.

Using the Serial Management Port

This procedure assumes that the system console is directed to use the serial management and network management ports (the default configuration).

When you are accessing the system console using a device connected to the serial management port, your first point of access is the ALOM system controller and its `sc>` prompt. After connecting to the ALOM system controller, you can switch to the system console itself.

For more information about the ALOM system controller card, refer to the *Netra 440 Server Product Overview* (817-3881-xx) and the *Advanced Lights Out Manager User's Guide* (817-5481-xx).

▼ To Use the Serial Management Port

1. **Ensure that the serial port on your connecting device is set to the following parameters:**
 - 9600 baud
 - 8 bits
 - No parity
 - 1 stop bit
 - No handshaking
2. **Establish an ALOM system controller session.**

See *Advanced Lights Out Manager User's Guide* (817-5481-xx) for instructions.
3. **To connect to the system console, at the ALOM system controller command prompt, type:**

```
sc> console
```

The `console` command switches you to the system console.

4. **To switch back to the `sc>` prompt, type the `#.` escape sequence.**

```
ok #. [characters are not echoed to the screen]
```

For instructions on how to use the ALOM system controller, see the *Advanced Lights Out Manager User's Guide* (817-5481-xx).

Activating the Network Management Port

You must assign an Internet Protocol (IP) address to the network management port before you can use it. If you are configuring the network management port for the first time, you must first connect to the ALOM system controller using the serial management port and assign an IP address to the network management port. You can either assign an IP address manually, or you can configure the port to obtain an IP address using the Dynamic Host Configuration Protocol (DHCP) from another server.

Data centers frequently devote a separate subnet to system management. If your data center has such a configuration, connect the network management port to this subnet.

Note – The network management port is a 10BASE-T port. The IP address assigned to the network management port is a unique IP address, separate from the main Netra 440 server IP address, and is dedicated for use only with the ALOM system controller. For more information, see the *Netra 440 Server Product Overview*.

▼ To Activate the Network Management Port

1. Connect an Ethernet cable to the network management port.
2. Log in to the ALOM system controller through the serial management port.

For more information about connecting to the serial management port, see [“Accessing the System Controller” on page 16](#).

3. Type one of the following commands:

- If your network uses static IP addresses, type:

```
SC> setsc if_network true
SC> setsc netsc_ipaddr ip-address
SC> setsc netsc_ipnetmask ip-address
SC> setsc netsc_ipgateway ip-address
```

- If your network uses Dynamic Host Configuration Protocol (DHCP), type:

```
SC> setsc netsc_dhcp
```

4. Enter the following so that the new settings will take affect:

```
SC> resetsc
```

5. To verify the network settings, type:

```
SC> shownetwork
```

6. Log out of the ALOM system controller session.

To connect through the network management port, use the `telnet` command to the IP address you specified in [Step 3](#) of the preceding procedure.

Accessing the System Console Through a Terminal Server

The following procedure assumes that you are accessing the system console by connecting a terminal server to the serial management port (SERIAL MGT) of the Netra 440 server.

▼ To Access The System Console Through a Terminal Server

1. Complete the physical connection from the serial management port to your terminal server.

The serial management port on the Netra 440 server is a data terminal equipment (DTE) port. The pinouts for the serial management port correspond with the pinouts for the RJ-45 ports on the Serial Interface Breakout Cable supplied by Cisco for use with the Cisco AS2511-RJ terminal server. If you use a terminal server made by another manufacturer, check that the serial port pinouts of the Netra 440 server match those of the terminal server you plan to use.

If the pinouts for the server serial ports correspond with the pinouts for the RJ-45 ports on the terminal server, you have two connection options:

- Connect a serial interface breakout cable directly to the Netra 440 server. See [“Accessing the System Controller” on page 16](#).
- Connect a serial interface breakout cable to a patch panel and use the straight-through patch cable (supplied by Sun) to connect the patch panel to the server.

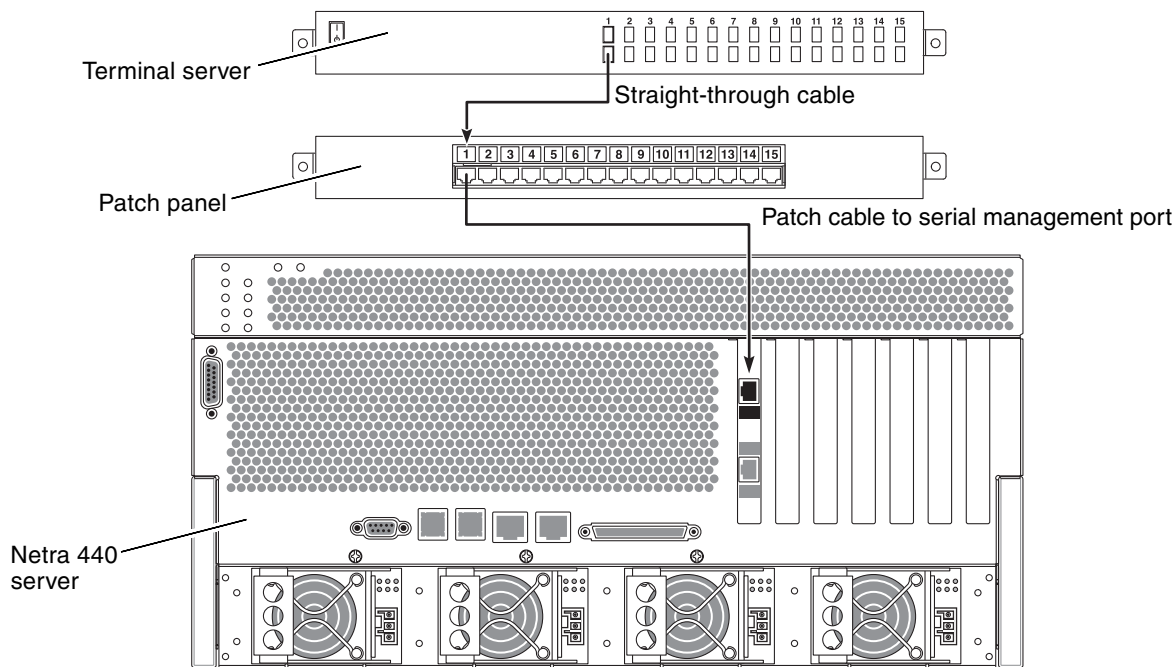


FIGURE 1-5 Patch Panel Connection Between a Terminal Server and a Netra 440 Server

If the pinouts for the serial management port *do not* correspond with the pinouts for the RJ-45 ports on the terminal server, you need to make a crossover cable that takes each pin on the Netra 440 server serial management port to the corresponding pin in the terminal server's serial port.

[TABLE 1-3](#) shows the crossovers that the cable must perform.

TABLE 1-3 Pin Crossovers for Connecting to a Typical Terminal Server

Netra 440 Serial Port (RJ-45 Connector) Pin	Terminal Server Serial Port Pin
Pin 1 (RTS)	Pin 1 (CTS)
Pin 2 (DTR)	Pin 2 (DSR)
Pin 3 (TXD)	Pin 3 (RXD)
Pin 4 (Signal Ground)	Pin 4 (Signal Ground)
Pin 5 (Signal Ground)	Pin 5 (Signal Ground)
Pin 6 (RXD)	Pin 6 (TXD)
Pin 7 (DSR /DCD)	Pin 7 (DTR)
Pin 8 (CTS)	Pin 8 (RTS)

2. Open a terminal session on the connecting device, and type:

```
% telnet IP-address-of-terminal-server port-number
```

For example, for a Netra 440 server connected to port 10000 on a terminal server whose IP address is 192.20.30.10, you would type:

```
% telnet 192.20.30.10 10000
```

3. If you want to use *TTYB* instead of the serial management port, do the following:

a. Redirect the system console by changing OpenBoot configuration variables.

At the `ok` prompt, type the following commands:

```
ok setenv input-device ttyb
ok setenv output-device ttyb
```

Note – Redirecting the system console does not redirect POST output. You can only view POST messages from the serial and network management port devices.

Note – There are many other OpenBoot configuration variables. Although these variables do not affect which hardware device is used to access the system console, some of them affect which diagnostic tests the system runs and which messages the system displays at its console. For details, refer to the *Netra 440 Server Diagnostics and Troubleshooting Guide* (817-3886-xx).

b. To cause the changes to take effect, power off the system. Type:

```
ok power-off
```

The system permanently stores the parameter changes and powers off.

Note – You can also power off the system using the front panel Power button.

c. Connect the null modem serial cable to the `ttyb` port on the Netra 440 server.

If required, use the DB-9 or DB-25 cable adapter supplied with the server.

d. Power on the system.

Refer to the *Netra 440 Server Installation Guide* for power-on procedures.

Continue with your installation or diagnostic test session as appropriate. When you are finished, end your session by typing the terminal server's escape sequence and exit the window.

For more information about connecting to and using the ALOM system controller, refer to the *Advanced Lights Out Manager User's Guide*.

If you have redirected the system console to `tttyb` and want to change the system console settings back to use the serial management and network management ports, see ["System Console OpenBoot Configuration Variable Settings"](#) on page 31.

Accessing the System Console Through a TIP Connection

This procedure assumes that you are accessing the Netra 440 server system console by connecting the serial port of another Sun system to the serial management port (SERIAL MGT) of the Netra 440 server ([FIGURE 1-6](#)).

