Sun Fire™ V440 Server Diagnostics and Troubleshooting Guide

Adobe PostScript

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Preface

The *Sun Fire V440 Server Diagnostics and Troubleshooting Guide* is intended to be used by experienced system administrators. It includes descriptive information about the Sun Fire™ V440 server and its diagnostic tools, and specific information about diagnosing and troubleshooting problems with the server.

Before You Read This Book

This book assumes that you are familiar with computer network concepts and terms, and have advanced familiarity with the Solaris™ operating environment.

To use the information in this document fully, you must have thorough knowledge of the topics discussed in this book:

- *Sun Fire V440 Server Administration Guide*

How This Book Is Organized

The first part of this book is organized a bit differently from others with which you may be familiar. Each chapter contains either conceptual or procedural material, but not both. Turn to the conceptual chapters to get the background information you need to understand the context of the tasks you must perform. Turn to the procedural chapters for quick access to step-by-step instructions with little or no explanatory material.

The chapters in the second part of this book, as well as the Appendix, contain a mixture of procedural and conceptual material.

To help you locate information quickly, the first page of each chapter contains a list that summarizes the topics covered in that chapter. Reference material appears as needed at the end of each chapter.

This book is divided into two parts. Part I covers diagnostic tools.

Chapter 1, a conceptual chapter, provides an overview of the diagnostic tools available for use with the Sun Fire V440 server.

Chapter 2, a conceptual chapter, provides detailed information about the uses and capabilities of the various diagnostic tools and explains how they are related to each other.

Chapter 3, a procedural chapter, provides instructions for isolating failed parts.

Chapter 4, a procedural chapter, provides instructions for monitoring the system.

Chapter 5, a procedural chapter, provides instructions for exercising the system.

Part II of this book covers troubleshooting.

Chapter 6, a conceptual and procedural chapter, explains the troubleshooting options available to you and provides instructions for implementing troubleshooting options.

Chapter 7, a conceptual and procedural chapter, explains troubleshooting approaches and provides instructions for troubleshooting hardware problems.

Appendix A contains both procedures and concepts. It provides background information about, and tells how to use the system console and the system controller.

Using UNIX Commands

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

See one or more of the following for this information:

- *Solaris Handbook for Sun Peripherals*
- AnswerBook2™ online documentation for the Solaris™ operating environment
- Other software documentation that you received with your system

Typographic Conventions

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

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

System Prompts

Type of Prompt	Prompt
Bourne shell and Korn shell	`$`
Bourne shell and Korn shell superuser	`#`
C shell	*machine-name*`%`
C shell superuser	*machine-name*`#`
ALOM system controller	`sc>`
OpenBoot firmware	`ok`
OpenBoot Diagnostics	`obdiag>`

Related Documentation

Application	Title	Part Number
Late-breaking product information	*Sun Fire V440 Server Product Notes*	816-7733
Cabling and power-on overview	*Sun Fire V440 Server Setup: Cabling and Power On*	816-7734
System installation, including rack installation and cabling	*Sun Fire V440 Server Installation Guide*	816-7727
Administration	*Sun Fire V440 Server Administration Guide*	816-7728
Parts installation and removal	*Sun Fire V440 Server Parts Installation and Removal Guide*	816-7729
Sun Advanced Lights Out Manager	*Sun Advanced Lights Out Manager (ALOM) Online Help*	817-1960
Sun Validation Test Suite (SunVTS)	*SunVTS User's Guide*	816-5144
	SunVTS Test Reference Manual	816-5145
	SunVTS Quick Reference Card	816-5146
	SunVTS Documentation Supplement	817-2116
Sun Management Center	*Sun Management Center Software User's Guide*	806-5942
Hardware Diagnostic Suite	*Sun Management Center Hardware Diagnostic Suite User's Guide*	816-5005
OpenBoot configuration variables	*OpenBoot Command Reference Manual*	816-1177

Accessing Sun Documentation

You can view, print, or purchase a broad selection of Sun documentation, including localized versions, at:

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

Note – For important safety, compliance, and conformity information regarding the Sun Fire V440 server, see the *Sun Fire V440 Server Safety and Compliance Guide*, part number 816-7731, on the documentation CD or online at the above location.

Contacting Sun Technical Support

If you have technical questions about this product that are not answered in this document, go to:

`http://www.sun.com/service/contacting`

Sun Welcomes Your Comments

Sun is interested in improving its documentation and welcomes your comments and suggestions. You can submit your comments by going to:

`http://www.sun.com/hwdocs/feedback`

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

Sun Fire V440 Server Diagnostics and Troubleshooting Guide, part number 816-7730-10

PART I   Diagnostics

The five chapters within this part of the *Sun Fire V440 Server Diagnostics and Troubleshooting Guide* introduce the server's hardware-, firmware- and software-based diagnostic tools, help you understand how those tools fit together, and tell you how to use the tools to monitor, exercise, and isolate faults in the system.

