



Sun Fire™ V445 Server Administration Guide

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Preface

The *Sun Fire V445 Server Administration Guide* is intended for experienced system administrators. It includes general descriptive information about the Sun Fire™ V445 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 (OS).

How This Book Is Organized

The *Sun Fire V445 Server Administration Guide* is divided into the following chapters:

- **Chapter 1** presents an illustrated overview of the system and a description of the system's reliability, availability, and serviceability (RAS) features, as well as new features introduced with this server.
- **Chapter 2** describes the system console and how to access it.
- **Chapter 3** describes how to power on and power off the system, and how to initiate a reconfiguration boot.
- **Chapter 4** describes and illustrates system hardware components. It also includes configuration information for CPU/Memory modules and DIMMs.
- **Chapter 5** 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 6** describes how to manage internal disk volumes and devices.
- **Chapter 7** provides instructions for configuring network interfaces.

- [Chapter 8](#) describes how to perform system diagnostics.
- [Chapter 9](#) describes how to troubleshoot the system.

This manual also includes the following appendices:

- [Appendix A](#) details connector pinouts.
- [Appendix B](#) provides tables of various system specifications.
- [Appendix C](#) provides a list of all OpenBoot™ configuration variables, and a short description of each.

Using UNIX Commands

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

See one or more of the following for this information:

- Online documentation for the Solaris OS at docs.sun.com
- Other software documentation that you received with your system

Typographic Conventions

TABLE P-1

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

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

System Prompts

TABLE P-2

Type of Prompt	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	#
ALOM system controller	sc>
OpenBoot firmware	ok
OpenBoot Diagnostics	obdiag>

Related Documentation

The documents listed as online are available at:

<http://www.sun.com/products-n-solutions/hardware/docs/>

TABLE P-3

Application	Title	Part Number	Format	Location
Late-breaking product information	<i>Sun Fire V445 Server Product Notes</i>	819-3744	PDF	Online
Installation overview	<i>Sun Fire V445 Server Getting Started Guide</i>	819-4664	Printed	Shipping kit
			PDF	Online
Installation	<i>Sun Fire V445 Server Installation Guide</i>	819-3743	PDF	Online
Service	<i>Sun Fire V445 Server Service Manual</i>	819-3742	PDF	Online
Site planning	<i>Site Planning Guide for Sun Servers</i>	819-5730	PDF	Online
Site planning data sheet	<i>Sun Fire V445 Server Site Planning Guide</i>	819-3745	Printed	Shipping kit
			PDF	Online
Sun Advanced Lights Out Manager (ALOM) system controller	<i>Sun Advanced Lights Out Manager (ALOM) 1.6 Online Help</i>	817-1960	PDF	Online

Documentation, Support, and Training

Sun Function	URL
Documentation	http://www.sun.com/documentation/
Support	http://www.sun.com/support/
Training	http://www.sun.com/training/

Third-Party Web Sites

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Please include the title and part number of your document with your feedback:

Sun Fire V445 Server Administration Guide, part number 819-3741

System Overview

This chapter introduces you to the Sun Fire V445 server and describes its features. The following sections are included:

- “Sun Fire V445 Server Overview” on page 1
- “New Features” on page 7
- “Locating Front Panel Features” on page 9
- “Locating Back Panel Features” on page 16
- “Reliability, Availability, and Serviceability (RAS) Features” on page 22
- “Sun Cluster Software” on page 22
- “Sun Management Center Software” on page 23

Note – This document does not provide instructions for installing or removing hardware components. For instructions on preparing the system for servicing and procedures to install and remove the server components described in this document, refer to the *Sun Fire V445 Server Service Manual*.

Sun Fire V445 Server Overview

The Sun Fire V445 server is a high-performance, shared memory, symmetric multiprocessing server that supports up to four UltraSPARC® IIIi processors and uses the Fire ASIC PCIe NorthBridge along with PCI-X and PCIe expansion slots. The UltraSPARC IIIi processor has a 1 Mbyte L2 cache and implements the SPARC® V9 Instruction Set Architecture (ISA) and the Visual Instruction Set extensions (Sun VIS software) that accelerate multimedia, networking, encryption, and Java™ software processing. The Fire ASIC provides higher I/O performance and interfaces with the I/O subsystem, which contains 4 10/100/1000Mb Ethernet ports, 8 SAS disk drives, 1 DVD-RW drive, 4 USB ports, a POSIX compliant DB-9 serial port, and service processor communication ports. The PCI expansion subsystem is configurable with a variety of plug-in third party adapters.

System reliability, availability, and serviceability (RAS) are enhanced by features that include hot-pluggable disk drives and redundant, hot-swappable power supplies and fan trays. RAS features are described in [Chapter 5](#).

The system, which is mountable in a 4-post rack, measures 6.85 inches high (4 rack units - U), 17.48 inches wide, and 25 inches deep (17.5 cm x 44.5 cm x 64.4 cm). The system weighs approximately 75 lb (34.02 kg). Robust remote access is provided with Advanced Lights Out Manager (ALOM) software, which also controls powering on/off and diagnostics. The system also meets ROHS requirements.

[TABLE 1-1](#) provides a brief description of the Sun Fire V445 server features. More details on these features are provided in the following subsections.

TABLE 1-1 Sun Fire V445 Server Features at a Glance

Feature	Description
Processor	4 UltraSPARC IIIi CPUs
Memory	16 slots that can be populated with one of the following types of DDR1 DIMMs: <ul style="list-style-type: none"> • 512 MB (8 GB maximum) • 1 GB (16 GB maximum) • 2 GB (32 GB maximum)
External ports	<ul style="list-style-type: none"> • 4 Gigabit Ethernet ports – Support several modes of operations at 10, 100, and 1000 megabits per second (Mbps) • 1 10BASE-T network management port – Reserved for the ALOM system controller and the system console • 2 Serial ports – One POSIX compliant DB-9 connector, and one RJ-45 serial management connector on the ALOM system controller card • 4 USB ports – USB 2.0 compliant and support 480 Mbps, 12 Mbps, and 1.5 Mbps speeds
Internal hard drives	8 2.5 inch (5.1 cm) high, hot-pluggable Serial Attached SCSI (SAS) disk drives
Other internal peripherals	1 DVD-ROM/RW device
PCI interfaces	8 PCI slots: four 8 lane PCIe slots (2 of which also support 16 lane form factor cards) and 4 PCI-X slots
Power	4 550-watt hot-swappable power supplies, each with its own cooling fan
Cooling	6 hot-swappable high-power fan trays (one fan per tray) organized into three redundant pairs – 1 redundant pair for disk drives – 2 redundant pairs for the CPU/memory modules, memory DIMMs, I/O subsystem, and front-to-rear cooling of the system

TABLE 1-1 Sun Fire V445 Server Features at a Glance (*Continued*)

Feature	Description
Remote management	A serial port for the ALOM management controller card and a 10BASE-T network management port for remote access to system functions and the system controller
Disk Mirroring	Hardware RAID 0,1 support for internal disk drives
RAS features	Robust reliability, availability, and serviceability (RAS) features are supported. See Chapter 5 for details.
Firmware	Sun system firmware containing: <ul style="list-style-type: none">• OpenBoot PROM for system settings and power-on self-test (POST) support• ALOM for remote management administration
Operating system	The Solaris OS is preinstalled on disk 0.

Processors and Memory

Processing power is provided by up to four CPU/Memory modules. Each module incorporates one UltraSPARC IIIi processor, and slots for four double data rate (DDR) dual inline memory modules (DIMMs).

System main memory is provided by up to 16 DDR synchronous dynamic random access memory DIMMs. The system supports 512-Mbyte, 1-Gbyte, and 2-Gbyte DIMMs. Total system memory is shared by all CPUs in the system and ranges from a minimum of 1 Gbyte (one CPU/memory module with two 512-Mbyte DIMMs) to a maximum of 32 Gbytes (four modules fully populated with 2-Gbyte DIMMs). For more information about system memory, see [“DIMMs” on page 74](#).

External Ports

The Sun Fire V445 server provides four Gigabit Ethernet ports, one 10BASE-T network management port, two Serial ports, and four USB ports.

Gigabit Ethernet Ports

The four on-board Gigabit Ethernet ports located on the back panel support several modes of operations at 10, 100, and 1000 megabits per second (Mbps). Additional Ethernet interfaces or connections to other network types can be provided by installing the appropriate PCI interface cards. Multiple network interfaces can be combined with Solaris Internet Protocol (IP) network multipathing software to

provide hardware redundancy and failover capability, as well as load balancing on outbound traffic. Should one of the interfaces fail, the software can automatically switch all network traffic to an alternate interface to maintain network availability. For more information about network connections, see [“Configuring the Primary Network Interface” on page 144](#) and [“Configuring Additional Network Interfaces” on page 145](#).

10BASE-T Network Management Port

The network management port (labeled NET MGT) is located on the chassis back panel. This port is reserved for use with the ALOM system controller and the system console.

This port provides direct network access to the ALOM system controller card and its firmware. This port also provides access to the system console, power-on self-test (POST) output messages, and ALOM system controller messages. Use this port to perform remote administration, including externally initiated resets (XIR).

Serial Management and DB-9 Ports

The DB-9 port is POSIX compliant with a general-purpose DB-9 connector (labeled TTYB) on the system back panel. The serial management port is an RJ-45 connector (labeled SERIAL MGT) on the chassis back panel, and is reserved for use with the ALOM system controller and the system console.

The serial management port enables you to set up a system console device, without configuring an existing port. All power-on self-test (POST) and ALOM system controller messages are directed to the serial management port by default. For more information, see [“About the Serial Ports” on page 96](#).

USB Ports

The front and back panels both provide two Universal Serial Bus (USB) ports for connecting peripheral devices such as modems, printers, scanners, digital cameras, or a Sun Type-6 USB keyboard and mouse. The USB ports are USB 2.0 compliant, and support 480 Mbps, 12 Mbps, and 1.5 Mbps speeds. For additional details, see [“About the USB Ports” on page 95](#).

RAID 0,1 Internal Hard Drives

Internal disk storage is provided by up to eight 2.5 inch (5.1 cm) high, hot-pluggable, SAS disk drives. The basic system includes a SAS disk backplane that accommodates eight disks capable of data transfer rates of up to 320 megabytes per second. See [“About the Internal Disk Drives” on page 87](#) and [“Locating Back Panel Features” on page 16](#).

External multidisk storage subsystems and redundant array of independent disks (RAID) storage arrays can be supported by installing peripheral component interconnect (PCI) host adapter cards along with the appropriate system software. Software drivers supporting SCSI and other types of devices are included in the Solaris OS. In addition, the system supports internal hardware mirroring (RAID 0,1) using the on-board SAS controller. See [“About RAID Technology” on page 120](#).

PCI Subsystem

System I/O is handled by two expanded Peripheral Component Interconnect (PCIe) buses and two PCI-X buses. The system has eight PCI slots: four 8 lane PCIe slots (two of which also support 16 lane form factor cards) and four PCI-X slots. The PCI-X slots operate at up to 133 MHz, are 64-bit capable, and support legacy PCI devices. All PCI-X slots comply with PCI Local Bus Specification Rev 2.2 and PCI-X Local Bus Specification Rev 1.0. All PCIe slots comply with PCIe Base Specification r1.0a and PCI Standard SHPC Specification, r1.1. For additional details, see [“About the PCI Cards and Buses” on page 81](#).

Power Supplies

The basic system includes four 550-watt power supplies, each with its own cooling fan. The power supplies are plugged into a separate power distribution board (PDB). This board is connected to the motherboard through 12-volt high current bus bars. Two power supplies provide sufficient current (1100 DC watts) for maximum configuration. The other power supplies provide 2+2 redundancy, enabling the system to continue operating if up to two power supplies fail.

The power supplies are hot-swappable – you can remove and replace a faulty power supply without shutting down the system. With four separate AC inlets you can wire the server with a fully redundant AC circuit. A failed power supply does not need to remain installed to sustain proper cooling. For more information about the power supplies, see [“About the Power Supplies” on page 89](#).

System Fan Trays

The system is equipped with six fan trays organized into three redundant pairs. One redundant pair is for cooling the disk drives. The other two redundant pairs are for cooling the CPU/Memory modules, memory DIMMs, I/O subsystem, and provide front-to-rear cooling of the system. Not all fans must be present to provide adequate cooling – only one fan per redundant pair must be present.

Note – All system cooling is provided by the fan trays – power supply fans do not provide system cooling.

See [“About the System Fan Trays” on page 92](#) for details.

ALOM System Controller Card

The Sun ALOM system controller card enables system management and administration for the Sun Fire V445 server over a serial line or an Ethernet network. The ALOM system controller provides remote system administration for geographically distributed or physically inaccessible systems. These features include powering on/off the system and enabling diagnostics. The firmware installed on the ALOM system controller card enables you to monitor the system, without having to install any supporting software.

The ALOM system controller card runs independently of the host system, and operates off of standby power from the systems power supplies. This allows the ALOM system controller to serve as a lights out management tool that continues to function even when the server operating system goes offline or when the server is powered off.

Hardware Disk Mirroring and Striping

The SAS controller supports hardware disk mirroring and striping (RAID 0,1) capabilities for all internal disk drives, resulting in improved disk drive performance, data integrity, data availability, and fault recovery.

Predictive Self-Healing

Sun Fire V445 servers with Solaris 10 or later feature the latest fault management technologies. With Solaris 10, Sun introduces a new architecture for building and deploying systems and services capable of predictive self-healing. Self-healing

technology enables Sun systems to accurately predict component failures and mitigate many serious problems before they actually occur. This technology is incorporated into both the hardware and software of the Sun Fire V445 server.

At the heart of the Predictive Self-Healing capabilities is the Solaris™ Fault Manager, a service that receives data relating to hardware and software errors, and automatically and silently diagnoses the underlying problem. Once a problem is diagnosed, a set of agents automatically responds by logging the event, and if necessary, takes the faulty component offline. By automatically diagnosing problems, business-critical applications and essential system services can continue uninterrupted in the event of software failures, or major hardware component failures.

New Features

The Sun Fire V445 server provides faster computing in a denser, more power-efficient package. The following key new features are included:

- **UltraSPARC IIIi CPU**

The UltraSPARC IIIi CPU provides a faster JBus system interface bus that considerably enhances system performance.

- **Higher I/O Performance With Fire ASIC, PCIe, and PCI-X**

The Sun Fire V445 server provides higher I/O performance with PCIe cards integrated with the latest Fire chip (NorthBridge). This integration allows higher bandwidth and lower latency datapaths between the I/O subsystem and the CPUs. The server supports two full height or low profile/full depth 16 lane (wired 8 lane) PCIe cards and two full height or low profile/half depth 8 lane PCIe cards. The system also supports four PCI-X slots that operate at up to 133 MHz, are 64-bit capable, and support legacy PCI cards.

The Fire ASIC is a high-performance JBus to PCIe host bridge. On the host bus side, Fire supports a coherent, split transaction, 128-bit JBus interface. On the I/O side, Fire supports two 8 lane serial PCIe interconnects.

- **SAS Disk Subsystem**

Compact 2.5-inch disk drives provide faster, denser, more flexible, and more robust storage. Hardware RAID 0/1 is supported across all eight disks.

- **ALOM Control of System Settings**

The Sun Fire V445 server provides robust remote access to system functions and the system controller. The physical system control keyswitch has been removed and the switch settings (power on/off, diagnostic mode) are now emulated with ALOM and software commands.

Other new features include the following:

- Four hot-swap power supplies enable fully redundant AC/DC capabilities (N+N)
- Fan trays are redundant and hot-swappable (N+1)
- Increased data Integrity and availability for all SAS disk drives using HW Raid (0+1) controller
- Persistent storage of firmware initialization and probing
- Persistent storage of error state on error reset events
- Persistent storage of diagnostic output
- Persistent storage of configuration change events
- Automated diagnosis of CPU, memory, and I/O fault events during runtime (Solaris 10 and subsequent compatible versions of Solaris OS)
- Dynamic FRUID support of environmental events
- Software readable chassis serial number for asset management

Locating Front Panel Features

The illustration below shows the system features that you can access from the front panel.

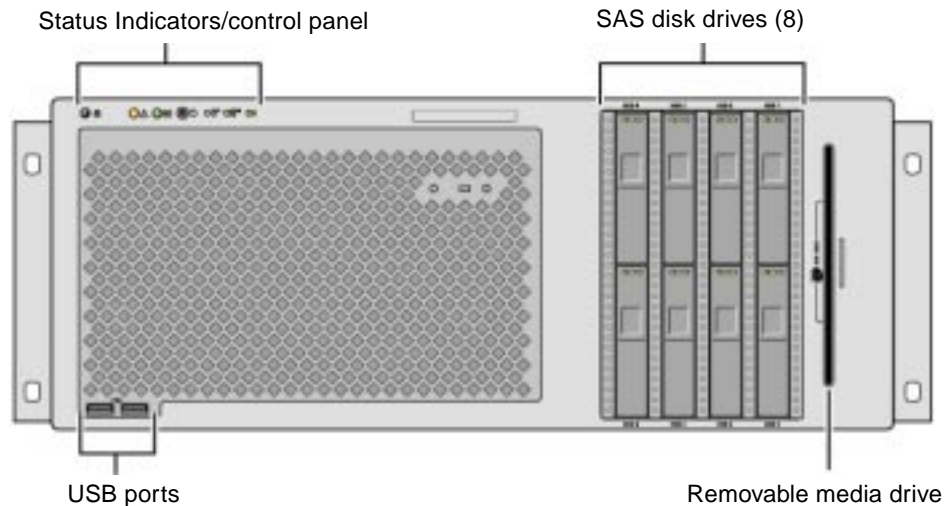


FIGURE 1-1 Front Panel Features

For information about front panel controls and indicators, see [“Front Panel Indicators” on page 10](#).

The system is configured with up to eight disk drives, which are accessible from the front of the system.

Front Panel Indicators

Several front panel indicators provide general system status, alert you to system problems, and help you to determine the location of system faults.

During system startup, the indicators are toggled on and off to verify that each one is working correctly. Indicators located on the front panel work in conjunction with specific fault indicators. For example, a fault in the power supply subsystem

illuminates the power supply Service Required indicator on the affected power supply, as well as the system Service Required indicator. Since all front panel status indicators are powered by the system's standby power source, fault indicators remain lit for any fault condition that results in a system shutdown.

At the top left of the system as you look at its front are six system status indicators. Power/OK indicator and the Service Required indicator provide a snapshot of the overall system status. The Locator indicator helps you to quickly locate a specific system even though it may be one of numerous systems in a room. The Locator indicator/button is at the far left in the cluster, and is lit remotely by the system administrator, or toggled on and off locally by pressing the button.






FIGURE 1-2 Front Panel System Status Indicators

Each system status indicator has a corresponding indicator on the back panel.


Listed from left to right, the system status indicators operate as described in the following table.

TABLE 1-2 System Status Indicators

Icon	Name	Description
	Locator	This white indicator is lit by a Solaris command, Sun Management Center command, or ALOM commands to help you locate the system. There is also a Locator indicator button that allows you to reset the Locator indicator. For information on controlling the Locator indicator, see “Controlling the Locator Indicator” on page 108 .
	Service Required	<p>This amber indicator lights steadily when a system fault is detected. For example, the system Service Required indicator lights when a fault occurs in a power supply or disk drive.</p> <p>In addition to the system Service Required indicator, other fault indicators might also be lit, depending on the nature of the fault. If the system Service Required indicator is lit, check the status of other fault indicators on the front panel and other FRUs to determine the nature of the fault. See Chapter 8 and Chapter 9.</p>
	System Activity	This green indicator blinks slowly then quickly during startup. The Power/OK indicator lights continuously when the system power is on and the Solaris Operating System is loaded and running.

[TABLE 1-3](#) lists additional fault indicators, and describes the type of service required.

TABLE 1-3 System Diagnostic Indicators

Icon	Name	Location
TOP FT	Fan Tray Fault	This indicator indicates a fault in a fan tray. Additional indicators on the top panel indicate which fan tray requires service.
REAR PS	Power Supply Fault	The indicator indicates a fault in a power supply. Look at the individual power supply status indicators (on the back panel) to determine which power supply requires service.
	CPU Overtemperature	This indicator indicates that a CPU has detected an overtemperature condition. Look for any fan failures, as well as a local overtemperature condition around the server.

For hard disk drive indicator descriptions, see [TABLE 4-4](#). For fan tray indicator descriptions located on the top panel of the server, see [TABLE 4-6](#).

Power Button

The system Power button is recessed to prevent accidentally turning the system on or off. If the operating system is running, pressing and releasing the Power button initiates a graceful software system shutdown. Pressing and holding down the Power button for four seconds causes an immediate hardware shutdown.



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

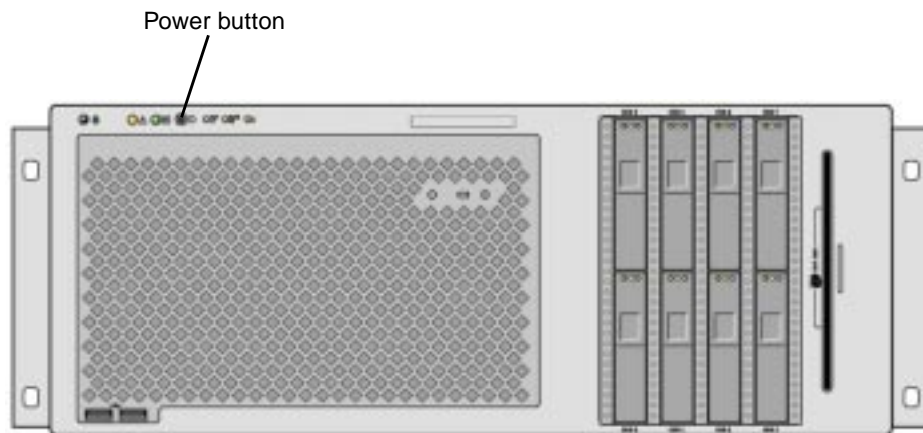


FIGURE 1-3 Power Button Location

USB Ports

The Sun Fire V445 server has four Universal Serial Bus (USB) ports: two on the front panel, and two on the back panel. All four USB ports comply with the USB 2.0 specification.

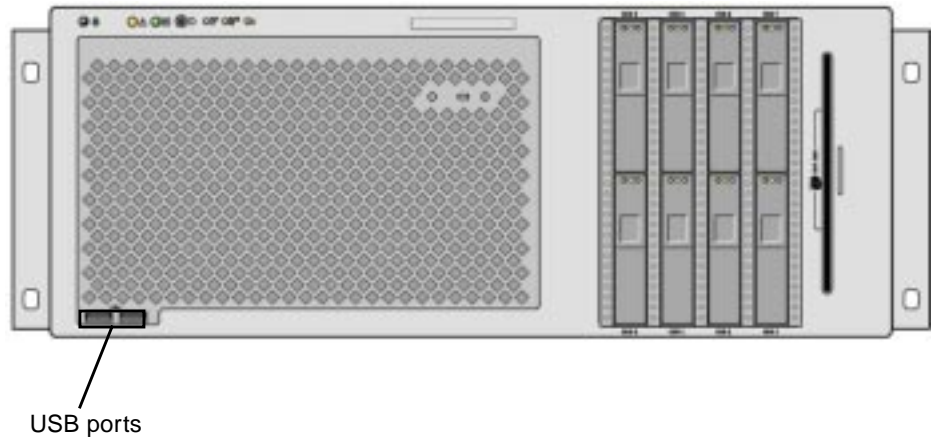


FIGURE 1-4 USB Ports Location

For more information about the USB ports, see [“About the USB Ports”](#) on page 95.

SAS Disk Drives

The system has up to eight hot-pluggable internal SAS disk drives.

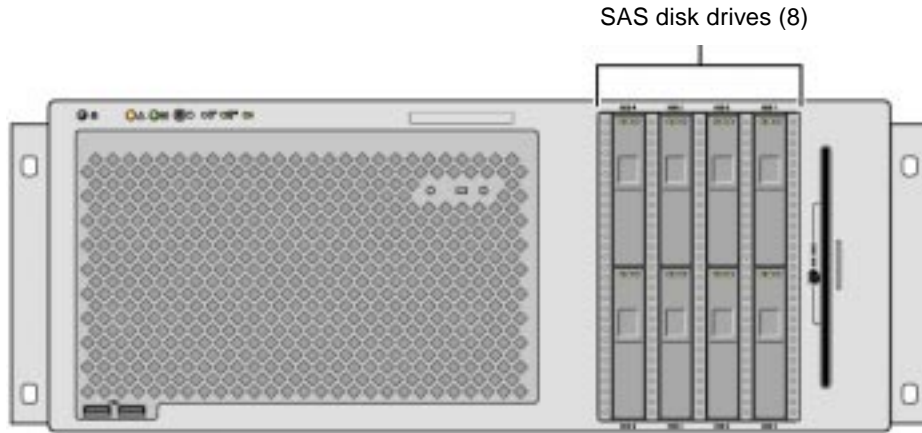


FIGURE 1-5 Hard Disk Drives Location

For more information about how to configure internal disk drives, see the [“About the Internal Disk Drives”](#) on page 87.

Removable Media Drive

The Sun Fire V445 server has a DVD-ROM drive in a removable media bay. This drive also has DVD-RW and CD-RW capabilities.

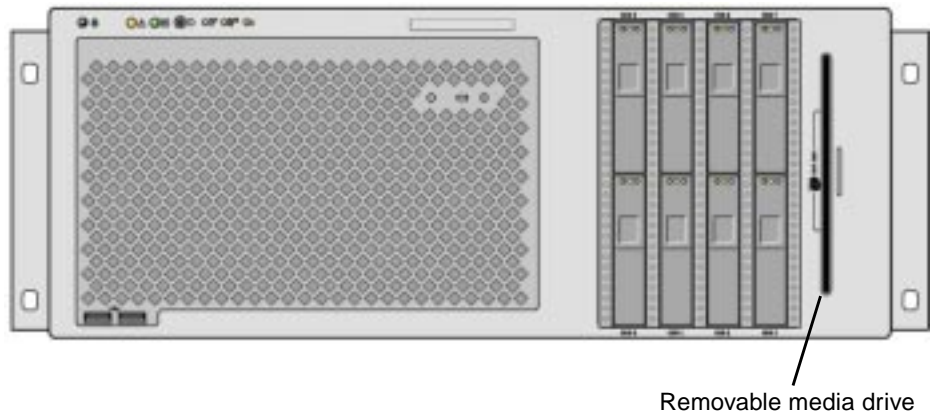


FIGURE 1-6 Removable Media Drive Location

For more information about servicing the DVD-ROM drive, see the *Sun Fire V445 Server Service Manual*.

Locating Back Panel Features

The illustration below shows the system features that are accessible from the back panel.

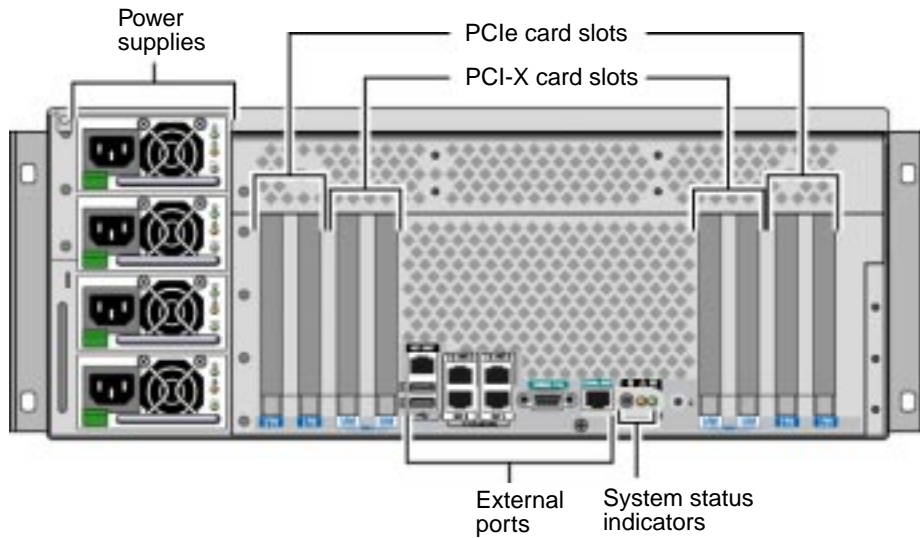


FIGURE 1-7 Back Panel Features

Back Panel Indicators

The back panel system status indicators consist of the Locator indicator, Service Required indicator, and the System Activity indicator. These indicators are located in the bottom center of the back panel, and operate as described in [TABLE 1-2](#).



Back panel system status indicators

For power supply indicator descriptions, see [TABLE 4-5](#). For fan tray indicator descriptions located on the top panel of the server, see [TABLE 4-6](#).

Power Supplies

There are four AC/DC redundant (N+N) and hot-swappable power supplies, where two power supplies are sufficient to power a fully configured system.

For more information about power supplies, see the following sections in the Sun Fire V445 Server Service Manual:

- “About Hot-Pluggable Components”
- “Removing a Power Supply”
- “Installing a Power Supply”
- “Reference for Power Supply Status LEDs”

For more information about power supplies, see [“About the Power Supplies” on page 89](#).

PCI Slots

The Sun Fire V445 server has four PCIe slots and four PCI-X slots. (One of the PCI-X slots is occupied by the LSI Logic 1068X SAS controller.) These are labeled on the back panel.

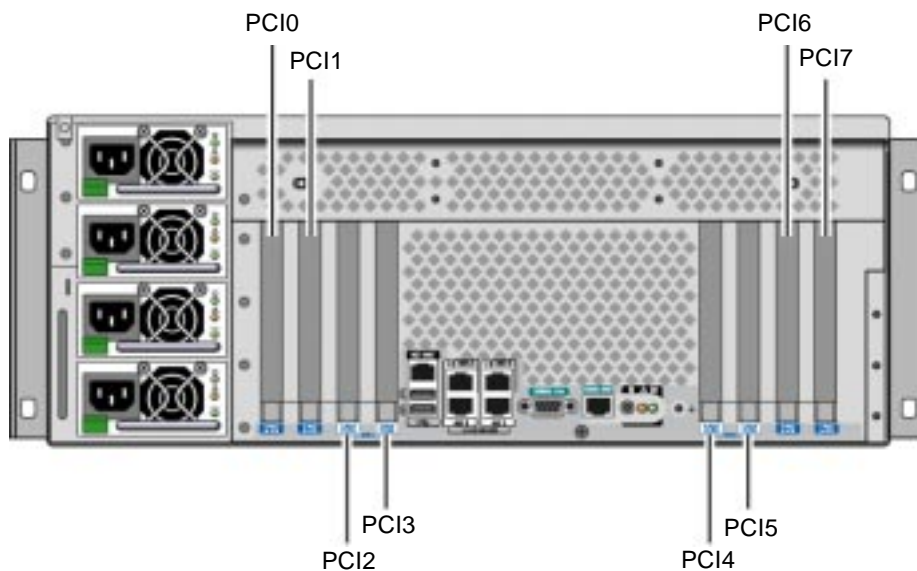


FIGURE 1-8 PCI Slot Locations

For more information about how to install a PCI card, see the *Sun Fire V445 Server Service Manual*.

For more information about PCI cards, see [“About the PCI Cards and Buses” on page 81](#).

System Controller Ports

There are two system controller ports. Both use an RJ-45 connector.

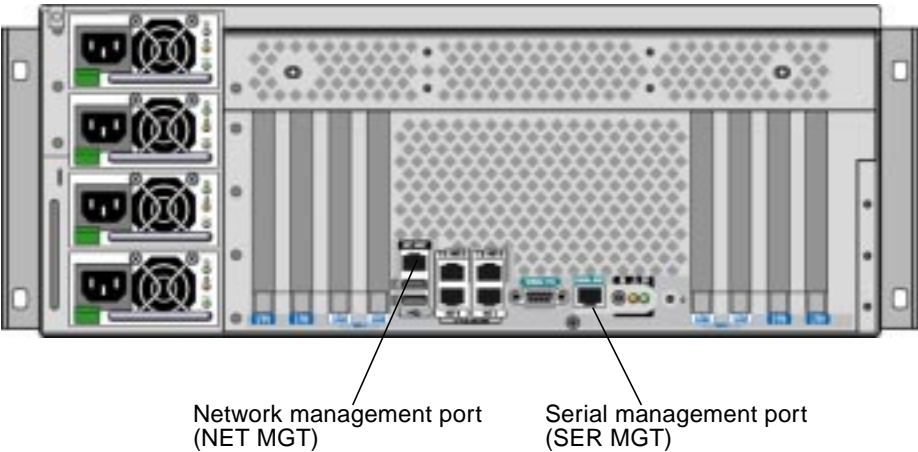


FIGURE 1-9 Network and Serial Management Port Locations

Network Management Port

This port provides direct network access to the ALOM system controller, when configured, and can access the ALOM prompt and system console output.

Note – The system controller is accessed through the serial management port by default. You must reconfigure the system controller to use the network management port. See [“Activating the Network Management Port” on page 42](#).

The network management port has a Link indicator that operates as described in [TABLE 1-4](#).

TABLE 1-4 Network Management Port Indicator

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

Serial Management Port

The serial management port provides the default connection to the system controller and can access the ALOM prompt and system console output. You can connect to the serial management port using a VT100 terminal, a tip connection, or a terminal server.

System I/O Ports

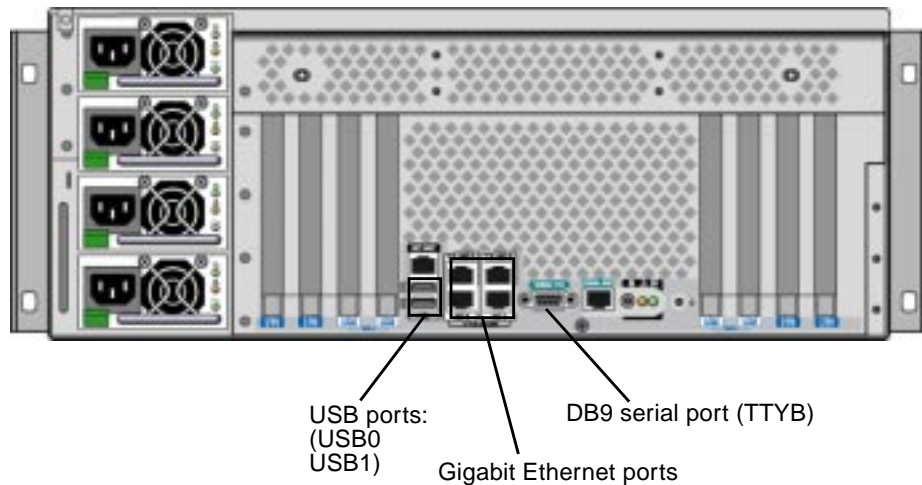


FIGURE 1-10 System I/O Port Locations

USB Ports

There are two USB ports on the back panel. These comply with the USB 2.0 specification.

For more information about the USB ports, see [“About the USB Ports” on page 95](#).