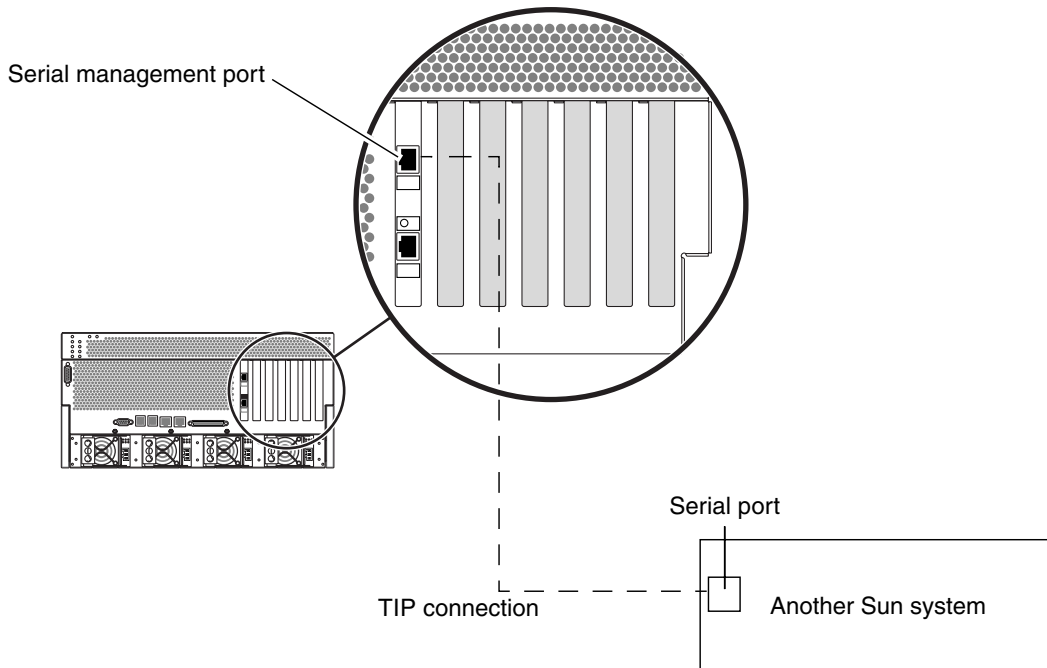


FIGURE 1-6 TIP Connection Between a Netra 440 Server and Another Sun System

▼ To Access the System Console Through the TIP Connection

1. **Connect the RJ-45 serial cable and, if required, the DB-9 or DB-25 adapter provided.**

The cable and adapter connect between another Sun system's serial port (typically `ttyb`) and the serial management port on the back panel of the Netra 440 server. Pinouts, part numbers, and other details about the serial cable and adapter are provided in the *Netra 440 Server Service Manual* (817-3883-xx).

2. **Ensure that the `/etc/remote` file on the Sun system contains an entry for `hardwire`.**

Most releases of Solaris OS software shipped since 1992 contain an `/etc/remote` file with the appropriate `hardwire` entry. However, if the Sun system is running an older version of Solaris OS software, or if the `/etc/remote` file has been modified, you might need to edit it. See [“Modifying the `/etc/remote` File” on page 25](#) for details.

3. **In a shell tool window on the Sun system, type:**

```
% tip hardwire
```

The Sun system responds by displaying:

```
connected
```

The shell tool is now a TIP window directed to the Netra 440 server through the Sun system's serial port. This connection is established and maintained even when the Netra 440 server is completely powered off or just starting up.

Note – Use a shell tool or a CDE terminal (such as `dtterm`), not a command tool. Some TIP commands might not work properly in a command tool window.

4. **If you want to use `TTYB` on the Netra 440 server instead of the serial management port, do the following:**

- a. **Redirect the system console by changing the OpenBoot configuration variables.**

At the `ok` prompt on the Netra 440 server, type the following commands:

```
ok setenv input-device ttyb
ok setenv output-device ttyb
```

Note – You can only access the `sc>` prompt and view POST messages from either the serial management port or the network management port.

Note – There are many other OpenBoot configuration variables. Although these variables do not affect which hardware device is used to access the system console, some of them affect which diagnostic tests the system runs and which messages the system displays at its console. For details, refer to the *Netra 440 Server Diagnostics and Troubleshooting Guide* (817-3886-xx).

b. To cause the changes to take effect, power off the system. Type:

```
ok power-off
```

The system permanently stores the parameter changes and powers off.

Note – You can also power off the system using the front panel Power button.

c. Connect the null modem serial cable to the `ttyb` port on the Netra 440 server.

If required, use the DB-9 or DB-25 cable adapter supplied with the server.

d. Power on the system.

Refer to the *Netra 440 Server Installation Guide* for power-on procedures.

Continue with your installation or diagnostic test session as appropriate. When you are finished using the TIP window, end your TIP session by typing `~.` (the tilde symbol followed by a period) and exit the window. For more information about TIP commands, see the TIP man page.

For more information about connecting to and using the ALOM system controller, see the *Advanced Lights Out Manager User's Guide* (817-5481-xx).

If you have redirected the system console to `ttyb` and want to change the system console settings back to use the serial management and network management ports, see [“System Console OpenBoot Configuration Variable Settings”](#) on page 31.

Modifying the `/etc/remote` File

This procedure might be necessary if you are accessing the Netra 440 server using a TIP connection from a Sun system running an older version of the Solaris OS software. You might also need to perform this procedure if the `/etc/remote` file on the Sun system has been altered and no longer contains an appropriate `hardware` entry.

This procedure assumes that you are logged in as superuser to the system console of a Sun system that you intend to use to establish a TIP connection to the Netra 440 server.

▼ To Modify the `/etc/remote` File

1. Determine the release level of Solaris OS software installed on the Sun system.

Type:

```
# uname -r
```

The system responds with a release number.

2. Do one of the following, depending on the number displayed.

- If the number displayed by the `uname -r` command is 5.0 or higher:

The Solaris OS software shipped with an appropriate entry for `hardware` in the `/etc/remote` file. If you have reason to suspect that this file was altered and the `hardware` entry modified or deleted, check the entry against the following example, and edit it as needed.

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

Note – If you intend to use the Sun system’s serial port A rather than serial port B, edit this entry by replacing `/dev/term/b` with `/dev/term/a`.

- If the number displayed by the `uname -r` command is less than 5.0:

Check the `/etc/remote` file and add the following entry, if it does not already exist.

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

Note – If you intend to use the Sun system’s serial port A rather than serial port B, edit this entry by replacing `/dev/ttyb` with `/dev/ttya`.

The `/etc/remote` file is now properly configured. Continue establishing a TIP connection to the Netra 440 server system console. See [“Accessing the System Console Through a TIP Connection”](#) on page 22.

If you have redirected the system console to `ttyb` and want to change the system console settings back to use the serial management and network management ports, see [“System Console OpenBoot Configuration Variable Settings”](#) on page 31.

Accessing the System Console Through an Alphanumeric Terminal

This procedure assumes that you are accessing the Netra 440 server system console by connecting the serial port of an alphanumeric terminal to the serial management port (SERIAL MGT) of the Netra 440 server.

▼ To Access the System Console Through an Alphanumeric Terminal

1. Attach one end of the serial cable to the alphanumeric terminal’s serial port.

Use a null modem serial cable or an RJ-45 serial cable and null modem adapter. Connect this cable to the terminal’s serial port connector.

2. Attach the opposite end of the serial cable to the serial management port on the Netra 440 server.

3. Connect the alphanumeric terminal’s power cord to an AC outlet.

4. Set the alphanumeric terminal to receive:

- 9600 baud
- 8 bits
- No parity
- 1 stop bit
- No handshake protocol

Refer to the documentation accompanying your terminal for information about how to configure the terminal.

5. *If you want to use `tttyb` instead of the serial management port, do the following:*
- a. **Redirect the system console by changing the OpenBoot configuration variables.**

At the `ok` prompt, type the following commands:

```
ok setenv input-device tttyb  
ok setenv output-device tttyb
```

Note – You can only access the `sc>` prompt and view POST messages from either the serial management port or the network management port.

Note – There are many other OpenBoot configuration variables. Although these variables do not affect which hardware device is used to access the system console, some of them affect which diagnostic tests the system runs and which messages the system displays at its console. For details, refer to the *Netra 440 Server Diagnostics and Troubleshooting Guide* (817-3886-xx).

- b. **To cause the changes to take effect, power off the system. Type:**

```
ok power-off
```

The system permanently stores the parameter changes and powers off.

Note – You can also power off the system using the front panel Power button.

- c. **Connect the null modem serial cable to the `tttyb` port on the Netra 440 server.**

If required, use the DB-9 or DB-25 cable adapter supplied with the server.

- d. **Power on the system.**

Refer to the *Netra 440 Server Installation Guide* for power-on procedures.

You can issue system commands and view system messages using the alphanumeric terminal. Continue with your installation or diagnostic procedure, as needed. When you are finished, type the alphanumeric terminal's escape sequence.

For more information about connecting to and using the ALOM system controller, refer to the *Advanced Lights Out Manager User's Guide* (817-5481-xx).

If you have redirected the system console to `tttyb` and want to change the system console settings back to use the serial management and network management ports, see [“System Console OpenBoot Configuration Variable Settings” on page 31](#).

Verifying Serial Port Settings on TTYB

This procedure lets you verify the baud rate and other serial port settings used by the Netra 440 server to communicate with a device attached to its `ttyb` port.

Note – The serial management port always operates at 9600 baud, 8 bits, with no parity and 1 stop bit.

You must be logged in to the Netra 440 server, and the server must be running Solaris OS software.