For information and detailed instructions on how to troubleshoot specific problems with the server, see the chapters in Part II – Troubleshooting.

Chapters included in Part I are:

- Chapter 1 – Diagnostic Tools Overview
- Chapter 2 – Diagnostic Tools and the Boot Process
- Chapter 3 – Isolating Failed Parts
- Chapter 4 – Monitoring the System
- Chapter 5 – Exercising the System

Diagnostic Tools Overview

The Sun Fire V440 server and its accompanying software and firmware contain many diagnostic tools and features that help you:

- *Isolate* problems when there is a failure of a field-replaceable component
- *Monitor* the status of a functioning system
- *Exercise* the system to disclose an intermittent or incipient problem

This chapter introduces the diagnostic tools you can use on the server.

The topic in this chapter is:

- "A Spectrum of Tools" on page 2

If you want comprehensive background information about diagnostic tools, read this chapter and then read Chapter 2 to find out how the tools fit together.

If you only want instructions for using diagnostic tools, skip the first two chapters and turn to:

- Chapter 3, for part isolating procedures
- Chapter 4, for system monitoring procedures
- Chapter 5, for system exercising procedures

You may also find it helpful to turn to:

- Appendix A, for information about the system console

A Spectrum of Tools

Sun provides a wide spectrum of diagnostic tools for use with the Sun Fire V440 server. These tools range from the formal, like SunVTS™ software, a comprehensive validation test suite, to the informal, like log files that may contain clues helpful in narrowing down the possible sources of a problem.

The diagnostic tool spectrum also ranges from standalone software packages, to firmware-based power-on self-test (POST), to hardware LEDs that tell you when the power supplies are operating.

Some diagnostic tools enable you to examine many systems from a single console, others do not. Some diagnostic tools stress the system by running tests in parallel, while other tools run sequential tests, enabling the system to continue its normal functions. Some diagnostic tools function on standby power or when the system is offline, while others require the operating system to be up and running.

TABLE 1-1 summarizes the full palette of tools. Most of these tools are discussed in depth in this manual; some are discussed in greater detail in the *Sun Fire V440 Server Administration Guide*. Some tools also have their own comprehensive documentation sets. See the Preface for more information.

TABLE 1-1   Summary of Diagnostic Tools

Diagnostic Tool	Type	What It Does	Accessibility and Availability	Remote Capability
Sun Advanced Lights Out Manager (ALOM)	Hardware, software, and firmware	Monitors environmental conditions, generates alerts, performs basic fault isolation, and provides remote console access	Can function on standby power and when the operating system is not running	Designed for remote access
LEDs	Hardware	Indicate status of overall system and particular components	Accessed from system chassis. Available anytime system power is available	Local, but can be accessed via ALOM
POST	Firmware	Tests core components of system: CPUs, memory, and motherboard I/O bridge integrated circuits	Can be run on startup, but default is no POST. Available when the operating system is not running	Local, but can be accessed via ALOM

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

Diagnostic Tool	Type	What It Does	Accessibility and Availability	Remote Capability
OpenBoot Diagnostics	Firmware	Tests system components, focusing on peripherals and I/O devices	Can be run automatically at startup, but the default is no diagnostics. Can also be run interactively. Available when the operating system is not running	Local, but can be accessed via ALOM
OpenBoot commands	Firmware	Display various kinds of system information	Available when the operating system is not running	Local, but can be accessed via ALOM
Solaris commands	Software	Display various kinds of system information	Requires operating system	Local, and over network
SunVTS	Software	Exercises and stresses the system, running tests in parallel	Requires operating system. You may need to install SunVTS software separately	View and control over network
Sun Management Center	Software	Monitors both hardware environmental conditions and software performance of multiple systems. Generates alerts for various conditions	Requires operating system to be running on both monitored and master systems. 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 field-replaceable units (FRUs)	Separately purchased optional add-on to Sun Management Center. Requires operating system and Sun Management Center software	Designed for remote access

Why are there so many different diagnostic tools?

There are a number of reasons for the lack of a single all-in-one diagnostic test, starting with the complexity of the server.