Gigabit Ethernet Ports

The Sun Fire V445 server has four Gigabit Ethernet ports.

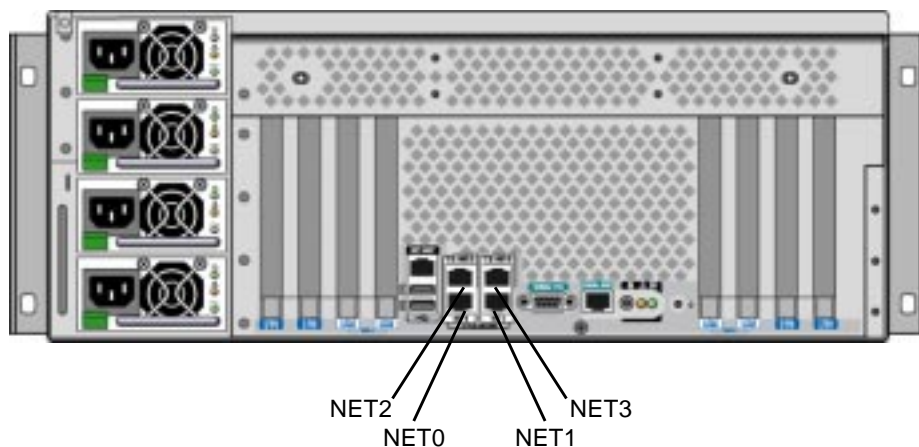


FIGURE 1-11 Gigabit Ethernet Port Locations

Each Gigabit Ethernet port has a corresponding status indicator, described in [TABLE 1-5](#).

TABLE 1-5 Ethernet Indicators

Color	Description
(None)	No connection present.
Green	This indicates a 10/100 Megabit Ethernet connection. The indicator blinks to indicate network activity.
Amber	This indicates a Gigabit Ethernet connection. The indicator blinks to indicate network activity.

DB-9 Serial Port

There is a POSIX compliant DB-9 serial port labeled TTYB. In addition, you may configure the RJ-45 serial management port as a conventional serial port. See [“About the Serial Ports” on page 96](#).

Reliability, Availability, and Serviceability (RAS) Features

The Sun Fire V445 server provides the following RAS features:

- Hot-pluggable disk drives
- Redundant, hot-swappable power supplies, fan trays, and USB components
- Sun ALOM system controller with SSH connections for all remote monitoring and control
- Environmental monitoring
- Automatic system restoration (ASR) capabilities for PCI cards and memory DIMMs
- Hardware watchdog mechanism and externally initiated reset (XIR) capability
- Internal hardware disk mirroring (RAID 0/1)
- Support for disk and network multipathing with automatic failover
- Error correction and parity checking for improved data integrity
- Easy access to all internal replaceable components
- Full in-rack serviceability for all components
- Persistent storage for all configuration change events
- Persistent storage for all system console output

See [Chapter 5](#) for information on how to configure these features.

Sun Cluster Software

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

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

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

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

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

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

Sun Management Center Software

Sun Management Center software is an open, extensible system monitoring and management tool. The software is written in Java and uses Simple Network Management Protocol (SNMP) to provide enterprise-wide monitoring of Sun servers and workstations, including their subsystems, components, and peripheral devices.

For more information, see [“About Sun Management Center” on page 218](#).

Configuring the System Console

This chapter explains what the system console is, describes the different ways of configuring it on a Sun Fire V445 server, and helps you understand its relation to the system controller.

Tasks covered in this chapter include:

- “Entering the `ok` Prompt” on page 40
- “Using the Serial Management Port” on page 41
- “Activating the Network Management Port” on page 42
- “Accessing the System Console With a Terminal Server” on page 44
- “Accessing the System Console With a Tip Connection” on page 47
- “Modifying the `/etc/remote` File” on page 51
- “Accessing the System Console With an Alphanumeric Terminal” on page 53
- “To Verify Serial Port Settings on TTYB” on page 55
- “Accessing the System Console With a Local Graphics Monitor” on page 56

Other information in this chapter includes:

- “About Communicating With the System” on page 26
- “About the `sc>` Prompt” on page 32
- “About the `ok` Prompt” on page 35
- “About Switching Between the ALOM System Controller and the System Console” on page 38
- “Reference for System Console OpenBoot Configuration Variable Settings” on page 59

About 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. See [TABLE 2-1](#) for a summary.

TABLE 2-1 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 TTYB. See: <ul style="list-style-type: none">• “Using the Serial Management Port” on page 41• “To Access the System Console With a Terminal Server Through the Serial Management Port” on page 44• “To Verify Serial Port Settings on TTYB” on page 55• “Reference for System Console OpenBoot Configuration Variable Settings” on page 59	✓	✓
An alphanumeric terminal or similar device attached to the serial management port (SERIAL MGT) or TTYB. See: <ul style="list-style-type: none">• “Using the Serial Management Port” on page 41• “Accessing the System Console With an Alphanumeric Terminal” on page 53• “To Verify Serial Port Settings on TTYB” on page 55• “Reference for System Console OpenBoot Configuration Variable Settings” on page 59	✓	✓

TABLE 2-1 Ways of Communicating With the System *(Continued)*

Devices Available for Accessing the System Console	During Installation*	After Installation
A <code>tip</code> line attached to the serial management port (SERIAL MGT) or TTYB. See: <ul style="list-style-type: none">• “Using the Serial Management Port” on page 41• “Accessing the System Console With a Tip Connection” on page 47• “Modifying the <code>/etc/remote</code> File” on page 51• “To Verify Serial Port Settings on TTYB” on page 55• “Reference for System Console OpenBoot Configuration Variable Settings” on page 59	✓	✓
An Ethernet line connected to the network management port (NET MGT). See: <ul style="list-style-type: none">• “Activating the Network Management Port” on page 42		✓
A local graphics monitor (frame buffer card, graphics monitor, mouse, and so forth). See: <ul style="list-style-type: none">• “To Access the System Console With a Local Graphics Monitor” on page 56• “Reference for System Console OpenBoot Configuration Variable Settings” on page 59		✓

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

About Using the System Console

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

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, see [Chapter 8](#) and [Chapter 9](#).

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

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 also must ensure that the system console is directed to the appropriate port on the Sun Fire V445 server's back panel – generally, the one to which your hardware console device is attached. (See [FIGURE 2-1](#).) You do this by setting the `input-device` and `output-device` OpenBoot configuration variables.

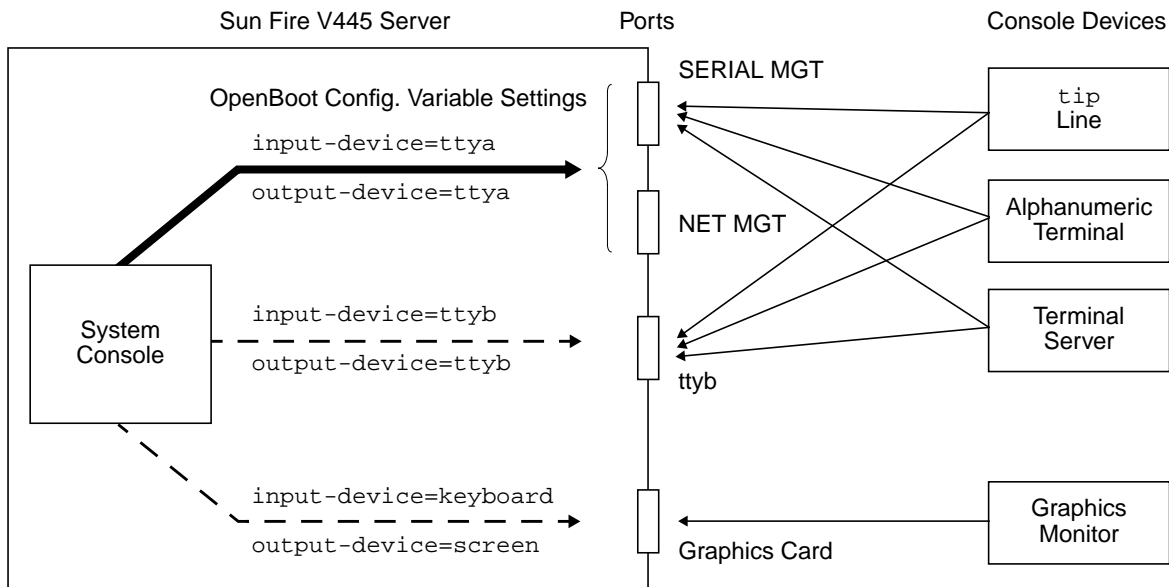


FIGURE 2-1 Directing the System Console to Different Ports and Different Devices

The following subsections provide background information and references to instructions appropriate for the particular device you choose to access the system console. For instructions on attaching and configuring a device to access the system console, see:

- [“Using the Serial Management Port” on page 41](#)
- [“Activating the Network Management Port” on page 42](#)
- [“Accessing the System Console With a Terminal Server” on page 44](#)
- [“Accessing the System Console With a Tip Connection” on page 47](#)

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

On Sun Fire V445 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 network parameters are assigned, your first connection must be to the serial management port. The network can be configured once the system is connected to power and ALOM completes its self test.

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

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

This provides for secure access at the installation site.

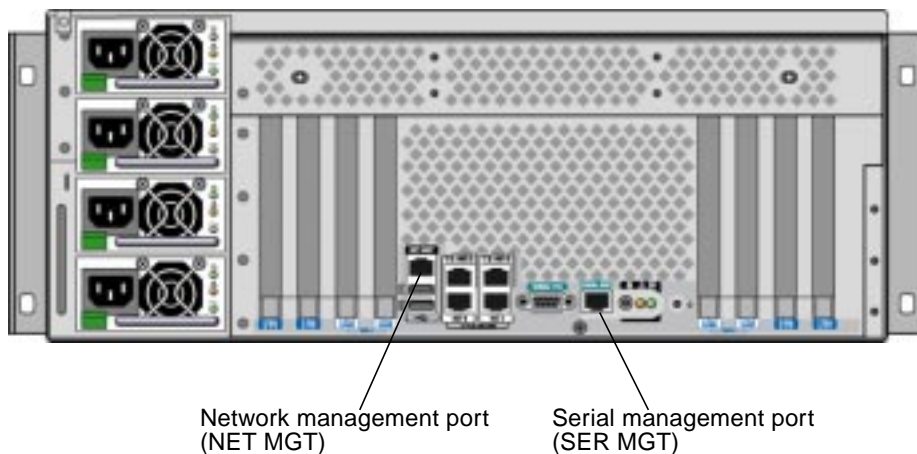


FIGURE 2-2 Serial Management Port (Default Console Connection)

Using a Tip line might be preferable to connecting an alphanumeric terminal, since the `tip` command allows you to use windowing and OS features on the machine being used to connect to the Sun Fire V445 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 Sun Fire V445. The Solaris OS sees this port as TTYB.

For instructions on accessing the system console through a terminal server, see [“Accessing the System Console With a Terminal Server”](#) on page 44.

For instructions on accessing the system console through an alphanumeric terminal, see [“Accessing the System Console With an Alphanumeric Terminal”](#) on page 53.

For instructions on accessing the system console with a Tip line, see [“To Access the System Console With a Tip Connection Through the Serial Management Port”](#) on page 48.

Access Through the Network Management Port

Once you have configured the network management port, you can connect an Ethernet-capable device to the system console through your network. This connection 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 42.

For more information about the system console and the ALOM system controller, see:

- [“About the `sc>` Prompt”](#) on page 32
- [“About the `ok` Prompt”](#) on page 35

ALOM

ALOM software is preinstalled on the server’s system controller (SC) and is enabled at the first power on. ALOM provides remote powering on and off, diagnostics capabilities, environmental control, and monitoring operations for the server. The primary functions of ALOM include the following:

- Operation of system indicators
- Fan speed monitoring and adjustment
- Temperature monitoring and alerts
- Power supply health monitoring and control
- USB overcurrent monitoring and alerts
- Hot-plug configuration change monitoring and alerts
- Dynamic FRU ID data transactions

For more information about ALOM software, see [“About the ALOM System Controller Card”](#) on page 77.

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.

A serial port and the PCI slots are located on the rear panel. Two USB ports are located on the front panel.

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:

- 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 enable you to open up to four additional windows by 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 enable 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 commands 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 [“Reference for System Console OpenBoot Configuration Variable Settings” on page 59](#).

You can also set OpenBoot configuration variables using the ALOM system controller. For details, see the *Sun Advanced Lights Out Manager (ALOM) Online Help*.

Accessing the System Console Through a Graphics Monitor

The Sun Fire V445 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 [“To Access the System Console With a Local Graphics Monitor” on page 56](#).

Note – Power-on self-test (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 Sun Fire V445 server and regardless of system power state. When you connect a Sun Fire V445 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 Sun Fire V445 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 `ok` prompt or from the Solaris prompt, provided the system console is configured to be accessible through the serial management and network management ports. For more information, see:

- [“Entering the `ok` Prompt” on page 40](#)
- [“About Switching Between the ALOM System Controller and the System Console” on page 38](#)

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, but only one user session can have write-access to the system console at anytime. The other sessions accessing the system console will have read-only capability.

For more information, see:

- [“Using the Serial Management Port” on page 41](#)
- [“Activating the Network Management Port” on page 42.](#)

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 *Sun Advanced Lights Out Manager (ALOM) Online Help*.

Ways of Reaching the `sc>` Prompt

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

- If the system console is directed to the serial management and network management ports, you can type the ALOM system controller escape sequence (`#.`).

Note – `#.` (pound period) is the default setting for the escape sequence to enter ALOM. It is a configurable variable.

- You can log in directly to the ALOM system controller from a device connected to the serial management port. See [“Using the Serial Management Port” on page 41.](#)
- 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 42.](#)

About the ok Prompt

A Sun Fire V445 server with the Solaris OS installed is capable of operating at different *run levels*. A synopsis of run levels follows. For a full description, see the Solaris system administration documentation.

Most of the time, you operate a Sun Fire V445 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 Sun Fire V445 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 in which OpenBoot firmware control can happen.

- By default, the system powers up to OpenBoot firmware control before the OS 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 OS is halted.
- The system reverts to OpenBoot firmware control when the OS crashes.
- When a serious hardware problem develops while the system is running, the OS transitions smoothly to run level 0.
- You deliberately place the server under firmware control in order to execute firmware-based commands or to run diagnostic tests.

It is the last of these scenarios that most often concerns you as an administrator, since there will be times when you need to reach the `ok` prompt. The several ways to do this are outlined in [“Entering the ok Prompt” on page 35](#). For detailed instructions, see [“Entering the ok Prompt” on page 40](#).

Entering the ok Prompt

There are several ways to enter 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 description of each method follows. For instructions, see [“Entering the ok Prompt” on page 40](#).

Graceful Shutdown

The preferred method of reaching the `ok` prompt is to shut down the OS 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.

For more information, see:

- [“Powering Off the Server Locally” on page 66](#)
- [“Powering Off the System Remotely” on page 64](#)

ALOM System Controller `break` or `console` Command

Typing `break` from the `sc>` prompt forces a running Sun Fire V445 server to move to OpenBoot firmware control. If the OS is already halted, you can use the `console` command instead of `break` to reach the `ok` prompt.

If you issue a `break` at the SC you will remain in an SC prompt. To use the OpenBoot prompt, enter the `console` command. For example:

TABLE 2-2

<pre>hostname> #. <i>[characters are not echoed to the screen]</i> sc> break -y <i>[break on its own will generate a confirmation prompt]</i> sc> console ok</pre>

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, or, if you have an alphanumeric terminal attached to the Sun Fire V445 server, by pressing 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 [“Reference for System Console OpenBoot Configuration Variable Settings” on page 59](#)

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, see:

- [Chapter 8](#) and [Chapter 9](#)
- *Sun Advanced Lights Out Manager (ALOM) Online Help*



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.



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 – When you access the `ok` prompt from a functioning Sun Fire V445 server, you are suspending the Solaris OS and placing the system under firmware control. Any processes that were running under the OS are also suspended, and *the state of such processes might not be recoverable*.

The 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 OS from the point at which it was suspended. The diagnostic tests you run from the `ok` prompt will affect the state of the system. This means that it is not possible to resume execution of the OS from the point at which it was suspended.

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

As a rule, before suspending the OS, 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 about the OpenBoot firmware, see 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.

About Switching Between the ALOM System Controller and the System Console

The Sun Fire V445 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 separate channels (FIGURE 2-3).

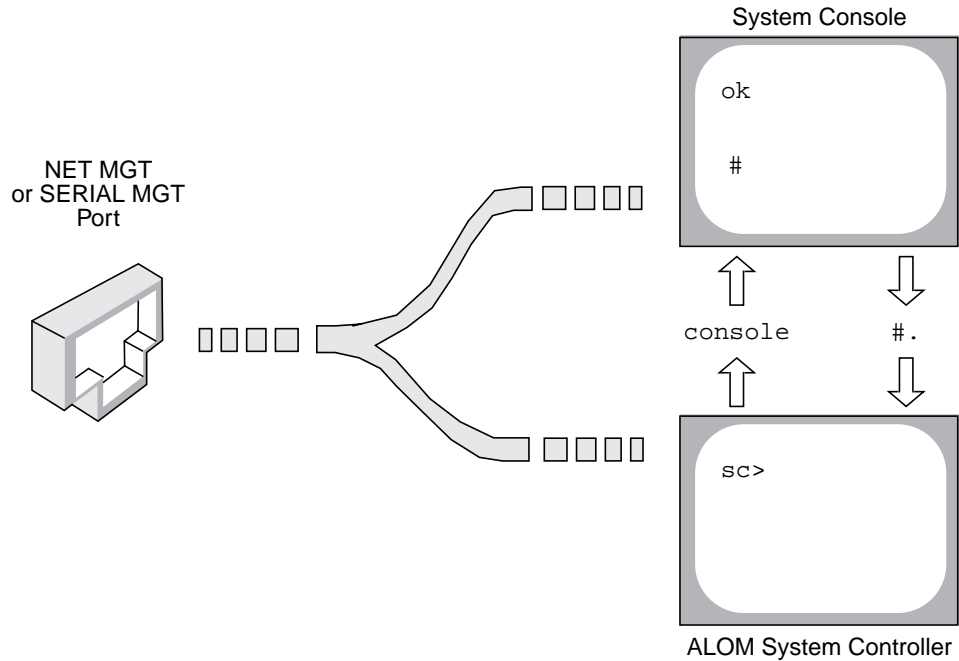


FIGURE 2-3 Separate System Console and System Controller Channels

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 might 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:

- [“About Communicating With the System” on page 26](#)
- [“About the `sc>` Prompt” on page 32](#)
- [“About the `ok` Prompt” on page 35](#)
- [“Using the Serial Management Port” on page 41](#)
- *Sun Advanced Lights Out Manager (ALOM) Online Help*

Entering 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 [“About the `ok` Prompt” on page 35](#).



Caution – Dropping the Sun Fire V445 server to the `ok` prompt suspends all application and OS 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.

▼ To Enter the `ok` Prompt

1. **If at all possible, back up system data before starting this procedure.**
For information about the appropriate backup and shutdown procedures, refer to Solaris system administration documentation.
2. **Exit or stop all applications and warn users of the impending loss of service.**
3. **Decide which method you need to use to reach the `ok` prompt.**
See [“About the `ok` Prompt” on page 35](#) for details.

4. Refer to [TABLE 2-3](#) for instructions.

TABLE 2-3 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 Sun Fire V445 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 console or break 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 OS 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 With a Local Graphics Monitor” on page 56](#) and [“Reference for System Console OpenBoot Configuration Variable Settings” on page 59](#).

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, see:

- [“About the ALOM System Controller Card” on page 77](#)
- *Sun Advanced Lights Out Manager (ALOM) Online Help*

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

▼ To Use the Serial Management Port

1. Establish an ALOM system controller session.

See *Sun Advanced Lights Out Manager (ALOM) Online Help* for instructions.

2. 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.

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

TABLE 2-4

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

For instructions on how to use the ALOM system controller, see:

- *Sun Advanced Lights Out Manager (ALOM) Online Help*

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 Sun Fire V445 server IP address, and is dedicated for use only with the ALOM system controller. For more information, see [“About the ALOM System Controller Card” on page 77](#).

▼ 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 [“Using the Serial Management Port” on page 41](#).
3. **Assign IP addresses by typing one of the following commands:**
 - **If your network uses static IP addresses, type:**

TABLE 2-5

sc> setsc if_network true
sc> setsc netsc_ipaddr ip-address
sc> setsc netsc_ipnetmask ip-address
sc> setsc netsc_ipgateway ip-address

Note – The `if_network` command requires resetting the SC before the changes take effect. Reset the SC with the `resetsc` command after changing network parameters.

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

TABLE 2-6

sc> setsc netsc_dhcp

4. **Select the communications protocol, either Telnet, SSH, or none, type:**

TABLE 2-7

sc> setsc if_connection none/ssh/telnet
--

Note – `none` is the default.

5. To verify the network settings, type:

TABLE 2-8

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 With 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 Sun Fire V445 server.

▼ To Access the System Console With a Terminal Server Through the Serial Management Port

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

The serial management port on the Sun Fire V445 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 Sun Fire V445 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 Sun Fire V445 server. See [“Using the Serial Management Port”](#) on page 41.
- 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.

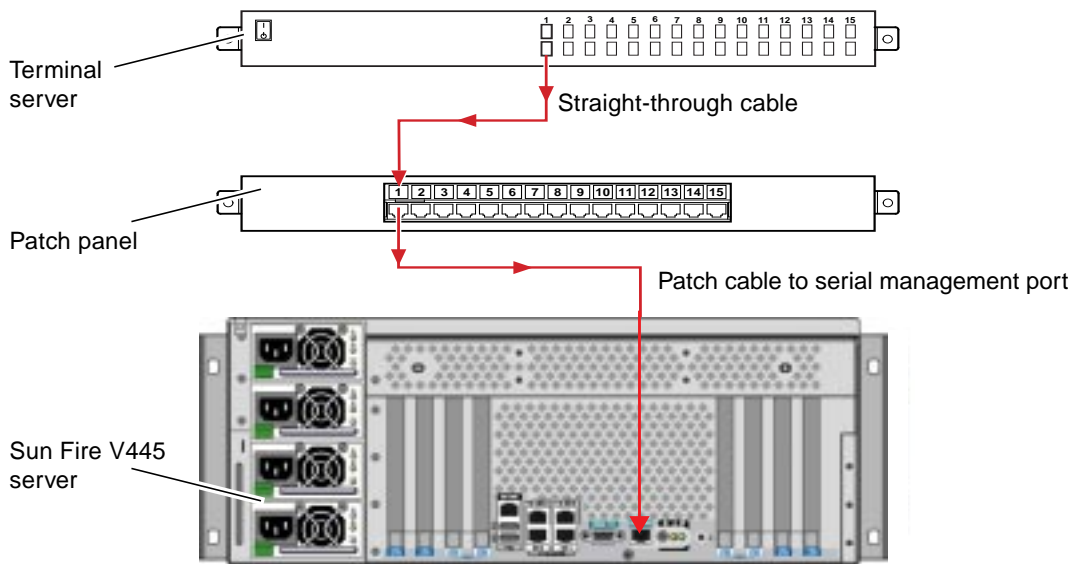


FIGURE 2-4 Patch Panel Connection Between a Terminal Server and a Sun Fire V445 Server

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 Sun Fire V445 server serial management port to the corresponding pin in the terminal server's serial port.

[TABLE 2-9](#) shows the crossovers that the cable must perform.

TABLE 2-9 Pin Crossovers for Connecting to a Typical Terminal Server

Sun Fire V445 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)

TABLE 2-9 Pin Crossovers for Connecting to a Typical Terminal Server *(Continued)*

Sun Fire V445 Serial Port (RJ-45 Connector) Pin	Terminal Server Serial Port Pin
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:

TABLE 5

% telnet <i>IP-address-of-terminal-server</i> <i>port-number</i>
--

For example, for a Sun Fire V445 server connected to port 10000 on a terminal server whose IP address is 192.20.30.10, you would type:

TABLE 6

% telnet 192.20.30.10 10000

▼ To Access the System Console With a Terminal Server Through the TTYB Port

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

At the ok prompt, type:

TABLE 2-10

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. See [Chapter 8](#) and [Chapter 9](#).

2. 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.

3. Connect the null modem serial cable to the TTYB port on the Sun Fire V445 server.

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

4. Power on the system.

See [Chapter 3](#) for power-on procedures.

What Next

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, see:

- *Sun Advanced Lights Out Manager (ALOM) Online Help*

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:

- [“Reference for System Console OpenBoot Configuration Variable Settings” on page 59](#)

Accessing the System Console With a Tip Connection

This procedure assumes that you are accessing the Sun Fire V445 server system console by connecting the serial port of another Sun system to the serial management port (SERIAL MGT) of the Sun Fire V445 server ([FIGURE 2-7](#)).

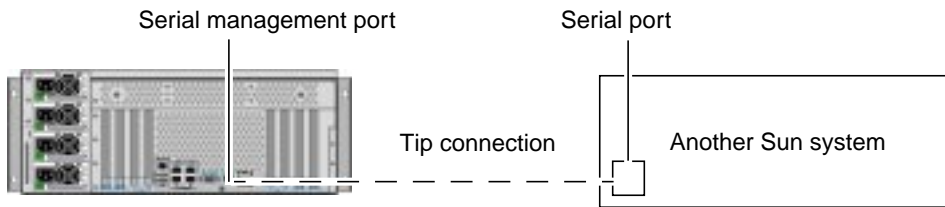


FIGURE 2-7 Tip Connection Between a Sun Fire V445 Server and Another Sun System

▼ To Access the System Console With a Tip Connection Throught the Serial Management Port

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 Sun Fire V445 server. Pinouts, part numbers, and other details about the serial cable and adapter are provided in the *Sun Fire V445 Server Parts Installation and Removal Guide*.

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 51](#) for details.

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

Table 2-11

% <code>tip hardware</code>

The Sun system responds by displaying:

Table 2-12

<code>connected</code>

The shell tool is now a Tip window directed to the Sun Fire V445 server through the Sun system's serial port. This connection is established and maintained even when the Sun Fire V445 server is completely powered off or just starting up.

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

▼ To Access the System Console With a Tip Connection Through the TTYB Port

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

At the `ok` prompt on the Sun Fire V445 server, type:

TABLE 2-13

<code>ok setenv input-device ttyb</code>
<code>ok setenv output-device ttyb</code>

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. See [Chapter 8](#) and [Chapter 9](#).

2. 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.

3. **Connect the null modem serial cable to the TTYB port on the Sun Fire V445 server.**

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

4. **Power on the system.**

See [Chapter 3](#) 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:

- *Sun Advanced Lights Out Manager (ALOM) Online Help*

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:

- [“Reference for System Console OpenBoot Configuration Variable Settings” on page 59](#)

Modifying the `/etc/remote` File

This procedure might be necessary if you are accessing the Sun Fire V445 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 `hardwire` 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 Sun Fire V445 server.

▼ To Modify the `/etc/remote` File

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

Table 2-14

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

Table 2-15

```
hardwire:\
: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.

Table 2-16

<pre>hardwire:\n:dv=/dev/ttyb:br#9600:el=^C^S^Q^U^D:ie=%\$:oe=^D:</pre>

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 Sun Fire V445 server system console. See:

- [“Accessing the System Console With a Tip Connection” on page 47](#)

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:

- [“Reference for System Console OpenBoot Configuration Variable Settings” on page 59](#)

Accessing the System Console With an Alphanumeric Terminal

This procedure assumes that you are accessing the Sun Fire V445 server system console by connecting the serial port of an alphanumeric terminal to the serial management port (SERIAL MGT) of the Sun Fire V445 server.

▼ To Access the System Console With an Alphanumeric Terminal Through the Serial Management Port

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. Plug this cable in to the terminal's serial port connector.

2. **Attach the opposite end of the serial cable to the serial management port on the Sun Fire V445 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

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

▼ To Access the System Console With an Alphanumeric Terminal Through the TTYB Port

1. **Redirect the system console by changing the OpenBoot configuration variables.**

At the `ok` prompt, type:

TABLE 2-17

<code>ok setenv input-device ttyb</code>
<code>ok setenv output-device ttyb</code>

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. See [Chapter 8](#) and [Chapter 9](#).

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

<code>ok power-off</code>

The system permanently stores the parameter changes and powers off.

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

3. **Connect the null modem serial cable to the TTYB port on the Sun Fire V445 server.**

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

4. **Power on the system.**

See [Chapter 3](#) 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, see:

- *Sun Advanced Lights Out Manager (ALOM) Online Help*

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:

- [“Reference for System Console OpenBoot Configuration Variable Settings” on page 59](#)

Verifying Serial Port Settings on TTYB

This procedure enables you to verify the baud rate and other serial port settings used by the Sun Fire V445 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 Sun Fire V445 server, and the server must be running Solaris OS software.

▼ To Verify Serial Port Settings on TTYB

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

Table 2-18

eeprom grep ttyb-mode

3. **Look for the following output:**

Table 2-19

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

This line indicates that the Sun Fire V445 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 C](#).

Accessing the System Console With 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.
An 8/24-Bit Color Graphics PCI adapter frame buffer card (Sun part number X3768A or X3769A is currently supported)
- 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 With 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, see the *Sun Fire V445 Server Installation Guide* 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 any USB port on the Sun Fire V445 server front panel.**
5. **Connect the USB mouse cable to any USB port on the Sun Fire V445 server front panel.**

6. Obtain the `ok` prompt.

For more information, see [“Entering the `ok` Prompt” on page 40.](#)

7. 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. See [Chapter 8](#) and [Chapter 9](#).

8. 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 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:

- [“Reference for System Console OpenBoot Configuration Variable Settings” on page 59.](#)

Reference for System Console OpenBoot Configuration Variable Settings

The Sun Fire V445 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 2-20 OpenBoot Configuration Variables That Affect the System Console

OpenBoot Configuration Variable Name	System Console Output		
	Serial and Network Management Ports	Serial Port (TTYB)*	Local Graphics Monitor*
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 need to connect it to TTYB, *not* the serial management port. See [“About the Serial Ports” on page 96](#) for more information.

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 2-20](#), there are other variables that affect and determine system behavior. These variables are created during system configuration and stored on a ROM chip.

Powering On and Powering Off the System

This chapter describes how to power on and power off the system, and how to initiate a reconfiguration boot.

This chapter explains the following tasks:

- “Powering On the Server Remotely” on page 62
- “Powering On the Server Locally” on page 63
- “Powering Off the System Remotely” on page 64
- “Powering Off the Server Locally” on page 66
- “Initiating a Reconfiguration Boot” on page 66
- “Selecting a Boot Device” on page 69

Before You Begin

Note – Before powering on the system, you must attach a system console device to gain access to the system. See [Chapter 2](#). ALOM automatically boots up when the system is plugged in.

The following is a brief summary of powering on the system properly:

1. Attach a system console device to the serial management port and turn the console device on.

Serial management access is only possible during first-time startup.

2. Plug in the system power cords.

ALOM boots and starts issuing console messages. At this time, you can assign a username and password.

3. Power on the system. Once powered on, type `console` to get to the OK prompt to watch the system boot sequence.

Powering On the Server Remotely

To issue software commands, you need to set up an alphanumeric terminal connection, a local graphics monitor connection, ALOM system controller connection, or a Tip connection to the Sun Fire V445 server. See [Chapter 2](#) for more information about connecting the Sun Fire V445 server to a terminal or similar device.

Do not use this power-on procedure if you have just added any new internal option or external storage device, or if you have removed a storage device without replacing it. To power on the system under those circumstances, you must initiate a reconfiguration boot. For those instructions, see:

- [“Initiating a Reconfiguration Boot” on page 66](#)



Caution – Before you power on the system, ensure that the system doors and all panels are properly installed.



Caution – Never move the system when the system power is on. Movement can cause catastrophic disk drive failure. Always power off the system before moving it.

For more information, see:

- [“About Communicating With the System” on page 26](#)
- [“About the `sc>` Prompt” on page 32](#)

▼ To Power On the Server Remotely

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

TABLE 3-1

<code>sc> poweron</code>

Powering On the Server Locally

Do not use this power-on procedure if you have just added any new internal option or external storage device, or if you have removed a storage device without replacing it. To power on the system under those circumstances, you must initiate a reconfiguration boot. For those instructions, see:

- [“Initiating a Reconfiguration Boot” on page 66](#)



Caution – Never move the system when the system power is on. Movement can cause catastrophic disk drive failure. Always power off the system before moving it.



Caution – Before you power on the system, ensure that the system doors and all panels are properly installed.

▼ To Power On the Server Locally

1. **Turn on power to any external peripherals and storage devices.**

Read the documentation supplied with the device for specific instructions.

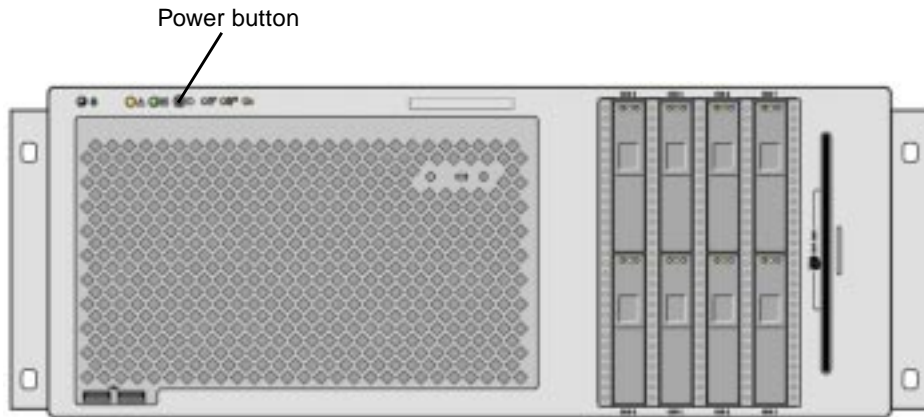
2. **Establish a connection to the system console.**

If you are powering on the system for the first time, connect a device to the serial management port using one of the methods described in [Chapter 2](#). Otherwise, use one of the methods for connecting to the system console, also described in [Chapter 2](#).

3. **Connect the AC power cords.**

Note – As soon as the AC power cords are connected to the system, the ALOM system controller boots and displays its power-on self-test (POST) messages. Though the system power is still off, the ALOM system controller is up and running, and monitoring the system. Regardless of system power state, as long as the power cords are connected and providing standby power, the ALOM system controller is on and monitoring the system.

4. Press and release the Power button with a ball-point pen to power on the system.



The power supply Power OK indicators light when power is applied to the system. Verbose POST output is immediately displayed to the system console if diagnostics are enabled at power-on, and the system console is directed to the serial and network management ports.

Text messages appear from 30 seconds to 20 minutes on the system monitor (if one is attached) or the system prompt appears on an attached terminal. This time depends on the system configuration (number of CPUs, memory modules, PCI cards, and console configuration), and the level of power-on self-test (POST) and OpenBoot Diagnostics tests being performed. The System Activity indicator lights when the server is running under control of the Solaris OS.

Powering Off the System Remotely

To issue software commands, you need to set up an alphanumeric terminal connection, a local graphics monitor connection, ALOM system controller connection, or a Tip connection to the Sun Fire V445 server. See [Chapter 2](#) for more information about connecting the Sun Fire V445 server to a terminal or similar device.

You can power off the system remotely either from the `ok` prompt or from the ALOM system controller `sc>` prompt.



Caution – Applications running on the Solaris OS can be adversely affected by a poorly executed system shutdown. ensure that you stop and exit applications, and shut down the OS before powering off the server.

For more information, see:

- [“About Communicating With the System” on page 26](#)
- [“About the ok Prompt” on page 35](#)
- [“Entering the ok Prompt” on page 40](#)
- [“About the sc> Prompt” on page 32](#)

▼ To Power Off the System Remotely From the ok Prompt

1. Notify users that the server will be powered off.
2. Back up the system files and data, if necessary.
3. Obtain the ok prompt.
See [“Entering the ok Prompt” on page 40](#).
4. Issue the following command:

TABLE 3-2

<code>ok power-off</code>

▼ To Power Off the System Remotely From the ALOM System Controller Prompt

1. Notify users that the system will be powered off.
2. Back up the system files and data, if necessary.
3. Log in to the ALOM system controller.
See [“Using the Serial Management Port” on page 41](#).
4. Issue the following command:

TABLE 3-3

<code>sc> poweroff</code>

Powering Off the Server Locally



Caution – Applications running on the Solaris OS can be adversely affected by a poorly executed system shutdown. Ensure that you stop and exit applications, and shut down the OS before powering off the server.

▼ To Power Off the Server Locally

1. **Notify users that the server will be powered down.**
2. **Back up the system files and data, if necessary.**
3. **Press and release the Power button with a ball-point pin.**

The system begins a graceful software system shutdown.

Note – Pressing and releasing the Power button initiates a graceful software system shutdown. Pressing and holding in the Power button for four seconds causes an immediate hardware shutdown. Whenever possible, you should use the graceful shutdown method. Forcing an immediate hardware shutdown can cause disk drive corruption and loss of data. Use that method only as a last resort.

4. **Wait for the system to power off.**

The power supply Power OK indicators extinguish when the system is powered off.



Caution – Ensure no other users have access to power on the system or system components while working on internal components.

Initiating a Reconfiguration Boot

After installing any new internal option or external storage device, you must perform a reconfiguration boot so that the OS is able to recognize newly installed devices. In addition, if you remove any device and do not install a replacement device prior to rebooting the system, you must perform a reconfiguration boot for

the OS to recognize the configuration change. This requirement also applies to any component that is connected to the system I²C bus to ensure proper environmental monitoring.

This requirement *does not* apply to any component that is:

- Installed or removed as part of a hot-plug operation
- Installed or removed before the OS is installed
- Installed as an identical replacement for a component that is already recognized by the OS

To issue software commands, you need to set up an alphanumeric terminal connection, a local graphics monitor connection, ALOM system controller connection, or a Tip connection to the Sun Fire V445 server. See [Chapter 2](#) for more information about connecting the Sun Fire V445 server to a terminal or similar device.

This procedure assumes that you are accessing the system console using the serial management or network management port.

For more information, see:

- [“About Communicating With the System” on page 26](#)
- [“About the `sc>` Prompt” on page 32](#)
- [“About the `ok` Prompt” on page 35](#)
- [“About Switching Between the ALOM System Controller and the System Console” on page 38](#)
- [“Entering the `ok` Prompt” on page 40](#)

▼ To Initiate a Reconfiguration Boot

1. **Turn on power to any external peripherals and storage devices.**
Read the documentation supplied with the device for specific instructions.
2. **Turn on power to the alphanumeric terminal or local graphics monitor, or log in to the ALOM system controller.**
3. **Use ALOM to initiate Diagnostics mode to run power-on self-test (POST) and OpenBoot Diagnostics tests to verify that the system functions correctly with the new part(s) you just installed.**
4. **Press the Power button with a ball-point pen to power on the system.**
5. **If you are logged in to the `sc>` prompt, switch to the `ok` prompt. Type:**

TABLE 3-4

<code>sc> console</code>

6. When the system banner is displayed on the system console, immediately stop the boot process to access the system `ok` prompt.

The system banner contains the Ethernet address and host ID. To stop the boot process, use one of the following methods:

- Hold down the Stop (or L1) key and press A on your keyboard.
- Press the Break key on the terminal keyboard.
- Type the `break` command from the `sc>` prompt.

7. At the `ok` prompt, type:

```
ok setenv auto-boot? false
ok reset-all
```

You must set the `auto-boot?` variable to `false` and issue the `reset-all` command to ensure that the system correctly initiates upon reboot. If you do not issue these commands, the system might fail to initialize, because the boot process was stopped in [Step 6](#).

8. At the `ok` prompt, type:

TABLE 3-5

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

You must set `auto-boot?` variable back to `true` so that the system boots automatically after a system reset.

9. At the `ok` prompt, type:

TABLE 3-6

```
ok boot -r
```

The `boot -r` command rebuilds the device tree for the system, incorporating any newly installed options so that the OS will recognize them.

Note – A system banner appears in 30 seconds to 20 minutes. This time depends on the system configuration (number of CPUs, memory modules, PCI cards) and the level of POST and OpenBoot Diagnostics tests being performed. For more information about OpenBoot configuration variables, see [Appendix C](#).

The system front panel LED indicators provide power-on status information. For information about the system indicators, see:

- [“Front Panel Indicators” on page 10](#)
- [“Back Panel Indicators” on page 17](#)

If the system encounters a problem during startup (running in the normal mode), try restarting the system in Diagnostics mode to determine the source of the problem.

Use ALOM or the OpenBoot Prompt (ok prompt) to switch to Diagnostics mode and power cycle the system. See [“Powering Off the Server Locally” on page 66](#).

For information about system diagnostics and troubleshooting, see [Chapter 8](#).

Selecting a Boot Device

You specify the boot device by setting an OpenBoot configuration variable called `boot-device`. The default setting of this variable is `disk net`. With this setting, the firmware first attempts to boot from the system hard disk drive, and if that fails, from the on-board `net0` Gigabit Ethernet interface.

Before you can select a boot device, you must complete system installation according to the instructions in the Sun Fire V445 Server Installation Guide.

This procedure assumes that you are familiar with the OpenBoot firmware and that you know how to enter the OpenBoot environment. For more information, see:

- [“About the ok Prompt” on page 35](#)

Note – The serial management port on the ALOM system controller card is preconfigured as the default system console port. For more information, see [Chapter 2](#).

If you want to boot from a network, you must connect the network interface to the network. See, [“Attaching a Twisted-Pair Ethernet Cable” on page 143](#).

▼ To Select a Boot Device

- At the `ok` prompt, type:

```
ok setenv boot-device device-specifier
```

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

- `cdrom` – Specifies the DVD-ROM drive
- `disk` – Specifies the system boot disk (internal disk 0 by default)
- `disk0` – Specifies internal disk 0
- `disk1` – Specifies internal disk 1
- `disk2` – Specifies internal disk 2
- `disk3` – Specifies internal disk 3
- `disk4` – Specifies internal disk 4
- `disk5` – Specifies internal disk 5
- `disk6` – Specifies internal disk 6
- `disk7` – Specifies internal disk 6
- `net`, `net0`, `net1` – Specifies the network interfaces
- *full path name* – Specifies the device or network interface by its full path name

Note – The Solaris OS modifies the `boot-device` variable to its full path name, not the alias name. If you choose a nondefault `boot-device` variable, the Solaris OS specifies the full device path of the boot device.

Note – You can also specify the name of the program to be booted as well as the way the boot program operates. For more information, see the *OpenBoot 4.x Command Reference Manual* in the *OpenBoot Collection AnswerBook* for your specific Solaris OS release.

If you want to specify a network interface other than an on-board Ethernet interface as the default boot device, you can determine the full path name of each interface by typing:

`ok show-devs`

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

For more information about using the OpenBoot firmware, refer to the *OpenBoot 4.x Command Reference Manual* in the *OpenBoot Collection AnswerBook* for your specific Solaris release.

Configuring Hardware

This chapter provides hardware configuration information for the Sun Fire V445 server.

Note – This chapter does not provide instructions for installing or removing hardware components. For instructions on preparing the system for servicing and procedures to install and remove the server components described in this chapter, refer to the Sun Fire V445 Server Service Manual.

Topics in this chapter include:

- [“About the CPU/Memory Modules” on page 73](#)
- [“About the ALOM System Controller Card” on page 77](#)
- [“About the PCI Cards and Buses” on page 81](#)
- [“About the SAS Controller” on page 84](#)
- [“About the SAS Backplane” on page 85](#)
- [“About Hot-Pluggable and Hot-Swappable Components” on page 85](#)
- [“About the Internal Disk Drives” on page 87](#)
- [“About the Power Supplies” on page 89](#)
- [“About the System Fan Trays” on page 92](#)
- [“About the USB Ports” on page 95](#)
- [“About the Serial Ports” on page 96](#)

About the CPU/Memory Modules

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

Note – CPU/Memory modules on a Sun Fire V445 server are *not* hot-pluggable or hot-swappable.

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

The Sun Fire V445 server employs a shared-memory multiprocessor architecture with all processors sharing the same physical address space. The system processors, main memory, and I/O subsystem communicate via a high-speed system interconnect bus. In a system configured with multiple CPU/Memory modules, all main memory is accessible from any processor over the system bus. The main memory is logically shared by all processors and I/O devices in the system. However, memory is controlled and allocated by the CPU on its host module, that is, the DIMMs on CPU/Memory module 0 are managed by CPU 0.

DIMMs

The Sun Fire V445 server uses 2.5-volt, high-capacity double data rate dual inline memory modules (DDR DIMMs) with error-correcting code (ECC). The system supports DIMMs with 512-Mbyte, 1-Gbyte, and 2-Gbyte capacities. Each CPU/Memory module contains slots for four DIMMs. Total system memory ranges from a minimum of 1 Gbyte (one CPU/Memory module with two 512-Mbyte DIMMs) to a maximum of 32 Gbytes (four modules fully populated with 2-Gbyte DIMMs).

Within each CPU/Memory module, the four DIMM slots are organized into groups of two. The system reads from, or writes to, both DIMMs in a group simultaneously. DIMMs, therefore, must be added in pairs. The figure below shows the DIMM slots and DIMM groups on a Sun Fire V445 server CPU/Memory module. Adjacent slots belong to the same DIMM group. The two groups are designated 0 and 1 as shown in [FIGURE 4-1](#).

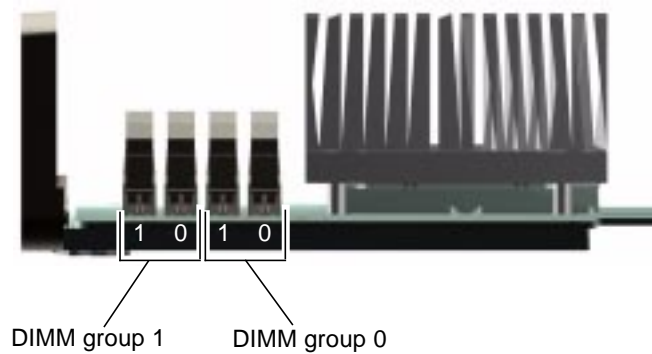


FIGURE 4-1 Memory Module Groups 0 and 1

TABLE 4-1 lists the DIMMs on the CPU/Memory module, and to which group each DIMM belongs.

TABLE 4-1 Memory Module Groups 0 and 1

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

The DIMMs must be added in pairs within the same DIMM group, and each pair used must have two identical DIMMs installed – that is, both DIMMs in each group must be from the same manufacturer and must have the same capacity (for example, two 512-Mbyte DIMMs or two 1-Gbyte DIMMs).

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



Caution – DIMMs are made of electronic components that are extremely sensitive to static electricity. Static from your clothes or work environment can destroy the modules. Do not remove a DIMM from its antistatic packaging until you are ready to install it on the CPU/Memory module. Handle the modules only by their edges. Do

not touch the components or any metal parts. Always wear an antistatic grounding strap when you handle the modules. For more information, refer to the Sun Fire V445 Server Installation Guide and the Sun Fire V445 Server Service Manual.

For guidelines and complete instructions on how to install and identify DIMMs in a CPU/Memory module, refer to the *Sun Fire V445 Server Service Manual* and the *Sun Fire V445 Server Installation Guide*.

Memory Interleaving

You can maximize the system's memory bandwidth by taking advantage of its memory interleaving capabilities. The Sun Fire V445 server supports two-way interleaving. In most cases, higher interleaving results in improved system performance. However, actual performance results can vary depending on the system application. Two-way interleaving occurs automatically in any DIMM bank where the DIMM capacities in DIMM group 0 match the capacities used in a DIMM group 1. For optimum performance, install identical DIMMs in all four slots in a CPU/Memory module.

Independent Memory Subsystems

Each Sun Fire V445 server CPU/Memory module contains an independent memory subsystem. Memory controller logic incorporated into the UltraSPARC IIIi CPU allows each CPU to control its own memory subsystem.

The Sun Fire V445 server uses a shared memory architecture. During normal system operations, the total system memory is shared by all CPUs in the system.

DIMM Configuration Rules

- You must physically remove a CPU/Memory module from the system before you can install or remove DIMMs.
- You must add DIMMs in pairs.
- Each group used must have two identical DIMMs installed – that is, both DIMMs must be from the same manufacturer and must have the same density and capacity (for example, two 512-Mbyte DIMMs or two 1-Gbyte DIMMs).
- For maximum memory performance and to take full advantage of the Sun Fire V445 server's memory interleaving features, use identical DIMMs in all four slots of a CPU/Memory module.

For information about installing or removing DIMMs, see the *Sun Fire V445 Server Parts Installation and Removal Guide*.

About the ALOM System Controller Card

The Sun Advanced Lights Out Manager (ALOM) system controller card enables access, monitoring, and control of the Sun Fire V445 server from a remote location. It is a fully independent processor card with its own resident firmware, self-diagnostics, and OS.

In addition, the ALOM system controller card functions as the default console connection to the system, through its serial management port. For more information about using the ALOM system controller as the default console connection, see:

- [“About Communicating With the System” on page 26](#)
- [“Using the Serial Management Port” on page 41](#)

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

The ALOM system controller provides the following features:

- Secure Shell (SSH) or Telnet connectivity – Network connectivity can also be disabled

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



FIGURE 4-2 ALOM System Controller Card

The ALOM system controller card features serial and 10BASE-T Ethernet interfaces that provide multiple ALOM system controller software users with simultaneous access to the Sun Fire V445 server. ALOM system controller software users are provided secure password-protected access to the system's Solaris and OpenBoot console functions. ALOM system controller users also have full control over power-on self-test (POST) and OpenBoot Diagnostics tests.



Caution – Although access to the ALOM system controller through the network management port is secure, access through the serial management port is not secure. Therefore, avoid connecting a serial modem to the serial management port.

Note – The ALOM system controller serial management port (labeled SERIAL MGT) and network management port (labeled NET MGT) are present in the Solaris OS device tree as `/dev/ttya`, and in the OpenBoot configuration variables as `ttya`. However, the serial management port does not function as a standard serial connection. If you want to attach a standard serial device to the system (such as a printer), you need to use the DB-9 connector on the system back panel, which corresponds to `/dev/ttyb` in the Solaris device tree, and as `ttvb` in the OpenBoot configuration variables. See [“About the Serial Ports” on page 96](#) for more information.

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

The ALOM system controller card plugs in to a dedicated slot on the motherboard and provides the following ports (as shown in [FIGURE 4-3](#)) through an opening in the system's back panel:

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

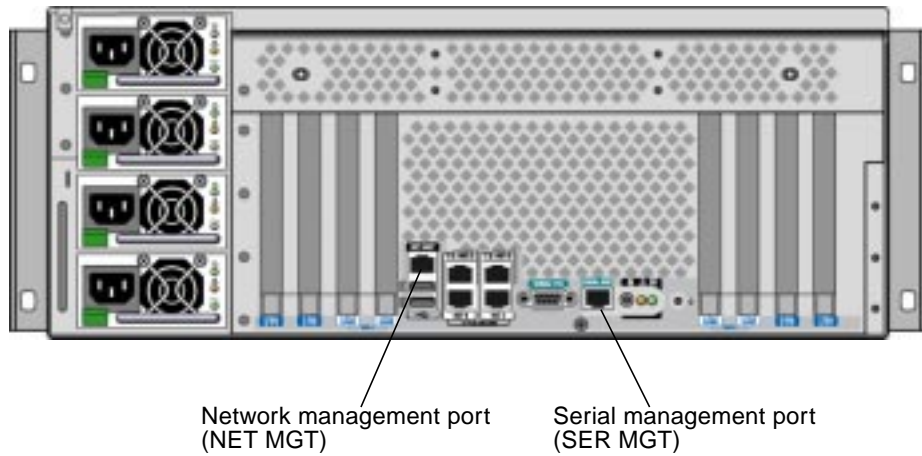


FIGURE 4-3 ALOM System Controller Card Ports

Configuration Rules



Caution – The system supplies power to the ALOM system controller card even when the system is powered off. To avoid personal injury or damage to the ALOM system controller card, you must disconnect the AC power cords from the system before servicing the ALOM system controller card. The ALOM system controller card is not hot-swappable or hot-pluggable.

- The ALOM system controller card is installed in a dedicated slot on the system motherboard. Never move the ALOM system controller card to another system slot, because it is *not* a PCI-compatible card. In addition, do not attempt to install a PCI card into the ALOM system controller slot.
- Avoid connecting a serial modem to the serial management port because it is not secure.
- The ALOM system controller card is *not* a hot-pluggable component. Before installing or removing the ALOM system controller card, you must power off the system and disconnect all system power cords.
- The serial management port on the ALOM system controller cannot be used as a conventional serial port. If your configuration requires a standard serial connection, use the DB-9 port labeled “TTYB” instead.

- The 100BASE-T network management port on the ALOM system controller is reserved for use with the ALOM system controller and the system console. The network management port does not support connections to Gigabit networks. If your configuration requires a high-speed Ethernet port, use one of the Gigabit Ethernet ports instead. For information on configuring the Gigabit Ethernet ports, see [Chapter 7](#).
- The ALOM system controller card must be installed in the system for the system to function properly.

About the PCI Cards and Buses

All system communication with storage, peripherals and network interface devices is mediated by four buses using three Peripheral Component Interconnect (PCI) bridge chips on the system motherboard. The Fire ASIC PCIe Northbridge manages communication between the system main interconnect bus (J-Bus) and two PCIe buses. In addition, two PCIe/PCI-X bridge ASICs manage communication from each PCIe bus to two PCI-X buses, giving the system a total of four PCI buses. The four PCI buses support up to four PCIe interface cards and four PCI-X interface cards, as well as multiple motherboard devices.

[TABLE 4-2](#) describes the PCI bus characteristics and maps each bus to its associated bridge chip, integrated devices, and PCI card slots. All slots comply with PCI Local Bus Specification Revision 2.2.

Note – PCI cards in a Sun Fire V445 server are *not* hot-pluggable or hot-swappable.

TABLE 4-2 PCI Bus Characteristics, Associated Bridge Chips, Motherboard Devices, and PCI Slots

PCIe Bus	Data Rate / Bandwidth	Integrated Devices	PCI Slot Type / Number / Capability
A	2.5 Gb/sec * 8 lanes	Gigabit Ethernet 0	PCIe Slot 0 x16 (wired x8)
		Gigabit Ethernet 1	PCIe Slot 6 x8 (wired x16)
		PCI-X Bridge 0	SAS Controller Expansion Connector **
B	2.5Gb/sec * 8 lanes		PCI-X Slot 2 64-bit 133MHz 3.3v
			PCI-X Slot 3 64-bit 133MHz 3.3v
		PCI-X Bridge 1	PCI-X Slot 4 64-bit 133MHz 3.3v ***
		Gigabit Ethernet 2	PCI-X Slot 5 64-bit 133MHz 3.3v
		Gigabit Ethernet 3	PCIe Slot 1 x16 (wired x8)
		Southbridge M1575 (USB 2.0 Controller DVD-ROM Controller Miscellaneous System Devices)	PCIe Slot 7 x8 (wired x16)

* Data Rate shown is per lane and per direction.

** Internal SAS Controller Card Expansion Connector not in use at time of this release

*** Slot Consumed by the SAS1068 Disk Controller

FIGURE 4-4 shows the PCI card slots on the motherboard.

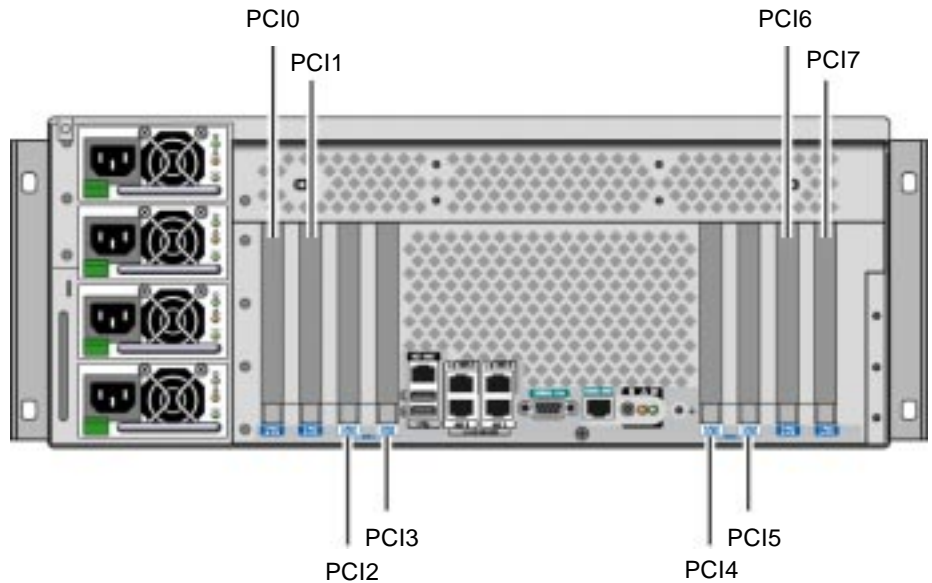


FIGURE 4-4 PCI Slots

[TABLE 4-3](#) lists the device name and path for the eight PCI slots.

TABLE 4-3 PCI Slot Device Names and Paths

PCI Slot	PCIe Bus	Device Name and Base Path (not full path)
PCIe Slot 0	A	/pci@1e,600000/pci@0
PCIe Slot 1	B	/pci@1f,700000/pci@0
PCI-X Slot 2	A	/pci@1e,600000/pci@0
PCI-X Slot 3	A	/pci@1e,600000/pci@0
PCI-X Slot 4	B	/pci@1f,700000/pci@0
PCI-X Slot 5	B	/pci@1f,700000/pci@0
PCIe Slot 6	A	/pci@1e,600000/pci@0
PCIe Slot 7	B	/pci@1f,700000/pci@0

Configuration Rules

- Slots (on the left) accept two long PCI-X cards and two long PCIe cards.

- Slots (on the right) accept two short PCI-X cards and two short PCIe cards
- All PCI-X slots comply with PCI-X local bus specification rev 1.0.
- All PCIe slots comply with PCIe base specification r1.0a and PCI standard SHPC specification, r1.1.
- All PCI-X slots accept either 32-bit or 64-bit PCI cards.
- All PCI-X slots comply with PCI Local Bus Specification Revision 2.2.
- All PCI-X slots accept universal PCI cards.
- Compact PCI (cPCI) cards and SBus cards are not supported.
- You can improve overall system availability by installing redundant network or storage interfaces on separate PCI buses. For additional information, see [“About Multipathing Software” on page 115.](#)

Note – A 33-MHz PCI card plugged in to any of the 66-MHz or 133-MHz slots causes that bus to operate at 33 MHz. PCI-X slots 2 and 3 run at the speed of the slowest card installed. PCI-X slots 4 and 5 run at the speed of the slowest card installed. If two PCI-X 133-MHz cards are installed on the same bus (PCI-X Slots 2 and 3) they each run at 100 MHz. 133-MHz operation is only possible when only one slot is populated with one PCI-X 133-MHz capable card.

For information about installing or removing PCI cards, see the *Sun Fire V445 Server Service Manual*.

About the SAS Controller

The Sun Fire V445 server supports 2 configurations for the SAS controller: the Standard configuration and the Alternate configuration. The Standard configuration embeds the SAS controller logic on the motherboard. The Alternate configuration uses an intelligent, two-channel, SAS controller. This controller resides on PCI Bus 2B and supports a 64-bit, 66-MHz PCI interface.

Either configuration provides hardware RAID mirroring (RAID 0,1) capability with higher performance than conventional software RAID mirroring. Up to two pairs of hard disk drives can be mirrored using a SAS controller.

For more information about RAID configurations, see [“About RAID Technology” on page 120](#). For more information about configuring hardware mirroring using the SAS controller, see [“Creating a Hardware Disk Mirror” on page 124](#).

About the SAS Backplane

The Sun Fire V445 server includes a single SAS backplane with connections for up to eight internal hard disk drives, all of which are hot-pluggable.

The SAS disk backplane accepts eight, low-profile (2.5-inch), SAS disk drives. Each hard disk drive is connected to the backplane with a standard SAS hot-plug disk connector, which makes it easy to add or remove hard disk drives from the system. Disks using SCA connectors provide better serviceability than disks using other types of connectors.

For information about installing or removing a SAS backplane, refer to the *Sun Fire V445 Server Service Manual*.

Configuration Rules

- The SAS backplane requires low-profile (2.5-inch) hard disk drives.
- The SAS disks are hot-pluggable.

For information about installing or removing the SAS backplane, refer to the *Sun Fire V445 Server Service Manual*.

About Hot-Pluggable and Hot-Swappable Components

In a Sun Fire V445 server, the SAS disk drives are *hot-pluggable* components. Hot-pluggable components you can install or remove while the system is running, without affecting system operation. However, you must prepare the OS prior to the hot-plug operation by performing certain system administration tasks.

The power supplies, fan trays, and USB components are *hot-swappable*. Hot-swappable components you can remove and replace without software preparation and without affecting system operation. No other components are hot-swappable.



Caution – You must always leave in place a minimum of two operational power supplies and one operational fan tray in each of the three fan tray pairs.



Caution – The ALOM system controller card is *not* a hot-pluggable component. To avoid personal injury and damage to the card, you must power off the system and disconnect all AC power cords before installing or removing an ALOM system controller card.



Caution – The PCI cards are *not* hot-pluggable components. To avoid damage to the cards, you must power off the system before removing or installing PCI cards. Access to the PCI slots requires removing the top cover, which automatically powers down the system.

Hard Disk Drives

Before performing hard disk drive hot-plug operations, use the Solaris `cfgadm(1m)` utility to prepare the OS. The `cfgadm` utility is a command-line tool for managing hot-plug operations on Sun Fire V445 internal disk drives and external storage arrays. Refer to the `cfgadm` man page.

For more information about the disk drives, see [“About the Internal Disk Drives” on page 87](#). For general hard disk hot-plug procedures, refer to the *Sun Fire V445 Server Service Manual*. For procedures to perform a hard disk hot-plug operation on mirrored and nonmirrored disks, see [“Performing a Mirrored Disk Hot-Plug Operation” on page 134](#) and [“Performing a Nonmirrored Disk Hot-Plug Operation” on page 136](#).



Caution – When hot-plugging a hard disk drive, first ensure that the drive's blue OK-to-Remove indicator is lit. Then, after disconnecting the drive from the SAS backplane, allow 30 seconds or so for the drive to spin down completely before removing it. Failing to let the drive spin down before removing it could damage the drive. See [Chapter 6](#).

Power Supplies

Sun Fire V445 server power supplies are hot-swappable. A power supply is hot-swappable only when it is part of a redundant power configuration, which is a system configured with more than two power supplies in working condition.



Caution – Removing a supply that is one of only two installed could cause undefined behavior in the server and could lead to system shutdown.

For additional information, see [“About the Power Supplies” on page 89](#). For instructions on removing or installing power supplies, refer to the *Sun Fire V445 Server Service Manual*.

System Fan Trays

For procedures on removing and installing fan trays, refer to the Sun Fire V445 Server Service Manual.



Caution – At least one fan must remain operational in each of the three pairs of fan trays to maintain adequate system cooling.

USB Components

There are two USB ports located on the front panel and two on the back panel. For details on the supported components, see [“About the USB Ports” on page 95](#).

About the Internal Disk Drives

The Sun Fire V445 server supports up to eight internal, hot-pluggable 2.5 inch SAS disk drives, attached to a backplane. The system also includes an internal SAS controller. See [“About the SAS Controller” on page 84](#).

Indicators are associated with each drive, indicating the drive’s operating status, hot-plug readiness, and any fault conditions associated with the drive.

[FIGURE 4-5](#) shows the system’s eight internal hard disk drives and highlights the series of indicators on each drive. Disk drives are numbered 0, 1, 2, 3, 4, 5, 6, and 7, with drive 0 being the default system disk.

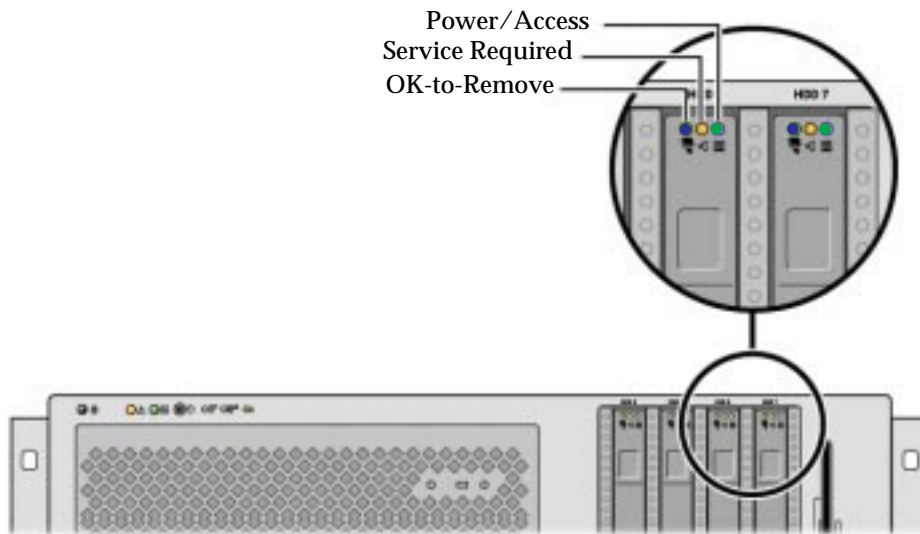


FIGURE 4-5 Hard Disk Drives and Indicators

See [TABLE 4-4](#) for a description of hard disk drive indicators and their function.

TABLE 4-4 Hard Disk Drive Status Indicators

LED	Color	Description
OK-to-Remove	Blue	On - The drive is read for hot-plug removal. Off - Normal operation.
Unused	Amber	
Activity	Green	On - Drive is receiving power. Solidly lit if drive is idle. Flashes while the drive processes a command. Off - Power is off.

Note – If a hard disk drive is faulty, the system Service Required indicator is also lit. See [“Front Panel Indicators” on page 10](#) for more information.

The hot-plug feature of the system’s internal hard disk drives enables you to add, remove, or replace disks while the system continues to operate. This capability significantly reduces system downtime associated with hard disk drive replacement.

Disk drive hot-plug procedures require software commands for preparing the system prior to removing a hard disk drive and for reconfiguring the OS after installing a drive. For detailed instructions, see [Chapter 6](#) and also the *Sun Fire V445 Server Service Manual*.

The Solaris Volume Manager software supplied as part of the Solaris OS allows you to use internal hard disk drives in four software RAID configurations: RAID 0 (striping), RAID 1 (mirroring), and RAID 0+1 (striping plus mirroring). You can also configure drives as *hot-spare*s, disks installed and ready to operate if other disks fail. In addition, you can configure hardware mirroring using the system's SAS controller. For more information about all supported RAID configurations, see [“About RAID Technology” on page 120](#). For more information about configuring hardware mirroring, see [“Creating a Hardware Disk Mirror” on page 124](#).

Configuration Rules

- You must use Sun standard 3.5-inch wide and 2.54-inch high (8.89-cm x 5.08-cm) hard disk drives that are SCSI-compatible and run at 10,000 revolutions per minute (rpm). Drives must be either the single-ended or low-voltage differential (LVD) type.
- The SCSI target address (SCSI ID) of each hard disk drive is determined by the slot location where the drive is connected to the SAS backplane. There is no need to set any SCSI ID jumpers on the hard disk drives themselves.

About the Power Supplies

The Power Distribution Board distributes DC power from four power supplies to all internal system components. The system's four power supplies called power supply 0, power supply 1, power supply 2 and power supply 3 plug in directly to connectors on the power distribution board. Each power supply has a separate AC inlet. Two independent AC power sources should be used to provide redundant AC inlet power. All four power supplies share equally in satisfying the power demands of the system – any two of which can satisfy the entire load of a system with a maximum configuration. AC power is brought to each power supply with a power cord (total of four power cords).

The Sun Fire V445 server's power supplies are modular, hot-swappable units. They are customer replaceable units (CRUs) designed for fast, easy installation or removal, even while the system is fully operational. Power supplies are installed in bays at the rear of the system.

The power supplies operate over an AC input range of 100 240 VAC, 47-63 Hz. Each power supply can provide up to 550 watts of 12V DC power. Each power supply contains a series of status indicators, visible when looking at the back panel of the system. [FIGURE 4-6](#) shows the location of the power supplies and indicators.

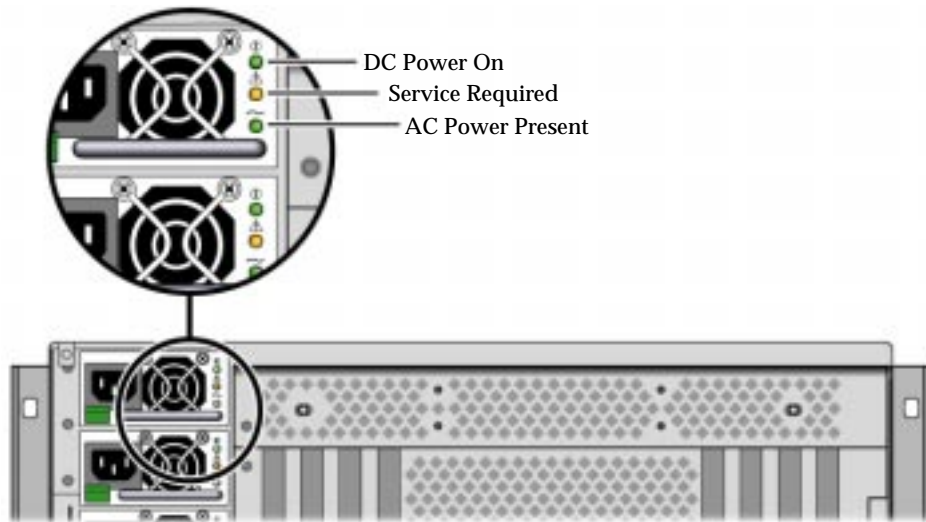


FIGURE 4-6 Power Supplies and Indicators

See [TABLE 4-5](#) for a description of power supply indicators and their function, listed from top to bottom.

TABLE 4-5 Power Supply Status Indicators

Indicator	Color	Notes
DC Power On	Green	This indicator is lit when the system is powered on and the power supply is operating normally.
Service Required	Amber	This indicator is lit if there is a fault in the power supply.
AC Power Present	Green	This indicator is lit when the power supply is plugged in and AC power is available, regardless of system power state.

Note – If a power supply is faulty, the system Service Required indicator is also lit. See [“Front Panel Indicators” on page 10](#) for more information.

Power supplies in a redundant configuration feature a hot-swap capability. You can remove and replace a faulty power supply without shutting down the OS or turning off the system power.

A power supply can be hot-swapped only when there are at least two other power supplies online and working properly. In addition, the cooling fans in each power supply are designed to operate independently of the power supplies. If a power supply fails, but its fans are still operable, the fans continue to operate by drawing power from the other power supply through the power distribution board.

For additional details, see [“About Hot-Pluggable and Hot-Swappable Components” on page 85](#). For information about removing and installing power supplies, see [“Performing a Power Supply Hot-Swap Operation” on page 91](#), and refer to your *Sun Fire V445 Server Service Manual*.

Performing a Power Supply Hot-Swap Operation

You can hot-swap any power supply while two others are installed, online, and operational. Check the Service Required indicators to verify which power supply has failed. The failed power supply causes the amber system Service Required indicator and power supply Service Required indicator to light.

To complete this procedure, refer to the *Sun Fire V445 Server Service Manual*.

Power Supply Configuration Rules

- Hot-swap a power supply only when there are at least two other power supplies online and working properly.
- Good practice is to connect the four power supplies to two separate AC circuits, two supplies per circuit, which enables the system to remain operational if one of the AC circuits fails. Consult your local electrical codes for any additional requirements.

About the System Fan Trays

The system is equipped with six fan trays organized into three redundant pairs. One redundant pair is for cooling the disk drives. The other two redundant pairs are for cooling the CPU/Memory modules, memory DIMMs, I/O subsystem, and provide front-to-rear cooling of the system. Not all fans must be present to provide adequate cooling – only one fan per redundant pair must be present.

Note – All system cooling is provided by the fan trays – power supply fans do not provide system cooling.

The fans in the system plug directly into the motherboard. Each fan is mounted on its own tray and is individually hot-swappable. If either fan in a pair fails the remaining fan is adequate to keep its portion of the system cool. The presence and health of the fans are indicated through six bicolor indicators located on the SAS backplane.

Open the fan tray doors on the top cover of the server to access the system fans. Power supplies are cooled separately, each power supply with its own internal fan.



Caution – Fan trays contain sharp moving parts. Use extreme caution when servicing fan trays and blowers.

FIGURE 4-7 shows all six system fan trays and their corresponding indicators. For each fan in the system, the environmental monitoring subsystem monitors fan speed in revolutions per minute.

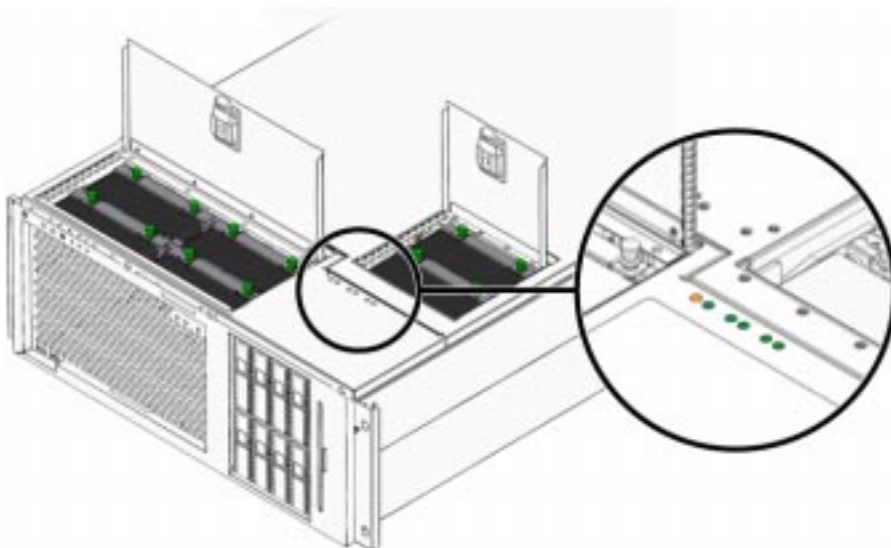


FIGURE 4-7 System Fan Trays and Fan Indicators

Refer to these indicators to determine which fan tray needs to be replaced.

[TABLE 4-6](#) provides a description of the fan tray indicators.

TABLE 4-6 Fan Tray Status Indicators

Indicator	Color	Notes
Power/OK	Green	This indicator is lit when the system is running and the fan tray is operating normally.
Service Required	Yellow	This indicator is lit when the system is running and the fan tray is faulty.

Note – If a fan tray is not present, its corresponding indicator is not lit.

Note – If a fan tray is faulty, the system Service Required indicator is also lit. See [“Front Panel Indicators” on page 10](#) for more information.

The environmental subsystem monitors all fans in the system, and prints a warning and lights the system Service Required indicator if any fan falls below its nominal operating speed. This provides an early warning to an impending fan failure, enabling you to schedule downtime for replacement before an overtemperature condition shuts down the system unexpectedly.

For a fan failure, the following indicators are lit:

Front panel:

- Service Required (amber)
- Operating (green)
- Fan failure (amber)
- CPU over temperature (if the system is overheating)

Top panel:

- Specific fan failure (amber)
- All other fans (green)

Back panel:

- Service Required (amber)
- Running (green)

In addition, the environmental subsystem prints a warning and lights the system Service Required indicator if internal temperature rises above a predetermined threshold, either due to fan failure or external environmental conditions. For additional details, see [Chapter 8](#).

System Fan Configuration Rules

The minimum system configuration requires at least one fan operating per redundant pair.

Note – For instructions on how to remove and install fan trays, refer to the Sun Fire V445 Server Service Manual.

About the USB Ports

The system front and back panels provide two external Universal Serial Bus (USB) ports on two independent controllers to connect USB peripheral devices such as:

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

The USB ports are compliant with the Open Host Controller Interface (Open HCI) specification for USB Revision 1.1 and also 2.0 compliant (EHCI) and capable of 480 Mbps as well as 12 Mbps and 1.5 Mbps. The ports support isochronous and asynchronous modes, and enable data transmission at speeds of 1.5 Mbps and 12 Mbps. Note that the USB data transmission speed is significantly faster than that of the standard serial ports, which operate at a maximum rate of 460.8 Kbaud.

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

For the USB port locations, see [“Locating Back Panel Features” on page 16](#) and [“Locating Front Panel Features” on page 9](#). Also see [“Reference for the USB Connectors” on page 239](#).

Configuration Rules

- USB ports support hot-swapping. You can connect and disconnect the USB cable and peripheral devices while the system is running, without issuing software commands and without affecting system operations. However, you can only hot-swap USB components while the OS is running.
- Hot-swapping USB components is not supported when the system ok prompt is displayed or before the OS boots.
- You can connect up to 126 devices to each of the two USB controllers, for a total of 252 USB devices per system.

About the Serial Ports

The default console connection to the Sun Fire V445 server is through the RJ-45 serial management port (labeled SERIAL MGT) on the back panel of the ALOM system controller card. This port operates only at 9600 baud.

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

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

For the serial port location, see [“Locating Back Panel Features” on page 16](#). Also see [“Reference for the Serial Port Connector” on page 238](#). For more information about the serial management port, see [Chapter 2](#).

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 restoration (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:

- [“About Reliability, Availability, and Serviceability Features” on page 98](#)
- [“About the ALOM System Controller Command Prompt” on page 103](#)
- [“Logging In to the ALOM System Controller” on page 104](#)
- [“About the `scadm` Utility” on page 106](#)
- [“Viewing Environmental Information” on page 107](#)
- [“Controlling the Locator Indicator” on page 108](#)
- [“About Performing OpenBoot Emergency Procedures” on page 109](#)
- [“About Automatic System Restoration” on page 111](#)
- [“Unconfiguring a Device Manually” on page 112](#)
- [“Reconfiguring a Device Manually” on page 114](#)
- [“Enabling the Hardware Watchdog Mechanism and Its Options” on page 114](#)
- [“About Multipathing Software” on page 115](#)

Note – This chapter does not cover detailed troubleshooting and diagnostic procedures. For information about fault isolation and diagnostic procedures, see [Chapter 8](#) and [Chapter 9](#).

About Reliability, Availability, and Serviceability Features

Reliability, availability, and serviceability (RAS) are aspects of a system's design that affect its ability to operate continuously and to minimize the time necessary to service the system.

- Reliability refers to a system's ability to operate continuously without failures and to maintain data integrity.
- System availability encompasses the ability of a system to both recover in the presence of a fault with no impact to the operational environment – and restore in the presence of a fault, with minimal impact to the operational environment.
- Serviceability refers to the time it takes to diagnose and complete the repair policy of a system, following a system failure.

Together, reliability, availability, and serviceability features provide near continuous system operation.

To deliver high levels of reliability, availability, and serviceability, the Sun Fire V445 server offers the following features:

- Hot-pluggable disk drives
- Redundant, hot-swappable power supplies, fan trays, and USB components
- Sun Advanced Lights Out Manager (ALOM) system controller with SSH connections for all remote monitoring and control
- Environmental monitoring
- Automatic system restoration (ASR) capabilities for PCI cards and memory DIMMs
- Hardware watchdog mechanism and externally initiated reset (XIR) capability
- Internal hardware disk mirroring (RAID 0/1)
- Support for disk and network multipathing with automatic failover
- Error correction and parity checking for improved data integrity
- Easy access to all internal replaceable components
- Full in-rack serviceability for all components

Hot-Pluggable and Hot-Swappable Components

Sun Fire V445 hardware is designed to support hot-plugging of internal disk drives. By using the proper software commands, you can install or remove these components while the system is running. The server also supports hot-swapping of

power supplies, fan trays, and USB components. These components can be removed and installed without issuing software commands. Hot-plug and hot-swap technology significantly increase the system's serviceability and availability, by providing you with the ability to do the following:

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

For additional information about the system's hot-pluggable and hot-swappable components, see [“About Hot-Pluggable and Hot-Swappable Components” on page 85](#).

n+2 Power Supply Redundancy

The system features four hot-pluggable power supplies, any two of which are capable of handling the system's entire load. Thus, the four power supplies provide N+N redundancy, enabling the system to continue operating should up to two of the power supplies or its AC power source fail.

For more information about power supplies, redundancy, and configuration rules, see [“About the Power Supplies” on page 89](#).

ALOM System Controller

Sun Advanced Lights Out Manager (ALOM) system controller is a secure server management tool that comes preinstalled on the Sun Fire V445 server, in the form of a module with preinstalled firmware. It lets you monitor and control your server over a serial line or over a network. The ALOM system controller provides remote system administration for geographically distributed or physically inaccessible systems. You can connect to the ALOM system controller card using a local alphanumeric terminal, a terminal server, or a modem connected to its serial management port, or over a network using its 10BASE-T network management port.

For more details about the ALOM system controller hardware, see [“About the ALOM System Controller Card” on page 77](#).

For information about configuring and using the ALOM system controller, see:

- [“About the ALOM System Controller Command Prompt” on page 103](#)
- [“Logging In to the ALOM System Controller” on page 104](#)
- [“About the `scadm` Utility” on page 106](#)
- *Sun Advanced Lights Out Manager (ALOM) Online Help*

Environmental Monitoring and Control

The Sun Fire V445 server features an environmental monitoring subsystem that protects the server and its components against:

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

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

The environmental monitoring subsystem uses an industry-standard I²C bus. The I²C bus is a simple two-wire serial bus used throughout the system to allow the monitoring and control of temperature sensors, fan trays, power supplies, and status indicators.

Temperature sensors are located throughout the system to monitor the ambient temperature of the system, the CPUs, and the CPU die temperature. The monitoring subsystem polls each sensor and uses the sampled temperatures to report and respond to any overtemperature or undertemperature conditions. Additional I²C sensors detect component presence and component faults.

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

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

The monitoring subsystem is also designed to detect fan failures. The system features integral power supply fan trays, and six fan trays each containing one fan. Four fans are for cooling CPU/Memory modules and two fans are for cooling the disk drive. All fans are hot-swappable. If any fan fails, the monitoring subsystem

detects the failure and generates an error message to the system console, logs the message in the `/var/adm/messages` file, and lights the Service Required indicators.

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

Note – The power supply fans are not required for system cooling. However, if a power supply fails, its fan obtains power from other power supplies and through the motherboard to maintain the cooling function.

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

Automatic System Restoration

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

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

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

Note – Control over the system ASR functionality is provided by several OpenBoot commands and configuration variables. For additional details, see [“About Automatic System Restoration” on page 209](#).

Sun StorEdge Traffic Manager

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

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

For more information, see [“Sun StorEdge Traffic Manager” on page 119](#). Also consult your Solaris software documentation.

Hardware Watchdog Mechanism and XIR

To detect and respond to a system hang, should one ever occur, the Sun Fire V445 server features a hardware “watchdog” mechanism, which is a hardware timer that is continually reset as long as the operating system is running. In the event of a system hang, the operating system is no longer able to reset the timer. The timer will then expire and cause an automatic externally initiated reset (XIR), eliminating the need for operator intervention. When the hardware watchdog mechanism issues the XIR, debug information is displayed on the system console. The hardware watchdog mechanism is present by default, but it requires some additional setup in the Solaris OS.

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

For more information, see:

- [“Enabling the Hardware Watchdog Mechanism and Its Options” on page 114](#)
- [Chapter 8](#) and [Chapter 9](#)

Support for RAID Storage Configurations

By attaching one or more external storage devices to the Sun Fire V445 server, you can use a redundant array of independent disks (RAID) software application such as Solstice DiskSuite™ to configure system disk storage in a variety of different RAID levels. Configuration options include RAID 0 (striping), RAID 1 (mirroring), RAID 0+1 (striping plus mirroring), RAID 1+0 (mirroring plus striping), and RAID 5

(striping with interleaved parity). You choose the appropriate RAID configuration based on the price, performance, reliability, and availability goals for your system. You can also configure one or more disk drives to serve as “hot spares” to fill in automatically in the event of a disk drive failure.

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

For more information, see:

- [“About Volume Management Software” on page 118](#)
- [“About RAID Technology” on page 120](#)
- [“Creating a Hardware Disk Mirror” on page 124](#)

Error Correction and Parity Checking

DIMMs employ error-correcting code (ECC) to ensure high levels of data integrity. The system reports and logs correctable ECC errors. (A correctable ECC error is any single-bit error in a 128-bit field.) Such errors are corrected as soon as they are detected. The ECC implementation can also detect double-bit errors in the same 128-bit field and multiple-bit errors in the same nibble (4 bits). In addition to providing ECC protection for data, parity protection is also used on the PCI and UltraSCSI buses, and in the UltraSPARC IIIi CPU internal caches. ECC detection and correction for DRAM is present in the 1 Mbyte on-chip ecache SRAM of the UltraSPARC-IIIi processor.

About the ALOM System Controller Command Prompt

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, see the *Sun Advanced Lights Out Manager (ALOM) Online Help*.

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.

TABLE 5-1

<code>sc> poweroff -f -y</code>
<code>sc> poweroff -fy</code>

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 32](#)

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

- [“Using the Serial Management Port” on page 41](#)
- [“Activating the Network Management Port” on page 42](#)

▼ To Log In to the ALOM System Controller

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

1. **If you are logged in to the system console, type #. to get to the `sc>` prompt.**
Press the hash key, followed by the period key. Then press the Return key.

2. **At the login prompt, enter the login name and press Return.**

The default login name is `admin`.

TABLE 5-2

Sun(tm) Advanced Lights Out Manager 1.1
Please login: <code>admin</code>

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

TABLE 5-3

Please Enter password:
<code>sc></code>

Note – There is no default password. You must assign a password during initial system configuration. For more information, see your *Sun Fire V445 Server Installation Guide* and *Sun Advanced Lights Out Manager (ALOM) Online Help*.



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 indicator on and off, or perform maintenance tasks on the ALOM system controller card itself. For more information, see:

About the `scadm` Utility

The System Controller Administration (`scadm`) utility, which is part of the Solaris OS, enables you to perform many ALOM tasks while logged in to the host server. The `scadm` 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 superuser to use the `scadm` utility. The `scadm` utility uses the following syntax:

TABLE 5-4

<code>scadm</code> <i>command</i>

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
- *Sun Advanced Lights Out Manager (ALOM) Online Help*

Viewing Environmental Information

Use the `showenvironment` command to view environment information.

▼ 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.

TABLE 5-5