▼ To Verify the Serial Port Settings on TTYB

1. Open a shell tool window.
2. Type:

```
# eeprom | grep ttyb-mode
```

3. Look for the following output:

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

This line indicates that the Netra 440 server's serial port `ttyb` is configured for:

- 9600 baud
- 8 bits
- No parity
- 1 stop bit
- No handshake protocol

For more information about serial port settings, see the `eeprom` man page. For more information about the `ttyb-mode` OpenBoot configuration variable, see [Appendix A](#).

Accessing the System Console Through a Local Graphics Monitor

After initial system installation, you can install a local graphics monitor and configure it to access the system console. You *cannot* use a local graphics monitor to perform initial system installation, nor can you use a local graphics monitor to view power-on self-test (POST) messages.

To install a local graphics monitor, you must have:

- A supported PCI-based graphics frame buffer card and software driver.
- A monitor with appropriate resolution to support the frame buffer
- A Sun-compatible USB keyboard (Sun USB Type-6 keyboard)
- A Sun-compatible USB mouse (Sun USB mouse) and mouse pad

▼ To Access the System Console Through a Local Graphics Monitor

1. Install the graphics card into an appropriate PCI slot.

Installation must be performed by a qualified service provider. For further information, refer to the *Netra 440 Server Service Manual* or contact your qualified service provider.

2. Attach the monitor's video cable to the graphics card's video port.

Tighten the thumbscrews to secure the connection.

3. Connect the monitor's power cord to an AC outlet.

4. Connect the USB keyboard cable to one USB port and the USB mouse cable to the other USB port on the Netra 440 server back panel (FIGURE 1-2).

5. Get to the `ok` prompt.

For more information, see [“Getting to the `ok` Prompt”](#) on page 13.

6. Set OpenBoot configuration variables appropriately.

From the existing system console, type:

```
ok setenv input-device keyboard
ok setenv output-device screen
```

Note – There are many other OpenBoot configuration variables. Although these variables do not affect which hardware device is used to access the system console, some of them affect which diagnostic tests the system runs and which messages the system displays at its console. For details, refer to the *Netra 440 Server Diagnostics and Troubleshooting Guide* (817-3886-xx).

7. To cause the changes to take effect, type:

```
ok reset-all
```

The system stores the parameter changes, and boots automatically when the OpenBoot configuration variable `auto-boot?` is set to `true` (its default value).

Note – To store parameter changes, you can also power cycle the system using the front panel Power button.

You can issue system commands and view system messages using your local graphics monitor. Continue with your installation or diagnostic procedure, as needed.

If you want to redirect the system console back to the serial management and network management ports, see [“System Console OpenBoot Configuration Variable Settings”](#) on page 31.

System Console OpenBoot Configuration Variable Settings

The Netra 440 system console is directed to the serial management and network management ports (SERIAL MGT and NET MGT) by default. However, you can redirect the system console to the serial DB-9 port (TTYB), or to a local graphics monitor, keyboard, and mouse. You can also redirect the system console back to the serial management and network management ports.

Certain OpenBoot configuration variables control from where system console input is taken and to where its output is directed. The table below shows how to set these variables in order to use the serial management and network management ports, TTYB, or a local graphics monitor as the system console connection.

TABLE 1-4 OpenBoot Configuration Variables That Affect the System Console

OpenBoot Configuration Variable Name	Setting for Sending System Console Output to:		
	Serial and Network Management Ports	Serial Port (TTYB)*	Local Graphics Monitor/USB Keyboard and Mouse*
output-device	ttya	ttyb	screen
input-device	ttya	ttyb	keyboard

* POST output will still be directed to the serial management port, as POST has no mechanism to direct its output to a graphics monitor.

The serial management port and network management port are present in the OpenBoot configuration variables as `ttya`. However, the serial management port does not function as a standard serial connection. If you want to connect a conventional serial device (such as a printer) to the system, you must connect it to TTYB, *not* the serial management port. Refer to the *Netra 440 Server Product Overview* (817-3881-xx) for more information.

It is important to note that the `sc>` prompt and POST messages are only available through the serial management port and network management port. In addition, the ALOM system controller `console` command is ineffective when the system console is redirected to `ttyb` or a local graphics monitor.

In addition to the OpenBoot configuration variables described in [TABLE 1-4](#), there are other variables that affect and determine system behavior. These variables, which are stored on the system configuration card, are discussed in more detail in the *Netra 440 Server Product Overview* (817-3881-xx).

Managing RAS Features and System Firmware

This chapter describes how to manage reliability, availability, and serviceability (RAS) features and system firmware, including Sun Advanced Lights Out Manager (ALOM) system controller, automatic system recovery (ASR), and the hardware watchdog mechanism. In addition, this chapter describes how to unconfigure and reconfigure a device manually, and introduces multipathing software.

This chapter contains the following sections:

- [“ALOM System Controller” on page 34](#)
 - [“ALOM System Controller” on page 34](#)
 - [“Logging In To the ALOM System Controller” on page 34](#)
 - [“About the `scadm` Utility” on page 35](#)
 - [“To View Environmental Information” on page 36](#)
 - [“Controlling the Locator LED” on page 37](#)
- [“OpenBoot Emergency Procedures” on page 39](#)
- [“Automatic System Recovery” on page 41](#)
 - [“Enabling and Disabling Automatic System Recovery” on page 44](#)
 - [“To Disable Automatic System Recovery” on page 45](#)
 - [“Obtaining Automatic System Recovery Information” on page 46](#)
- [“Unconfiguring and Reconfiguring Devices” on page 46](#)
 - [“To Unconfigure a Device Manually” on page 46](#)
 - [“To Reconfigure a Device Manually” on page 48](#)
- [“Enabling the Hardware Watchdog Mechanism and Its Options” on page 49](#)
- [“Multipathing Software” on page 50](#)

Note – This chapter does not cover detailed troubleshooting and diagnostic procedures. For information about fault isolation and diagnostic procedures, refer to the *Netra 440 Server Diagnostics and Troubleshooting Guide* (817-3886-xx).

ALOM System Controller

The ALOM system controller supports a total of five concurrent sessions per server: four connections available through the network management port and one connection through the serial management port.

Note – Some of the ALOM system controller commands are also available through the Solaris `scadm` utility. For more information, refer to the *Advanced Lights Out Manager User's Guide* (817-5481-xx).

After you log in to your ALOM account, the ALOM system controller command prompt (`sc>`) appears, and you can enter ALOM system controller commands. If the command you want to use has multiple options, you can either enter the options individually or grouped together, as shown in the following example. The commands are identical.

```
sc> poweroff -f -y
sc> poweroff -fy
```

Logging In To the ALOM System Controller

All environmental monitoring and control is handled by the ALOM system controller. The ALOM system controller command prompt (`sc>`) provides you with a way of interacting with the system controller. For more information about the `sc>` prompt, see [“About the `sc>` Prompt” on page 8](#).

For instructions on connecting to the ALOM system controller, see:

- [“Accessing the System Controller” on page 16](#)
- [“Activating the Network Management Port” on page 17](#)

Note – This procedure assumes that the system console is directed to use the serial management and network management ports (the default configuration).

▼ To Log In To the ALOM System Controller

1. **If you are logged in to the system console, type #. to get to the `sc>` prompt.**
Press the pound sign key, followed by the period key. Then press the Return key.
2. **At the ALOM login prompt, enter the login name and press Return.**
The default login name is `admin`.

```
Sun(tm) Advanced Lights Out Manager 1.3
Please login: admin
```

3. **At the password prompt, enter the password and press Return twice to get to the `sc>` prompt.**

```
Please Enter password:
sc>
```

Note – There is no default password. You must assign a password during initial system configuration. For more information, refer to your *Netra 440 Server Installation Guide* (817-3882-xx) and *Advanced Lights Out Manager User's Guide* (817-5481-xx).



Caution – In order to provide optimum system security, best practice is to change the default system login name and password during initial setup.

Using the ALOM system controller, you can monitor the system, turn the Locator LED on and off, or perform maintenance tasks on the ALOM system controller card itself. For more information, refer to the *Advanced Lights Out Manager User's Guide* (817-5481-xx).

About the `scaadm` Utility

The System Controller Administration (`scaadm`) utility, which is part of the Solaris OS, enables you to perform many ALOM tasks while logged in to the host server. The `scaadm` commands control several functions. Some functions allow you to view or set ALOM environment variables.

Note – Do not use the `scadm` utility while SunVTS™ diagnostics are running. See your SunVTS documentation for more information.

You must be logged in to the system as root to use the `scadm` utility. The `scadm` utility uses the following syntax:

```
# scadm command
```

The `scadm` utility sends its output to `stdout`. You can also use `scadm` in scripts to manage and configure ALOM from the host system.

For more information about the `scadm` utility, refer to the following:

- `scadm` man page
- *Advanced Lights Out Manager User's Guide (817-5481-xx)*

▼ To View Environmental Information

1. Log in to the ALOM system controller.
2. Use the `showenvironment` command to display a snapshot of the server's environmental status.

```
sc> showenvironment

===== Environmental Status =====

-----
System Temperatures (Temperatures in Celsius):
-----
Sensor           Status      Temp LowHard LowSoft LowWarn HighWarn HighSoft HighHard
-----
C0.P0.T_CORE     OK          48   -20   -10     0     97     102     120
C1.P0.T_CORE     OK          53   -20   -10     0     97     102     120
C2.P0.T_CORE     OK          49   -20   -10     0     97     102     120
C3.P0.T_CORE     OK          57   -20   -10     0     97     102     120
C0.T_AMB         OK          28   -20   -10     0     70      82      87
C1.T_AMB         OK          33   -20   -10     0     70      82      87
C2.T_AMB         OK          27   -20   -10     0     70      82      87
C3.T_AMB         OK          28   -20   -10     0     70      82      87
MB.T_AMB         OK          32   -18   -10     0     65      75      85
...