Consider the bus repeater circuit built into every Sun Fire V440 server. This circuit interconnects all CPUs and high-speed I/O interfaces (see FIGURE 1-1), sensing and adapting its communications depending on how many CPU modules are present. This sophisticated high-speed interconnect represents just one facet of the Sun Fire V440 server's advanced architecture.

```
                    ┌─────────┐ ┌─────────┐ ┌─────────┐ ┌─────────┐
                    │ Memory  │ │ Memory  │ │ Memory  │ │ Memory  │
                    │ ┌┐┌┐┌┐┌┐ │ │ ┌┐┌┐┌┐┌┐ │ │ ┌┐┌┐┌┐┌┐ │ │ ┌┐┌┐┌┐┌┐ │
                    │ └┘└┘└┘└┘ │ │ └┘└┘└┘└┘ │ │ └┘└┘└┘└┘ │ │ └┘└┘└┘└┘ │
                    │ ┌─────┐ │ │ ┌─────┐ │ │ ┌─────┐ │ │ ┌─────┐ │
                    │ │CPU 0│ │ │ │CPU 1│ │ │ │CPU 2│ │ │ │CPU 3│ │
                    │ └─────┘ │ │ └─────┘ │ │ └─────┘ │ │ └─────┘ │
                    └─────────┘ └─────────┘ └─────────┘ └─────────┘
```
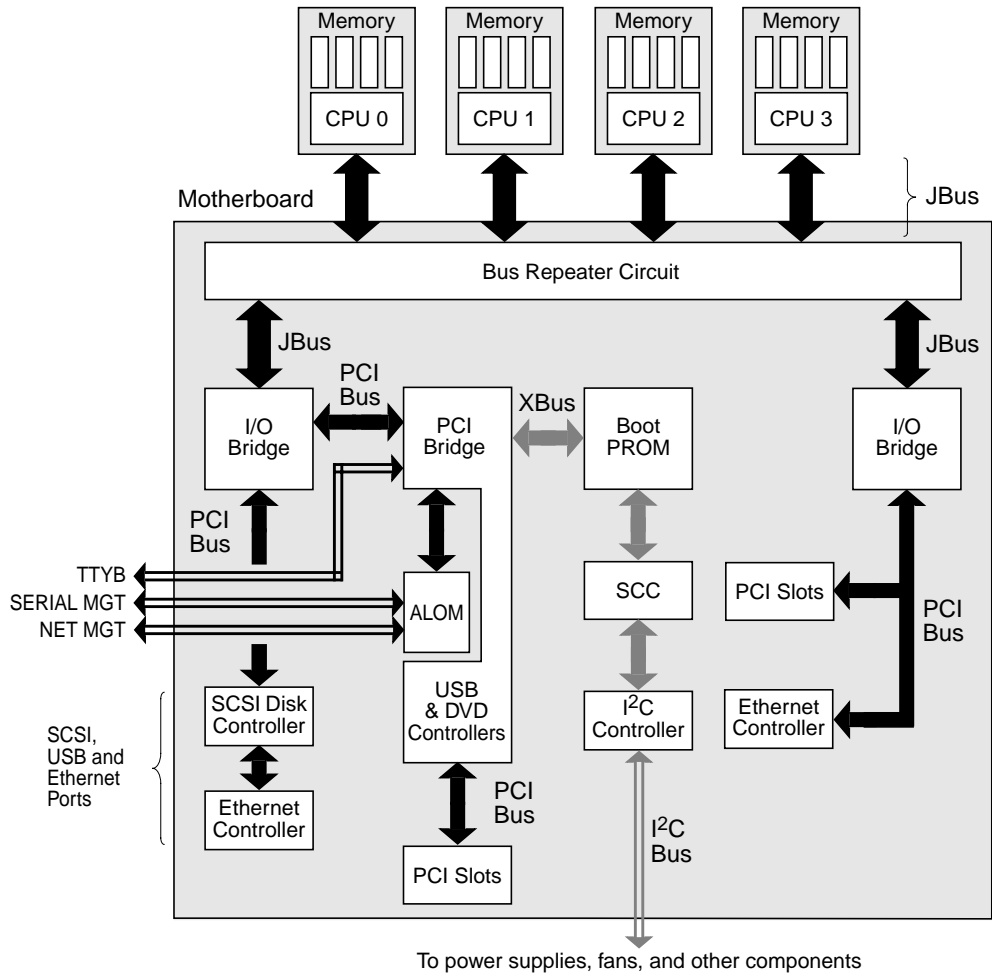
FIGURE 1-1   Simplified Schematic View of a Sun Fire V440 Server

Consider also that some diagnostics must function even when the system fails to boot. Any diagnostic capable of isolating problems when the system fails to boot must be independent of the operating system. But any diagnostic that is independent of the operating system will also be unable to make use of the operating system's considerable resources for getting at the more complex causes of failures.