```
sc> showenvironment

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

-----
System Temperatures (Temperatures in Celsius):
-----
```

Sensor	Status	Temp	LowHard	LowSoft	LowWarn	HighWarn	HighSoft	HighHard
C1.P0.T_CORE	OK	72	-20	-10	0	108	113	120
C1.P0.T_CORE	OK	68	-20	-10	0	108	113	120
C2.P0.T_CORE	OK	70	-20	-10	0	108	113	120
C3.P0.T_CORE	OK	70	-20	-10	0	108	113	120
C0.T_AMB	OK	23	-20	-10	0	60	65	75
C1.T_AMB	OK	23	-20	-10	0	60	65	75
C2.T_AMB	OK	23	-20	-10	0	60	65	75
C3.T_AMB	OK	23	-20	-10	0	60	65	75
FIRE.T_CORE	OK	40	-20	-10	0	80	85	92
MB.IO.T_AMB	OK	31	-20	-10	0	70	75	82
FIOB.T_AMB	OK	26	-18	-10	0	65	75	85
MB.T_AMB	OK	28	-20	-10	0	70	75	82
....								

The information this command can display includes temperature, power supply status, front panel indicator status, 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.

Controlling the Locator Indicator

The Locator indicator locates the server in a data center or lab. When the Locator indicator is enabled, the white Locator indicator flashes. You can control the Locator indicator either from the Solaris command prompt or from the `sc>` prompt. You can also reset the Locator indicator with the Locator indicator button.

▼ To Control the Locator Indicator

1. To turn on the Locator indicator, do one of the following:

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

TABLE 5-6

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

- From the ALOM system controller command prompt, type:

TABLE 5-7

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

2. To turn off the Locator indicator, do one of the following:

- In Solaris, log in as root and type:

TABLE 5-8

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

- From the ALOM system controller command prompt, type:

TABLE 5-9

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

3. To display the state of the Locator indicator, do one of the following:

- In the Solaris OS, log in as root and type:

TABLE 5-10

```
# /usr/sbin/locator
The 'system' locator is on.
```

- From the ALOM system controller command prompt, type:

TABLE 5-11

```
sc> locator
The 'system' locator is on.
```

Note – You do not need user permissions to use the `locator` commands.

About Performing 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 Sun Fire V445 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.

The following sections describe how to perform the functions of the Stop commands on systems that use USB keyboards, such as the Sun Fire V445 server. These same functions are available through Sun Advanced Lights Out Manager (ALOM) system controller software.

Stop-A Function

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 [“Entering the ok Prompt” on page 35](#).

Stop-N Function

The Stop-N function is not available. However, you can reset OpenBoot configuration variables to their default values 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 Emulate the Stop-N Function

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

TABLE 5-12

```
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:

TABLE 5-13

```
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.

TABLE 5-14

<pre>sc> console</pre>
<pre>ok</pre>

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

Stop-F Function

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

Stop-D Function

The Stop-D (Diags) key sequence is not supported on systems with USB keyboards. However, the Stop-D function can be closely emulated with ALOM software by enabling the Diagnostics mode.

In addition, you can emulate Stop-D function using the ALOM system controller `bootmode diag` command. For more information, see the *Sun Advanced Lights Out Manager (ALOM) Online Help*.

About Automatic System Restoration

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

Automatic system restoration 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 autoconfiguring 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.

For more information about ASR, see [“About Automatic System Restoration” on page 209](#).

Unconfiguring a Device Manually

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 *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 the following table

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

TABLE 5-15 Device Identifiers and Devices

Device Identifiers	Devices
cpu0-bank0, cpu0-bank1, cpu0-bank2, cpu0-bank3, ... cpu3-bank0, cpu3-bank1, cpu3-bank2, cpu3-bank3	Memory banks 0 – 3 for each CPU
cpu0-bank*, cpu1-bank*, ... cpu3-bank*	All memory banks for each CPU
ide	On-board IDE controller
net0, net1, net2, net3	On-board Ethernet controllers
ob-scsi	SAS controller
pci0, ... pci7	PCI slots 0 – 7
pci-slot*	All PCI slots
pci*	All on-board PCI devices (on-board Ethernet, SAS) and all PCI slots

TABLE 5-15 Device Identifiers and Devices (Continued)

Device Identifiers	Devices
hba8, hba9	PCI bridge chips 0 and 1, respectively
usb0, ..., usb4	USB devices
*	All devices

- You can determine full physical device paths by typing:

```
ok show-devs
```

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

- You can display a list of current device aliases by typing:

```
ok devalias
```

- You can also create your own device alias for a physical device by typing:

```
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.

Reconfiguring a Device Manually

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

▼ 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 the following table

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

For a list of device identifiers and devices, see [TABLE 5-15](#).

Enabling the Hardware Watchdog Mechanism and Its Options

For background information about the hardware watchdog mechanism and related externally initiated reset (XIR) functionality, see:

- [“Hardware Watchdog Mechanism and XIR” on page 102](#)

▼ To Enable the Hardware Watchdog Mechanism and Its Options

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

```
set watchdog_enable = 1
```

2. To obtain the `ok` prompt, type:

TABLE 5-16

```
# init 0
```

3. Reboot the system so that the changes can take effect.
4. To have the hardware watchdog mechanism automatically reboot the system in case of system hang, at the `ok` prompt, type:

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

5. To generate automated crash dumps in case of system hang, at the `ok` prompt, type:

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

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

About Multipathing Software

Multipathing software allows you to 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 Sun Fire V445 server, three different types of multipathing software are available:

- Solaris IP Network Multipathing software provides multipathing and load-balancing capabilities for IP network interfaces.
- 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.
- VERITAS Volume Manager

For information about setting up redundant hardware interfaces for networks, see [“About Redundant Network Interfaces” on page 142](#).

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 Sun StorEdge Traffic Manager, see [“Sun StorEdge Traffic Manager” on page 102](#) and refer to your Solaris OS documentation.

For information about VERITAS Volume Manager and its DMP feature, see [“About Volume Management Software” on page 118](#) and refer to the documentation provided with the VERITAS Volume Manager software.

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 SAS controller.

This chapter contains the following sections:

- [“About Disk Volumes” on page 118](#)
- [“About Volume Management Software” on page 118](#)
- [“About RAID Technology” on page 120](#)
- [“About Hardware Disk Mirroring” on page 122](#)
- [“About Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names” on page 123](#)
- [“Creating a Hardware Disk Mirror” on page 124](#)
- [“Creating a Hardware Mirrored Volume of the Default Boot Device” on page 126](#)
- [“Creating a Hardware Striped Volume” on page 128](#)
- [“Configuring and Labeling a Hardware RAID Volume for Use in the Solaris Operating System” on page 129](#)
- [“Deleting a Hardware Disk Mirror” on page 132](#)
- [“Performing a Mirrored Disk Hot-Plug Operation” on page 134](#)
- [“Performing a Nonmirrored Disk Hot-Plug Operation” on page 136](#)

About 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 OS 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.

About Volume Management Software

Volume management software lets you create disk volumes. Sun Microsystems offers two different volume management applications for use on the Sun Fire V445 server:

- Solaris Volume Manager software
- VERITAS 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, VERITAS Volume Manager 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 Sun Fire V445 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 Sun Fire V445 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)
- 2 GByte PCI Single Fibre-Channel Host Adapter (Sun part number x6767A)
- 2 GByte 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 VERITAS Volume Manager instead. See [“Creating a Hardware Disk Mirror” on page 124](#) and [“About Volume Management Software” on page 118](#).

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

About 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:

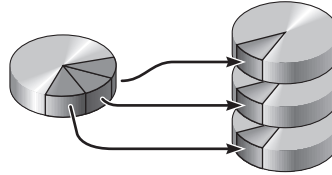
- Disk concatenation
- Disk striping, integrated stripe (IS), or IS volumes (RAID 0)
- Disk mirroring, integrated mirror (IM), or IM volumes (RAID 1)
- Hot-spares

Disk Concatenation

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

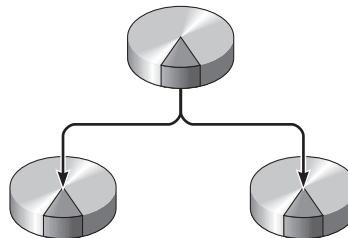
Disk striping, Integrated Stripe (IS), or RAID 0 is a technique for increasing system throughput by using several disk drives in parallel. In nonstriped disks the OS writes a single block to a single disk. In a striped arrangement, each block is divided and portions of the data are written to different disks simultaneously.



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

RAID 1: Disk Mirroring or Integrated Mirror (IM)

Disk mirroring, Integrated Mirror (IM), or 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.



Whenever the OS 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 OS 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.

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

On the Sun Fire V445 server, you can configure hardware disk mirroring using the SAS controller. This provides higher performance than with conventional software mirroring using volume management software. For more information, see:

- [“Creating a Hardware Disk Mirror” on page 124](#)
- [“Deleting a Hardware Disk Mirror” on page 132](#)
- [“Performing a Mirrored Disk Hot-Plug Operation” on page 134](#)

Hot-Spares

In a *hot-spares* arrangement, one or more disk 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.

About Hardware Disk Mirroring

On the Sun Fire V445 server, the SAS controller supports mirroring and striping using the Solaris OS `raidctl` utility.

A hardware RAID volume created under the `raidctl` utility behaves slightly differently than one created using volume management software. Under a software volume, each device has its own entry in the virtual device tree, and read/write operations are performed to both virtual devices. Under hardware RAID volumes, only one device appears in the device tree. Member disk devices are invisible to the operating system, and are accessed only by the SAS controller.

Note – The Sun Fire V445 server’s on-board controller can configure as many as two RAID sets. Prior to volume creation, ensure that the member disks are available and that there are not two sets already created.



Caution – Creating RAID volumes using the on-board controller destroys all data on the member disks. The disk controller's volume initialization procedure reserves a portion of each physical disk for metadata and other internal information used by the controller. Once the volume initialization is complete, you can configure the volume and label it using `format(1M)`. You can then use the volume in the Solaris Operating System.



Caution – If a RAID Volume is created using the on-board controller and a disk drive in the volume set is removed without deleting the RAID Volume, the disk will not be useable in the Solaris Operating System unless special procedures are followed. Contact Sun Services if you have removed a disk from a RAID Volume and cannot reuse the drive.

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

In order to perform a disk hot-plug 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` file(s).

These error messages typically refer to a failed hard disk 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 6-1](#) to associate internal disk slot numbers with the logical and physical device names for each hard disk drive.

TABLE 6-1 Disk Slot Numbers, Logical Device Names, and Physical Device Names

Disk Slot Number	Logical Device Name*	Physical Device Name
Slot 0	c1t0d0	/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1/sd@0,0
Slot 1	c1t1d0	/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1/sd@1,0
Slot 2	c1t2d0	/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1/sd@2,0
Slot 3	c1t3d0	/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1/sd@3,0
Slot 4	c1t4d0	/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1/sd@4,0
Slot 5	c1t5d0	/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1/sd@5,0
Slot 6	c1t6d0	/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1/sd@6,0
Slot 7	c1t7d0	/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1/sd@7,0

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

Creating a Hardware Disk Mirror

Perform this procedure to create an internal hardware disk mirror (IM or RAID 1) configuration on your system.

Verify which disk drive corresponds with which logical device name and physical device name. See:

- [“About Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names” on page 123](#)

▼ To Create a Hardware Disk Mirror

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

TABLE 6-2

<pre># raidctl No RAID volumes found.</pre>

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

TABLE 6-3

# raidctl				
RAID	Volume	RAID	RAID	Disk
Volume	Type	Status	Disk	Status

c0t4d0	IM	OK	c0t5d0	OK
			c0t4d0	OK

The example 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:**

TABLE 6-4

raidctl -c master slave

For example:

TABLE 6-5

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:**

TABLE 6-6

# raidctl				
RAID	RAID	RAID	Disk	
Volume	Status	Disk	Status	

c1t0d0	RESYNCING	c1t0d0	OK	
		c1t1d0	OK	

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

Note – The process of synchronizing a drive may take up to 60 minutes.

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

TABLE 6-7

#	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:

- [“Performing a Mirrored Disk Hot-Plug Operation” on page 134](#)

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

Creating a Hardware Mirrored Volume of the Default Boot Device

Due to the volume initialization that occurs on the disk controller when a new volume is created, the volume must be configured and labeled using the `format(1M)` utility prior to use with the Solaris Operating System (see [“Configuring and Labeling a Hardware RAID Volume for Use in the Solaris Operating System” on page 129](#)). Because of this limitation, `raidctl(1M)` blocks the creation of a hardware RAID volume if any of the member disks currently have a file system mounted.

This section describes the procedure required to create a hardware RAID volume containing the default boot device. Since the boot device always has a mounted file system when booted, an alternate boot medium must be employed, and the volume created in that environment. One alternate medium is a network installation image in single-user mode (refer to the *Solaris 10 Installation Guide* for information about configuring and using network-based installations).

▼ To Create a Hardware Mirrored Volume of the Default Boot Device

1. Determine which disk is the default boot device

From the OpenBoot ok prompt, type the `printenv` command, and if necessary the `devalias` command, to identify the default boot device. For example:

TABLE 6-8

<code>ok printenv boot-device</code>
<code>boot-device = disk</code>
<code>ok devalias disk</code>
<code>disk /pci@780/pci@0/pci@9/scsi@0/disk@0,0</code>

2. Type the `boot net -s` command.

TABLE 6-9

<code>ok boot net -s</code>

3. Once the system has booted, use the `raidctl(1M)` utility to create a hardware mirrored volume, using the default boot device as the primary disk.

See “[Configuring and Labeling a Hardware RAID Volume for Use in the Solaris Operating System](#)” on page 129. For example:

TABLE 6-10

<code># raidctl -c c0t0d0 c0t1d0</code>
Creating RAID volume c0t0d0 will destroy all data on member disks, proceed
(yes/no)? yes
Volume c0t0d0 created
#

4. Install the volume with the Solaris Operating System using any supported method.

The hardware RAID volume `c0t0d0` appears as a disk to the Solaris installation program.

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

Creating a Hardware Striped Volume

Use this procedure to create a hardware striped (IS or RAID 0) volume.

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

See [“About Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names” on page 123.](#)

To verify the current RAID configuration, type:

TABLE 6-11

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

The preceding example indicates that no RAID volume exists.

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:**

TABLE 6-12

```
# raidctl -c -r 0 disk1 disk2 ...
```

The creation of the RAID volume is interactive, by default. For example:

TABLE 6-13

```
# raidctl -c -r 0 c0t1d0 c0t2d0 c0t3d0
Creating RAID volume c0t1d0 will destroy all data on member disks,
proceed
(yes/no)? yes
Volume 'c0t1d0' created
#
```

When you create a RAID striped volume, the other member drives (in this case, c0t2d0 and c0t3d0) disappear from the Solaris device tree.

As an alternative, you can use the `-f` option to force the creation if you are sure of the member disks, and sure that the data on all other member disks can be lost. For example:

TABLE 6-14

```
# raidctl -f -c -r 0 c0t1d0 c0t2d0 c0t3d0
Volume 'c0t1d0' created
#
```

3. To check the status of a RAID striped volume, type:

TABLE 6-15

# raidctl				
RAID	Volume	RAID	RAID	Disk
Volume	Type	Status	Disk	Status

c0t1d0	IS	OK	c0t1d0	OK
			c0t2d0	OK
			c0t3d0	OK

The example shows that the RAID striped volume is online and functioning.

Under RAID 0 (disk striping), there is no replication of data across drives. The data is written to the RAID volume across all member disks in a round-robin fashion. If any one disk is lost, all data on the volume is lost. For this reason, RAID 0 cannot be used to ensure data integrity or availability, but can be used to increase write performance in some scenarios.

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



Configuring and Labeling a Hardware RAID Volume for Use in the Solaris Operating System

After a creating a RAID volume using `raidctl`, use `format(1M)` to configure and label the volume before attempting to use it in the Solaris Operating System.

1. Start the `format` utility

TABLE 6-16

```
# format
```

The `format` utility might generate messages about corruption of the current label on the volume, which you are going to change. You can safely ignore these messages.

2. Select the disk name that represents the RAID volume that you have configured.

In this example, `c0t2d0` is the logical name of the volume.

TABLE 6-17

```
# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
    0. c0t0d0 <SUN72G cyl 14084 alt 2 hd 24 sec 424>
       /pci@780/pci@0/pci@9/scsi@0/sd@0,0
    1. c0t1d0 <SUN72G cyl 14084 alt 2 hd 24 sec 424>
       /pci@780/pci@0/pci@9/scsi@0/sd@1,0
    2. c0t2d0 <SUN72G cyl 14084 alt 2 hd 24 sec 424>
       /pci@780/pci@0/pci@9/scsi@0/sd@2,0
Specify disk (enter its number): 2
selecting c0t2d0
[disk formatted]
FORMAT MENU:
    disk          - select a disk
    type          - select (define) a disk type
    partition     - select (define) a partition table
    current       - describe the current disk
    format        - format and analyze the disk
    fdisk         - run the fdisk program
    repair        - repair a defective sector
    label         - write label to the disk
    analyze       - surface analysis
    defect        - defect list management
    backup        - search for backup labels
    verify        - read and display labels
    save          - save new disk/partition definitions
    inquiry       - show vendor, product and revision
    volname       - set 8-character volume name
    !<cmd>        - execute <cmd>, then return
quit
```



Caution – If a RAID Volume is created using the on-board controller and a disk drive in the volume set is removed without deleting the RAID Volume, the disk will not be useable in the Solaris Operating System unless special procedures are followed. Contact Sun Services if you have removed a disk from a RAID Volume and cannot reuse the drive

3. Type the `type` command at the `format>` prompt, then select 0 (zero) to auto configure the volume.

For example:

TABLE 6-18

```
format> type

AVAILABLE DRIVE TYPES:
    0. Auto configure
    1. DEFAULT
    2. SUN72G
    3. SUN72G
    4. other
Specify disk type (enter its number)[3]: 0
c0t2d0: configured with capacity of 68.23GB
<LSILOGIC-LogicalVolume-3000 cyl 69866 alt 2 hd 16 sec 128>
selecting c0t2d0
[disk formatted]
```

4. Use the `partition` command to partition, or *slice*, the volume according to your desired configuration.

See the `format(1M)` man page for additional details.