```

The information this command can display includes temperature, power supply status, front panel LED status, system control keyswitch position, and so on. The display uses a format similar to that of the UNIX command `prtdiag(1m)`.

Note – Some environmental information might not be available when the server is in standby mode.

Note – You do not need ALOM system controller user permissions to use this command.

The `showenvironment` command has one option: `-v`. If you use this option, ALOM returns more detailed information about the host server's status, including warning and shutdown thresholds.

Controlling the Locator LED

You can control the Locator LED either from the Solaris command prompt or from the `sc>` prompt.

- **To turn on the Locator LED, do one of the following:**
 - In the Solaris OS, log as superuser and type the following command:

```
# /usr/sbin/setlocator -n
Locator LED is on.
```

- From the ALOM system controller command prompt, type:

```
sc> setlocator on
Locator LED is on.
```

- **To turn off the Locator LED, do one of the following:**

- In the Solaris OS, log in as superuser and type the following command:

```
# /usr/sbin/setlocator -f
Locator LED is off.
```

- From the ALOM system controller command prompt, type:

```
sc> setlocator off
Locator LED is off.
```

- **To display the state of the Locator LED, do one of the following:**

- In the Solaris OS, log in as superuser and type the following command:

```
# /usr/sbin/showlocator
Locator LED is on.
```

- From the ALOM system controller command prompt, type:

```
sc> showlocator
Locator LED is on.
```

Note – You do not need user permissions to use the `setlocator` and `showlocator` commands.

OpenBoot Emergency Procedures

The introduction of Universal Serial Bus (USB) keyboards with the newest Sun systems has made it necessary to change some of the OpenBoot emergency procedures. Specifically, the Stop-N, Stop-D, and Stop-F commands that were available on systems with non-USB keyboards are not supported on systems that use USB keyboards, such as the Netra 440 server. If you are familiar with the earlier (non-USB) keyboard functionality, this section describes the analogous OpenBoot emergency procedures available in newer systems that use USB keyboards.

OpenBoot Emergency Procedures for Systems With Non-USB Keyboards

[TABLE 2-1](#) summarizes the Stop key command functions for systems that use standard (non-USB) keyboards.

TABLE 2-1 Stop Key Command Functions for Systems With Standard (Non-USB) Keyboards

Standard (Non-USB) Keyboard Command	Description
Stop	Bypass POST. This command does not depend on security mode.
Stop-A	Abort.
Stop-D	Enter the diagnostic mode (set <code>diag-switch?</code> to <code>true</code>).
Stop-F	Enter Forth on <code>ttya</code> instead of probing. Use <code>fexit</code> to continue with the initialization sequence. Useful when there is a hardware problem.
Stop-N	Reset OpenBoot configuration variables to their default values.

OpenBoot Emergency Procedures for Systems With USB Keyboards

The following sections describe how to perform the functions of the Stop commands on systems that use USB keyboards, such as the Netra 440 server. These same functions are available through Sun Advanced Lights Out Manager (ALOM) system controller software.

Stop-A Functionality

Stop-A (Abort) key sequence works the same as it does on systems with standard keyboards, except that it does not work during the first few seconds after the server is reset. In addition, you can issue the ALOM system controller `break` command. For more information, see [“Reaching the ok Prompt” on page 10](#).

Stop-N Functionality

Stop-N functionality is not available. However, the Stop-N functionality can be closely emulated by completing the following steps, provided the system console is configured to be accessible using either the serial management port or the network management port.

▼ To Restore OpenBoot Configuration Defaults

1. **Log in to the ALOM system controller.**
2. **Type the following command:**

```
sc> bootmode reset_nvram
sc>
SC Alert: SC set bootmode to reset_nvram, will expire
20030218184441.
bootmode
Bootmode: reset_nvram
Expires TUE FEB 18 18:44:41 2003
```

This command resets the default OpenBoot configuration variables.

3. To reset the system, type the following command:

```
sc> reset  
Are you sure you want to reset the system [y/n]? y  
sc> console
```

4. To view console output as the system boots with default OpenBoot configuration variables, switch to `console` mode.

```
sc> console  
  
ok
```

5. Type `set-defaults` to discard any customized IDPROM values and to restore the default settings for all OpenBoot configuration variables.

Stop-F Functionality

The Stop-F functionality is not available on systems with USB keyboards.

Stop-D Functionality

The Stop-D (Diags) key sequence is not supported on systems with USB keyboards. However, the Stop-D functionality can be closely emulated by turning the system control keyswitch to the Diagnostics position. For more information, refer to the *Netra 440 Server Product Overview* (817-3881-xx).

In addition, you can emulate Stop-D functionality using the ALOM system controller `bootmode diag` command. For more information, refer to the *Advanced Lights Out Manager User's Guide* (817-5481-xx).

Automatic System Recovery

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

Automatic system recovery functionality enables the system to resume operation after experiencing certain nonfatal hardware faults or failures. When ASR is enabled, the system's firmware diagnostics automatically detect failed hardware components.

An auto-configuring capability designed into the OpenBoot firmware enables the system to unconfigure failed components and to restore system operation. As long as the system is capable of operating without the failed component, the ASR features enable the system to reboot automatically, without operator intervention.

Note – ASR is not activated until you enable it. See [“Enabling and Disabling Automatic System Recovery”](#) on page 44.

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

Auto-Boot Options

The OpenBoot firmware stores a configuration variable on the system configuration card (SCC) called `auto-boot?`, which controls whether the firmware will automatically boot the operating system after each reset. The default setting for Sun platforms is `true`.

Normally, if a system fails power-on diagnostics, `auto-boot?` is ignored and the system does not boot unless an operator boots the system manually. A manual boot is obviously not acceptable for booting a system in a degraded state. Therefore, the Netra 440 server OpenBoot firmware provides a second setting, `auto-boot-on-error?`. This setting controls whether the system will attempt a degraded boot when a subsystem failure is detected. Both the `auto-boot?` and `auto-boot-on-error?` switches must be set to `true` to enable an automatic degraded boot. To set the switches, type:

```
ok setenv auto-boot? true
ok setenv auto-boot-on-error? true
```

Note – The default setting for `auto-boot-on-error?` is `false`. Therefore, the system will not attempt a degraded boot unless you change this setting to `true`. In addition, the system will not attempt a degraded boot in response to any fatal nonrecoverable error, even if degraded booting is enabled. For examples of fatal nonrecoverable errors, see [“Error Handling Summary”](#) on page 43.

Error Handling Summary

Error handling during the power-on sequence falls into one of the following three cases:

- If no errors are detected by POST or OpenBoot Diagnostics, the system attempts to boot if `auto-boot?` is true.
- If only nonfatal errors are detected by POST or OpenBoot Diagnostics, the system attempts to boot if `auto-boot?` is true and `auto-boot-on-error?` is true. Nonfatal errors include the following:
 - Ultra-4 SCSI subsystem failure. In this case, a working alternate path to the boot disk is required. For more information, see [“Multipathing Software” on page 50](#).
 - Ethernet interface failure.
 - USB interface failure.
 - Serial interface failure.
 - PCI card failure.
 - Memory failure. Given a failed DIMM, the firmware will unconfigure the entire logical bank associated with the failed module. Another nonfailing logical bank must be present in the system for the system to attempt a degraded boot. For more information, refer to the *Netra 440 Server Product Overview* (817-3881-xx).

Note – If POST or OpenBoot Diagnostics detects a nonfatal error associated with the normal boot device, the OpenBoot firmware automatically unconfigures the failed device and tries the next-in-line boot device, as specified by the `diag-device` configuration variable.

- If a fatal error is detected by POST or OpenBoot Diagnostics, the system does not boot regardless of the settings of `auto-boot?` or `auto-boot-on-error?`. Fatal nonrecoverable errors include the following:
 - Any CPU failed
 - All logical memory banks failed
 - Flash RAM cyclical redundancy check (CRC) failure
 - Critical field-replaceable unit (FRU) PROM configuration data failure
 - Critical system configuration card (SCC) read failure
 - Critical application-specific integrated circuit (ASIC) failure

For more information about troubleshooting fatal errors, refer to the *Netra 440 Server Diagnostics and Troubleshooting Guide* (817-3886-xx).

Reset Scenarios

Three OpenBoot configuration variables, `diag-switch?`, `obdiag-trigger`, and `post-trigger`, control whether the system runs firmware diagnostics in response to system reset events.

The standard system reset protocol bypasses POST and OpenBoot Diagnostics completely unless the variable `diag-switch?` is set to `true`, or the system control keyswitch is in the Diagnostics position. The default setting for this variable is `false`. Therefore, to enable ASR, which relies on firmware diagnostics to detect faulty devices, you must change this setting to `true`. For instructions, see [“Enabling and Disabling Automatic System Recovery” on page 44](#).

To control which reset events, if any, automatically initiate firmware diagnostics, the OpenBoot firmware provides variables called `obdiag-trigger` and `post-trigger`. For detailed explanations of these variables and their uses, refer to the *Netra 440 Server Diagnostics and Troubleshooting Guide* (817-3886-xx).

Automatic System Recovery User Commands

The OpenBoot commands `.asr`, `asr-disable`, and `asr-enable` are available for obtaining ASR status information and for manually unconfiguring or reconfiguring system devices. For more information, see:

- [“Unconfiguring and Reconfiguring Devices” on page 46](#)
- [“To Reconfigure a Device Manually” on page 48](#)
- [“Obtaining Automatic System Recovery Information” on page 46](#)

Enabling and Disabling Automatic System Recovery

The automatic system recovery (ASR) feature is not activated until you enable it at the system `ok` prompt.