Another complicating factor is that different sites have differing diagnostic requirements. You may be administering a single computer or a whole data center full of equipment in racks. Alternatively, your systems may be deployed remotely— perhaps in areas that are physically inaccessible.

Finally, consider the different tasks you expect to perform with your diagnostic tools:

- Isolating faults to a specific replaceable hardware component
- Exercising the system to disclose more subtle problems that may or may not be hardware related
- Monitoring the system to catch problems before they become serious enough to cause unplanned downtime

Not every diagnostic tool can be optimized for all these varied tasks.

Instead of one unified diagnostic tool, Sun provides a palette of tools each of which has its own specific strengths and applications. To best appreciate how each tool fits into the larger picture, it is necessary to have some understanding of what happens when the server starts up, during the so-called *boot process.* This is discussed in the next chapter.

CHAPTER **2**

Diagnostics and the Boot Process

This chapter introduces the tools that let you accomplish the goals of isolating faults and monitoring and exercising systems. It also helps you to understand how the various tools fit together.

Topics in this chapter include:

- "About Diagnostics and the Boot Process" on page 8
- "About Isolating Faults in the System" on page 32
- "About Monitoring the System" on page 34
- "About Exercising the System" on page 39
- "Reference for Identifying Memory Modules" on page 43
- "Reference for OpenBoot Diagnostics Test Descriptions" on page 47
- "Reference for Decoding I^{2}C Diagnostic Test Messages" on page 49
- "Reference for Terms in Diagnostic Output" on page 51

If you only want instructions for using diagnostic tools, skip this chapter and turn to:

- Chapter 3, for part isolating procedures
- Chapter 4, for system monitoring procedures
- Chapter 5, for system exercising procedures

You may also find it helpful to turn to:

- Appendix A, for information about the system console

About Diagnostics and the Boot Process

You have probably had the experience of powering on a Sun system and watching as it goes through its boot process. Perhaps you have watched as your console displays messages that look like the following.

```
0>@(#) Sun Fire[TM] V440 POST 4.10.0 2003/04/01 22:28

/export/work/staff/firmware_re/post/post-build
4.10.0/Fiesta/chalupa/integrated  (firmware_re)
0>Hard Powerup RST thru SW
0>CPUs present in system: 0 1 2 3
0>OBP->POST Call with %o0=00000000.01008000.
0>Diag level set to MAX.
0>MFG scrpt mode set to NONE
0>I/O port set to TTYA.
0>
0>Start selftest...
```

It turns out these messages are not quite so inscrutable as they first appear once you understand the boot process. These kinds of messages are discussed later.

It is possible to bypass firmware-based diagnostic tests in order to minimize how long it takes a server to reboot. However, in the following discussion, assume that the system is attempting to boot in *diagnostics mode*, during which the firmware-based tests run. See "How to Put the System in Diagnostics Mode" on page 57 for instructions.

The boot process requires several stages, detailed in these sections:

- "Prologue: System Controller Boot" on page 8
- "Stage One: OpenBoot Firmware and POST" on page 9
- "Stage Two: OpenBoot Diagnostics Tests" on page 15
- "Stage Three: The Operating Environment" on page 23

Prologue: System Controller Boot

As soon as you plug in the Sun Fire V440 server to an electrical outlet, and before you turn on power to the server, the *system controller* inside the server begins its self-diagnostic and boot cycle. The system controller is incorporated into the Sun Advanced Lights Out Manager (ALOM) card installed in the Sun Fire V440 server chassis. Running off standby power, the card begins functioning before the server itself comes up.

The system controller provides access to a number of control and monitoring functions through the ALOM command-line interface. For more information about ALOM, see "Monitoring the System Using Sun Advanced Lights Out Manager" on page 35.

Stage One: OpenBoot Firmware and POST

Every Sun Fire V440 server includes a chip holding about 2 Mbytes of firmware-based code. This chip is called the *boot PROM*. After you turn on system power, the first thing the system does is execute code that resides in the boot PROM.

This code, which is referred to as the *OpenBoot™ firmware*, is a small-scale operating system unto itself. However, unlike a traditional operating system that can run multiple applications for multiple simultaneous users, OpenBoot firmware runs in single-user mode and is designed solely to configure and boot the system. OpenBoot firmware also initiates firmware-based diagnostics that test the system, thereby ensuring that the hardware is sufficiently "healthy" to run its normal operating environment.

When system power is turned on, the OpenBoot firmware begins running directly out of the boot PROM, since at this stage system memory has not been verified to work properly.