5. Write the new label to the disk using the `label` command.

TABLE 6-19

```
format> label
Ready to label disk, continue? yes
```

6. Verify that the new label has been written by printing the disk list using the `disk` command.

TABLE 6-20

```
format> disk

AVAILABLE DISK SELECTIONS:
  0. c0t0d0 <SUN72G cyl 14084 alt 2 hd 24 sec 424>
    /pci@780/pci@0/pci@9/scsi@0/sd@0,0
  1. c0t1d0 <SUN72G cyl 14084 alt 2 hd 24 sec 424>
    /pci@780/pci@0/pci@9/scsi@0/sd@1,0
  2. c0t2d0 <LSILOGIC-LogicalVolume-3000 cyl 69866 alt 2 hd
16 sec 128>
    /pci@780/pci@0/pci@9/scsi@0/sd@2,0
Specify disk (enter its number)[2]:
```

Note that `c0t2d0` now has a type indicating it is an `LSILOGIC-LogicalVolume`.

7. Exit the `format` utility.

The volume can now be used in the Solaris Operating System.

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

Deleting a Hardware Disk Mirror

Perform this procedure to remove a hardware disk mirror configuration from your system.

Verify which disk drive corresponds with which logical device name and physical device name. See:

- [“About Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names” on page 123](#)

▼ To Delete a Hardware Disk Mirror

1. Determine the name of the mirrored volume. Type:

TABLE 6-21

# 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.

2. To delete the volume, type:

TABLE 6-22

raidctl -d <i>mirrored-volume</i>

For example:

TABLE 6-23

raidctl -d c1t0d0
RAID Volume 'c1t0d0' deleted

3. To confirm that you have deleted the RAID array, type:

TABLE 6-24

raidctl

For example:

TABLE 6-25

raidctl
No RAID volumes found

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

Performing a Mirrored Disk Hot-Plug Operation

Verify which disk drive corresponds with which logical device name and physical device name. See:

- [“About Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names” on page 123](#)

You need to refer to the following document to perform this procedure:

- Sun Fire V445 Server Service Manual

▼ To Perform a Mirrored Disk Hot-Plug Operation



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

1. To confirm a failed disk, type:

TABLE 6-26

```
# raidctl
```

For example:

TABLE 6-27

```
# 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.

- 2. **Remove the disk drive, as described in the *Sun Fire V445 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 indicator is lit.
- 3. **Install a new disk drive, as described in the *Sun Fire V445 Server Service Manual*.**
The RAID utility automatically restores the data to the disk.
- 4. **To check the status of a RAID rebuild, type:**

TABLE 6-28

raidctl

For example:

TABLE 6-29

# 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:

TABLE 6-30

# raidctl			
RAID	RAID	RAID	Disk
Volume	Status	Disk	Status

c1t1d0	OK	c1t1d0	OK
		c1t2d0	OK

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

Performing a Nonmirrored Disk Hot-Plug Operation

Verify which disk drive corresponds with which logical device name and physical device name. See:

- [“About Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names” on page 123](#)

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

You need to refer to the following document to perform this procedure:

- Sun Fire V445 Server Service Manual

▼ To View the Status of the SCSI Devices

1. Type:

TABLE 6-31

```
# cfgadm -al
```

For example:

TABLE 6-32

#	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 disk drive hot-plug procedure, these commands issue the following warning message when you invoke these commands on a bus containing the system disk:

TABLE 6-33

```
# cfgadm -x remove_device c0::dsk/clt1d0
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/clt0d0s0    mounted filesystem "/"
/dev/dsk/clt0d0s6    mounted filesystem "/usr"
```

This warning is issued because these commands attempt to quiesce the SAS bus, but the Sun Fire V445 server firmware prevents it. This warning message can be safely ignored in the Sun Fire V445 server, but the following procedure avoids this warning message altogether.

▼ To Perform a Nonmirrored Disk Hot-Plug Operation

1. To remove the disk drive from the device tree, type:

TABLE 6-34

<code>cfgadm -c unconfigure Ap_Id</code>
--

For example:

TABLE 6-35

<code>cfgadm -c unconfigure c1::dsk/c1t3d0</code>

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

2. To verify that the device has been removed from the device tree, type:

TABLE 6-36

# 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
#				

`c1t3d0` is now unavailable and unconfigured. The corresponding disk drive OK-to-Remove indicator is lit.

3. Remove the disk drive, as described in the *Sun Fire V445 Server Parts Installation and Removal Guide*.

The blue OK-to-Remove indicator goes out when you remove the disk drive.

4. **Install a new disk drive, as described in the *Sun Fire V445 Server Parts Installation and Removal Guide*.**
5. **To configure the new disk drive, type:**

TABLE 6-37

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

For example:

TABLE 6-38

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

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

6. **To verify that the new disk drive is in the device tree, type:**

TABLE 6-39

```
# cfgadm -al
```

Ap_Id	Type	Receptacle	Occupant	Condition
c0	scsi-bus	connected	configured	unknown
c0::disk/c0t0d0	CD-ROM	connected	configured	unknown
c1	scsi-bus	connected	configured	unknown
c1::disk/c1t0d0	disk	connected	configured	unknown
c1::disk/c1t1d0	disk	connected	configured	unknown
c1::disk/c1t2d0	disk	connected	configured	unknown
c1::disk/c1t3d0	disk	connected	configured	unknown
c2	scsi-bus	connected	configured	unknown
c2::disk/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.

Managing Network Interfaces

This chapter describes how to manage network interfaces.

This chapter contains the following sections:

- [“About the Network Interfaces” on page 141](#)
 - [“About Redundant Network Interfaces” on page 142](#)
 - [“Attaching a Twisted-Pair Ethernet Cable” on page 143](#)
 - [“Configuring the Primary Network Interface” on page 144](#)
 - [“Configuring Additional Network Interfaces” on page 145](#)
-

About the Network Interfaces

The Sun Fire V445 server provides four on-board Sun Gigabit Ethernet interfaces, which reside on the system motherboard and conform to the IEEE 802.3z Ethernet standard. For an illustration of the Ethernet ports, see [FIGURE 1-7](#). The Ethernet interfaces operate at 10 Mbps, 100 Mbps, and 1000 Mbps.

Four back panel ports with RJ-45 connectors provide access to the on-board Ethernet interfaces. Each interface is configured with a unique Media Access Control (MAC) address. Each connector features two LED indicators, as described in [TABLE 1-5](#). Additional Ethernet interfaces or connections to other network types are available by installing the appropriate PCI interface cards.

The system’s on-board interfaces can be configured for redundancy, or an additional network interface card can serve as a redundant network interface for one of the system’s on-board interfaces. If the active network interface becomes unavailable, the system can automatically switch to the redundant interface to maintain availability. This capability is known as *automatic failover* and must be configured at the Solaris OS level. In addition, this configuration provides outbound data load balancing for increased performance. For additional details, see [“About Redundant Network Interfaces” on page 142](#).

The Ethernet driver is installed automatically during the Solaris installation procedure.

For instructions on configuring the system network interfaces, see:

- [“Configuring the Primary Network Interface” on page 144](#)
- [“Configuring Additional Network Interfaces” on page 145](#)

About Redundant Network Interfaces

Two Sun Gigabit Ethernet (bge0 and bge1) interfaces are on one controller and two (bge2 and bge3) are on another controller. These interfaces are connected to the Broadcom 5714 chips, which are Dual Ethernet controller and PCI-X bridge components.

You can configure your system with redundant network interfaces to provide a highly available network connection. Such a configuration relies on special Solaris software features to detect a failed or failing network interface and automatically switch all network traffic over to the redundant interface. This capability is known as automatic failover.

To set up redundant network interfaces, you can enable automatic failover between the two similar interfaces using the IP Network Multipathing feature of the Solaris OS. For additional details, see [“About Multipathing Software” on page 115](#). You can also install a pair of identical PCI network interface cards, or add a single card that provides an interface identical to one of the two on-board Ethernet interfaces.

To ensure maximum redundancy, each on-board Ethernet interface resides on a different PCI bus. To help further maximize system availability, ensure that any additional network interfaces added for redundancy also reside on separate PCI buses, which are supported by separate PCI bridges. For additional details, see [“About the PCI Cards and Buses” on page 81](#).

Attaching a Twisted-Pair Ethernet Cable

You must complete this task in the following section.

▼ To Attach a Twisted-Pair Ethernet Cable

1. Install the server into the rack.

Refer to the *Sun Fire V445 Server Installation Guide*.

2. Locate the RJ-45 twisted-pair Ethernet (TPE) connector for the appropriate Ethernet interface – the left top (`net0`), left bottom (`net1`), right top (`net2`), right bottom (`net3`).

See [“Locating Back Panel Features” on page 16](#). For a PCI Ethernet adapter card, see the documentation supplied with the card.

3. Connect a Category-5 unshielded twisted-pair (UTP) cable to the appropriate RJ-45 connector on the system back panel.

You should hear the connector tab click into place. The UTP cable length must not exceed 100 meters (328 feet).

4. Connect the other end of the cable to the RJ-45 outlet of the appropriate network device.

You should hear the connector tab click into place.

Consult your network documentation if you need more information about how to connect to your network.

If you are installing your system, complete the installation procedure, as described in the *Sun Fire V445 Server Installation Guide*.

If you are adding an additional network interface to the system, you need to configure that interface. See:

- [“Configuring Additional Network Interfaces” on page 145](#)

Configuring the Primary Network Interface

For background information, see:

- *Sun Fire V445 Server Installation Guide*
- [“About the Network Interfaces” on page 141](#)

If you are using a PCI network interface card, see the documentation supplied with the card.

▼ To Configure the Primary Network Interface

1. **Choose a network port, using the following table as a guide.**

Ethernet Port	OpenBoot PROM Device Alias	Device Path
0	net0	/pci@1e,600000/pci@0/pci@1/pci@0/network@4
1	net1	/pci@1e,600000/pci@0/pci@1/pci@0/network@4,1
2	net2	/pci@1f,700000/pci@0/pci@2/pci@0/network@4
3	net3	/pci@1f,700000/pci@0/pci@2/pci@0/network@4,1

2. **Attach an Ethernet cable to the port you chose.**

See [“Attaching a Twisted-Pair Ethernet Cable” on page 143](#).

3. **Choose a network host name for the system and make a note of it.**

You need to furnish the name in a later step.

The host name must be unique within the network. It can consist only of alphanumeric characters and the dash (-). Do not use a dot in the host name. Do not begin the name with a number or a special character. The name must not be longer than 30 characters.

4. **Determine the unique Internet Protocol (IP) address of the network interface and make a note of it.**

You need to furnish the address in a later step.

An IP address must be assigned by the network administrator. Each network device or interface must have a unique IP address.

During installation of the Solaris OS, the software automatically detects the system's on-board network interfaces and any installed PCI network interface cards for which native Solaris device drivers exist. The OS then asks you to select one of the interfaces as the primary network interface and prompts you for its host name and IP address. You can configure only one network interface during installation of the OS. You must configure any additional interfaces separately, after the OS is installed. For more information, see [“Configuring Additional Network Interfaces” on page 145](#).

Note – The Sun Fire V445 server conforms to the Ethernet 10/100BASE-T standard, which states that the Ethernet 10BASE-T link integrity test function should always be enabled on both the host system and the Ethernet hub. If you have problems establishing a connection between this system and your hub, verify that the Ethernet hub also has the link test function enabled. Consult the manual provided with your hub for more information about the link integrity test function.

After completing this procedure, the primary network interface is ready for operation. However, in order for other network devices to communicate with the system, you must enter the system's IP address and host name into the namespace on the network name server. For information about setting up a network name service, consult:

- *Solaris Naming Configuration Guide* for your specific Solaris release

The device driver for the system's on-board Sun Gigabit Ethernet interfaces is automatically installed with the Solaris release. For information about operating characteristics and configuration parameters for this driver, refer to the following document:

- *Platform Notes: The Sun GigaSwift Ethernet Device Driver*

This document is available on the *Solaris on Sun Hardware AnswerBook*, which is provided on the Solaris CD or DVD for your specific Solaris release.

If you want to set up an additional network interface, you must configure it separately, after installing the OS. See:

- [“Configuring Additional Network Interfaces” on page 145](#)

Configuring Additional Network Interfaces

Perform the following tasks to prepare an additional network interface:

- Install the Sun Fire V445 server as described in the Sun Fire V445 Server Installation Guide.
- If you are setting up a redundant network interface, see [“About Redundant Network Interfaces” on page 142](#).
- If you need to install a PCI network interface card, follow the installation instructions in the *Sun Fire V445 Server Parts Installation and Removal Guide*.
- Attach an Ethernet cable to the appropriate port on the system back panel. See [“Attaching a Twisted-Pair Ethernet Cable” on page 143](#). If you are using a PCI network interface card, see the documentation supplied with the card.

Note – All internal options, except hard disk drives, must be installed by qualified service personnel only. Installation procedures for these components are covered in the *Sun Fire V445 Server Parts Installation and Removal Guide*.

▼ To Configure Additional Network Interfaces

1. Choose a network host name for each new interface.

You need to furnish the name in a later step.

The host name must be unique within the network. It can consist only of alphanumeric characters and the dash (-). Do not use a dot in the host name. Do not begin the name with a number or a special character. The name must not be longer than 30 characters.

Usually an interface host name is based on the system host name. For more information, see the installation instructions accompanying the Solaris software.

2. Determine the Internet Protocol (IP) address for each new interface.

You need to furnish the IP address in a later step.

An IP address must be assigned by your network administrator. Each interface on a network must have a unique IP address.

3. Boot the OS, if it is not already running.

Be sure to perform a reconfiguration boot if you just added a new PCI network interface card. See [“Initiating a Reconfiguration Boot” on page 66](#).

4. Log in to the system as superuser.

5. Create an appropriate `/etc/hostname` file for each new network interface.

The name of the file you create should be of the form `/etc/hostname.typenum`, where *type* is the network interface type identifier (some common types are `ce`, `le`, `hme`, `eri`, and `ge`) and *num* is the device instance number of the interface according to the order in which it was installed in the system.

For example, the file names for the system's Gigabit Ethernet interfaces are `/etc/hostname.ce0` and `/etc/hostname.ce1`. If you add a PCI Fast Ethernet adapter card as a third interface, its file name should be `/etc/hostname.eri0`. At least one of these files, the primary network interface, should exist already, having been created automatically during the Solaris installation process.

Note – The documentation accompanying the network interface card should identify its type. Alternatively, you can enter the `show-devs` command from the `ok` prompt to obtain a list of all installed devices.

6. Edit the `/etc/hostname` file(s) created in [Step 5](#) to add the host name(s) determined in [Step 1](#).

Following is an example of the `/etc/hostname` files required for a system called `sunrise`, which has two on-board Sun Gigabit Ethernet interfaces (`bge0` and `bge1`) and an Intel Ophir Gigabit Ethernet adapter (`e1000g0`). A network connected to the on-board `bge0` and `bge1` interfaces will know the system as `sunrise` and `sunrise-1`, while networks connected to the PCI-based `e1000g0` interface will know the system as `sunrise-2`.

```
sunrise # cat /etc/hostname.bge0
sunrise
sunrise # cat /etc/hostname.bge1
sunrise-1
sunrise # cat /etc/hostname.e1000g0
sunrise-2
```

7. Create an entry in the `/etc/hosts` file for each active network interface.

An entry consists of the IP address and the host name for each interface.

The following example shows an `/etc/hosts` file with entries for the three network interfaces used as examples in this procedure.

```
sunrise # cat /etc/hosts
#
# Internet host table
#
127.0.0.1      localhost
129.144.10.57  sunrise loghost
129.144.14.26  sunrise-1
129.144.11.83  sunrise-2
```

8. Manually configure and enable each new interface using the `ifconfig` command.

For example, for the interface `eri0`, type:

```
# ifconfig e1000g0 plumb inet ip-address netmask ip-netmask .... up
```

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

Note – The Sun Fire V445 server conforms to the Ethernet 10/100BASE-T standard, which states that the Ethernet 10BASE-T link integrity test function should always be enabled on both the host system and the Ethernet hub. If you have problems establishing a connection between this system and your Ethernet hub, verify that the hub also has the link test function enabled. Consult the manual provided with your hub for more information about the link integrity test function.

After completing this procedure, any new network interfaces are ready for operation. However, in order for other network devices to communicate with the system through the new interface, the IP address and host name for each new interface must be entered into the namespace on the network name server. For information about setting up a network name service, consult:

- *Solaris Naming Configuration Guide* for your specific Solaris release

The `ce` device driver for each of the system's on-board Sun Gigabit Ethernet interfaces is automatically configured during Solaris installation. For information about operating characteristics and configuration parameters for these drivers, refer to the following document:

- *Platform Notes: The Sun GigaSwift Ethernet Device Driver*

This document is available on the *Solaris on Sun Hardware AnswerBook*, which is provided on the Solaris CD or DVD for your specific Solaris release.

Diagnostics

This chapter describes the diagnostic tools available for the Sun Fire V445 server.

Topics in this chapter include:

- “Diagnostic Tools Overview” on page 152
- “About Sun Advanced Lights-Out Manager 1.0 (ALOM)” on page 154
- “About Status Indicators” on page 157
- “About POST Diagnostics” on page 157
- “OpenBoot PROM Enhancements for Diagnostic Operation” on page 158
- “OpenBoot Diagnostics” on page 177
- “About OpenBoot Commands” on page 182
- “About Predictive Self-Healing” on page 186
- “About Traditional Solaris OS Diagnostic Tools” on page 191
- “Viewing Recent Diagnostic Test Results” on page 204
- “Setting OpenBoot Configuration Variables” on page 204
- “Additional Diagnostic Tests for Specific Devices” on page 206
- “About Automatic Server Restart” on page 208
- “About Automatic System Restoration” on page 209
- “About SunVTS” on page 215
- “About Sun Management Center” on page 218
- “Hardware Diagnostic Suite” on page 221

Diagnostic Tools Overview

Sun provides a range of diagnostic tools for use with the Sun Fire V445 server.

The diagnostic tools are summarized in [TABLE 8-1](#).

TABLE 8-1 Summary of Diagnostic Tools

Diagnostic Tool	Type	What It Does	Accessibility and Availability	Remote Capability
ALOM system controller	Hardware and Software	Monitors environmental conditions, performs basic fault isolation, and provides remote console access	Can function on standby power and without OS	Designed for remote access
LED indicators	Hardware	Indicates status of overall system and particular components	Accessed from system chassis. Available anytime power is available	Local, but can be viewed with the ALOM system console
POST	Firmware	Tests core components of system	Runs automatically on startup. Available when the OS is not running	Local, but can be viewed with ALOM system controller
OpenBoot Diagnostics	Firmware	Tests system components, focusing on peripherals and I/O devices	Runs automatically or interactively. Available when the OS is not running	Local, but can be viewed with ALOM system controller
OpenBoot commands	Firmware	Display various kinds of system information	Available when the OS is not running	Local, but can be accessed with ALOM system controller
Solaris 10 Predictive Self-Healing	Software	Monitors system errors and reports and disables faulty hardware	Runs in the background when the OS is running	Local, but can be accessed with ALOM system controller
Traditional Solaris OS commands	Software	Displays various kinds of system information	Requires OS	Local, but can be accessed with ALOM system controller

TABLE 8-1 Summary of Diagnostic Tools *(Continued)*

Diagnostic Tool	Type	What It Does	Accessibility and Availability	Remote Capabilities
SunVTS	Software	Exercises and stresses the system, running tests in parallel	Requires OS. Optional package that needs to be installed separately	View and control over network
Sun Management Center	Software	Monitors both hardware environmental conditions and software performance of multiple machines. Generates alerts for various conditions	Requires OS to be running on both monitored and master servers. Requires a dedicated database on the master server	Designed for remote access
Hardware Diagnostic Suite	Software	Exercises an operational system by running sequential tests. Also reports failed FRUs	Separately purchased optional add-on to Sun Management Center. Requires OS and Sun Management Center	Designed for remote access

About Sun Advanced Lights-Out Manager 1.0 (ALOM)

The Sun Fire V445 server ships with Sun Advanced Lights Out Manager (ALOM) 1.0 installed. The system console is directed to ALOM by default and is configured to show server console information on startup.

ALOM enables you to monitor and control your server over either a serial connection (using the SERIAL MGT port), or Ethernet connection (using the NET MGT port). For information on configuring an Ethernet connection, refer to the *ALOM Online Help*.

Note – The ALOM serial port, labelled SERIAL MGT, is for server management only. If you need a general purpose serial port, use the serial port labeled TTYB.

ALOM can send email notification of hardware failures and other events related to the server or to ALOM.

The ALOM circuitry uses standby power from the server. This means that:

- ALOM is active as soon as the server is connected to a power source, and until power is removed by unplugging the power cable.
- ALOM firmware and software continue to be effective when the server OS goes offline.

See [TABLE 8-2](#) for a list of the components monitored by ALOM and the information it provides for each.

TABLE 8-2 What ALOM Monitors

Component	Information
Hard disk drives	Presence and status
System and CPU fans	Speed and status
CPUs	Presence, temperature and any thermal warning or failure conditions
Power supplies	Presence and status
System temperature	Ambient temperature and any thermal warning or failure conditions

TABLE 8-2 What ALOM Monitors (*Continued*)

Component	Information
Server front panel	Status indicator
Voltage	Status and thresholds
SAS and USB circuit breakers	Status

ALOM Management Ports

The default management port is labeled SERIAL MGT. This port uses an RJ-45 connector and is for server management *only* – it supports only ASCII connections to an external console. Use this port when you first begin to operate the server.

Another serial port – labeled TTYB – is available for general purpose serial data transfer. This port uses a DB-9 connector. For information on pinouts, refer to the *Sun Fire V445 Server Installation Guide*.

In addition, the server has one 10BASE-T Ethernet management domain interface, labelled NET MGT. To use this port, ALOM configuration is required. For more information, see the *ALOM Online Help*.

Setting the admin Password for ALOM

When you switch to the ALOM prompt after initial power-on, you will be logged in as the `admin` user and prompted to set a password. You must set this password in order to execute certain commands.

If you are prompted to do so, set a password for the admin user.

The password must:

- contain at least two alphabetic characters
- contain at least one numeric or one special character
- be at least six characters long

Once the password is set, the admin user has full permissions and can execute all ALOM CLI commands.

Basic ALOM Functions

This section covers some basic ALOM functions. For comprehensive documentation, refer to the *ALOM Online Help*.

▼ To Switch to the ALOM Prompt

- Type the default keystroke sequence:

TABLE 8-3

#.

Note – When you switch to the ALOM prompt, you will be logged in with the userid `admin`. See [“Setting the admin Password for ALOM” on page 155](#).

▼ To Switch to the Server Console Prompt

- Type:

TABLE 8-4

<code>sc> console</code>

More than one ALOM user can be connected to the server console stream at a time, but only one user is permitted to type input characters to the console.

If another user is logged on and has write capability, you will see the message below after issuing the `console` command:

TABLE 8-5

<code>sc> Console session already in use. [view mode]</code>

To take console write capability away from another user, type:

TABLE 8-6

<code>sc> console -f</code>

About Status Indicators

For a summary of the server's LED status indicators, see [“Front Panel Indicators” on page 10](#) and [“Back Panel Indicators” on page 17](#).

About POST Diagnostics

POST is a firmware program that is useful in determining if a portion of the system has failed. POST verifies the core functionality of the system, including the CPU module(s), motherboard, memory, and some on-board I/O devices, and generates messages that can determine the nature of a hardware failure. POST can be run even if the system is unable to boot.

POST detects CPU and Memory subsystem faults and is located in a EEPROM on the MBC (ALOM) board. POST can be set to run by the OpenBoot program at power-on by setting three environment variables, the `diag-switch?`, `diag-trigger`, and `diag-level`.

POST runs automatically when the system power is applied, or following a noncritical error reset, if all of the following conditions apply:

- `diag-switch?` is set to `true` or `false` (default is `false`)
- `diag-level` is set to `min`, `max`, or `menus` (default is `min`)
- `diag-trigger` is set to `power-on-reset` and `error-reset` (default is `power-on-reset` and `error-reset`)

If `diag-level` is set to `min` or `max`, POST performs an abbreviated or extended test, respectively. If `diag-level` is set to `menus`, a menu of all the tests executed at power-up is displayed. POST diagnostic and error message reports are displayed on a console.

For information on starting and controlling POST diagnostics, see [“About the `post` Command” on page 165](#).

OpenBoot PROM Enhancements for Diagnostic Operation

This section describes the diagnostic operation enhancements provided by OpenBoot PROM Version 4.15 and later and presents information about how to use the resulting new operational features. Note that the behavior of certain operational features on your system might differ from the behavior described in this section.

What's New in Diagnostic Operation

The following features are the diagnostic operation enhancements:

- New and redefined configuration variables simplify diagnostic controls and allow you to customize a “normal mode” of diagnostic operation for your environment. See [“About the New and Redefined Configuration Variables” on page 158](#).
- New standard (default) configuration enables and runs diagnostics and enables Automatic System Restoration (ASR) capabilities at power-on and after error reset events. See [“About the Default Configuration” on page 159](#).
- Service mode establishes a Sun prescribed methodology for isolating and diagnosing problems. See [“About Service Mode” on page 162](#).
- The `post` command executes the power-on self-test (POST) and provides options that enable you to specify the level of diagnostic testing and verbosity of diagnostic output. See [“About the `post` Command” on page 165](#).

About the New and Redefined Configuration Variables

New and redefined configuration variables simplify diagnostic operation and provide you with more control over the amount of diagnostic output. The following list summarizes the configuration variable changes. See [TABLE 8-7](#) for complete descriptions of the variables.

- New variables:
 - `service-mode?` – Diagnostics are executed at a Sun-prescribed level.
 - `diag-trigger` – Replaces and consolidates the functions of `post-trigger` and `obdiag-trigger`.
 - `verbosity` – Controls the amount and detail of firmware output.
- Redefined variable:

- `diag-switch?` parameter has modified behaviors for controlling diagnostic execution in normal mode on Sun UltraSPARC based volume servers. Behavior of the `diag-switch?` parameter is unchanged on Sun workstations.
- Default value changes:
 - `auto-boot-on-error?` – New default value is `true`.
 - `diag-level` – New default value is `max`.
 - `error-reset-recovery` – New default value is `sync`.

About the Default Configuration

The new standard (default) configuration runs diagnostic tests and enables full ASR capabilities during power-on and after the occurrence of an error reset (RED State Exception Reset, CPU Watchdog Reset, System Watchdog Reset, Software-Instruction Reset, or Hardware Fatal Reset). This is a change from the previous default configuration, which did not run diagnostic tests. When you power on your system for the first time, the change will be visible to you through the increased boot time and the display of approximately two screens of diagnostic output produced by POST and OpenBoot Diagnostics.

Note – The standard (default) configuration does not increase system boot time after a reset that is initiated by user commands from OpenBoot (`reset-all` or `boot`) or from Solaris (`reboot`, `shutdown`, or `init`).

The visible changes are due to the default settings of two configuration variables, `diag-level` (`max`) and `verbosity` (`normal`):

- `diag-level` (`max`) specifies maximum diagnostic testing, including extensive memory testing, which increases system boot time. See [“Reference for Estimating System Boot Time \(to the ok Prompt\)” on page 168](#) for more information about the increased boot time.
- `verbosity` (`normal`) specifies that diagnostic messages and information will be displayed, which usually produces approximately two screens of output. See [“Reference for Sample Outputs” on page 170](#) for diagnostic output samples of `verbosity` settings `min` and `normal`.

After initial power-on, you can customize the standard (default) configuration by setting the configuration variables to define a “normal mode” of operation that is appropriate for your production environment. [TABLE 8-7](#) lists and describes the defaults and keywords of the OpenBoot configuration variables that control diagnostic testing and ASR capabilities. These are the variables you will set to define your normal mode of operation.

Note – The standard (default) configuration is recommended for improved fault isolation and system restoration, and for increased system availability.

TABLE 8-7 OpenBoot Configuration Variables That Control Diagnostic Testing and Automatic System Restoration

OpenBoot Configuration Variable	Description and Keywords
auto-boot?	<p>Determines whether the system automatically boots. Default is <code>true</code>.</p> <ul style="list-style-type: none"> <code>true</code> – System automatically boots after initialization, provided no firmware-based (diagnostics or OpenBoot) errors are detected. <code>false</code> – System remains at the <code>ok</code> prompt until you type <code>boot</code>.
auto-boot-on-error?	<p>Determines whether the system attempts a degraded boot after a nonfatal error. Default is <code>true</code>.</p> <ul style="list-style-type: none"> <code>true</code> – System automatically boots after a nonfatal error if the variable <code>auto-boot?</code> is also set to <code>true</code>. <code>false</code> – System remains at the <code>ok</code> prompt.
boot-device	Specifies the name of the default boot device, which is also the normal mode boot device.
boot-file	Specifies the default boot arguments, which are also the normal mode boot arguments.
diag-device	Specifies the name of the boot device that is used when <code>diag-switch?</code> is <code>true</code> .
diag-file	Specifies the boot arguments that are used when <code>diag-switch?</code> is <code>true</code> .
diag-level	<p>Specifies the level or type of diagnostics that are executed. Default is <code>max</code>.</p> <ul style="list-style-type: none"> <code>off</code> – No testing. <code>min</code> – Basic tests are run. <code>max</code> – More extensive tests might be run, depending on the device. Memory is extensively checked.
diag-out-console	<p>Redirects system console output to the system controller.</p> <ul style="list-style-type: none"> <code>true</code> – Redirects output to the system controller. <code>false</code> – Restores output to the local console. <p>Note: See your system documentation for information about redirecting system console output to the system controller. (Not all systems are equipped with a system controller.)</p>
diag-passes	<p>Specifies the number of consecutive executions of OpenBoot Diagnostics self-tests that are run from the OpenBoot Diagnostics (<code>obdiag</code>) menu. Default is <code>1</code>.</p> <p>Note: <code>diag-passes</code> applies only to systems with firmware that contains OpenBoot Diagnostics and has no effect outside the OpenBoot Diagnostics menu.</p>

TABLE 8-7 OpenBoot Configuration Variables That Control Diagnostic Testing and Automatic System Restoration (*Continued*)

OpenBoot Configuration Variable	Description and Keywords
diag-script	<p>Determines which devices are tested by OpenBoot Diagnostics. Default is <code>normal</code>.</p> <ul style="list-style-type: none"> • <code>none</code> – OpenBoot Diagnostics do not run. • <code>normal</code> – Tests all devices that are expected to be present in the system's baseline configuration for which self-tests exist. • <code>all</code> – Tests all devices that have self-tests.
diag-switch?	<p>Controls diagnostic execution in normal mode. Default is <code>false</code>.</p> <p><i>For servers:</i></p> <ul style="list-style-type: none"> • <code>true</code> – Diagnostics are <i>only</i> executed on power-on reset events, but the level of test coverage, verbosity, and output is determined by user-defined settings. • <code>false</code> – Diagnostics are executed upon next system reset, but only for those class of reset events specified by the OpenBoot configuration variable <code>diag-trigger</code>. The level of test coverage, verbosity, and output is determined by user-defined settings. <p><i>For workstations:</i></p> <ul style="list-style-type: none"> • <code>true</code> – Diagnostics are <i>only</i> executed on power-on reset events, but the level of test coverage, verbosity, and output is determined by user-defined settings. • <code>false</code> – Diagnostics are disabled.
diag-trigger	<p>Specifies the class of reset event that causes diagnostics to run automatically. Default setting is <code>power-on-reset error-reset</code>.</p> <ul style="list-style-type: none"> • <code>none</code> – Diagnostic tests are not executed. • <code>error-reset</code> – Reset that is caused by certain hardware error events such as RED State Exception Reset, Watchdog Resets, Software-Instruction Reset, or Hardware Fatal Reset. • <code>power-on-reset</code> – Reset that is caused by power cycling the system. • <code>user-reset</code> – Reset that is initiated by an OS panic or by user-initiated commands from OpenBoot (<code>reset-all</code> or <code>boot</code>) or from Solaris (<code>reboot</code>, <code>shutdown</code>, or <code>init</code>). • <code>all-resets</code> – Any kind of system reset. <p>Note: Both POST and OpenBoot Diagnostics run at the specified reset event if the variable <code>diag-script</code> is set to <code>normal</code> or <code>all</code>. If <code>diag-script</code> is set to <code>none</code>, only POST runs.</p>
error-reset-recovery	<p>Specifies recovery action after an error reset. Default is <code>sync</code>.</p> <ul style="list-style-type: none"> • <code>none</code> – No recovery action. • <code>boot</code> – System attempts to boot. • <code>sync</code> – Firmware attempts to execute a Solaris <code>sync</code> callback routine.

TABLE 8-7 OpenBoot Configuration Variables That Control Diagnostic Testing and Automatic System Restoration *(Continued)*

OpenBoot Configuration Variable	Description and Keywords
service-mode?	<p>Controls whether the system is in service mode. Default is <code>false</code>.</p> <ul style="list-style-type: none"> • <code>true</code> – Service mode. Diagnostics are executed at Sun-specified levels, overriding but preserving user settings. • <code>false</code> – Normal mode. Diagnostics execution depends entirely on the settings of <code>diag-switch?</code> and other user-defined OpenBoot configuration variables.
test-args	<p>Customizes OpenBoot Diagnostics tests. Allows a text string of reserved keywords (separated by commas) to be specified in the following ways:</p> <ul style="list-style-type: none"> • As an argument to the <code>test</code> command at the <code>ok</code> prompt. • As an OpenBoot variable to the <code>setenv</code> command at the <code>ok</code> or <code>obdiag</code> prompt. <p>Note: The variable <code>test-args</code> applies only to systems with firmware that contains OpenBoot Diagnostics. See your system documentation for a list of keywords.</p>
verbosity	<p>Controls the amount and detail of OpenBoot, POST, and OpenBoot Diagnostics output. Default is <code>normal</code>.</p> <ul style="list-style-type: none"> • <code>none</code> – Only error and fatal messages are displayed on the system console. Banner is not displayed. Note: Problems in systems with <code>verbosity</code> set to <code>none</code> might be deemed not diagnosable, rendering the system unserviceable by Sun. • <code>min</code> – Notice, error, warning, and fatal messages are displayed on the system console. Transitional states and banner are also displayed. • <code>normal</code> – Summary progress and operational messages are displayed on the system console in addition to the messages displayed by the <code>min</code> setting. The work-in-progress indicator shows the status and progress of the boot sequence. • <code>max</code> – Detailed progress and operational messages are displayed on the system console in addition to the messages displayed by the <code>min</code> and <code>normal</code> settings.

About Service Mode

Service mode is an operational mode defined by Sun that facilitates fault isolation and recovery of systems that appear to be nonfunctional. When initiated, service mode overrides the settings of key OpenBoot configuration variables.

Note that service mode does not change your stored settings. After initialization (at the `ok` prompt), all OpenBoot PROM configuration variables revert to the user-defined settings. In this way, you or your service provider can quickly invoke a known and maximum level of diagnostics and still preserve your normal mode settings.

[TABLE 8-8](#) lists the OpenBoot configuration variables that are affected by service mode and the overrides that are applied when you select service mode.

TABLE 8-8 Service Mode Overrides

OpenBoot Configuration Variable	Service Mode Override
auto-boot?	false
diag-level	max
diag-trigger	power-on-reset error-reset user-reset
input-device	Factory default
output-device	Factory default
verbosity	max
The following apply only to systems with firmware that contains OpenBoot Diagnostics:	
diag-script	normal
test-args	subtests,verbose

About Initiating Service Mode

Enhancements provide a software mechanism for specifying service mode:

`service-mode?` configuration variable – When set to `true`, initiates service mode. (Service mode should be used only by authorized Sun service providers.)

Note – The `diag-switch?` configuration variable should remain at the default setting (`false`) for normal operation. To specify diagnostic testing for your OS, see [“To Initiate Normal Mode” on page 167](#).

For instructions, see [“To Initiate Service Mode” on page 167](#).

About Overriding Service Mode Settings

When the system is in service mode, three commands can override service mode settings. [TABLE 8-9](#) describes the effect of each command.

TABLE 8-9 Scenarios for Overriding Service Mode Settings

Command	Issued From	What It Does
<code>post</code>	ok prompt	OpenBoot firmware forces a one-time execution of normal mode diagnostics. <ul style="list-style-type: none">• For information about normal mode, see “About Normal Mode” on page 164.• For information about <code>post</code> command options, see “About the <code>post</code> Command” on page 165.
<code>bootmode diag</code>	system controller	OpenBoot firmware overrides service mode settings and forces a one-time execution of normal mode diagnostics. ¹
<code>bootmode skip_diag</code>	system controller	OpenBoot firmware suppresses service mode and bypasses all firmware diagnostics. ¹

¹ – If the system is not reset within 10 minutes of issuing the `bootmode` system controller command, the command is cleared.

Note – Not all systems are equipped with a system controller.

About Normal Mode

Normal mode is the customized operational mode that you define for your environment. To define normal mode, set the values of the OpenBoot configuration variables that control diagnostic testing. See [TABLE 8-7](#) for the list of variables that control diagnostic testing.

Note – The standard (default) configuration is recommended for improved fault isolation and system restoration, and for increased system availability.

When you are deciding whether to enable diagnostic testing in your normal environment, remember that you always should run diagnostics to troubleshoot an existing problem or after the following events:

- Initial system installation
- New hardware installation and replacement of defective hardware
- Hardware configuration modification
- Hardware relocation
- Firmware upgrade
- Power interruption or failure
- Hardware errors
- Severe or inexplicable software problems

About Initiating Normal Mode

If you define normal mode for your environment, you can specify normal mode with the following method:

System controller `bootmode diag` command – When you issue this command, it specifies normal mode with the configuration values defined by you – with the following exceptions:

- If you defined `diag-level = off`, `bootmode diag` specifies diagnostics at `diag-level = min`.
- If you defined `verbosity = none`, `bootmode diag` specifies diagnostics at `verbosity = min`.

Note – The next reset cycle must occur within 10 minutes of issuing the `bootmode diag` command or the `bootmode` command is cleared and normal mode is not initiated.

For instructions, see [“To Initiate Normal Mode” on page 167](#).

About the `post` Command

The `post` command enables you to easily invoke POST diagnostics and to control the level of testing and the amount of output. When you issue the `post` command, OpenBoot firmware performs the following actions:

- Initiates a user reset
- Triggers a one-time execution of POST at the test level and verbosity that you specify
- Clears old test results
- Displays and logs the new test results

Note – The `post` command overrides service mode settings and pending system controller `bootmode diag` and `bootmode skip_diag` commands.

The syntax for the `post` command is:

```
post [level [verbosity]]
```

where:

- `level` = min or max
- `verbosity` = min, normal, or max

The `level` and `verbosity` options provide the same functions as the OpenBoot configuration variables `diag-level` and `verbosity`. To determine which settings you should use for the `post` command options, see [TABLE 8-7](#) for descriptions of the keywords for `diag-level` and `verbosity`.

You can specify settings for:

- Both `level` and `verbosity`
- `level` only (If you specify a `verbosity` setting, you must also specify a `level` setting.)
- Neither `level` nor `verbosity`

If you specify a setting for `level` only, the `post` command uses the normal mode value for `verbosity` with the following exception:

- If the normal mode value of `verbosity` = none, `post` uses `verbosity` = min.

If you specify settings for neither `level` nor `verbosity`, the `post` command uses the normal mode values you specified for the configuration variables, `diag-level` and `verbosity`, with two exceptions:

- If the normal mode value of `diag-level = off`, `post` uses `level = min`.
- If the normal mode value of `verbosity = none`, `post` uses `verbosity = min`.

▼ To Initiate Service Mode

For background information, see [“About Service Mode” on page 162](#).

- **Set the `service-mode?` variable. At the `ok` prompt, type:**

TABLE 1

<code>ok setenv service-mode? true</code>

For service mode to take effect, you must reset the system.

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

TABLE 2

<code>ok reset-all</code>

▼ To Initiate Normal Mode

For background information, see [“About Normal Mode” on page 164](#).

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

TABLE 3

<code>ok setenv service-mode? false</code>
--

The system will not actually enter normal mode until the next reset.

- 2. Type:**

TABLE 4

<code>ok reset-all</code>

Reference for Estimating System Boot Time (to the ok Prompt)

Note – The standard (default) configuration does not increase system boot time after a reset that is initiated by user commands from OpenBoot (`reset-all` or `boot`) or from Solaris (`reboot`, `shutdown`, or `init`).

The measurement of system boot time begins when you power on (or reset) the system and ends when the OpenBoot `ok` prompt appears. During the boot time period, the firmware executes diagnostics (POST and OpenBoot Diagnostics) and performs OpenBoot initialization. The time required to run OpenBoot Diagnostics and to perform OpenBoot setup, configuration, and initialization is generally similar for all systems, depending on the number of I/O cards installed when `diag-script` is set to `all`. However, at the default settings (`diag-level = max` and `verbosity = normal`), POST executes extensive memory tests, which will increase system boot time.

System boot time will vary from system-to-system, depending on the configuration of system memory and the number of CPUs:

- Because each CPU tests its associated memory and POST performs the memory tests simultaneously, memory test time will depend on the amount of memory on the most populated CPU.
- Because the competition for system resources makes CPU testing a less linear process than memory testing, CPU test time will depend on the number of CPUs.

If you need to know the approximate boot time of your new system before you power on for the first time, the following sections describe two methods you can use to estimate boot time:

- If your system configuration matches one of the three typical configurations cited in [“Boot Time Estimates for Typical Configurations” on page 169](#), you can use the approximate boot time given for the appropriate configuration.
- If you know how the memory is configured among the CPUs, you can estimate the boot time for your specific system configuration using the method described in [“Estimating Boot Time for Your System” on page 169](#).

Boot Time Estimates for Typical Configurations

The following are three typical configurations and the approximate boot time you can expect for each:

- Small configuration (2 CPUs and 4 Gbytes of memory) – Boot time is approximately 5 minutes.
- Medium configuration (4 CPUs and 16 Gbytes of memory) – Boot time is approximately 10 minutes.
- Large configuration (4 CPUs and 32 Gbytes of memory) – Boot time is approximately 15 minutes.

Estimating Boot Time for Your System

Generally, for systems configured with default settings, the times required to execute OpenBoot Diagnostics and to perform OpenBoot setup, configuration, and initialization are the same for all systems:

- 1 minute for OpenBoot Diagnostics testing might require more time for systems with a greater number of devices to be tested.
- 2 minutes for OpenBoot setup, configuration, and initialization

To estimate the time required to run POST memory tests, you need to know the amount of memory associated with the most populated CPU. To estimate the time required to run POST CPU tests, you need to know the number of CPUs. Use the following guidelines to estimate memory and CPU test times:

- 2 minutes per Gbyte of memory associated with the most populated CPU
- 1 minute per CPU

The following example shows how to estimate the system boot time of a sample configuration consisting of 4 CPUs and 32 Gbytes of system memory, with 8 Gbytes of memory on the most populated CPU.

Sample Configuration

CPU0	8 Gbytes	← 8 Gbytes on most populated CPU
CPU1	4 Gbytes	
CPU2	8 Gbytes	
CPU3	4 Gbytes	
CPU4	2 Gbytes	
CPU5	2 Gbytes	
CPU6	2 Gbytes	
CPU7	2 Gbytes	
↑		8 CPUs in the system

Estimation of Boot Time

POST memory test	8 Gbytes	x	2 min per Gbyte	=	16 min
POST CPU test	8 CPUs	x	1 min per CPU	=	8 min
OpenBoot Diagnostics					1 min
OpenBoot initialization					<u>2 min</u>
Total system boot time (to the ok prompt)					27 min

Reference for Sample Outputs

At the default setting of `verbosity = normal`, POST and OpenBoot Diagnostics generate less diagnostic output (about 2 pages) than was produced before the OpenBoot PROM enhancements (over 10 pages). This section includes output samples for `verbosity` settings at `min` and `normal`.

Note – The `diag-level` configuration variable also affects how much output the system generates. The following samples were produced with `diag-level` set to `max`, the default setting.

The following sample shows the firmware output after a power reset when `verbosity` is set to `min`. At this `verbosity` setting, OpenBoot firmware displays notice, error, warning, and fatal messages but does not display progress or operational messages. Transitional states and the power-on banner are also displayed. Since no error conditions were encountered, this sample shows only the POST execution message, the system's install banner, and the device self-tests conducted by OpenBoot Diagnostics.

TABLE 5

```
Executing POST w/%o0 = 0000.0400.0101.2041
Sun Fire V445, Keyboard Present
Copyright 1998-2006 Sun Microsystems, Inc. All rights reserved.
OpenBoot 4.15.0, 4096 MB memory installed, Serial #12980804.
Ethernet address 8:0:20:c6:12:44, Host ID: 80c61244.
Running diagnostic script obdiag/normal
Testing /pci@8,600000/network@1
Testing /pci@8,600000/SUNW,qlc@2
Testing /pci@9,700000/ebus@1/i2c@1,2e
Testing /pci@9,700000/ebus@1/i2c@1,30
Testing /pci@9,700000/ebus@1/i2c@1,50002e
Testing /pci@9,700000/ebus@1/i2c@1,500030
Testing /pci@9,700000/ebus@1/bbc@1,0
Testing /pci@9,700000/ebus@1/bbc@1,500000
Testing /pci@8,700000/scsi@1
Testing /pci@9,700000/network@1,1
Testing /pci@9,700000/usb@1,3
Testing /pci@9,700000/ebus@1/gpio@1,300600
Testing /pci@9,700000/ebus@1/pmc@1,300700
Testing /pci@9,700000/ebus@1/rtc@1,300070
{7} ok
```

The following sample shows the diagnostic output after a power reset when verbosity is set to normal, the default setting. At this verbosity setting, the OpenBoot firmware displays summary progress or operational messages in addition to the notice, error, warning, and fatal messages; transitional states; and install banner displayed by the min setting. On the console, the work-in-progress indicator shows the status and progress of the boot sequence.

TABLE 6

```
Sun Fire V445, Keyboard Present
Copyright 1998-2004 Sun Microsystems, Inc. All rights reserved.
OpenBoot 4.15.0, 4096 MB memory installed, Serial #12980804.
Ethernet address 8:0:20:c6:12:44, Host ID: 80c61244.
Running diagnostic script obdiag/normal
Testing /pci@8,600000/network@1
Testing /pci@8,600000/SUNW,qlc@2
Testing /pci@9,700000/ebus@1/i2c@1,2e
Testing /pci@9,700000/ebus@1/i2c@1,30
Testing /pci@9,700000/ebus@1/i2c@1,50002e
Testing /pci@9,700000/ebus@1/i2c@1,500030
Testing /pci@9,700000/ebus@1/bbc@1,0
Testing /pci@9,700000/ebus@1/bbc@1,500000
Testing /pci@8,700000/scsi@1
Testing /pci@9,700000/network@1,1
Testing /pci@9,700000/usb@1,3
Testing /pci@9,700000/ebus@1/gpio@1,300600
Testing /pci@9,700000/ebus@1/pmc@1,300700
Testing /pci@9,700000/ebus@1/rtc@1,300070
{7} ok
```

Reference for Determining Diagnostic Mode

The flowchart in [FIGURE 8-7](#) summarizes graphically how various system controller and OpenBoot variables affect whether a system boots in normal or service mode, as well as whether any overrides occur.

CODE EXAMPLE 8-1

```
{3} ok post
SC Alert: Host System has Reset

Executing Power On Self Test
Q#0>
```

CODE EXAMPLE 8-1

```
0>@(#)Sun Fire[TM] V445 POST 4.22.11 2006/06/12 15:10

/export/delivery/delivery/4.22/4.22.11/post4.22.x/Fiesta/boston/
integrated (root)
0>Copyright ? 2006 Sun Microsystems, Inc. All rights reserved
    SUN PROPRIETARY/CONFIDENTIAL.
    Use is subject to license terms.
0>OBP->POST Call with %o0=00000800.01012000.
0>Diag level set to MIN.
0>Verbosity level set to NORMAL.
0>Start Selftest.....
0>CPUs present in system: 0 1 2 3
0>Test CPU(s)....Done
0>Interrupt Crosscall....Done
0>Init Memory....|
SC Alert: Host System has Reset
'Done
0>PLL Reset....Done
0>Init Memory....Done
0>Test Memory....Done
0>IO-Bridge Tests....Done
0>INFO:
0>    POST Passed all devices.
0>
0>POST:    Return to OBP.

SC Alert: Host System has Reset

Configuring system memory & CPU(s)

Probing system devices
Probing memory
Probing I/O buses
screen not found.
keyboard not found.
Keyboard not present. Using ttya for input and output.
Probing system devices
Probing memory
Probing I/O buses

Sun Fire V445, No Keyboard
```

CODE EXAMPLE 8-1

```
Copyright 2006 Sun Microsystems, Inc. All rights reserved.  
OpenBoot 4.22.11, 24576 MB memory installed, Serial #64548465.  
Ethernet address 0:3:ba:d8:ee:71, Host ID: 83d8ee71.
```


FIGURE 8-7 Diagnostic Mode Flowchart

Quick Reference for Diagnostic Operation

TABLE 8-10 summarizes the effects of the following user actions on diagnostic operation:

- Set `service-mode?` to `true`
- Issue the `bootmode` commands, `bootmode diag` or `bootmode skip_diag`
- Issue the `post` command

TABLE 8-10 Summary of Diagnostic Operation

User Action	Sets Configuration Variables	And Initiates
Service Mode		
Set <code>service-mode?</code> to <code>true</code>	<p>Note: Service mode overrides the settings of the following configuration variables without changing your stored settings:</p> <ul style="list-style-type: none">• <code>auto-boot?</code> = <code>false</code>• <code>diag-level</code> = <code>max</code>• <code>diag-trigger</code> = <code>power-on-reset</code> <code>error-reset</code> <code>user reset</code>• <code>input-device</code> = Factory default• <code>output-device</code> = Factory default• <code>verbosity</code> = <code>max</code> <p>The following apply only to systems with firmware that contains OpenBoot Diagnostics:</p> <ul style="list-style-type: none">• <code>diag-script</code> = <code>normal</code>• <code>test-args</code> = <code>subtests,verbose</code>	Service mode (defined by Sun)
Normal Mode		
Set <code>service-mode?</code> to <code>false</code>	<ul style="list-style-type: none">• <code>auto-boot?</code> = user-defined setting• <code>auto-boot-on-error?</code> = user-defined setting• <code>diag-level</code> = user-defined setting• <code>verbosity</code> = user-defined setting• <code>diag-script</code> = user-defined setting• <code>diag-trigger</code> = user-defined setting• <code>input-device</code> = user-defined setting• <code>output-device</code> = user-defined setting	Normal mode (user-defined)
bootmode Commands		

TABLE 8-10 Summary of Diagnostic Operation (*Continued*)

User Action	Sets Configuration Variables	And Initiates
Issue <code>bootmode diag</code> command	Overrides service mode settings and uses normal mode settings with the following exceptions: <ul style="list-style-type: none">• <code>diag-level</code> = min if normal mode value = off• <code>verbosity</code> = min if normal mode value = none	Normal mode diagnostics with the exceptions in the preceding column.
Issue <code>bootmode skip_diag</code> command		OpenBoot initialization without running diagnostics
post Command Note: If the value of <code>diag-script</code> = normal or all, OpenBoot Diagnostics also run.		
Issue <code>post</code> command		POST diagnostics
Specify both level and verbosity	level and verbosity = user-defined values	
Specify neither level nor verbosity	level and verbosity = normal mode values with the following exceptions: <ul style="list-style-type: none">• level = min if normal mode value of <code>diag-level</code> = none• verbosity = min if normal mode value of <code>verbosity</code> = none	
Specify level only	level = user-defined value verbosity = normal mode value for verbosity (Exception: verbosity = min if normal mode value of <code>verbosity</code> = none)	

OpenBoot Diagnostics

Like POST diagnostics, OpenBoot Diagnostics code is firmware-based and resides in the boot PROM.

▼ To Start OpenBoot Diagnostics

1. Type:

TABLE 8-11

```
ok setenv diag-switch? true
ok setenv auto-boot? false
ok reset-all
```

2. Type:

TABLE 8-12

```
ok obdiag
```

This command displays the OpenBoot Diagnostics menu. See [TABLE 8-13](#).

TABLE 8-13 Sample obdiag Menu

obdiag		
1 LSILogic,sas@1	2 flashprom@0,0	3 network@0
4 rmc-comm@0,c28000	5 rtc@0,70	6 serial@0,c2c000
serial@3,ffffff8		
Commands: test test-all except help what setenv set-default exit		
diag-passes=1 diag-level=min test-args=args		

Note – If you have a PCI card installed in the server, then additional tests will appear on the obdiag menu.

3. Type:

TABLE 8-14

```
obdiag> test n
```

where *n* represents the number corresponding to the test you want to run.

A summary of the tests is available. At the obdiag> prompt, type:

TABLE 8-15

```
obdiag> help
```

4. You can also run all tests, type:

TABLE 8-16

```
obdiag> test-all
Hit the spacebar to interrupt testing
Testing /pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1
..... passed
Testing /ebus@1f,464000/flashprom@0,0
..... passed
Testing /pci@1f,700000/pci@0/pci@2/pci@0/pci@8/pci@2/network@0
Internal loopback test -- succeeded.
Link is -- up
..... passed
Testing /ebus@1f,464000/rmc-comm@0,c28000
..... passed
Testing /pci@1f,700000/pci@0/pci@1/pci@0/isa@1e/rtc@0,70
..... passed
Testing /ebus@1f,464000/serial@0,c2c000
..... passed
Testing /ebus@1f,464000/serial@3,fffff8
..... passed
Pass:1 (of 1) Errors:0 (of 0) Tests Failed:0 Elapsed Time: 0:0:1:1

Hit any key to return to the main menu
```

Note – From the obdiag prompt you can select a device from the list and test it. However, at the ok prompt you need to use the full device path. In addition, the device needs to have a self-test method, otherwise errors will result.

Controlling OpenBoot Diagnostics Tests

Most of the OpenBoot configuration variables you use to control POST (see [TABLE 8-7](#)) also affect OpenBoot Diagnostics tests.

- Use the `diag-level` variable to control the OpenBoot Diagnostics testing level.
- Use `test-args` to customize how the tests run.

By default, `test-args` is set to contain an empty string. You can modify `test-args` using one or more of the reserved keywords shown in [TABLE 8-17](#).

TABLE 8-17 Keywords for the `test-args` OpenBoot Configuration Variable

Keyword	What It Does
<code>bist</code>	Invokes built-in self-test (BIST) on external and peripheral devices
<code>debug</code>	Displays all debug messages
<code>iopath</code>	Verifies bus/interconnect integrity
<code>loopback</code>	Exercises external loopback path for the device
<code>media</code>	Verifies external and peripheral device media accessibility
<code>restore</code>	Attempts to restore original state of the device if the previous execution of the test failed
<code>silent</code>	Displays only errors rather than the status of each test
<code>subtests</code>	Displays main test and each subtest that is called
<code>verbose</code>	Displays detailed messages of status of all tests
<code>callers=N</code>	Displays backtrace of <i>N</i> callers when an error occurs <ul style="list-style-type: none"> <code>callers=0</code> - displays backtrace of all callers before the error
<code>errors=N</code>	Continues executing the test until <i>N</i> errors are encountered <ul style="list-style-type: none"> <code>errors=0</code> - displays all error reports without terminating testing

If you want to make multiple customizations to the OpenBoot Diagnostics testing, you can set `test-args` to a comma-separated list of keywords, as in this example:

TABLE 8-18

<code>ok setenv test-args debug,loopback,media</code>

test and test-all Commands

You can also run OpenBoot Diagnostics tests directly from the `ok` prompt. To do this, type the `test` command, followed by the full hardware path of the device (or set of devices) to be tested. For example:

TABLE 8-19

<code>ok test /pci@x,y/SUNW,qlc@2</code>
--

Note – Knowing how to construct an appropriate hardware device path requires precise knowledge of the hardware architecture of the Sun Fire V445 system.

To customize an individual test, you can use `test-args` as follows:

TABLE 8-20

<code>ok test /usb@1,3:test-args={verbose,debug}</code>

This affects only the current test without changing the value of the `test-args` OpenBoot configuration variable.

You can test all the devices in the device tree with the `test-all` command:

TABLE 8-21

<code>ok test-all</code>

If you specify a path argument to `test-all`, then only the specified device and its children are tested. The following example shows the command to test the USB bus and all devices with self-tests that are connected to the USB bus:

TABLE 8-22

<code>ok test-all /pci@9,700000/usb@1,3</code>
--

OpenBoot Diagnostics Error Messages

OpenBoot Diagnostics error results are reported in a tabular format that contains a short summary of the problem, the hardware device affected, the subtest that failed, and other diagnostic information. The following example displays a sample OpenBoot Diagnostics error message.

CODE EXAMPLE 8-2 OpenBoot Diagnostics Error Message

```
Testing /pci@1e,600000/isa@7/flashprom@2,0

  ERROR   : There is no POST in this FLASHROM or POST header is
unrecognized
  DEVICE  : /pci@1e,600000/isa@7/flashprom@2,0
  SUBTEST : selftest:crc-subtest
  MACHINE : Sun Fire V445
  SERIAL# : 51347798
  DATE    : 03/05/2003 15:17:31 GMT
  CONTR0LS: diag-level=max test-args=errors=1

Error: /pci@1e,600000/isa@7/flashprom@2,0 selftest failed, return code = 1
Selftest at /pci@1e,600000/isa@7/flashprom@2,0 (errors=1) .....
failed
Pass:1 (of 1) Errors:1 (of 1) Tests Failed:1 Elapsed Time: 0:0:0:1
```

About OpenBoot Commands

OpenBoot commands are commands you type from the `ok` prompt. OpenBoot commands that can provide useful diagnostic information are:

- `probe-scsi-all`
- `probe-ide`
- `show-devs`

`probe-scsi-all`

The `probe-scsi-all` command diagnoses problems with the SAS devices.



Caution – If you used the `halt` command or the Stop-A key sequence to reach the `ok` prompt, then issuing the `probe-scsi-all` command can hang the system.

The `probe-scsi-all` command communicates with all SAS devices connected to on-board SAS controllers and accesses devices connected to any host adapters installed in PCI slots.

For any SAS device that is connected and active, the `probe-scsi-all` command displays its loop ID, host adapter, logical unit number, unique World Wide Name (WWN), and a device description that includes type and manufacturer.

The following is sample output from the `probe-scsi-all` command.

CODE EXAMPLE 8-3 Sample `probe-scsi-all` Command Output

```
{3} ok probe-scsi-all
/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1

MPT Version 1.05, Firmware Version 1.08.04.00

Target 0
  Unit 0   Disk      SEAGATE ST973401LSUN72G 0356      143374738
Blocks, 73 GB
  SASAddress 5000c50000246b35  PhyNum 0
Target 1
  Unit 0   Disk      SEAGATE ST973401LSUN72G 0356      143374738
Blocks, 73 GB
  SASAddress 5000c50000246bc1  PhyNum 1
Target 4 Volume 0
  Unit 0   Disk      LSILOGICLogical Volume 3000      16515070
Blocks, 8455 MB
Target 6
  Unit 0   Disk      FUJITSU MAV2073RCSUN72G 0301      143374738
Blocks, 73 GB
  SASAddress 500000e0116a81c2  PhyNum 6

{3} ok
```

probe-ide

The `probe-ide` command communicates with all Integrated Drive Electronics (IDE) devices connected to the IDE bus. This is the internal system bus for media devices such as the DVD drive.



Caution – If you used the `halt` command or the Stop-A key sequence to reach the `ok` prompt, then issuing the `probe-ide` command can hang the system.

The following is sample output from the `probe-ide` command.

CODE EXAMPLE 8-4 Sample `probe-ide` Command Output

```
{1} ok probe-ide
Device 0 ( Primary Master )
        Removable ATAPI Model: DV-28E-B

Device 1 ( Primary Slave )
        Not Present

Device 2 ( Secondary Master )
        Not Present

Device 3 ( Secondary Slave )
        Not Present
```


show-devs

The `show-devs` command lists the hardware device paths for each device in the firmware device tree. `show-devs` shows some sample output.

CODE EXAMPLE 8-5 `show-devs` Command Output (Truncated)

```
/i2c@1f,520000
/ebus@1f,464000
/pci@1f,700000
/pci@1e,600000
/memory-controller@3,0
/SUNW,UltraSPARC-IIIi@3,0
/memory-controller@2,0
/SUNW,UltraSPARC-IIIi@2,0
/memory-controller@1,0
/SUNW,UltraSPARC-IIIi@1,0
/memory-controller@0,0
/SUNW,UltraSPARC-IIIi@0,0
/virtual-memory
/memory@m0,0
/aliases
/options
/openprom
/chosen
/packages
/i2c@1f,520000/cpu-fru-prom@0,e8
/i2c@1f,520000/dimm-spd@0,e6
/i2c@1f,520000/dimm-spd@0,e4
.
.
.
/pci@1f,700000/pci@0
/pci@1f,700000/pci@0/pci@9
/pci@1f,700000/pci@0/pci@8
/pci@1f,700000/pci@0/pci@2
/pci@1f,700000/pci@0/pci@1
/pci@1f,700000/pci@0/pci@2/pci@0
/pci@1f,700000/pci@0/pci@2/pci@0/pci@8
/pci@1f,700000/pci@0/pci@2/pci@0/network@4,1
/pci@1f,700000/pci@0/pci@2/pci@0/network@4
/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/pci@2
/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1
/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/pci@2/network@0
/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1/disk
/pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1/tape
```

▼ To Run OpenBoot Commands

1. **Halt the system to reach the `ok` prompt.**

How you do this depends on the system's condition. If possible, you should warn users before you shut the system down.

2. **Type the appropriate command at the console prompt.**

About Predictive Self-Healing

In Solaris 10 systems, the Solaris Predictive Self-Healing (PSH) technology enables Sun Fire V445 server to diagnose problems while the Solaris OS is running, and mitigate many problems before they negatively affect operations.

The Solaris OS uses the fault manager daemon, `fmd(1M)`, which starts at boot time and runs in the background to monitor the system. If a component generates an error, the daemon handles the error by correlating the error with data from previous errors and other related information to diagnose the problem. Once diagnosed, the fault manager daemon assigns the problem a Universal Unique Identifier (UUID) that distinguishes the problem across any set of systems. When possible, the fault manager daemon initiates steps to self-heal the failed component and take the component offline. The daemon also logs the fault to the `syslogd` daemon and provides a fault notification with a message ID (MSGID). You can use message ID to get additional information about the problem from Sun's knowledge article database.

The Predictive Self-Healing technology covers the following Sun Fire V445 server components:

- UltraSPARC IIIi processors
- Memory
- I/O bus

The PSH console message provides the following information:

- Type
- Severity
- Description
- Automated Response
- Impact
- Suggested Action for System Administrator

If the Solaris PSH facility has detected a faulty component, use the `fmdump` command (described in the following subsections) to identify the fault. Faulty FRUs are identified in fault messages using the FRU name.

Use the following web site to interpret faults and obtain information on a fault:

<http://www.sun.com/msg/>

This web site directs you to provide the message ID that your system displayed. The web site then provides knowledge articles about the fault and corrective action to resolve the fault. The fault information and documentation at this web site is updated regularly.

You can find more detailed descriptions of Solaris 10 Predictive Self-Healing at the following web site:

<http://www.sun.com/bigadmin/features/articles/selfheal.html>

Predictive Self-Healing Tools

In summary, the Solaris Fault Manager daemon (`fmd`) performs the following functions:

- Receives telemetry information about problems detected by the system software.
- Diagnoses the problems and provides system generated messages.
- Initiates pro-active self-healing activities such as disabling faulty components.

TABLE 8-23 shows a typical message generated when a fault occurs on your system. The message appears on your console and is recorded in the `/var/adm/messages` file.

Note – The messages in **TABLE 8-23** indicate that the fault has already been diagnosed. Any corrective action that the system can perform has already taken place. If your server is still running, it continues to run.

TABLE 8-23 System Generated Predictive Self-Healing Message

Output Displayed	Description
Jul 1 14:30:20 sunrise EVENT-TIME: Tue Nov 1 16:30:20 PST 2005	EVENT-TIME: the time stamp of the diagnosis.
Jul 1 14:30:20 sunrise PLATFORM: SUNW,A70, CSN: -, HOSTNAME: sunrise	PLATFORM: A description of the system encountering the problem
Jul 1 14:30:20 sunrise SOURCE: eft, REV: 1.13	SOURCE: Information on the Diagnosis Engine used to determine the fault

TABLE 8-23 System Generated Predictive Self-Healing Message

Output Displayed	Description
Jul 1 14:30:20 sunrise EVENT-ID: afc7e660-d609-4b2f-86b8-ae7c6b8d50c4	EVENT-ID: The Universally Unique event ID (UUID) for this fault
Jul 1 14:30:20 sunrise DESC: Jul 1 14:30:20 sunrise A problem was detected in the PCI-Express subsystem	DESC: A basic description of the failure
Jul 1 14:30:20 sunrise Refer to http://sun.com/msg/SUN4-8000-0Y for more information.	WEBSITE: Where to find specific information and actions for this fault
Jul 1 14:30:20 sunrise AUTO-RESPONSE: One or more device instances may be disabled	AUTO-RESPONSE: What, if anything, the system did to alleviate any follow-on issues
Jul 1 14:30:20 sunrise IMPACT: Loss of services provided by the device instances associated with this fault	IMPACT: A description of what that response may have done
Jul 1 14:30:20 sunrise REC-ACTION: Schedule a repair procedure to replace the affected device. Use Nov 1 14:30:20 sunrise fmdump -v -u EVENT_ID to identify the device or contact Sun for support.	REC-ACTION: A short description of what the system administrator should do

Using the Predictive Self-Healing Commands

For complete information about Predictive Self-Healing commands, refer to the Solaris 10 man pages. This section describes some details of the following commands:

- fmdump(1M)
- fmadm(1M)
- fmstat(1M)

Using the fmdump Command

After the message in [TABLE 8-23](#) is displayed, more information about the fault is available. The `fmdump` command displays the contents of any log files associated with the Solaris Fault Manager.

The `fmdump` command produces output similar to [TABLE 8-23](#). This example assumes there is only one fault.

TABLE 8-24

```
# fmdump
TIME  UUID  SUNW-MSG-ID
Jul 02 10:04:15.4911 0ee65618-2218-4997-c0dc-b5c410ed8ec2  SUN4-8000-0Y
```

`fmdump -V`

The `-v` option provides more details.

TABLE 8-25

```
# fmdump -v -u 0ee65618-2218-4997-c0dc-b5c410ed8ec2
TIME                UUID                SUNW-MSG-ID
Jul 02 10:04:15.4911 0ee65618-2218-4997-c0dc-b5c410ed8ec2  SUN4-8000-0Y
100% fault.io.fire.asic
FRU: hc://product-id=SUNW,A70/motherboard=0
rsrc: hc:///motherboard=0/hostbridge=0/pciexrc=0
```

Three lines of new output are delivered with the `-v` option.

- The first line is a summary of information displayed previously in the console message but includes the timestamp, the UUID, and the Message-ID.
- The second line is a declaration of the certainty of the diagnosis. In this case the failure is in the ASIC described. If the diagnosis could involve multiple components, two lines would be displayed here with 50 percent in each, for example.
- The `FRU` line declares the part that needs to be replaced to return the system to a fully operational state.
- The `rsrc` line describes what component was taken out of service as a result of this fault.

`fmdump -e`

To get information of the errors that caused this failure, use the `-e` option.

TABLE 8-26

```
# fmdump -e
TIME                CLASS
Nov 02 10:04:14.3008 ereport.io.fire.jbc.mb_per
```

Using the `fmadm faulty` Command

The `fmadm faulty` command lists and modifies system configuration parameters that are maintained by the Solaris Fault Manager. The `fmadm faulty` command is primarily used to determine the status of a component involved in a fault.

TABLE 8-27