▼ To Enable Automatic System Recovery

1. At the `ok` prompt, type:

```
ok setenv diag-switch? true
ok setenv auto-boot? true
ok setenv auto-boot-on-error? true
```

2. Set the `obdiag-trigger` variable to any combination of `power-on-reset`, `error-reset`, and `user-reset`. For example, type:

```
ok setenv obdiag-trigger power-on-reset error-reset
```

Note – For more information about OpenBoot configuration variables, refer to the *Netra 440 Server Diagnostics and Troubleshooting Guide (817-3886-xx)*.

3. To cause the parameter changes to take effect, type:

```
ok reset-all
```

The system permanently stores the parameter changes and boots automatically when the OpenBoot configuration variable `auto-boot?` is set to `true` (its default value).

Note – To store parameter changes, you can also power cycle the system using the front panel Power button.

▼ To Disable Automatic System Recovery

1. At the `ok` prompt, type:

```
ok setenv auto-boot-on-error? false
```

2. To cause the parameter change to take effect, type:

```
ok reset-all
```

The system permanently stores the parameter change.

Note – To store parameter changes, you can also power cycle the system using the front panel Power button.

After you disable the automatic system recovery (ASR) feature, it is not activated again until you enable it at the system `ok` prompt.

Obtaining Automatic System Recovery Information

Use the following procedure to retrieve information about the status of the automatic system recovery (ASR) feature.

- **At the `ok` prompt, type:**

```
ok .asr
```

In the `.asr` command output, any devices marked `disabled` have been manually unconfigured using the `asr-disable` command. The `.asr` command also lists devices that have failed firmware diagnostics and have been automatically unconfigured by the OpenBoot ASR feature.

For more information, see:

- [“Automatic System Recovery” on page 41](#)
- [“Enabling and Disabling Automatic System Recovery” on page 44](#)
- [“To Disable Automatic System Recovery” on page 45](#)
- [“Unconfiguring and Reconfiguring Devices” on page 46](#)
- [“To Reconfigure a Device Manually” on page 48](#)

Unconfiguring and Reconfiguring Devices

To support a degraded boot capability, the OpenBoot firmware provides the `asr-disable` command, which enables you to unconfigure system devices manually. This command “marks” a specified device as *disabled*, by creating an appropriate *status* property in the corresponding device tree node. By convention, the Solaris OS does not activate a driver for any device so marked.

▼ To Unconfigure a Device Manually

1. **At the `ok` prompt, type:**

```
ok asr-disable device-identifier
```

where the *device-identifier* is one of the following:

- Any full physical device path, as reported by the OpenBoot `show-devs` command
- Any valid device alias, as reported by the OpenBoot `devalias` command
- Any device identifier from [TABLE 2-2](#)

Note – The device identifiers are not case sensitive. You can type them as uppercase or lowercase characters.

TABLE 2-2 Device Identifiers and Devices

Device Identifiers	Devices
<code>cpu0-bank0, cpu0-bank1, cpu0-bank2, cpu0-bank3, ... cpu3-bank0, cpu3-bank1, cpu3-bank2, cpu3-bank3</code>	Memory banks 0–3 for each CPU
<code>cpu0-bank*, cpu1-bank*, ... cpu3-bank*</code>	All memory banks for each CPU
<code>ob-ide</code>	On-board IDE controller
<code>ob-net0, ob-net1</code>	On-board Ethernet controllers
<code>ob-scsi</code>	On-board Ultra-4 SCSI controller
<code>pci-slot0, pci-slot1, ... pci-slot5</code>	PCI slots 0–5
<code>pci-slot*</code>	All PCI slots
<code>pci*</code>	All on-board PCI devices (on-board Ethernet, Ultra-4 SCSI) and all PCI slots
<code>hba8, hba9</code>	PCI bridge chips 0 and 1, respectively
<code>ob-usb0, ob-usb1</code>	USB devices
<code>*</code>	All devices

- To determine full physical device paths, type:

```
ok show-devs
```

The `show-devs` command lists the system devices and displays the full path name of each device.

- To display a list of current device aliases, type:

```
ok devalias
```

- To create your own device alias for a physical device, type:

```
ok devalias alias-name physical-device-path
```

where *alias-name* is the alias that you want to assign, and *physical-device-path* is the full physical device path for the device.

Note – If you manually disable a device using `asr-disable`, and then assign a different alias to the device, the device remains disabled even though the device alias has changed.

2. To cause the parameter change to take effect, type:

```
ok reset-all
```

The system permanently stores the parameter change.

Note – To store parameter changes, you can also power cycle the system using the front panel Power button.

▼ To Reconfigure a Device Manually

1. At the `ok` prompt, type:

```
ok asr-enable device-identifier
```

where the *device-identifier* is one of the following:

- Any full physical device path, as reported by the OpenBoot `show-devs` command
- Any valid device alias, as reported by the OpenBoot `devalias` command
- Any device identifier from [TABLE 2-2](#)

Note – The device identifiers are not case sensitive. You can type them as uppercase or lowercase characters.

You can use the OpenBoot `asr-enable` command to reconfigure any device that you previously unconfigured with the `asr-disable` command.

Enabling the Hardware Watchdog Mechanism and Its Options

For background information about the hardware watchdog mechanism and related externally initiated reset (XIR) functionality, refer to the *Netra 440 Server Product Overview* (817-3881-xx).

▼ To Enable the Hardware Watchdog Mechanism

1. Edit the `/etc/system` file to include the following entry:

```
set watchdog_enable = 1
```

2. Bring the system to the `ok` prompt by typing the following:

```
# init 0
```

3. Reboot the system so that the changes can take effect.

To have the hardware watchdog mechanism automatically reboot the system in case of system hangs:

- At the `ok` prompt, type the following:

```
ok setenv error-reset-recovery boot
```

To generate automated crash dumps in case of system hangs:

- At the `ok` prompt, type the following:

```
ok setenv error-reset-recovery none
```

The `sync` option leaves you at the `ok` prompt in order to debug the system. For more information about OpenBoot configuration variables, see [Appendix A](#).

Multipathing Software

Multipathing software lets you define and control redundant physical paths to I/O devices, such as storage devices and network interfaces. If the active path to a device becomes unavailable, the software can automatically switch to an alternate path to maintain availability. This capability is known as *automatic failover*. To take advantage of multipathing capabilities, you must configure the server with redundant hardware, such as redundant network interfaces or two host bus adapters connected to the same dual-ported storage array.

For the Netra 440 server, three different types of multipathing software are available:

- Solaris IP Network Multipathing software provides multipathing and load-balancing capabilities for IP network interfaces.
- VERITAS Volume Manager (VVM) software includes a feature called Dynamic Multipathing (DMP), which provides disk multipathing as well as disk load balancing to optimize I/O throughput.
- Sun StorEdge™ Traffic Manager is an architecture fully integrated within the Solaris OS (beginning with the Solaris 8 release) that enables I/O devices to be accessed through multiple host controller interfaces from a single instance of the I/O device.

For More Information

For information about setting up redundant hardware interfaces for networks, refer to the *Netra 440 Server Installation Guide* (817-3882-xx).

For instructions on how to configure and administer Solaris IP Network Multipathing, consult the *IP Network Multipathing Administration Guide* provided with your specific Solaris release.

For information about VVM and its DMP feature, see [“Volume Management Software” on page 52](#) and refer to the documentation provided with the VERITAS Volume Manager software.

For information about Sun StorEdge Traffic Manager, refer to the *Netra 440 Server Product Overview* (817-3881-xx) and refer to your Solaris OS documentation.

Managing Disk Volumes

This chapter describes redundant array of independent disks (RAID) concepts, how to manage disk volumes, and how to configure hardware mirroring using the on-board Ultra-4 SCSI controller.

This chapter contains the following sections:

- [“Disk Volumes” on page 51](#)
- [“Volume Management Software” on page 52](#)
- [“RAID Technology” on page 54](#)
- [“Hardware Disk Mirroring” on page 56](#)
- [“Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names” on page 57](#)
- [“To Create a Hardware Disk Mirror” on page 57](#)
- [“To Delete a Hardware Disk Mirror” on page 59](#)
- [“To Perform a Mirrored Disk Hot-Plug Operation” on page 61](#)
- [“To Perform a Non-Mirrored Disk Hot-Swap Operation” on page 62](#)

Disk Volumes

Disk volumes are logical disk devices comprising one or more physical disks or partitions from several different disks.

Once you create a volume, the operating system uses and maintains the volume as if it were a single disk. By providing this logical volume management layer, the software overcomes the restrictions imposed by physical disk devices.

Sun’s volume management products also provide RAID data redundancy and performance features. RAID is a technology that helps protect against disk and hardware failures. Through RAID technology, volume management software is able to provide high data availability, excellent I/O performance, and simplified administration.

Volume Management Software

Volume management software lets you create disk volumes. Sun Microsystems offers two different volume management applications for use on the Netra 440 server:

- VERITAS Volume Manager (VVM) software
- Solaris™ Volume Manager software

Sun's volume management applications offer the following features:

- Support for several types of RAID configurations, which provide varying degrees of availability, capacity, and performance
- Hot-spare facilities, which provide for automatic data recovery when disks fail
- Performance analysis tools, which enable you to monitor I/O performance and isolate bottlenecks
- A graphical user interface (GUI), which simplifies storage management
- Support for online resizing, which enables volumes and their file systems to grow and shrink online
- Online reconfiguration facilities, which let you change to a different RAID configuration or modify characteristics of an existing configuration

VERITAS Dynamic Multipathing

VERITAS Volume Manager software actively supports multiported disk arrays. It automatically recognizes multiple I/O paths to a particular disk device within an array. Called Dynamic Multipathing (DMP), this capability provides increased reliability by providing a path failover mechanism. If one connection to a disk is lost, VVM continues to access the data over the remaining connections. This multipathing capability also provides greater I/O throughput by automatically balancing the I/O load uniformly across multiple I/O paths to each disk device.