Soon after power is turned on, the system hardware determines that at least one CPU is powered on, and is submitting a bus access request, which indicates that the CPU in question is at least partly functional. This becomes the master CPU, and is responsible for executing OpenBoot firmware instructions.

The OpenBoot firmware's first actions are to check whether to run the *power-on self-test* (POST) diagnostics and other tests. The POST diagnostics constitute a separate chunk of code stored in a different area of the boot PROM (see FIGURE 2-1).
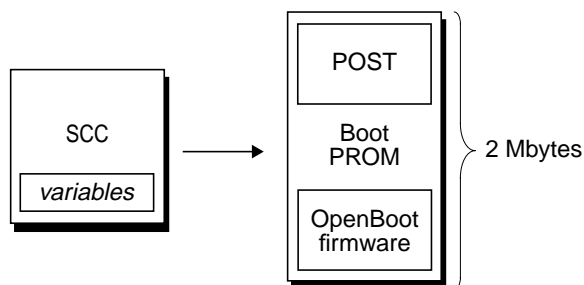
FIGURE 2-1   Boot PROM and SCC

The extent of these power-on self-tests, and whether they are performed at all, is controlled by configuration variables stored in the removable system configuration card (SCC). These *OpenBoot configuration variables* are discussed in "Controlling POST Diagnostics" on page 13.

As soon as POST diagnostics can verify that some subset of system memory is functional, tests are loaded into system memory.

The Purpose of POST Diagnostics

The POST diagnostics verify the core functionality of the system. A successful execution of the POST diagnostics does not ensure that there is nothing wrong with the server, but it does ensure that the server can proceed to the next stage of the boot process.

For a Sun Fire V440 server, this means:

- At least one of the CPUs is working.
- At least a subset (512 Mbytes) of system memory is functional.
- Input/output bridges located on the motherboard are functioning.
- The PCI bus is intact—that is, there are no electrical shorts.

It is possible for a system to pass all POST diagnostics and still be unable to boot the operating system. However, you can run POST diagnostics even when a system fails to boot, and these tests are likely to disclose the source of most hardware problems.

POST generally reports errors that are persistent in nature. To catch intermittent problems, consider running a system exercising tool. See "About Exercising the System" on page 39.

What POST Diagnostics Do

Each POST diagnostic is a low-level test designed to pinpoint faults in a specific hardware component. For example, individual memory tests called *address bitwalk* and *data bitwalk* ensure that binary *0*s and *1*s can be written on each address and data line. During such a test, the POST may display output similar to this example.

```
1>Data Bitwalk on Slave 3
1>     Test Bank 0.
```

In this example, CPU 1 is the master CPU, as indicated by the prompt `1>`, and it is about to test the memory associated with CPU 3, as indicated by the message "`Slave 3`."

The failure of such a test reveals precise information about particular integrated circuits, the memory registers inside them, or the data paths connecting them.

```
1>ERROR: TEST = Data Bitwalk on Slave 3
1>H/W under test = CPU3 B0/D1 J0602 side 1 (Bank 1), CPU Module C3
1>Repair Instructions: Replace items in order listed by 'H/W under test' above
1>MSG = ERROR: miscompare on mem test!
             Address: 00000030.001b0040
             Expected: ffffffff.fffffffe
             Observed: fffffbff.fffffff6
```

In this case, the DIMM labeled J0602, associated with CPU 3, was found to be faulty. For information about the several ways firmware messages identify memory, see "Reference for Identifying Memory Modules" on page 43.

What POST Error Messages Tell You

When a specific power-on self-test discloses an error, it reports different kinds of information about the error:

- The specific test that failed
- The specific integrated circuit or subcomponent that is most likely at fault
- The field-replaceable units (FRUs) most likely to require replacement, in order of likelihood

Here is an excerpt of POST output showing another error message.

CODE EXAMPLE 2-1   POST Error Message

```
1>ERROR: TEST = IO-Bridge unit 0 PCI id    test
1>H/W under test = Motherboard IO-Bridge 0, CPU
1>Repair Instructions: Replace items in order listed by 'H/W under test' above
1>MSG = ERROR: PCI Master Abort Detected for
    TOMATILLO:0, PCI BUS: A, DEVICE NUMBER:2.
    DEVICE NAME: SCSI
1>END_ERROR

1>
1>ERROR: TEST = IO-Bridge unit 0 PCI id    test
1>H/W under test = Motherboard IO-Bridge 0, CPU
1>MSG =
        *** Test Failed!! ***

1>END_ERROR
```

Identifying FRUs

An important feature of POST error messages is the `H/W under test` line. (The second line in CODE EXAMPLE 2-1.)