```
# fmadm faulty
STATERESOURCE / UUID
-----
degraded dev:///pci@1e,600000
0ee65618-2218-4997-c0dc-b5c410ed8ec2
```

The PCI device is degraded and is associated with the same UUID as seen above. You may also see faulted states.

`fmadm config`

The `fmadm config` command output shows the version numbers of the diagnosis engines in use by your system, and also displays their current state. You can check these versions against information on the <http://sunsolve.sun.com> web site to determine if your server is using the latest diagnostic engines.

TABLE 8-28

# fmadm config			
MODULE	VERSION	STATUS	DESCRIPTION
cpumem-diagnosis	1.5	active	UltraSPARC-III/IV CPU/Memory Diagnosis
cpumem-retire	1.1	active	CPU/Memory Retire Agent
eft	1.16	active	eft diagnosis engine
fmd-self-diagnosis	1.0	active	Fault Manager Self-Diagnosis
io-retire	1.0	active	I/O Retire Agent
snmp-trapgen	1.0	active	SNMP Trap Generation Agent
sysevent-transport	1.0	active	SysEvent Transport Agent
syslog-msgs	1.0	active	Syslog Messaging Agent
zfs-diagnosis	1.0	active	ZFS Diagnosis Engine

Using the `fmstat` Command

The `fmstat` command can report statistics associated with the Solaris Fault Manager. The `fmstat` command shows information about DE performance. In the example below, the `eft` DE (also seen in the console output) has received an event which it accepted. A case is opened for that event and a diagnosis is performed to solve the cause for the failure.

TABLE 8-29

# fmstat											
module	ev_rcv	ev_acpt	wait	svc_t	%w	%b	open	solve	memsz	bufsz	
cpumem-diagnosis	0	0	0.0	0.0	0	0	0	0	3.0K	0	
cpumem-retire	0	0	0.0	0.0	0	0	0	0	0	0	
eft	0	0	0.0	0.0	0	0	0	0	713K	0	
fmd-self-diagnosis	0	0	0.0	0.0	0	0	0	0	0	0	
io-retire	0	0	0.0	0.0	0	0	0	0	0	0	
snmp-trapgen	0	0	0.0	0.0	0	0	0	0	32b	0	
sysevent-transport	0	0	0.0	6704.4	1	0	0	0	0	0	
syslog-msgs	0	0	0.0	0.0	0	0	0	0	0	0	
zfs-diagnosis	0	0	0.0	0.0	0	0	0	0	0	0	

About Traditional Solaris OS Diagnostic Tools

If a system passes OpenBoot Diagnostics tests, it normally attempts to boot its multiuser OS. For most Sun systems, this means the Solaris OS. Once the server is running in multiuser mode, you have access to the software-based exerciser tools, SunVTS and Sun Management Center. These tools enable you to monitor the server, exercise it, and isolate faults.

Note – If you set the `auto-boot` OpenBoot configuration variable to `false`, the OS does *not* boot following completion of the firmware-based tests.

In addition to the tools mentioned above, you can refer to error and system message log files, and Solaris system information commands.

Error and System Message Log Files

Error and other system messages are saved in the `/var/adm/messages` file. Messages are logged to this file from many sources, including the OS, the environmental control subsystem, and various software applications.

Solaris System Information Commands

The following Solaris commands display data that you can use when assessing the condition of a Sun Fire V445 server:

- `prtconf`
- `prtdiag`
- `prtfru`
- `psrinfo`
- `showrev`

This section describes the information these commands give you. For more information on using these commands, refer to the Solaris man pages.

Using the prtconf Command

The `prtconf` command displays the Solaris device tree. This tree includes all the devices probed by OpenBoot firmware, as well as additional devices, like individual disks. The output of `prtconf` also includes the total amount of system memory, and shows an excerpt of `prtconf` output (truncated to save space).

CODE EXAMPLE 8-6 prtconf Command Output (Truncated)

```
# prtconf
System Configuration: Sun Microsystems sun4u
Memory size: 1024 Megabytes
System Peripherals (Software Nodes):

SUNW,Sun-Fire-V445
  packages (driver not attached)
    SUNW,builtin-drivers (driver not attached)
    deblocker (driver not attached)
    disk-label (driver not attached)
    terminal-emulator (driver not attached)
    dropins (driver not attached)
    kbd-translator (driver not attached)
    obp-tftp (driver not attached)
    SUNW,i2c-ram-device (driver not attached)
    SUNW,fru-device (driver not attached)
    ufs-file-system (driver not attached)
  chosen (driver not attached)
  openprom (driver not attached)
    client-services (driver not attached)
  options, instance #0
  aliases (driver not attached)
  memory (driver not attached)
  virtual-memory (driver not attached)
  SUNW,UltraSPARC-IIIi (driver not attached)
  memory-controller, instance #0
  SUNW,UltraSPARC-IIIi (driver not attached)
  memory-controller, instance #1 ...
```

The `prtconf` command `-p` option produces output similar to the OpenBoot `show-devs` command. This output lists only those devices compiled by the system firmware.

Using the prtdiag Command

The `prtdiag` command displays a table of diagnostic information that summarizes the status of system components.

The display format used by the `prtdiag` command can vary depending on what version of the Solaris OS is running on your system. Following is an excerpt of some of the output produced by `prtdiag` on a Sun Fire V445 server.

CODE EXAMPLE 8-7 `prtdiag` Command Output

```
# prtdiag
System Configuration: Sun Microsystems sun4u Sun Fire V445
System clock frequency: 199 MHZ
Memory size: 24GB

===== CPUs =====
CPU   Freq      E$      CPU              CPU
-----  -----  ---  Implementation  Mask  Status  Location
0     1592 MHz  1MB    SUNW,UltraSPARC-IIIi  3.4   on-line MB/C0/P0
1     1592 MHz  1MB    SUNW,UltraSPARC-IIIi  3.4   on-line MB/C1/P0
2     1592 MHz  1MB    SUNW,UltraSPARC-IIIi  3.4   on-line MB/C2/P0
3     1592 MHz  1MB    SUNW,UltraSPARC-IIIi  3.4   on-line MB/C3/P0

===== IO Devices =====
Bus    Freq  Slot +   Name +
Type   MHz  Status  Path
-----  ---  ---
pci     199  MB/PCI4  LSILogic,sas-pci1000,54 (scs+ LSI,1068
okay    /pci@1f,700000/pci@0/pci@2/pci@0/pci@8/LSILogic,sas@1

pci     199  MB/PCI5  pci108e,abba (network)      SUNW,pci-ce
okay    /pci@1f,700000/pci@0/pci@2/pci@0/pci@8/pci@2/network@0

pciex   199  MB      pci14e4,1668 (network)
okay    /pci@1e,600000/pci/pci/pci/network

pciex   199  MB      pci14e4,1668 (network)
okay    /pci@1e,600000/pci/pci/pci/network

pciex   199  MB      pci10b9,5229 (ide)
okay    /pci@1f,700000/pci@0/pci@1/pci@0/ide

pciex   199  MB      pci14e4,1668 (network)
okay    /pci@1f,700000/pci@0/pci@2/pci@0/network

pciex   199  MB      pci14e4,1668 (network)
okay    /pci@1f,700000/pci@0/pci@2/pci@0/network

===== Memory Configuration =====
Segment Table:
-----
```

CODE EXAMPLE 8-7 prtdiag Command Output (Continued)

Base Address	Size	Interleave Factor	Contains	

0x0	8GB	16	BankIDs	
0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15				
0x1000000000	8GB	16	BankIDs	
16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31				
0x2000000000	4GB	4	BankIDs 32,33,34,35	
0x3000000000	4GB	4	BankIDs 48,49,50,51	
Bank Table:				

Physical Location				
ID	ControllerID	GroupID	Size	Interleave Way

0	0	0	512MB	0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15
1	0	0	512MB	
2	0	1	512MB	
3	0	1	512MB	
4	0	0	512MB	
5	0	0	512MB	
6	0	1	512MB	
7	0	1	512MB	
8	0	1	512MB	
9	0	1	512MB	
10	0	0	512MB	
11	0	0	512MB	
12	0	1	512MB	
13	0	1	512MB	
14	0	0	512MB	
15	0	0	512MB	
16	1	0	512MB	0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15
17	1	0	512MB	
18	1	1	512MB	
19	1	1	512MB	
20	1	0	512MB	
21	1	0	512MB	
22	1	1	512MB	
23	1	1	512MB	
24	1	1	512MB	
25	1	1	512MB	
26	1	0	512MB	
27	1	0	512MB	
28	1	1	512MB	
29	1	1	512MB	
30	1	0	512MB	
31	1	0	512MB	
32	2	0	1GB	0,1,2,3

CODE EXAMPLE 8-7 prtdiag Command Output (Continued)

```

33      2      1      1GB
34      2      1      1GB
35      2      0      1GB
48      3      0      1GB      0,1,2,3
49      3      1      1GB
50      3      1      1GB
51      3      0      1GB

```

Memory Module Groups:

```

-----
ControllerID  GroupID  Labels      Status
-----
0             0      MB/C0/P0/B0/D0
0             0      MB/C0/P0/B0/D1
0             1      MB/C0/P0/B1/D0
0             1      MB/C0/P0/B1/D1
1             0      MB/C1/P0/B0/D0
1             0      MB/C1/P0/B0/D1
1             1      MB/C1/P0/B1/D0
1             1      MB/C1/P0/B1/D1
2             0      MB/C2/P0/B0/D0
2             0      MB/C2/P0/B0/D1
2             1      MB/C2/P0/B1/D0
2             1      MB/C2/P0/B1/D1
3             0      MB/C3/P0/B0/D0
3             0      MB/C3/P0/B0/D1
3             1      MB/C3/P0/B1/D0
3             1      MB/C3/P0/B1/D1

```

===== usb Devices =====

```

Name          Port#
-----
hub           HUB0
bash-3.00#

```

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Verbose output with fan tach fail

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

Fan Status:

```

-----
Location      Sensor      Status
-----
MB/FT0/F0     TACH      okay

```

CODE EXAMPLE 8-7 prtdiag Command Output (Continued)

MB/FT1/F0	TACH	failed (0 rpm)
MB/FT2/F0	TACH	okay
MB/FT5/F0	TACH	okay
PS1	FF_FAN	okay
PS3	FF_FAN	okay
Temperature sensors:		

Location	Sensor	Status

MB/C0/P0	T_CORE	okay
MB/C1/P0	T_CORE	okay
MB/C2/P0	T_CORE	okay
MB/C3/P0	T_CORE	okay
MB/C0	T_AMB	okay
MB/C1	T_AMB	okay
MB/C2	T_AMB	okay
MB/C3	T_AMB	okay
MB	T_CORE	okay
MB	IO_T_AMB	okay
MB/FIOB	T_AMB	okay
MB	T_AMB	okay
PS1	FF_OT	okay
PS3	FF_OT	okay

Current sensors:		

Location	Sensor	Status

MB/USB0	I_USB0	okay
MB/USB1	I_USB1	okay

In addition to the information in [CODE EXAMPLE 8-7](#), prtdiag with the verbose option (-v) also reports on front panel status, disk status, fan status, power supplies, hardware revisions, and system temperatures.

CODE EXAMPLE 8-8 prtdiag Verbose Output

System Temperatures (Celsius):		

Device	Temperature	Status

CPU0	59	OK
CPU2	64	OK
DBP0	22	OK

In the event of an overtemperature condition, `prtdiag` reports an error in the Status column.

CODE EXAMPLE 8-9 `prtdiag` Overtemperature Indication Output

System Temperatures (Celsius):		

Device	Temperature	Status

CPU0	62	OK
CPU1	102	ERROR

Similarly, if there is a failure of a particular component, `prtdiag` reports a fault in the appropriate Status column.

CODE EXAMPLE 8-10 `prtdiag` Fault Indication Output

Fan Status:		

Bank	RPM	Status
----	-----	-----
CPU0	4166	[NO_FAULT]
CPU1	0000	[FAULT]

Using the `prtfru` Command

The Sun Fire V445 system maintains a hierarchical list of all FRUs in the system, as well as specific information about various FRUs.

The `prtfriu` command can display this hierarchical list, as well as data contained in the serial electrically erasable programmable read-only memory (EEPROM) devices located on many FRUs. [CODE EXAMPLE 8-11](#) shows an excerpt of a hierarchical list of FRUs generated by the `prtfriu` command with the `-l` option.

CODE EXAMPLE 8-11 `prtfriu -l` Command Output (Truncated)

```
# prtfriu -l
/frutree
/frutree/chassis (fru)
/frutree/chassis/MB?Label=MB
/frutree/chassis/MB?Label=MB/system-board (container)
/frutree/chassis/MB?Label=MB/system-board/FT0?Label=FT0
/frutree/chassis/MB?Label=MB/system-board/FT0?Label=FT0/fan-tray (fru)
/frutree/chassis/MB?Label=MB/system-board/FT0?Label=FT0/fan-tray/F0?Label=F0
/frutree/chassis/MB?Label=MB/system-board/FT1?Label=FT1
/frutree/chassis/MB?Label=MB/system-board/FT1?Label=FT1/fan-tray (fru)
/frutree/chassis/MB?Label=MB/system-board/FT1?Label=FT1/fan-tray/F0?Label=F0
/frutree/chassis/MB?Label=MB/system-board/FT2?Label=FT2
/frutree/chassis/MB?Label=MB/system-board/FT2?Label=FT2/fan-tray (fru)
/frutree/chassis/MB?Label=MB/system-board/FT2?Label=FT2/fan-tray/F0?Label=F0
/frutree/chassis/MB?Label=MB/system-board/FT3?Label=FT3
/frutree/chassis/MB?Label=MB/system-board/FT4?Label=FT4
/frutree/chassis/MB?Label=MB/system-board/FT5?Label=FT5
/frutree/chassis/MB?Label=MB/system-board/FT5?Label=FT5/fan-tray (fru)
/frutree/chassis/MB?Label=MB/system-board/FT5?Label=FT5/fan-tray/F0?Label=F0
/frutree/chassis/MB?Label=MB/system-board/C0?Label=C0
/frutree/chassis/MB?Label=MB/system-board/C0?Label=C0/cpu-module (container)
/frutree/chassis/MB?Label=MB/system-board/C0?Label=C0/cpu-module/P0?Label=P0
/frutree/chassis/MB?Label=MB/system-board/C0?Label=C0/cpu-module/P0?Label=
P0/cpu
/frutree/chassis/MB?Label=MB/system-board/C0?Label=C0/cpu-module/P0?Label=
P0/cpu/B0?Label=B0
```

[CODE EXAMPLE 8-12](#) shows an excerpt of EEPROM data generated by the `prtfriu` command with the `-c` option.

CODE EXAMPLE 8-12 `prtfriu -c` Command Output

```
# prtfriu -c
/frutree/chassis/MB?Label=MB/system-board (container)
  SEGMENT: FD
    /Customer_DataR
    /Customer_DataR/UNIX_Timestamp32: Wed Dec 31 19:00:00 EST 1969
    /Customer_DataR/Cust_Data:
    /InstallationR (4 iterations)
    /InstallationR[0]
    /InstallationR[0]/UNIX_Timestamp32: Fri Dec 31 20:47:13 EST 1999
    /InstallationR[0]/Fru_Path: MB.SEEPROM
```

CODE EXAMPLE 8-12 prtfru -c Command Output (Continued)

```
/InstallationR[0]/Parent_Part_Number: 5017066
/InstallationR[0]/Parent_Serial_Number: BM004E
/InstallationR[0]/Parent_Dash_Level: 05
/InstallationR[0]/System_Id:
/InstallationR[0]/System_Tz: 238
/InstallationR[0]/Geo_North: 15658734
/InstallationR[0]/Geo_East: 15658734
/InstallationR[0]/Geo_Alt: 238
/InstallationR[0]/Geo_Location:
/InstallationR[1]
/InstallationR[1]/UNIX_Timestamp32: Mon Mar 6 10:08:30 EST 2006
/InstallationR[1]/Fru_Path: MB.SEEPROM
/InstallationR[1]/Parent_Part_Number: 3753302
/InstallationR[1]/Parent_Serial_Number: 0001
/InstallationR[1]/Parent_Dash_Level: 03
/InstallationR[1]/System_Id:
/InstallationR[1]/System_Tz: 238
/InstallationR[1]/Geo_North: 15658734
/InstallationR[1]/Geo_East: 15658734
/InstallationR[1]/Geo_Alt: 238
/InstallationR[1]/Geo_Location:
/InstallationR[2]
/InstallationR[2]/UNIX_Timestamp32: Tue Apr 18 10:00:45 EDT 2006
/InstallationR[2]/Fru_Path: MB.SEEPROM
/InstallationR[2]/Parent_Part_Number: 5017066
/InstallationR[2]/Parent_Serial_Number: BM004E
/InstallationR[2]/Parent_Dash_Level: 05
/InstallationR[2]/System_Id:
/InstallationR[2]/System_Tz: 0
/InstallationR[2]/Geo_North: 12704
/InstallationR[2]/Geo_East: 1
/InstallationR[2]/Geo_Alt: 251
/InstallationR[2]/Geo_Location:
/InstallationR[3]
/InstallationR[3]/UNIX_Timestamp32: Fri Apr 21 08:50:32 EDT 2006
/InstallationR[3]/Fru_Path: MB.SEEPROM
/InstallationR[3]/Parent_Part_Number: 3753302
/InstallationR[3]/Parent_Serial_Number: 0001
/InstallationR[3]/Parent_Dash_Level: 03
/InstallationR[3]/System_Id:
/InstallationR[3]/System_Tz: 0
/InstallationR[3]/Geo_North: 1
/InstallationR[3]/Geo_East: 16531457
/InstallationR[3]/Geo_Alt: 251
/InstallationR[3]/Geo_Location:
/Status_EventsR (0 iterations)
SEGMENT: PE
```


CODE EXAMPLE 8-12 prtfru -c Command Output (*Continued*)

```
/Power_EventsR (50 iterations)
/Power_EventsR[0]
/Power_EventsR[0]/UNIX_Timestamp32: Mon Jul 10 12:34:20 EDT 2006
/Power_EventsR[0]/Event: power_on
/Power_EventsR[1]
/Power_EventsR[1]/UNIX_Timestamp32: Mon Jul 10 12:34:49 EDT 2006
/Power_EventsR[1]/Event: power_off
/Power_EventsR[2]
/Power_EventsR[2]/UNIX_Timestamp32: Mon Jul 10 12:35:27 EDT 2006
/Power_EventsR[2]/Event: power_on
/Power_EventsR[3]
/Power_EventsR[3]/UNIX_Timestamp32: Mon Jul 10 12:58:43 EDT 2006
/Power_EventsR[3]/Event: power_off
/Power_EventsR[4]
/Power_EventsR[4]/UNIX_Timestamp32: Mon Jul 10 13:07:27 EDT 2006
/Power_EventsR[4]/Event: power_on
/Power_EventsR[5]
/Power_EventsR[5]/UNIX_Timestamp32: Mon Jul 10 14:07:20 EDT 2006
/Power_EventsR[5]/Event: power_off
/Power_EventsR[6]
/Power_EventsR[6]/UNIX_Timestamp32: Mon Jul 10 14:07:21 EDT 2006
/Power_EventsR[6]/Event: power_on
/Power_EventsR[7]
/Power_EventsR[7]/UNIX_Timestamp32: Mon Jul 10 14:17:01 EDT 2006
/Power_EventsR[7]/Event: power_off
/Power_EventsR[8]
/Power_EventsR[8]/UNIX_Timestamp32: Mon Jul 10 14:40:22 EDT 2006
/Power_EventsR[8]/Event: power_on
/Power_EventsR[9]
/Power_EventsR[9]/UNIX_Timestamp32: Mon Jul 10 14:42:38 EDT 2006
/Power_EventsR[9]/Event: power_off
/Power_EventsR[10]
/Power_EventsR[10]/UNIX_Timestamp32: Mon Jul 10 16:12:35 EDT 2006
/Power_EventsR[10]/Event: power_on
/Power_EventsR[11]
/Power_EventsR[11]/UNIX_Timestamp32: Tue Jul 11 08:53:47 EDT 2006
/Power_EventsR[11]/Event: power_off
/Power_EventsR[12]
```

Data displayed by the prtfru command varies depending on the type of FRU. In general, it includes:

- FRU description
- Manufacturer name and location
- Part number and serial number
- Hardware revision levels

Using the psrinfo Command

The `psrinfo` command displays the date and time each CPU came online. With the verbose (`-v`) option, the command displays additional information about the CPUs, including their clock speed. The following is sample output from the `psrinfo` command with the `-v` option.

CODE EXAMPLE 8-13 `psrinfo -v` Command Output

```
# psrinfo -v
Status of virtual processor 0 as of: 07/13/2006 14:18:39
on-line since 07/13/2006 14:01:26.
    The sparcv9 processor operates at 1592 MHz,
        and has a sparcv9 floating point processor.
Status of virtual processor 1 as of: 07/13/2006 14:18:39
on-line since 07/13/2006 14:01:26.
    The sparcv9 processor operates at 1592 MHz,
        and has a sparcv9 floating point processor.
Status of virtual processor 2 as of: 07/13/2006 14:18:39
on-line since 07/13/2006 14:01:26.
    The sparcv9 processor operates at 1592 MHz,
        and has a sparcv9 floating point processor.
Status of virtual processor 3 as of: 07/13/2006 14:18:39
on-line since 07/13/2006 14:01:24.
    The sparcv9 processor operates at 1592 MHz,
        and has a sparcv9 floating point processor.
```

Using the showrev Command

The `showrev` command displays revision information for the current hardware and software. [CODE EXAMPLE 8-14](#) shows sample output of the `showrev` command.

CODE EXAMPLE 8-14 `showrev` Command Output

```
# showrev
Hostname: sunrise
Hostid: 83d8ee71
Release: 5.10
Kernel architecture: sun4u
Application architecture: sparc
Hardware provider: Sun_Microsystems
Domain: Ecd.East.Sun.COM
Kernel version: SunOS 5.10 Generic_118833-17
bash-3.00#
```

When used with the `-p` option, this command displays installed patches. [TABLE 8-30](#) shows a partial sample output from the `showrev` command with the `-p` option.

TABLE 8-30 `showrev -p` Command Output

Patch:	109729-01	Obsoletes:	Requires:	Incompatibles:	Packages:	SUNWcsu
Patch:	109783-01	Obsoletes:	Requires:	Incompatibles:	Packages:	SUNWcsu
Patch:	109807-01	Obsoletes:	Requires:	Incompatibles:	Packages:	SUNWcsu
Patch:	109809-01	Obsoletes:	Requires:	Incompatibles:	Packages:	SUNWcsu
Patch:	110905-01	Obsoletes:	Requires:	Incompatibles:	Packages:	SUNWcsu
Patch:	110910-01	Obsoletes:	Requires:	Incompatibles:	Packages:	SUNWcsu
Patch:	110914-01	Obsoletes:	Requires:	Incompatibles:	Packages:	SUNWcsu
Patch:	108964-04	Obsoletes:	Requires:	Incompatibles:	Packages:	SUNWcsr

▼ To Run Solaris System Information Commands

- Decide what kind of system information you want to display.**
For more information, see [“Solaris System Information Commands” on page 192](#).
- Type the appropriate command at a console prompt.**
See [TABLE 8-31](#) for a summary of the commands.

TABLE 8-31 Using Solaris Information Display Commands

Command	What It Displays	What to Type	Notes
<code>fmadm</code>	Fault management information	<code>/usr/sbin/fmadm</code>	Lists information and changes settings.
<code>fmdump</code>	Fault management information	<code>/usr/sbin/fmdump</code>	Use the <code>-v</code> option for additional detail.
<code>prtconf</code>	System configuration information	<code>/usr/sbin/prtconf</code>	–
<code>prtdiag</code>	Diagnostic and configuration information	<code>/usr/platform/sun4u/sbin/prtdiag</code>	Use the <code>-v</code> option for additional detail.
<code>prtfru</code>	FRU hierarchy and SEEPROM memory contents	<code>/usr/sbin/prtfru</code>	Use the <code>-l</code> option to c hierarchy. Use the <code>-c</code> to display SEEPROM
<code>psrinfo</code>	Date and time each CPU came online; processor clock speed	<code>/usr/sbin/psrinfo</code>	Use the <code>-v</code> option to c clock speed and other
<code>showrev</code>	Hardware and software revision information	<code>/usr/bin/showrev</code>	Use the <code>-p</code> option to s software patches.

Viewing Recent Diagnostic Test Results

A summary of the results of the most recent power-on self-test (POST) are saved across power cycles.

▼ To View Recent Test Results

1. Obtain the `ok` prompt.
2. To see a summary of the most recent POST results, type:

TABLE 8-32

<code>ok show-post-results</code>

Setting OpenBoot Configuration Variables

Switches and diagnostic configuration variables stored in the IDPROM determine how and when power-on self-test (POST) diagnostics and OpenBoot Diagnostics tests are performed. This section explains how to access and modify OpenBoot configuration variables. For a list of important OpenBoot configuration variables, see [TABLE 8-7](#).

Changes to OpenBoot configuration variables usually take effect upon the next reboot.

▼ To View and Set OpenBoot Configuration Variables

1. Obtain the `ok` prompt.

- To display the current values of all OpenBoot configuration variables, use the `printenv` command.

The following example shows a short excerpt of this command's output.

TABLE 8-33

ok printenv		
Variable Name	Value	Default Value
diag-level	min	min
diag-switch?	false	false

- To set or change the value of an OpenBoot configuration variable, use the `setenv` command:

TABLE 8-34

ok setenv diag-level max		
diag-level =	max	

To set OpenBoot configuration variables that accept multiple keywords, separate keywords with a space.

Additional Diagnostic Tests for Specific Devices

Using the `probe-scsi` Command to Confirm That Hard Disk Drives are Active

The `probe-scsi` command transmits an inquiry to SAS devices connected to the system's internal SAS interface. If a SAS device is connected and active, the command displays the unit number, device type, and manufacturer name for that device.

CODE EXAMPLE 8-15 `probe-scsi` Output Message

```
ok probe-scsi
Target 0
  Unit 0   Disk      SEAGATE ST336605LSUN36G 4207
Target 1
  Unit 0   Disk      SEAGATE ST336605LSUN36G 0136
```

The `probe-scsi-all` command transmits an inquiry to all SAS devices connected to both the system's internal and its external SAS interfaces. [CODE EXAMPLE 8-16](#) shows sample output from a server with no externally connected SAS devices but containing two 36 Gbyte Hard Disk Drives, both of them active.

CODE EXAMPLE 8-16 `probe-scsi-all` Output Message

```
ok probe-scsi-all
/pci@1f,0/pci@1/scsi@8,1

/pci@1f,0/pci@1/scsi@8
Target 0
  Unit 0   Disk      SEAGATE ST336605LSUN36G 4207
Target 1
  Unit 0   Disk      SEAGATE ST336605LSUN36G 0136
```

Using the `probe-ide` Command To Confirm That the DVD Drive is Connected

The `probe-ide` command transmits an inquiry command to internal and external IDE devices connected to the system's on-board IDE interface. The following sample output reports a DVD drive installed (as Device 0) and active in a server.

CODE EXAMPLE 8-17 `probe-ide` Output Message

```
ok probe-ide
Device 0 ( Primary Master )
      Removable ATAPI Model: DV-28E-B

Device 1 ( Primary Slave )
      Not Present

Device 2 ( Secondary Master )
      Not Present

Device 3 ( Secondary Slave )
      Not Present
```

Using the `watch-net` and `watch-net-all` Commands to Check the Network Connections

The `watch-net` diagnostics test monitors Ethernet packets on the primary network interface. The `watch-net-all` diagnostics test monitors Ethernet packets on the primary network interface and on any additional network interfaces connected to the system board. Good packets received by the system are indicated by a period (.). Errors such as the framing error and the cyclic redundancy check (CRC) error are indicated with an X and an associated error description.

Start the `watch-net` diagnostic test by typing the `watch-net` command at the `ok` prompt. For the `watch-net-all` diagnostic test, type `watch-net-all` at the `ok` prompt.

CODE EXAMPLE 8-18 `watch-net` Diagnostic Output Message

```
{0} ok watch-net
Internal loopback test -- succeeded.
Link is -- up
Looking for Ethernet Packets.
`.` is a Good Packet. `X` is a Bad Packet.
Type any key to stop.....
```

CODE EXAMPLE 8-19 `watch-net-all` Diagnostic Output Message

```
{0} ok watch-net-all
/pci@1f,0/pci@1,1/network@c,1
Internal loopback test -- succeeded.
Link is -- up
Looking for Ethernet Packets.
`.` is a Good Packet. `X` is a Bad Packet.
Type any key to stop.
```

About Automatic Server Restart

Note – Automatic Server Restart is not the same as Automatic System Restoration (ASR), which the Sun Fire V445 server also supports.

Automatic Server Restart is a functional part of ALOM. It monitors the Solaris OS while it is running and, by default, captures `cpu register` and `memory contents` to the *dump-device* using the firmware level `sync` command.

ALOM uses a watchdog process to monitor *only* the kernel. ALOM will not restart the server if a process hangs and the kernel is still running. The ALOM watchdog parameters for the watchdog patting interval and watchdog timeout are not user configurable.

If the kernel hangs and the watchdog times out, ALOM reports and logs the event and performs one of three user configurable actions.

- `xir`: this is the default action and will cause the server to capture `cpu register` and `memory contents` to the *dump-device* using the firmware level `sync` command. In the event of the `sync` hanging, ALOM falls back to a hard reset after 15 minutes.

Note – Do not confuse this OpenBoot `sync` command with the Solaris OS `sync` command, which results in I/O writes of buffered data to the disk drives, prior to unmounting file systems.

- `Reset`: this is a hard reset and results in a rapid system recovery but diagnostic data regarding the hang is not stored, and file system damage may result.
- `None` - this will result in the system being left in the hung state indefinitely after the watchdog timeout has been reported.

For more information, see the `sys_autorestart` section of the *ALOM Online Help*.

About Automatic System Restoration

Note – Automatic System Restoration (ASR) is not the same as Automatic Server Restart, which the Sun Fire V445 server also supports.

Automatic System Restoration (ASR) consists of self-test features and an auto-configuring capability to detect failed hardware components and unconfigure them. By doing this, the server is able to resume operating after certain nonfatal hardware faults or failures have occurred.

If a component is one that is monitored by ASR, and the server is capable of operating without it, the server will automatically reboot if that component should develop a fault or fail.

ASR monitors the following components:

- Memory modules
- PCI cards

If a fault is detected during the power-on sequence, the faulty component is disabled. If the system remains capable of functioning, the boot sequence continues.

If a fault occurs on a running server, and it is possible for the server to run without the failed component, the server automatically reboots. This prevents a faulty hardware component from keeping the entire system down or causing the system to crash repeatedly.

To support such a degraded boot capability, the OpenBoot firmware uses the 1275 Client Interface (via the device tree) to mark a device as either *failed* or *disabled*, by creating an appropriate status property in the device tree node. The Solaris OS will not activate a driver for any subsystem so marked.

As long as a failed component is electrically dormant (not causing random bus errors or signal noise, for example), the system will reboot automatically and resume operation while a service call is made.

Note – ASR is enabled by default.

Auto-Boot Options

The OpenBoot firmware stores configuration variables on a ROM chip called `auto-boot?` and `auto-boot-on-error?`. The default setting on the Sun Fire V445 server for both of these variables is `true`.

The `auto-boot?` setting controls whether or not the firmware automatically boots the OS after each reset. The `auto-boot-on-error?` 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?` settings must be set to `true` (default) to enable an automatic degraded boot.

▼ To Set the Auto-Boot Switches

1. Type:

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

Note – With both of these variables set to `true`, the system attempts a degraded boot in response to any fatal nonrecoverable error.

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. Non-fatal errors include the following:
 - SAS subsystem failure. In this case, a working alternate path to the boot disk is required. For more information, see [“About Multipathing Software” on page 115](#).
 - Ethernet interface failure.
 - USB interface failure.
 - Serial interface failure.
 - PCI card failure.
 - Memory failure.

Given a failed DIMM, the firmware unconfigures 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. See [“About the CPU/Memory Modules” on page 73](#).

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 `boot-device` configuration variable.

- If a critical or fatal error is detected by POST or OpenBoot Diagnostics, the system will not boot regardless of the settings of `auto-boot?` or `auto-boot-on-error?`. Critical and 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 application-specific integrated circuit (ASIC) failure

For more information about troubleshooting fatal errors, see [Chapter 9](#).

Reset Scenarios

Two OpenBoot configuration variables, `diag-switch?` and `diag-trigger` control whether the system executes firmware diagnostics in response to system reset events.

POST is enabled as the default for `power-on-reset` and `error-reset` events. When the `diag-switch?` variable is set to `true`, diagnostics are executed using user-defined settings. If the `diag-switch?` variable is set to `false`, diagnostics are executed depending on the `diag-trigger` variable setting.

In addition, ASR is enabled by default because `diag-trigger` is set to `power-on-reset` and `error-reset`. This default setting remains when the `diag-switch?` variable is set to `false`. `auto-boot?` and `auto-boot-on-error?` are set to `true` by default.

Automatic System Restoration 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 a Device Manually” on page 112](#).

Enabling Automatic System Restoration

The ASR feature is enabled by default. ASR is always enabled when the `diag-switch?` OpenBoot variable is set to `true`, and when the `diag-trigger` setting is set to `error-reset`.

To activate any parameter changes, type the following at the `ok` prompt:

```
ok reset-all
```

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

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

Disabling Automatic System Restoration

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

▼ To Disable Automatic System Restoration

1. At the `ok` prompt, type:

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

2. To activate the parameter change, 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.

Displaying Automatic System Restoration Information

Use the following command to display information about the status of the 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.

About SunVTS

SunVTS is a software suite that performs system and subsystem stress testing. You can view and control a SunVTS session over a network. Using a remote machine, you can view the progress of a testing session, change testing options, and control all testing features of another machine on the network.

You can run SunVTS software in four different test modes:

- *Connection* test mode provides a low-stress, quick testing of the availability and connectivity of selected devices. These tests are nonintrusive, meaning they release the devices after a quick test, and they do not place a heavy load on system activity.
- *Functional* test mode provides robust testing of your system and devices. It uses your system resources for thorough testing and it assumes that no other applications are running.
- *Exclusive* test mode enables performing the tests that require no other SunVTS tests or applications running at the same time.
- *Online* test mode enables performance of SunVTS testing while other customer applications are running.
- *Auto Config* automatically detects all subsystems and exercises them in one of two ways:
 - *Confidence testing* – Performs one pass of tests on all subsystems, and then stops. For typical system configurations, this requires one or two hours.
 - *Comprehensive testing* – Tests all subsystems repeatedly for up to 24 hours.

Since SunVTS software can run many tests in parallel and consume many system resources, you should be cautious when using it on a production system. If you are stress-testing a system using the Functional test mode, do not run anything else on that system at the same time.

To install and use SunVTS, a system must be running a Solaris OS compatible for the SunVTS version. Since SunVTS software packages are optional, they may not be installed on your system. See [“To Find Out Whether SunVTS Is Installed” on page 217](#) for instructions.

SunVTS Software and Security

During SunVTS software installation, you must choose between Basic or Sun Enterprise Authentication Mechanism™ security. Basic security uses a local security file in the SunVTS installation directory to limit the users, groups, and hosts

permitted to use SunVTS software. Sun Enterprise Authentication Mechanism security is based on the standard network authentication protocol Kerberos and provides secure user authentication, data integrity and privacy for transactions over networks.

If your site uses Sun Enterprise Authentication Mechanism security, you must have the Sun Enterprise Authentication Mechanism client and server software installed in your networked environment and configured properly in both Solaris and SunVTS software. If your site does not use Sun Enterprise Authentication Mechanism security, do not choose the Sun Enterprise Authentication Mechanism option during SunVTS software installation.

If you enable the wrong security scheme during installation, or if you improperly configure the security scheme you choose, you may find yourself unable to run SunVTS tests. For more information, see the *SunVTS User's Guide* and the instructions accompanying the Sun Enterprise Authentication Mechanism software.

Using SunVTS

SunVTS, the Sun Validation and Test Suite, is an online diagnostics tool that you can use to verify the configuration and functionality of hardware controllers, devices, and platforms. It runs in the Solaris OS and presents the following interfaces:

- Command line interface
- Serial (TTY) interface

SunVTS software enables you to view and control testing sessions on a remotely connected server. [TABLE 8-35](#) lists some of the tests that are available:

TABLE 8-35 SunVTS Tests

SunVTS Test	Description
<code>cputest</code>	Tests the CPU
<code>disktest</code>	Tests the local disk drives
<code>dvdtest</code>	Tests the DVD-ROM drive
<code>fpptest</code>	Tests the floating-point unit
<code>nettest</code>	Tests the Ethernet hardware on the system board and the networking hardware on any optional PCI cards
<code>netlptest</code>	Performs a loopback test to check that the Ethernet adapter can send and receive packets
<code>pmemtest</code>	Tests the physical memory (read only)
<code>sutest</code>	Tests the server's on-board serial ports

TABLE 8-35 SunVTS Tests

SunVTS Test	Description
<code>vmemtest</code>	Tests the virtual memory (a combination of the swap partition and the physical memory)
<code>env6test</code>	Tests the environmental devices
<code>ssptest</code>	Tests ALOM hardware devices
<code>i2c2test</code>	Tests I2C devices for correct operation

▼ To Find Out Whether SunVTS Is Installed

● Type:

TABLE 8-36