Sun StorEdge Traffic Manager

A newer alternative to DMP that is also supported by the Netra 440 server is Sun StorEdge Traffic Manager software. Sun StorEdge Traffic Manager is a server-based dynamic path failover software solution, used to improve the overall availability of business applications. Sun StorEdge Traffic Manager (previously known as multiplexed input/output, or MPxIO) is included in the Solaris OS.

The Sun StorEdge Traffic Manager software integrates multiple path I/O capabilities, automatic load balancing, and path failover functions into one package for Sun servers connected to supported Sun StorEdge systems. Sun StorEdge Traffic Manager can provide you with increased system performance and availability for building mission-critical storage area networks (SANs).

The Sun StorEdge Traffic Manager architecture provides the following capabilities:

- Helps protect against I/O outages due to I/O controller failures. Should one I/O controller fail, Sun StorEdge Traffic Manager automatically switches to an alternate controller.
- Increases I/O performance by load balancing across multiple I/O channels.

Sun StorEdge T3, Sun StorEdge 3510, and Sun StorEdge A5x00 storage arrays are all supported by Sun StorEdge Traffic Manager on a Netra 440 server. Supported I/O controllers are single and dual fibre-channel network adapters, including the following:

- PCI Single Fibre-Channel Host Adapter (Sun part number x6799A)
- PCI Dual Fibre-Channel Network Adapter (Sun part number x6727A)
- 2GByte PCI Single Fibre-Channel Host Adapter (Sun part number x6767A)
- 2GByte PCI Dual Fibre-Channel Network Adapter (Sun part number x6768A)

Note – Sun StorEdge Traffic Manager is not supported for boot disks containing the `root (/)` file system. You can use hardware mirroring or VVM instead. See [“To Create a Hardware Disk Mirror” on page 57](#) and [“Volume Management Software” on page 52](#).

For More Information

Refer to the documentation supplied with the VERITAS Volume Manager and Solaris Volume Manager software. For more information about Sun StorEdge Traffic Manager, refer to your Solaris system administration documentation.

RAID Technology

VERITAS Volume Manager and Solstice DiskSuite™ software support RAID technology to optimize performance, availability, and cost per user. RAID technology reduces recovery time in the event of file system errors, and increases data availability even in the event of a disk failure. There are several levels of RAID configurations that provide varying degrees of data availability with corresponding trade-offs in performance and cost.

This section describes some of the most popular and useful of those configurations, including:

- Disk concatenation
- Disk striping (RAID 0)
- Disk mirroring (RAID 1)
- Disk striping with parity (RAID 5)
- Hot-spares

Disk Concatenation

Disk concatenation is a method for increasing logical volume size beyond the capacity of one hard drive by creating one large volume from two or more smaller drives. This lets you create arbitrarily large partitions.

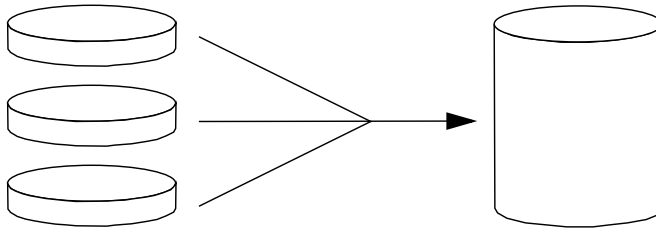


FIGURE 3-1 Graphical Representation of Disk Concatenation

Using this method, the concatenated disks are filled with data sequentially, with the second disk being written to when no space remains on the first, the third when no space remains on the second, and so on.

RAID 0: Disk Striping

Disk striping (RAID 0) is a technique for increasing system throughput by using several hard drives in parallel. Whereas in non-striped disks the operating system writes a single block to a single disk, in a striped arrangement, each block is divided and portions of the data are written to different disks simultaneously.

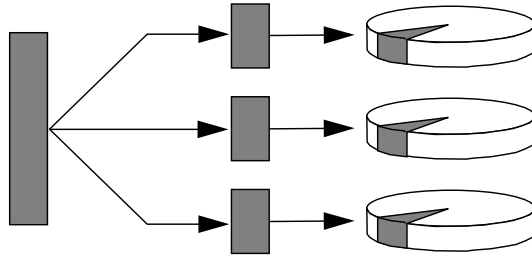


FIGURE 3-2 Graphical Representation of Disk Striping

System performance using RAID 0 will be better than using RAID 1 or 5, but the possibility of data loss is greater because there is no way to retrieve or reconstruct data stored on a failed hard drive.

RAID 1: Disk Mirroring

Disk mirroring (RAID 1) is a technique that uses data redundancy—two complete copies of all data stored on two separate disks—to protect against loss of data due to disk failure. One logical volume is duplicated on two separate disks.

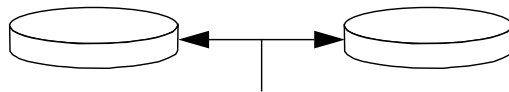


FIGURE 3-3 Graphical Representation of Disk Mirroring

Whenever the operating system needs to write to a mirrored volume, both disks are updated. The disks are maintained at all times with exactly the same information. When the operating system needs to read from the mirrored volume, it reads from whichever disk is more readily accessible at the moment, which can result in enhanced performance for read operations.

On the Netra 440 server, you can configure hardware disk mirroring using the on-board Ultra-4 SCSI controller. This provides higher performance than with conventional software mirroring using volume management software. For more information, see:

- [“To Create a Hardware Disk Mirror” on page 57](#)
- [“To Delete a Hardware Disk Mirror” on page 59](#)
- [“To Perform a Mirrored Disk Hot-Plug Operation” on page 61](#)

RAID 1 offers the highest level of data protection, but storage costs are high, and write performance compared to RAID 0 or RAID 5 is reduced since all data must be stored twice.

RAID 5: Disk Striping With Parity

RAID 5 is an implementation of disk striping in which parity information is included with each disk write. The advantage of this technique is that if any one disk in a RAID 5 array fails, all the information about the failed drive can be reconstructed from the data and parity on the remaining disks.

System performance using RAID 5 will fall between that of RAID 0 and RAID 1; however, RAID 5 provides limited data redundancy. If more than one disk fails, all data is lost.

Hot-Spares

In a *hot-spares* arrangement, one or more hard drives are installed in the system but are unused during normal operation. This configuration is also referred to as *hot relocation*. Should one of the active drives fail, the data on the failed disk is automatically reconstructed and generated on a hot-spare disk, enabling the entire data set to maintain its availability.

Hardware Disk Mirroring

On the Netra 440 server, the Ultra-4 SCSI controller supports internal hardware disk mirroring using the Solaris OS `raidctl` utility.

A hardware disk mirror created under the `raidctl` utility behaves slightly differently than one created using volume management software. Under a software mirror, each device has its own entry in the virtual device tree, and read/write operations are performed to both virtual devices. Under hardware disk mirroring,

only one device (the *master*) appears in the device tree. The mirrored device (the *slave*) is invisible to the operating system, and is accessed only by the Ultra-4 SCSI controller.



Caution – Creating or restoring a disk mirror destroys all data previously stored on the hard drive.

Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names

To perform a disk hot-swap procedure, you must know the physical or logical device name for the drive that you want to install or remove. If your system encounters a disk error, often you can find messages about failing or failed disks in the system console. This information is also logged in the `/var/adm/messages` files.

These error messages typically refer to a failed hard drive by its physical device name (such as `/devices/pci@1f,700000/scsi@2/sd@1,0`) or by its logical device name (such as `c1t1d0`). In addition, some applications might report a disk slot number (0 through 3).

You can use [TABLE 3-1](#) to associate internal disk slot numbers with the logical and physical device names for each hard drive.

TABLE 3-1 Disk Slot Numbers, Logical Device Names, and Physical Device Names

Disk Slot Number	Logical Device Name*	Physical Device Name
Slot 0	<code>c1t0d0</code>	<code>/devices/pci@1f,700000/scsi@2/sd@0,0</code>
Slot 1	<code>c1t1d0</code>	<code>/devices/pci@1f,700000/scsi@2/sd@1,0</code>
Slot 2	<code>c1t2d0</code>	<code>/devices/pci@1f,700000/scsi@2/sd@2,0</code>
Slot 3	<code>c1t3d0</code>	<code>/devices/pci@1f,700000/scsi@2/sd@3,0</code>

* The logical device names might appear differently on your system, depending on the number and type of add-on disk controllers installed.

▼ To Create a Hardware Disk Mirror

1. Verify which hard drive corresponds with which logical device name and physical device name.

See [“Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names”](#) on page 57.

To verify that a hardware disk mirror does not exist already, type:

```
# raidctl  
No RAID volumes found.
```

The example above indicates that no RAID volume exists. In another case:

```
# raidctl  
RAID      RAID   RAID     Disk  
Volume    Status Disk      Status  
-----  
c1t1d0    DEGRADEDc1t1d0   OK  
                c1t2d0   DEGRADED
```

The example above indicates a hardware mirror has degraded at disk c1t2d0.

Note – The logical device names might appear differently on your system, depending on the number and type of add-on disk controllers installed.