The `H/W under test` line indicates which FRU or FRUs may be responsible for the error. Note that in CODE EXAMPLE 2-1, two different FRUs are indicated. Using TABLE 2-15 to decode some of the terms, you can see that this POST error was most likely caused by bad integrated circuits (`IO-Bridge`) or electrical pathways on the motherboard. However, the error message also indicates that the master CPU, in this case CPU 1, may be at fault. For information on how Sun Fire V440 CPUs are numbered, see "Identifying CPU/Memory Modules" on page 46.

Though beyond the scope of this manual, it is worth noting that POST error messages provide fault isolation capability beyond the FRU level. In the current example, the `MSG` line located immediately below the `H/W under test` line specifies the particular integrated circuit (`DEVICE NAME: SCSI`) most likely at fault. This level of isolation is most useful at the repair depot.

Why a POST Error May Implicate Multiple FRUs

Because each test operates at such a low level, the POST diagnostics are often more definite in reporting the minute details of the error, like the numerical values of expected and observed results, than they are about reporting which FRU is responsible. If this seems counter-intuitive, consider the block diagram of one data path within a Sun Fire V440 server, shown in FIGURE 2-2.
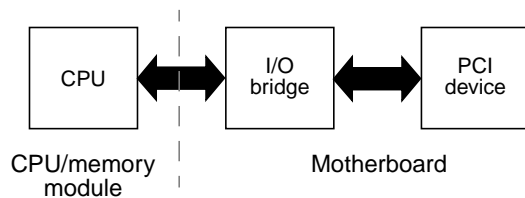
FIGURE 2-2 POST Diagnostic Running Across FRUs

The dashed line in FIGURE 2-2 represents a boundary between FRUs. Suppose a POST diagnostic is running in the CPU in the left part of the diagram. This diagnostic attempts to access registers in a PCI device located in the right side of the diagram.

If this access fails, there could be a fault in the PCI device, or, less likely, in one of the data paths or components leading to that PCI device. The POST diagnostic can tell you only that the test failed, but not *why*. So, though the POST diagnostic may present very precise data about the nature of the test failure, potentially several different FRUs could be implicated.

Controlling POST Diagnostics

You control POST diagnostics (and other aspects of the boot process) by setting OpenBoot configuration variables in the system configuration card. Changes to OpenBoot configuration variables generally take effect only after the server is reset.

TABLE 2-1 lists the most important and useful of these variables, which are more fully documented in the *OpenBoot Command Reference Manual*. You can find instructions for changing OpenBoot configuration variables in "How to View and Set OpenBoot Configuration Variables" on page 54.

TABLE 2-1   OpenBoot Configuration Variables

OpenBoot Configuration Variable	Description and Keywords
auto-boot?	Determines whether the operating system automatically starts up. Default is `true`. • `true`—Operating system automatically starts once OpenBoot firmware completes initialization. • `false`—System remains at `ok` prompt until you type `boot`.
diag-level	Determines the level or type of diagnostics executed. Default is `min`. • `off`—No testing. • `min`—Only basic tests are run. • `max`—More extensive tests may be run, depending on the device. Memory is especially thoroughly checked.
diag-script	Determines which devices are tested by OpenBoot Diagnostics. Default is `none`. • `none`—No devices are tested. • `normal`—On-board (motherboard-based) devices that have self-tests are tested. • `all`—All devices that have self-tests are tested.
diag-switch?	Toggles the system in and out of diagnostics mode. Also selects the boot device and boot file. Default is `false`. • `true`—Runs POST diagnostics and OpenBoot Diagnostics tests if `post-trigger` and `obdiag-trigger` conditions, respectively, are satisfied. Causes system to boot using `diag-device` and `diag-file` parameters. • `false`—Does not run POST diagnostics and OpenBoot Diagnostics tests, even if `post-trigger` and `obdiag-trigger` conditions are satisfied. Causes system to boot using `boot-device` and `boot-file` parameters. **NOTE**: You can put the system in diagnostics mode either by setting this variable to `true` or by setting the system control keyswitch to the Diagnostics position. For details, see "How to Put the System in Diagnostics Mode" on page 57.