```
# pkginfo -l SUNWvts
```

If SunVTS software is loaded, information about the package will be displayed.
If SunVTS software is not loaded, you will see the following error message:

TABLE 8-37

```
ERROR: information for "SUNWvts" was not found
```

Installing SunVTS

By default, SunVTS is not installed on the Sun Fire V445 servers. However, it is available in the `Solaris_10/ExtraValue/CoBundled/SunVTS_X.X` Solaris 10 DVD supplied in the Solaris Media Kit. For information about downloading SunVTS from the Sun Download Center, refer to the *Sun Hardware Platform Guide* for the Solaris version you are using.

To find out more about using SunVTS, refer to the SunVTS documentation that corresponds to the Solaris release that you are running.

Viewing SunVTS Documentation

The SunVTS documents are accessible in the Solaris on Sun Hardware documentation collection at <http://docs.sun.com>.

For further information, you can also consult the following SunVTS documents:

- *SunVTS User's Guide* describes how to install, configure, and run the SunVTS diagnostic software.
- *SunVTS Quick Reference Card* provides an overview of how to use the SunVTS graphical user interface.
- *SunVTS Test Reference Manual for SPARC Platforms* provides details about each individual SunVTS test.

About Sun Management Center

Sun Management Center software provides enterprise-wide monitoring of Sun servers and workstations, including their subsystems, components, and peripheral devices. The system being monitored must be up and running, and you need to install all the proper software components on various systems in your network.

Sun Management Center enables you to monitor the following on the Sun Fire V445 server.

TABLE 8-38 What Sun Management Center Monitors

Item Monitored	What Sun Management Center Monitors
Disk drives	Status
Fans	Status
CPUs	Temperature and any thermal warning or failure conditions
Power supply	Status
System temperature	Temperature and any thermal warning or failure conditions

Sun Management Center software extends and enhances the management capability of Sun's hardware and software products.

TABLE 8-39 Sun Management Center Features

Feature	Description
System management	Monitors and manages the system at the hardware and operating system levels. Monitored hardware includes boards, tapes, power supplies, and disks.
Operating system management	Monitors and manages operating system parameters including load, resource usage, disk space, and network statistics.
Application and business system management	Provides technology to monitor business applications such as trading systems, accounting systems, inventory systems, and real-time control systems.
Scalability	Provides an open, scalable, and flexible solution to configure and manage multiple management administrative domains (consisting of many systems) spanning an enterprise. The software can be configured and used in a centralized or distributed fashion by multiple users.

Sun Management Center software is geared primarily toward system administrators who have large data centers to monitor or other installations that have many computer platforms to monitor. If you administer a more modest installation, you need to weigh Sun Management Center software's benefits against the requirement of maintaining a significant database (typically over 700 Mbytes) of system status information.

The servers being monitored must be up and running if you want to use Sun Management Center, since this tool relies on the Solaris OS. For instructions on using this tool to monitor a Sun Fire V445 server, see [Chapter 8](#).

How Sun Management Center Works

Sun Management Center consists of three components:

- Agent
- Server
- Monitor

You install *agents* on systems to be monitored. The agents collect system status information from log files, device trees, and platform-specific sources, and report that data to the server component.

The *server* component maintains a large database of status information for a wide range of Sun platforms. This database is updated frequently, and includes information about boards, tapes, power supplies, and disks as well as OS parameters like load, resource usage, and disk space. You can create alarm thresholds and be notified when these are exceeded.

The *monitor* components present the collected data to you in a standard format. Sun Management Center software provides both a standalone Java application and a Web browser-based interface. The Java interface affords physical and logical views of the system for highly-intuitable monitoring.

Using Sun Management Center

Sun Management Center software is aimed at system administrators who have large data centers to monitor or other installations that have many computer platforms to monitor. If you administer a smaller installation, you need to weigh Sun Management Center software's benefits against the requirement of maintaining a significant database (typically over 700 Mbytes) of system status information.

The servers to be monitored must be running , Sun Management Center relies on the Solaris OS for its operation.

For detailed instructions, see the *Sun Management Center Software User's Guide*.

Other Sun Management Center Features

Sun Management Center software provides you with additional tools, which can operate with management utilities made by other companies.

The tools are an informal tracking mechanism and the optional add-on, Hardware Diagnostics Suite.

Informal Tracking

Sun Management Center agent software must be loaded on any system you want to monitor. However, the product enables you to informally track a supported platform even when the agent software has not been installed on it. In this case, you do not have full monitoring capability, but you can add the system to your browser, have Sun Management Center periodically check whether it is up and running, and notify you if it goes out of commission.

Hardware Diagnostic Suite

The *Hardware Diagnostic Suite* is a package that you can purchase as an add-on to Sun Management Center. The suite enables you to exercise a system while it is still up and running in a production environment. See “[Hardware Diagnostic Suite](#)” on [page 221](#) for more information.

Interoperability With Third-Party Monitoring Tools

If you administer a heterogeneous network and use a third-party network-based system monitoring or management tool, you might be able to take advantage of Sun Management Center software’s support for Tivoli Enterprise Console, BMC Patrol, and HP Openview.

Obtaining the Latest Information

For the latest information about this product, go to the Sun Management Center web site: <http://www.sun.com/sunmanagementcenter>

Hardware Diagnostic Suite

The Sun Management Center features an optional Hardware Diagnostic Suite, which you can purchase as an add-on. The Hardware Diagnostic Suite is designed to exercise a production system by running tests sequentially.

Sequential testing means the Hardware Diagnostic Suite has a low impact on the system. Unlike SunVTS, which stresses a system by consuming its resources with many parallel tests (see “[About SunVTS](#)” on [page 215](#)), the Hardware Diagnostic Suite lets the server run other applications while testing proceeds.

When to Run Hardware Diagnostic Suite

The best use of the Hardware Diagnostic Suite is to disclose a suspected or intermittent problem with a noncritical part on an otherwise functioning machine. Examples might include questionable disk drives or memory modules on a machine that has ample or redundant disk and memory resources.

In cases like these, the Hardware Diagnostic Suite runs unobtrusively until it identifies the source of the problem. The machine under test can be kept in production mode until and unless it must be shut down for repair. If the faulty part is hot-pluggable or hot-swappable, the entire diagnose-and-repair cycle can be completed with minimal impact to system users.

Requirements for Using Hardware Diagnostic Suite

Since it is a part of Sun Management Center, you can only run Hardware Diagnostic Suite if you have set up your data center to run Sun Management Center. This means you have to dedicate a master server to run the Sun Management Center server software that supports Sun Management Center software's database of platform status information. In addition, you must install and set up Sun Management Center agent software on the systems to be monitored. Finally, you need to install the console portion of Sun Management Center software, which serves as your interface to the Hardware Diagnostic Suite.

Instructions for setting up Sun Management Center, as well as for using the Hardware Diagnostic Suite, can be found in the *Sun Management Center Software User's Guide*.

Troubleshooting

This chapter describes the diagnostic tools available for the Sun Fire V445 server.

Topics in this chapter include:

- [“Troubleshooting Options” on page 223](#)
- [“About Updated Troubleshooting Information” on page 224](#)
- [“About Firmware and Software Patch Management” on page 225](#)
- [“About Sun Install Check Tool” on page 226](#)
- [“About Sun Explorer Data Collector” on page 226](#)
- [“About Sun Remote Services Net Connect” on page 227](#)
- [“About Configuring the System for Troubleshooting” on page 227](#)
- [“Core Dump Process” on page 230](#)
- [“Enabling the Core Dump Process” on page 231](#)
- [“Testing the Core Dump Setup” on page 233](#)

Troubleshooting Options

There are several troubleshooting options that you can implement when you set up and configure the Sun Fire V445 server. By setting up your system with troubleshooting in mind, you can save time and minimize disruptions if the system encounters any problems.

Tasks covered in this chapter include:

- [“Enabling the Core Dump Process” on page 231](#)
- [“Testing the Core Dump Setup” on page 233](#)

Other information in this chapter includes:

- [“About Updated Troubleshooting Information” on page 224](#)
- [“About Firmware and Software Patch Management” on page 225](#)
- [“About Sun Install Check Tool” on page 226](#)

- “About Sun Explorer Data Collector” on page 226
- “About Configuring the System for Troubleshooting” on page 227

About Updated Troubleshooting Information

You can obtain the most current server troubleshooting information in the *Sun Fire V445 Server Product Notes* and at Sun web sites. These resources can help you understand and diagnose problems that you might encounter.

Product Notes

Sun Fire V445 Server Product Notes contain late-breaking information about the system, including the following:

- Current recommended and required software patches
- Updated hardware and driver compatibility information
- Known issues and bug descriptions, including solutions and workarounds

The latest product notes are available at:

<http://www.sun.com/documentation>

Web Sites

The following Sun web sites provide troubleshooting and other useful information.

SunSolve Online

This site presents a collection of resources for Sun technical and support information. Access to some of the information on this site depends on the level of your service contract with Sun. This site includes the following:

- *Patch Support Portal* – Everything you need to download and install patches, including tools, product patches, security patches, signed patches, x86 drivers, and more.
- *Sun Install Check tool* – A utility you can use to verify proper installation and configuration of a new Sun Fire server. This resource checks a Sun Fire server for valid patches, hardware, OS, and configuration.

- *Sun System Handbook* – A document that contains technical information and provides access to discussion groups for most Sun hardware, including the Sun Fire V445 server.
- Support documents, security bulletins, and related links.

The SunSolve Online Web site is at:

<http://sunsolve.sun.com>

Big Admin

This site is a one-stop resource for Sun system administrators. The Big Admin web site is at:

<http://www.sun.com/bigadmin>

About Firmware and Software Patch Management

Sun makes every attempt to ensure that each system is shipped with the latest firmware and software. However, in complex systems, bugs and problems are discovered in the field after systems leave the factory. Often, these problems are fixed with patches to the system's firmware. Keeping your system's firmware and Solaris OS current with the latest recommended and required patches can help you avoid problems that others might have already discovered and solved.

Firmware and OS updates are often required to diagnose or fix a problem. Schedule regular updates of your system's firmware and software so that you will not have to update the firmware or software at an inconvenient time.

You can find the latest patches and updates for the Sun Fire V445 server at the Web sites listed in [“Web Sites” on page 224](#).

About Sun Install Check Tool

When you install the Sun Install Check tool, you also install Sun Explorer Data Collector. The Sun Install Check tool uses Sun Explorer Data Collector to help you confirm that Sun Fire V445 server installation has been completed optimally. Together, they can evaluate your system for the following:

- Minimum required OS level
- Presence of key critical patches
- Proper system firmware levels
- Unsupported hardware components

When Sun Install Check tool and Sun Explorer Data Collector identify potential problems, a report is generated that provides specific instructions to remedy the issue.

The Sun Install Check tool is available at:

<http://sunsolve.sun.com>

At that site, click on the link to the Sun Install Check tool.

See also “[About Sun Explorer Data Collector](#)” on page 226.

About Sun Explorer Data Collector

The Sun Explorer Data Collector is a system data collection tool that Sun support services engineers sometimes use when troubleshooting Sun systems. In certain support situations, Sun support services engineers might ask you to install and run this tool. If you installed the Sun Install Check tool at initial installation, you also installed Sun Explorer Data Collector. If you did not install the Sun Install Check tool, you can install Sun Explorer Data Collector later without the Sun Install Check tool. By installing this tool as part of your initial system setup, you avoid having to install the tool at a later, and often inconvenient time.

Both the Sun Install Check tool (with bundled Sun Explorer Data Collector) and the Sun Explorer Data Collector (standalone) are available at:

<http://sunsolve.sun.com>

At that site, click on the appropriate link.

About Sun Remote Services Net Connect

Sun Remote Services (SRS) Net Connect is a collection of system management services designed to help you better control your computing environment. These Web-delivered services enable you to monitor systems, to create performance and trend reports, and to receive automatic notification of system events. These services help you to act more quickly when a system event occurs and to manage potential issues before they become problems.

More information about SRS Net Connect is available at:

<http://www.sun.com/service/support/srs/netconnect>

About Configuring the System for Troubleshooting

System failures are characterized by certain symptoms. Each symptom can be traced to one or more problems or causes by using specific troubleshooting tools and techniques. This section describes troubleshooting tools and techniques that you can control through configuration variables.

Hardware Watchdog Mechanism

The hardware watchdog mechanism is a hardware timer that is continually reset as long as the OS is running. If the system hangs, the OS is no longer able to reset the timer. The timer then expires and causes an automatic externally initiated reset (XIR), displaying debug information on the system console. The hardware watchdog mechanism is enabled by default. If the hardware watchdog mechanism is disabled, the Solaris OS must be configured before the hardware watchdog mechanism can be reenabled.

The configuration variable `error-reset-recovery` allows you to control how the hardware watchdog mechanism behaves when the timer expires. The following are the error-reset-recovery settings:

- `boot` (default) – Resets the timer and attempts to reboot the system.
- `sync` (recommended) – Attempts to automatically generate a core dump file dump, reset the timer, and reboot the system.

- none (equivalent to issuing a manual XIR from the ALOM system controller) – Drops the server to the ok prompt, enabling you to issue commands and debug the system.

For more information about the hardware watchdog mechanism and XIR, see [Chapter 5](#).

Automatic System Restoration Settings

The Automatic System Restoration (ASR) features enable 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.

How you configure ASR settings has an effect not only on how the system handles certain types of failures but also on how you go about troubleshooting certain problems.

For day-to-day operations, enable ASR by setting OpenBoot configuration variables as shown in [TABLE 9-1](#).

TABLE 9-1 OpenBoot Configuration Variable Settings to Enable Automatic System Restoration

Variable	Setting
auto-boot?	true
auto-boot-on-error?	true
diag-level	max
diag-switch?	true
diag-trigger	all-resets
diag-device	(Set to the boot-device value)

Configuring your system this way ensures that diagnostic tests run automatically when most serious hardware and software errors occur. With this ASR configuration, you can save time diagnosing problems since POST and OpenBoot Diagnostics test results are already available after the system encounters an error.

For more information about how ASR works, and complete instructions for enabling ASR capability, see [“About Automatic System Restoration” on page 209](#).

Remote Troubleshooting Capabilities

You can use the Sun Advanced Lights Out Manager (ALOM) system controller to troubleshoot and diagnose the system remotely. The ALOM system controller enables you to do the following:

- Turn system power on and off
- Control the Locator indicator
- Change OpenBoot configuration variables
- View system environmental status information
- View system event logs

In addition, you can use the ALOM system controller to access the system console, provided it has not been redirected. System console access enables you to do the following:

- Run OpenBoot Diagnostics tests
- View Solaris OS output
- View POST output
- Issue firmware commands at the `ok` prompt
- View error events when the Solaris OS terminates abruptly

For more information about ALOM system controller, see: [Chapter 5](#) or the *Sun Advanced Lights Out Manager (ALOM) Online Help*.

For more information about the system console, see [Chapter 2](#).

System Console Logging

Console logging is the ability to collect and log system console output. Console logging captures console messages so that system failure data, like Fatal Reset error details and POST output, can be recorded and analyzed.

Console logging is especially valuable when troubleshooting Fatal Reset errors and RED State Exceptions. In these conditions, the Solaris OS terminates abruptly, and although it sends messages to the system console, the OS software does not log any messages in traditional file system locations like the `/var/adm/messages` file.

The error logging daemon, `syslogd`, automatically records various system warnings and errors in message files. By default, many of these system messages are displayed on the system console and are stored in the `/var/adm/messages` file.

Note – Solaris 10 moves CPU and memory hardware detected data from the `/var/adm/messages` file to the fault management components. This make it easier to locate hardware events and to facilitate predictive self healing.

You can direct where system log messages are stored or have them sent to a remote system by setting up system message logging. For more information, see “How to Customize System Message Logging” in the *System Administration Guide: Advanced Administration*, which is part of the Solaris System Administrator Collection.

In some failure situations, a large stream of data is sent to the system console. Because ALOM system controller log messages are written into a circular buffer that holds 64 Kbytes of data, it is possible that the output identifying the original failing component can be overwritten. Therefore, you may want to explore further system console logging options, such as SRS Net Connect or third-party vendor solutions. For more information about SRS Net Connect, see “[About Sun Remote Services Net Connect](#)” on page 227.

More information about SRS Net Connect is available at:

<http://www.sun.com/service/support/>

Certain third-party vendors offer data logging terminal servers and centralized system console management solutions that monitor and log output from many systems. Depending on the number of systems you are administering, these might offer solutions for logging system console information.

For more information about the system console, see [Chapter 2](#).

Predictive Self-Healing

The Solaris Fault Manager daemon, `fmd(1M)`, runs in the background on every Solaris 10 or later system and receives telemetry information about problems detected by the system software. The fault manager then uses this information to diagnose detected problems and initiate proactive self-healing activities such as disabling faulty components.

`fmdump(1M)`, `fmadm(1M)`, and `fmstat(1M)` are the three core commands that administer the system generated messages produced by the Solaris Fault Manager. See “[About Predictive Self-Healing](#)” on page 186 for details. Also refer to the man pages for these commands.

Core Dump Process

In some failure situations, a Sun engineer might need to analyze a system core dump file to determine the root cause of a system failure. Although the core dump process is enabled by default, you should configure your system so that the core dump file is saved in a location with adequate space. You might also want to change the default

core dump directory to another locally mounted location so that you can better manage any system core dumps. In certain testing and pre-production environments, this is recommended since core dump files can take up a large amount of file system space.

Swap space is used to save the dump of system memory. By default, Solaris software uses the first swap device that is defined. This first swap device is known as the *dump device*.

During a system core dump, the system saves the content of kernel core memory to the dump device. The dump content is compressed during the dump process at a 3:1 ratio; that is, if the system were using 6 Gbytes of kernel memory, the dump file will be about 2 Gbytes. For a typical system, the dump device should be at least one third the size of the total system memory.

See [“Enabling the Core Dump Process” on page 231](#) for instructions on how to calculate the amount of available swap space.

Enabling the Core Dump Process

This is normally a task that you would complete just prior to placing a system into the production environment.

Access the system console. See:

- [“About Communicating With the System” on page 26](#)

▼ To Enable the Core Dump Process

1. **Check that the core dump process is enabled. As root, type the `dumpadm` command.**

TABLE 9-2

<pre># dumpadm Dump content: kernel pages Dump device: /dev/dsk/c0t0d0s1 (swap) Savecore directory: /var/crash/machinename Savecore enabled: yes</pre>
--

By default, the core dump process is enabled in the Solaris 8 OS.

2. Verify that there is sufficient swap space to dump memory. Type the `swap -l` command.

TABLE 9-3

# <code>swap -l</code>				
swapfile	dev	swaplo	blocks	free
/dev/dsk/c0t3d0s0	32,24	16	4097312	4062048
/dev/dsk/c0t1d0s0	32,8	16	4097312	4060576
/dev/dsk/c0t1d0s1	32,9	16	4097312	4065808

To determine how many bytes of swap space are available, multiply the number in the `blocks` column by 512. Taking the number of blocks from the first entry, `c0t3d0s0`, calculate as follows:

$$4097312 \times 512 = 2097823744$$

The result is approximately 2 Gbytes.

3. Verify that there is sufficient file system space for the core dump files. Type the `df -k` command.

TABLE 9-4

<code>df -k /var/crash/`uname -n`</code>
--

By default the location where `savecore` files are stored is:

`/var/crash/`uname -n``

For instance, for the *mysystem* server, the default directory is:

`/var/crash/mysystem`

The file system specified must have space for the core dump files.

If you see messages from `savecore` indicating not enough space in the `/var/crash/` file, any other locally mounted (not NFS) file system can be used. Following is a sample message from `savecore`.

TABLE 9-5

System dump time: Wed Apr 23 17:03:48 2003 savecore: not enough space in /var/crash/sf440-a (216 MB avail, 246 MB needed)

Perform Steps 4 and 5 if there is not enough space.

4. Type the `df -kl` command to identify locations with more space.

TABLE 9-6

# <code>df -kl</code>					
Filesystem	kbytes	used	avail	capacity	Mounted on
/dev/dsk/c1t0d0s0	832109	552314	221548	72%	/
/proc	0	0	0	0%	/proc
fd	0	0	0	0%	/dev/fd
mnttab	0	0	0	0%	/etc/mnttab
swap	3626264	16	362624	81%	/var/run
swap	3626656	408	362624	81%	/tmp
/dev/dsk/c1t0d0s7	33912732	9	33573596	1%	/export/home

5. Type the `dumpadm -s` command to specify a location for the dump file.

TABLE 9-7

<code>dumpadm -s /export/home/</code>
Dump content: kernel pages
Dump device: /dev/dsk/c3t5d0s1 (swap)
Savecore directory: /export/home
Savecore enabled: yes

The `dumpadm -s` command enables you to specify the location for the swap file. See the `dumpadm (1M)` man page for more information.

Testing the Core Dump Setup

Before placing the system into a production environment, it might be useful to test whether the core dump setup works. This procedure might take some time depending on the amount of installed memory.

Back up all your data and access the system console. See:

- [“About Communicating With the System” on page 26](#)

▼ To Test the Core Dump Setup

1. Gracefully shut down the system using the `shutdown` command.

2. At the `ok` prompt, issue the `sync` command.

You should see “dumping” messages on the system console.

The system reboots. During this process, you can see the `savecore` messages.

3. Wait for the system to finish rebooting.

4. Look for system core dump files in your `savecore` directory.

The files are named `unix.y` and `vmcore.y`, where `y` is the integer dump number. There should also be a `bounds` file that contains the next crash number `savecore` will use.

If a core dump is not generated, perform the procedure described in [“Enabling the Core Dump Process” on page 231](#).

Connector Pinouts

This appendix provides reference information about the system back panel ports and pin assignments.

Topics covered in this appendix include:

- [“Reference for the Serial Management Port Connector” on page 235](#)
- [“Reference for the Network Management Port Connector” on page 236](#)
- [“Reference for the Serial Port Connector” on page 238](#)
- [“Reference for the USB Connectors” on page 239](#)
- [“Reference for the Gigabit Ethernet Connectors” on page 240](#)

Reference for the Serial Management Port Connector

The serial management connector (labeled SERIAL MGT) is an RJ-45 connector located on the back panel. This port is the default connection to the system console.

Serial Management Connector Diagram

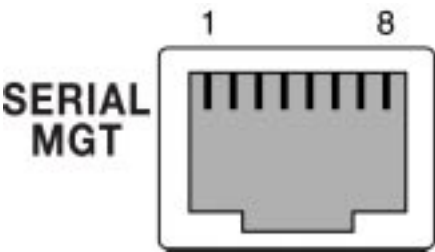


FIGURE A-1 Serial Management Connector Diagram

Serial Management Connector Signals

For Serial Management connector signals, see [TABLE A-1](#).

TABLE A-1 Serial Management Connector Signals

Pin	Signal Description	Pin	Signal Description
1	Request to Send	5	Ground
2	Data Terminal Ready	6	Receive Data
3	Transmit Data	7	Data Set Ready
4	Ground	8	Clear to Send

Reference for the Network Management Port Connector

The network management connector (labeled NET MGT) is an RJ-45 connector located on the ALOM card and can be accessed from the back panel. This port needs to be configured prior to use.

Network Management Connector Diagram



FIGURE A-2 Network Management Connector Diagram

Network Management Connector Signals

For Network Management connector signals, see [TABLE A-2](#).

TABLE A-2 Network Management Connector Signals

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

Reference for the Serial Port Connector

The serial port connector (TTYB) is a DB-9 connector that can be accessed from the back panel.

Serial Port Connector Diagram

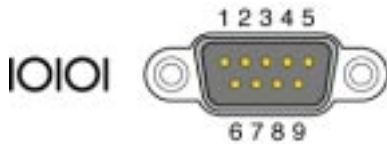


FIGURE A-3 Serial Port Connector Diagram

Serial Port Connector Signals

For serial port connector signals, see [TABLE A-3](#).

TABLE A-3 Serial Port Connector Signals

Pin	Signal Description	Pin	Signal Description
1	Data Carrier Detect	6	Data Set Ready
2	Receive Data	7	Request to Send
3	Transmit Data	8	Clear to Send
4	Data Terminal Ready	9	Ring Indicate
5	Ground		

Reference for the USB Connectors

Two Universal Serial Bus (USB) ports are located on the motherboard in a double-stacked layout and can be accessed from the back panel.

USB Connector Diagram

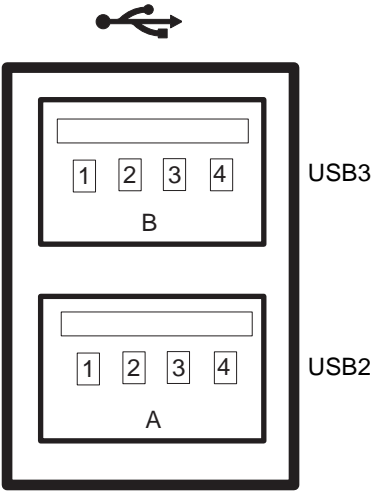


FIGURE A-4 USB Connector Diagram

USB Connector Signals

For USB connector signals, see [TABLE A-4](#).

TABLE A-4 USB Connector Signals

Pin	Signal Description	Pin	Signal Description
A1	+5 V (fused)	B1	+5 V (fused)

TABLE A-4 USB Connector Signals

Pin	Signal Description	Pin	Signal Description
A2	USB0/1-	B2	USB2/3-
A3	USB0/1+	B3	USB2/3+
A4	Ground	B4	Ground

Reference for the Gigabit Ethernet Connectors

Four RJ-45 Gigabit Ethernet connectors (NET0, NET1, NET2, NET3) are located on the system motherboard and can be accessed from the back panel. The Ethernet interfaces operate at 10 Mbit/sec, 100 Mbit/sec, and 1000 Mbit/sec.

Gigabit Ethernet Connector Diagram

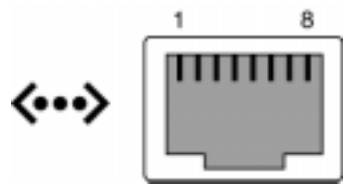


FIGURE A-5 Gigabit Ethernet Connector Diagram

Gigabit Ethernet Connector Signals

For Gigabit Ethernet connector signals, see [TABLE A-5](#).

TABLE A-5 Gigabit Ethernet Connector Signals

Pin	Signal Description	Pin	Signal Description
1	Transmit/Receive Data 0 +	5	Transmit/Receive Data 2 –
2	Transmit/Receive Data 0 –	6	Transmit/Receive Data 1 –
3	Transmit/Receive Data 1 +	7	Transmit/Receive Data 3 +
4	Transmit/Receive Data 2 +	8	Transmit/Receive Data 3 –

System Specifications

This appendix provides the following specifications for the Sun Fire V445 server:

- [“Reference for Physical Specifications” on page 244](#)
- [“Reference for Electrical Specifications” on page 244](#)
- [“Reference for Environmental Specifications” on page 245](#)
- [“Reference for Agency Compliance Specifications” on page 247](#)
- [“Reference for Clearance and Service Access Specifications” on page 248](#)

Reference for Physical Specifications

The dimensions and weight of the system are as follows.

TABLE B-1 Dimensions and Weight

Measurement	U.S.	Metric
Height	6.85 in.	17.5 cm
Width	17.48 in.	44.5 cm
Depth	25 in.	64.4 cm
Weight:		
Minimum	70 lbs	31 kg
Maximum	82 lbs	37.2 kg
Power Cord	8.2 ft	2.5 m

Reference for Electrical Specifications

The following table provides the electrical specifications for the system. All specifications pertain to a fully configured system operating at 50 Hz or 60 Hz.

TABLE B-2 Electrical Specifications

Parameter	Value
Input	
Nominal Frequencies	50 or 60 Hz
Nominal Voltage Range	100 to 240 VAC
Maximum Current AC RMS *	13.2 A @ 100 VAC 11 A @ 120 VAC 6.6 A @ 200 VAC 6.35 A @ 208 VAC 6 A @ 220 VAC 5.74 A @ 230 VAC 5.5A @ 240 VAC
Output	

TABLE B-2 Electrical Specifications

Parameter	Value
+12 VDC	0.5 to 45A
-12 VDC	0 to 0.8A
+5 VDC	0.5 to 28A
-5 VDC	0.5 to 50A
Maximum DC Output of Two (2) Power Supplies	1100W Max AC power consumption 1320W for operation @ 100 VAC to 240 VAC Max heat dissipation 4505 BTUs/Hr for operation @ 200 VAC to 240 VAC.
Maximum AC Power Consumption	788W for operation @ 100 VAC to 240 VAC (maximum configuration)
Maximum Heat Dissipation	4505 Btu/hr for operation @ 100 VAC to 240 VAC

* Refers to total input current required for four AC inlets when operating with all four power supplies or current required for a dual AC inlet when operating with the minimum of two power supplies.

Reference for Environmental Specifications

The operating and nonoperating environmental specifications for the system are as follows.

TABLE B-3 Environmental Specifications

Parameter	Value
Operating	
Temperature	5°C to 35°C (41°F to 95°F) noncondensingIEC 60068-2-1&2
Humidity	20% to 80% RH noncondensing; 27°C max wet bulbIEC 60068-2-3&56
Altitude	Up to 3000 meters, max ambient temperature is derated by 1°C per 500 meters above 500 meters IEC 60068-2-13
Vibration (random)	0.0001 g2/Hz, 5 to 150 Hz, -12db/octave slope 150 to 500 Hz
Shock	3.0 g peak, 11 milliseconds half-sine pulseIEC 60068-2-27
Nonoperating	
Temperature	-40°C to 60°C (-40°F to 140°F)noncondensingIEC 60068-2-1&2

TABLE B-3 Environmental Specifications (*Continued*)

Parameter	Value
Humidity	Up to 93% RH noncondensing; 38°C max wet bulbIEC 60068-2-3&56
Altitude	0 to 12,000 meters (0 to 40,000 feet)IEC 60068-2-13
Vibration	0.001 g ² /Hz, 5 to 150 Hz, -12db/octave slope 150 to 500 Hz
Shock	15.0 g peak, 11 milliseconds half-sine pulse; 1.0 inch roll-off front to back, 0.5 inch roll-off side to sideIEC 60068-2-27
Handling Drops	60 mm, 1 drop per corner, 4 cornersIEC 60068-2-31
Threshold Impact	0.85m/s, 3 impacts per caster, all 4 casters, 25 mm step-upETE 1010-01

Reference for Agency Compliance Specifications

The system complies with the following specifications.

TABLE B-4 Agency Compliance Specifications

Category	Relevant Standards
Safety	UL/CSA-60950-1, EN60950-1, IEC60950-1 CB Scheme with all country deviations, IEC825-1, 2, CFR21 part 1040, CNS14336
RFI/EMI	EN55022 Class A 47 CFR 15B Class A ICES-003 Class A VCCI Class A AS/NZ 3548 Class A CNS 13438 Class A KSC 5858 Class A EN61000-3-2 EN61000-3-3
Immunity	EN55024 IEC 61000-4-2 IEC 61000-4-3 IEC 61000-4-4 IEC 61000-4-5 IEC 61000-4-6 IEC 61000-4-8 IEC 61000-4-11
Telecommunications	EN300-386
Regulatory Marking	CE, FCC, ICES-003, C-tick, VCCI, GOST-R, BSMI, MIC, UL/cUL, UL/S-mark, UL/GS-mark

Reference for Clearance and Service Access Specifications

Minimum clearances needed for servicing the system are as follows.

TABLE B-5 Clearance and Service Access Specifications

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

OpenBoot Configuration Variables

TABLE C-1 describes the OpenBoot firmware configuration variables stored on an IDPROM module on a new system controller. The OpenBoot configuration variables are printed here in the order in which they appear when you issue the `showenv` command.

TABLE C-1 OpenBoot Configuration Variables Stored on a ROM Chip

Variable	Possible Values	Default Value	Description
test-args	<i>variable-name</i>	none	Default test arguments passed to OpenBoot Diagnostics. For more information and a list of possible test argument values, see Chapter 8 .
diag-passes	0-n	1	Defines the number of times self-test method(s) are performed.
local-mac-address?	true, false	false	If true, network drivers use their own MAC address, not the server MAC address.
fcode-debug?	true, false	false	If true, include name fields for plug-in device FCodes.
silent-mode?	true, false	false	Suppress all messages if true and diag-switch? is false.
scsi-initiator-id	0-15	7	SAS ID of the SAS controller.
oem-logo?	true, false	false	If true, use custom OEM logo, otherwise, use Sun logo.
oem-banner?	true, false	false	If true, use custom OEM banner.
ansi-terminal?	true, false	true	If true, enable ANSI terminal emulation.
screen-#columns	0-n	80	Sets number of columns on screen.
screen-#rows	0-n	34	Sets number of rows on screen.

TABLE C-1 OpenBoot Configuration Variables Stored on a ROM Chip (*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 start-up.
nvramrc	<i>variable-name</i>	none	Command script to execute if use-nvramrc? is true.
security-mode	none, command, full	none	Firmware security level.

TABLE C-1 OpenBoot Configuration Variables Stored on a ROM Chip (*Continued*)

Variable	Possible Values	Default Value	Description
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.
diag-script	all, normal, none	normal	Specifies the set of tests that OpenBoot Diagnostics will 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
diag-trigger	none, error-reset, power-on-reset, user-reset, all-resets	power-on-reset, error-reset	Specifies the class of reset event that causes diagnostics to run automatically. Default setting is power-on-reset error-reset. <ul style="list-style-type: none"> • none – Diagnostic tests are not executed. • error-reset – Reset that is caused by certain hardware error events such as RED State Exception Reset, Watchdog Resets, Software-Instruction Reset, or Hardware Fatal Reset. • power-on-reset – Reset that is caused by power cycling the system. • user-reset – Reset that is initiated by an operating system panic or by user-initiated commands from OpenBoot (reset-all or boot) or from Solaris (reboot, shutdown, or init). • all-resets – Any kind of system reset. Note: Both POST and OpenBoot Diagnostics run at the specified reset event if the variable diag-script is set to normal or all. If diag-script is set to none, only POST runs.
error-reset-recovery	boot, sync, none	boot	Command to execute following a system reset generated by an error.

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