2. Type the following command:

```
# raidctl -c master slave
```

For example:

```
# raidctl -c c1t0d0 c1t1d0
```

When you create a RAID mirror, the slave drive (in this case, c1t1d0) disappears from the Solaris device tree.

3. To check the status of a RAID mirror, type the following command:

```
# raidctl
RAID      RAID      RAID      Disk
Volume    Status    Disk      Status
-----
c1t0d0    RESYNCING c1t0d0    OK
                   c1t1d0    OK
```

The example above indicates that the RAID mirror is still resynchronizing with the backup drive.

The example below shows that the RAID mirror is completely restored and online.

```
# raidctl
RAID      RAID      RAID      Disk
Volume    Status    Disk      Status
-----
c1t0d0    OK        c1t0d0    OK
                   c1t1d0    OK
```

Under RAID 1 (disk mirroring), all data is duplicated on both drives. If a disk fails, replace it with a working drive and restore the mirror. For instructions, see [“To Perform a Mirrored Disk Hot-Plug Operation” on page 61](#).

For more information about the `raidctl` utility, see the `raidctl(1M)` man page.

▼ To Delete a Hardware Disk Mirror

1. Verify which hard drive corresponds with which logical device name and physical device name.

See [“Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names” on page 57](#).

2. Determine the name of the mirrored volume. Type the following command:

```
# raidctl
  RAID      RAID      RAID      Disk
  Volume    Status    Disk      Status
-----
  c1t0d0    OK        c1t0d0    OK
           c1t1d0    OK
```

In this example, the mirrored volume is c1t0d0.

Note – The logical device names might appear differently on your system, depending on the number and type of add-on disk controllers installed.

3. To delete the volume, type the following command:

```
# raidctl -d mirrored-volume
```

For example:

```
# raidctl -d c1t0d0
RAID Volume 'c1t0d0' deleted
```

4. To confirm that you have deleted the RAID array, type the following command:

```
# raidctl
```

For example:

```
# raidctl
No RAID volumes found
```

For more information, see the `raidctl(1M)` man page.

▼ To Perform a Mirrored Disk Hot-Plug Operation

1. Verify which hard drive corresponds with which logical device name and physical device name.

See “Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names” on page 57.



Caution – Ensure that the hard drive OK-to-Remove LED is lit, indicating that the hard drive is offline. If the hard drive is still online, you risk removing the disk during a read/write operation, which could result in data loss.

2. To confirm a failed disk, type the following command:

```
# raidctl
```

For example:

```
# raidctl
RAID      RAID      RAID      Disk
Volume    Status    Disk      Status
-----
c1t1d0    DEGRADED  c1t1d0    OK
                   c1t2d0    DEGRADED
```

This example indicates that the disk mirror has degraded due to a failure in disk c1t2d0.

Note – The logical device names might appear differently on your system, depending on the number and type of add-on disk controllers installed.

3. Remove the hard drive, as described in the *Netra 440 Server Service Manual*.

There is no need to issue a software command to bring the drive offline when the drive has failed and the OK-to-Remove LED is lit.

4. Install a new hard drive, as described in the *Netra 440 Server Service Manual*.

The RAID utility automatically restores the data to the disk.

5. To check the status of a RAID rebuild, type the following command:

```
# raidctl
```

For example:

```
# raidctl
RAID      RAID      RAID      Disk
Volume    Status    Disk      Status
-----
c1t1d0    RESYNCING c1t1d0    OK
           c1t2d0    OK
```

This example indicates that RAID volume `c1t1d0` is resynchronizing.

If you issue the command again some minutes later, it indicates that the RAID mirror is finished resynchronizing and is back online:

```
# raidctl
RAID      RAID      RAID      Disk
Volume    Status    Disk      Status
-----
c1t1d0    OK        c1t1d0    OK
           c1t2d0    OK
```

For more information, see the `raidctl(1M)` man page.

▼ To Perform a Non-Mirrored Disk Hot-Swap Operation

1. Verify which hard drive corresponds with which logical device name and physical device name.

See [“Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names”](#) on page 57.

Ensure that no applications or processes are accessing the hard drive.

2. View the status of the SCSI devices.

To view the status of the SCSI devices, type the following command:

```
# cfgadm -al
```

For example:

```
# cfgadm -al
Ap_Id          Type          Receptacle    Occupant      Condition
c0             scsi-bus     connected     configured    unknown
c0::dsk/c0t0d0 CD-ROM       connected     configured    unknown
c1             scsi-bus     connected     configured    unknown
c1::dsk/c1t0d0 disk         connected     configured    unknown
c1::dsk/c1t1d0 disk         connected     configured    unknown
c1::dsk/c1t2d0 disk         connected     configured    unknown
c1::dsk/c1t3d0 disk         connected     configured    unknown
c2             scsi-bus     connected     configured    unknown
c2::dsk/c2t2d0 disk         connected     configured    unknown
usb0/1         unknown      empty         unconfigured  ok
usb0/2         unknown      empty         unconfigured  ok
usb1/1         unknown      empty         unconfigured  ok
usb1/2         unknown      empty         unconfigured  ok
#
```

Note – The logical device names might appear differently on your system, depending on the number and type of add-on disk controllers installed.

The `-al` options return the status of all SCSI devices, including buses and USB devices. (In this example, no USB devices are connected to the system.)

Note that while you can use the Solaris OS `cfgadm install_device` and `cfgadm remove_device` commands to perform a hard drive hot-swap procedure, these commands issue the following warning message when you invoke these commands on a bus containing the system disk:

```
# cfgadm -x remove_device c0::dsk/c1t1d0
Removing SCSI device: /devices/pci@1f,4000/scsi@3/sd@1,0
This operation will suspend activity on SCSI bus: c0
Continue (yes/no)? y
dev = /devices/pci@1f,4000/scsi@3/sd@1,0
cfgadm: Hardware specific failure: failed to suspend:
      Resource                Information
-----
/dev/dsk/c1t0d0s0  mounted filesystem "/"
/dev/dsk/c1t0d0s6  mounted filesystem "/usr"
```

This warning is issued because these commands attempt to quiesce the Ultra-4 SCSI bus, but the Netra 440 server firmware prevents it. This warning message can be safely ignored in the Netra 440 server, but the following procedure avoids this warning message altogether.

3. Remove the hard drive from the device tree.

To remove the hard drive from the device tree, type the following command:

```
# cfgadm -c unconfigure Ap-Id
```

For example:

```
# cfgadm -c unconfigure c1::dsk/c1t3d0
```

This example removes `c1t3d0` from the device tree. The blue OK-to-Remove LED lights.

4. Verify that the device has been removed from the device tree.

To verify that the device has been removed from the device tree, type the following command:

```
# cfgadm -al
Ap_Id          Type          Receptacle  Occupant    Condition
c0             scsi-bus     connected   configured  unknown
c0::dsk/c0t0d0 CD-ROM       connected   configured  unknown
c1             scsi-bus     connected   configured  unknown
c1::dsk/c1t0d0 disk         connected   configured  unknown
c1::dsk/c1t1d0 disk         connected   configured  unknown
c1::dsk/c1t2d0 disk         connected   configured  unknown
c1::dsk/c1t3d0 unavailable  connected   unconfigured unknown
c2             scsi-bus     connected   configured  unknown
c2::dsk/c2t2d0 disk         connected   configured  unknown
usb0/1         unknown      empty       unconfigured ok
usb0/2         unknown      empty       unconfigured ok
usb1/1         unknown      empty       unconfigured ok
usb1/2         unknown      empty       unconfigured ok
#
```

Note that `c1t3d0` is now unavailable and unconfigured. The corresponding hard drive OK-to-Remove LED is lit.

5. Remove the hard drive, as described in the *Netra 440 Server Service Manual*.

The blue OK-to-Remove LED goes out when you remove the hard drive.

6. Install a new hard drive, as described in the *Netra 440 Server Service Manual*.

7. Configure the new hard drive.

To configure the new hard drive, type the following command:

```
# cfgadm -c configure Ap-Id
```

For example:

```
# cfgadm -c configure c1::dsk/c1t3d0
```

The green Activity LED flashes as the new disk at `c1t3d0` is added to the device tree.

8. Verify that the new hard drive is in the device tree.

To verify that the new hard drive is in the device tree, type the following command:

```
# cfgadm -al
Ap_Id          Type          Receptacle    Occupant      Condition
c0             scsi-bus     connected     configured    unknown
c0::dsk/c0t0d0 CD-ROM       connected     configured    unknown
c1             scsi-bus     connected     configured    unknown
c1::dsk/c1t0d0 disk         connected     configured    unknown
c1::dsk/c1t1d0 disk         connected     configured    unknown
c1::dsk/c1t2d0 disk         connected     configured    unknown
c1::dsk/c1t3d0 disk         connected     configured    unknown
c2             scsi-bus     connected     configured    unknown
c2::dsk/c2t2d0 disk         connected     configured    unknown
usb0/1         unknown      empty         unconfigured  ok
usb0/2         unknown      empty         unconfigured  ok
usb1/1         unknown      empty         unconfigured  ok
usb1/2         unknown      empty         unconfigured  ok
#
```

Note that c1t3d0 is now listed as configured.

OpenBoot Configuration Variables

TABLE A-1 describes the OpenBoot firmware configuration variables stored on the system configuration card (SCC). The OpenBoot configuration variables are printed here in the order in which they appear when you issue the `showenv` command.