TABLE 2-1   OpenBoot Configuration Variables *(Continued)*

OpenBoot Configuration Variable	Description and Keywords
`post-trigger` `obdiag-trigger`	Specifies the class of reset event that causes POST diagnostics or OpenBoot Diagnostics tests to run. These variables can accept single keywords as well as combinations of the first three keywords separated by spaces. For details, see "How to View and Set OpenBoot Configuration Variables" on page 54. • `error-reset`—A reset caused by certain nonrecoverable hardware error conditions. In general, an error reset occurs when a hardware problem corrupts system state data and the machine becomes "confused." Examples include CPU and system watchdog resets, fatal errors, and certain CPU reset events (default). • `power-on-reset`—A reset caused by pressing the Power button (default). • `user-reset`—A reset initiated by the user or the operating system. Examples of user resets include the OpenBoot `boot` and `reset-all` commands, as well as the Solaris `reboot` command. • `all-resets`—Any kind of system reset. • `none`—No POST diagnostics or OpenBoot Diagnostics tests run.
`input-device`	Selects where system console input is taken from. Default is `ttya`. • `ttya`—From serial and network management ports. • `ttyb`—From built-in serial port B.[*] • `keyboard`—From attached keyboard that is part of a local graphics monitor.[*]
`output-device`	Selects where diagnostic and other system console output is displayed. Default is `ttya`. • `ttya`—To serial and network management ports. • `ttyb`—To built-in serial port B.[*] • `screen`—To attached screen that is part of a local graphics monitor.[*]

[*] POST messages cannot be displayed on a local graphics monitor. They are sent to `ttya` even when `output-device` is set to `screen`. Likewise POST can accept input only from `ttya`.

Note – These variables affect OpenBoot Diagnostics tests as well as POST diagnostics.

Diagnostics: Reliability versus Availability

The OpenBoot configuration variables described in TABLE 2-1 let you control not only how diagnostic tests proceed, but also what triggers them.

By default, firmware-based diagnostic tests are disabled to minimize the amount of time it takes for a server to reboot. However, skipping these tests does create some system reliability risks.

Bypassing diagnostic tests can create a situation where a server with faulty hardware gets locked into a cycle of repeated booting and crashing. Depending on the type of problem, the cycle may repeat intermittently. Because diagnostic tests are never invoked, the crashes may occur without leaving behind any log entries or meaningful console messages.

The section "How to Put the System in Diagnostics Mode" on page 57 provides instructions for ensuring that your server runs diagnostics when starting up. The section "How to Bypass Firmware Diagnostics" on page 58 explains how to disable firmware diagnostics.

Temporarily Bypassing Diagnostics

Even if you set up the server to run diagnostic tests automatically on reboot, it is still possible to bypass diagnostic tests for a single boot cycle. This can be useful in cases where you are reconfiguring the server, or on those rare occasions when POST or OpenBoot Diagnostics tests themselves stall or "hang," leaving the server unable to boot and in an unusable state. These "hangs" most commonly result from firmware corruption of some sort, especially of having flashed an incompatible firmware image into the server's PROMs.

If you do find yourself needing to skip diagnostic tests for a single boot cycle, the ALOM system controller provides a convenient way to do this. See "How to Bypass Diagnostics Temporarily" on page 59 for instructions.

Maximizing Reliability

By default, diagnostics do not run following a user- or operating system-initiated reset. This means the system does not run diagnostics in the event of an operating system panic. To ensure the maximum reliability, especially for automatic system recovery (ASR), you can configure the system to run its firmware-based diagnostic tests following all resets. For instructions, see "How to Maximize Diagnostic Testing" on page 61.

Stage Two: OpenBoot Diagnostics Tests

Once POST diagnostics have finished running, POST marks the status of any faulty device as "FAILED," and returns control to OpenBoot firmware.

OpenBoot firmware compiles a hierarchical "census" of all devices in the system. This census is called a *device tree*. Though different for every system configuration, the device tree generally includes both built-in system components and optional PCI bus devices. The device tree does *not* include any components marked as "FAILED" by POST diagnostics.

Following the successful execution of POST diagnostics, the OpenBoot firmware proceeds to run OpenBoot Diagnostics tests. Like the POST diagnostics, OpenBoot Diagnostics code is firmware-based and resides in the boot PROM.

The Purpose of OpenBoot Diagnostics Tests

OpenBoot Diagnostics tests focus on system I/O and peripheral devices. Any device in the device tree, regardless of manufacturer, that includes an IEEE 1275-compatible self-test is included in the suite of OpenBoot Diagnostics tests. On a Sun Fire V440 server, OpenBoot Diagnostics examine the following system components:

- I/O interfaces; including USB and serial ports, SCSI and IDE controllers, and Ethernet interfaces
- ALOM card
- Keyboard, mouse, and video (when present)
- Inter-Integrated Circuit (I^2C) bus components; including thermal and other kinds of sensors located on the motherboard, CPU/memory modules, DIMMs, power supply, and SCSI backplane
- Any PCI option card with an IEEE 1275-compatible built-in self-test

The OpenBoot Diagnostics tests run automatically via a script when you start up the system in diagnostics mode. However, you can also run OpenBoot Diagnostics tests manually, as explained in the next section.