TABLE A-1 OpenBoot Configuration Variables Stored on the System Configuration Card

Variable	Possible Values	Default Value	Description
<code>test-args</code>	<i>variable_name</i>	none	Default test arguments passed to OpenBoot Diagnostics. For more information and a list of possible test argument values, refer to the <i>Netra 440 Server Diagnostics and Troubleshooting Guide</i> .
<code>diag-passes</code>	0-n	1	Defines the number of times self-test methods are performed.
<code>local-mac-address?</code>	true, false	false	If true, network drivers use their own MAC address, not the server MAC address.
<code>fcode-debug?</code>	true, false	false	If true, include name fields for plug-in device FCodes.
<code>silent-mode?</code>	true, false	false	Suppress all messages if true and <code>diag-switch?</code> is false.
<code>scsi-initiator-id</code>	0-15	7	SCSI ID of the Ultra-4 SCSI controller.
<code>oem-logo?</code>	true, false	false	If true, use custom OEM logo; otherwise, use Sun logo.
<code>oem-banner?</code>	true, false	false	If true, use custom OEM banner.
<code>ansi-terminal?</code>	true, false	true	If true, enable ANSI terminal emulation.
<code>screen-#columns</code>	0-n	80	Sets number of columns on screen.
<code>screen-#rows</code>	0-n	34	Sets number of rows on screen.

TABLE A-1 OpenBoot Configuration Variables Stored on the System Configuration Card (Continued)

Variable	Possible Values	Default Value	Description
ttyb-rts-dtr-off	true, false	false	If true, operating system does not assert rts (request-to-send) and dtr (data-transfer-ready) on ttyb.
ttyb-ignore-cd	true, false	true	If true, operating system ignores carrier-detect on ttyb.
ttya-rts-dtr-off	true, false	false	If true, operating system does not assert rts (request-to-send) and dtr (data-transfer-ready) on serial management port.
ttya-ignore-cd	true, false	true	If true, operating system ignores carrier-detect on serial management port.
ttyb-mode	<i>baud_rate, bits, parity, stop, handshake</i>	9600,8,n,1,-	ttyb (baud rate, number of bits, parity, number of stops, handshake).
ttya-mode	9600,8,n,1,-	9600,8,n,1,-	Serial management port (baud rate, bits, parity, stop, handshake). The serial management port only works at the default values.
output-device	ttya, ttyb, screen	ttya	Power-on output device.
input-device	ttya, ttyb, keyboard	ttya	Power-on input device.
auto-boot-on-error?	true, false	false	If true, boot automatically after system error.
load-base	0-n	16384	Address.
auto-boot?	true, false	true	If true, boot automatically after power on or reset.
boot-command	<i>variable name</i>	boot	Action following a boot command.
diag-file	<i>variable name</i>	none	File from which to boot if diag-switch? is true.
diag-device	<i>variable name</i>	net	Device from which to boot if diag-switch? is true.
boot-file	<i>variable name</i>	none	File from which to boot if diag-switch? is false.
boot-device	<i>variable name</i>	disk net	Device(s) from which to boot if diag-switch? is false.
use-nvramrc?	true, false	false	If true, execute commands in NVRAMRC during server startup.

TABLE A-1 OpenBoot Configuration Variables Stored on the System Configuration Card (Continued)

Variable	Possible Values	Default Value	Description
nvrnrc	<i>variable_name</i>	none	Command script to execute if use-nvrnrc? is true.
security-mode	none, command, full	none	Firmware security level.
security-password	<i>variable_name</i>	none	Firmware security password if security-mode is not none (never displayed) - <i>do not set this directly.</i>
security-#badlogins	<i>variable_name</i>	none	Number of incorrect security password attempts.
post-trigger	error-reset, power-on-reset, user-reset, all-resets	power-on-reset	Sets trigger events that will cause POST to run, provided diag-switch? is true. POST does not run if diag-switch? is false, regardless of the post-trigger setting.
diag-script	all, normal, none	normal	Specifies the set of tests for OpenBoot Diagnostics to run. Selecting all is equivalent to running test-all from the OpenBoot command line.
diag-level	none, min, max	min	Defines how diagnostic tests are run.
diag-switch?	true, false	false	If true: <ul style="list-style-type: none"> • Run in diagnostic mode • After a boot request, boot diag-file from diag-device If false: <ul style="list-style-type: none"> • Run in nondiagnostic mode • After a boot request, boot boot-file from boot-device
obdiag-trigger	error-reset, power-on-reset, user-reset, all-resets	error-reset	Sets trigger events that cause OpenBoot Diagnostics to run, provided diag-switch? is true, and diag-script is not none. OpenBoot Diagnostics does not run if diag-switch? is false or if diag-script is none, regardless of the obdiag-trigger setting.
error-reset-recovery	boot, sync, none	boot	Command to execute following a system reset generated by an error.

Alarm Relay Output Application Programming Interface

This appendix provides a sample program that illustrates how to *get/set* the status of the alarms. The application can use `LOMIOCALSTATE` ioctl to obtain the status of each alarm and `LOMIOCALCTL` ioctl to set them individually. For more details on the Alarm Indicators, refer to the *Netra 440 Server Service Manual* (817-3883-xx).

CODE EXAMPLE B-1 Example Program for *get/set* Status of the Alarms

```
#include <sys/types.h>
#include <string.h>
#include <stdlib.h>
#include <sys/unistd.h>
#include <fcntl.h>
#include "lom_io.h"

#define ALARM_INVALID    -1
#define LOM_DEVICE      "/dev/lom"

static void usage();
static void get_alarm(const char *alarm);
static int set_alarm(const char *alarm, const char *alarmval);
static int parse_alarm(const char *alarm);
static int lom_ioctl(int ioc, char *buf);
static char *get_alarmval(int state);
static void get_alarmvals();

main(int argc, char *argv[])
{
    if (argc < 3) {
        usage();
        if (argc == 1)
```

CODE EXAMPLE B-1 Example Program for get/set Status of the Alarms *(Continued)*

```
#include <sys/types.h>
        get_alarmvals();
        exit(1);
    }

    if (strcmp(argv[1], "get") == 0) {
        if (argc != 3) {
            usage();
            exit (1);
        }

        get_alarm(argv[2]);
    }
    else
    if (strcmp(argv[1], "set") == 0) {
        if (argc != 4) {
            usage();
            exit (1);
        }
        set_alarm(argv[2], argv[3]);
    } else {
        usage();
        exit (1);
    }
}

static void
usage()
{
    printf("usage: alarm [get|set] [crit|major|minor|user] [on|off]\n");
}

static void
get_alarm(const char *alarm)
{
    ts_aldata_t    ald;
    int altype = parse_alarm(alarm);
    char *val;

    if (altype == ALARM_INVALID) {
        usage();
        exit (1);
    }

    ald.alarm_no = altype;
    ald.alarm_state = ALARM_OFF;

    lom_ioctl(LOMIOCALSTATE, (char *)&ald);
}
```

CODE EXAMPLE B-1 Example Program for get/set Status of the Alarms *(Continued)*

```
#include <sys/types.h>

    if ((ald.alarm_state != ALARM_OFF) &&
        (ald.alarm_state != ALARM_ON)) {
        printf("Invalid value returned: %d\n", ald.alarm_state);
        exit(1);
    }

    printf("ALARM.%s = %s\n", alarm, get_alarmval(ald.alarm_state));
}

static int
set_alarm(const char *alarm, const char *alarmstate)
{
    ts_aldata_t    ald;
    int alarmval = ALARM_OFF, altype = parse_alarm(alarm);

    if (altype == ALARM_INVALID) {
        usage();
        exit (1);
    }

    if (strcmp(alarmstate, "on") == 0)
        alarmval = ALARM_ON;
    else
    if (strcmp(alarmstate, "off") == 0)
        alarmval = ALARM_OFF;
    else {
        usage();
        exit (1);
    }

    ald.alarm_no = altype;
    ald.alarm_state = alarmval;

    if (lom_ioctl(LOMIOCALCTL, (char *)&ald) != 0) {
        printf("Setting ALARM.%s to %s failed\n", alarm, alarmstate);
        return (1);
    } else {
        printf("Setting ALARM.%s successfully set to %s\n", alarm,
alarmstate);
        return (1);
    }
}

static int
parse_alarm(const char *alarm)
```

CODE EXAMPLE B-1 Example Program for get/set Status of the Alarms *(Continued)*

```
#include <sys/types.h>
{
    int altype;

    if (strcmp(alarm, "crit") == 0)
        altype = ALARM_CRITICAL;
    else
    if (strcmp(alarm, "major") == 0)
        altype = ALARM_MAJOR;
    else
    if (strcmp(alarm, "minor") == 0)
        altype = ALARM_MINOR;
    else
    if (strcmp(alarm, "user") == 0)
        altype = ALARM_USER;
    else {
        printf("invalid alarm value: %s\n", alarm);
        altype = ALARM_INVALID;
    }

    return (altype);
}

static int
lom_ioctl(int ioc, char *buf)
{
    int fd, ret;

    fd = open(LOM_DEVICE, O_RDWR);

    if (fd == -1) {
        printf("Error opening device: %s\n", LOM_DEVICE);
        exit (1);
    }

    ret = ioctl(fd, ioc, (void *)buf);

    close (fd);

    return (ret);
}

static char *
get_alarmval(int state)
{
    if (state == ALARM_OFF)
```


CODE EXAMPLE B-1 Example Program for get/set Status of the Alarms *(Continued)*

```
#include <sys/types.h>
        return ("off");
    else
        if (state == ALARM_ON)
            return ("on");
        else
            return (NULL);
}
static void
get_alarmvals()
{
    get_alarm("crit");
    get_alarm("major");
    get_alarm("minor");
    get_alarm("user");
}
}
```


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