Like POST diagnostics, OpenBoot Diagnostics tests catch persistent errors. To disclose intermittent problems, consider running a system exercising tool. See "About Exercising the System" on page 39.

Controlling OpenBoot Diagnostics Tests

When you restart the system, you can run OpenBoot Diagnostics tests either interactively from a test menu, or by entering commands directly from the `ok` prompt.

Note – You cannot reliably run OpenBoot Diagnostics tests following an operating system halt, since the halt leaves system memory in an unpredictable state. Best practice is to reset the system before running these tests.

Most of the same OpenBoot configuration variables you use to control POST (see TABLE 2-1) also affect OpenBoot Diagnostics tests. Notably, you can determine OpenBoot Diagnostics testing level—or suppress testing entirely—by appropriately setting the `diag-level` variable.

In addition, the OpenBoot Diagnostics tests use a special variable called `test-args` that enables you to customize how the tests operate. By default, `test-args` is set to contain an empty string. However, you can set `test-args` to one or more of the reserved keywords, each of which has a different effect on OpenBoot Diagnostics tests. TABLE 2-2 lists the available keywords.

TABLE 2-2   Keywords for the `test-args` OpenBoot Configuration Variable

Keyword	What It Does
`bist`	Invokes built-in self-test (BIST) on external and peripheral devices
`debug`	Displays all debug messages
`iopath`	Verifies bus and interconnect integrity
`loopback`	Exercises external loopback path for the device
`media`	Verifies external and peripheral device media accessibility
`restore`	Attempts to restore original state of the device if the previous execution of the test failed
`silent`	Displays only errors rather than the status of each test
`subtests`	Displays main test and each subtest that is called
`verbose`	Displays detailed messages of status of all tests
`callers=`*N*	Displays backtrace of *N* callers when an error occurs • `callers=0` — Displays backtrace of all callers before the error
`errors=`*N*	Continues executing the test until *N* errors are encountered • `errors=0` — 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:

```
ok setenv test-args debug,loopback,media
```

From the OpenBoot Diagnostics Test Menu

It is easiest to run OpenBoot Diagnostics tests interactively from a menu. You access the menu by typing `obdiag` at the `ok` prompt. See "How to Isolate Faults Using Interactive OpenBoot Diagnostics Tests" on page 67 for full instructions.

The `obdiag>` prompt and the OpenBoot Diagnostics interactive menu (FIGURE 2-3) appear. Only the devices detected by OpenBoot firmware appear in this menu. For a brief explanation of each OpenBoot Diagnostics test, see TABLE 2-12 in "Reference for OpenBoot Diagnostics Test Descriptions" on page 47.

```
                          o  b  d  i  a  g

  1  flashprom@2,0          2  i2c@0,320           3  ide@d

  4  network@1              5  network@2            6  rmc-comm@0,3e8

  7  rtc@0,70               8  scsi@2               9  scsi@2,1

 10  serial@0,2e8          11  serial@0,3f8        12  usb@a

 13  usb@b

     Commands: test test-all except help what setenv set-default exit

                  diag-passes=1 diag-level=min test-args=
```

FIGURE 2-3   OpenBoot Diagnostics Interactive Test Menu

Interactive OpenBoot Diagnostics Commands

You run individual OpenBoot Diagnostics tests from the `obdiag>` prompt by typing:

```
obdiag> test n
```

where *n* represents the number associated with a particular menu item.

Note – You cannot reliably run OpenBoot Diagnostics commands following an operating system halt, since the halt leaves system memory in an unpredictable state. Best practice is to reset the system before running these commands.

There are several other commands available to you from the `obdiag>` prompt. For descriptions of these commands, see TABLE 2-13 in "Reference for OpenBoot Diagnostics Test Descriptions" on page 47.

You can obtain a summary of this same information by typing `help` at the `obdiag>` prompt.

From the ok *Prompt: The* 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:

```
ok test /pci@1c,600000/scsi@2,1
```

Note – Knowing how to construct an appropriate hardware device path requires precise knowledge of the hardware architecture of the Sun Fire V440 server. If you lack this knowledge, it may help to use the OpenBoot show-devs command (see "show-devs Command" on page 23), which displays a list of all configured devices.

To customize an individual test, you can use test-args as follows:

```
ok test /pci@1e,600000/usb@b:test-args={verbose,subtests}
```

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:

```
ok test-all
```

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:

```
ok test-all /pci@1f,700000
```

Note – You cannot reliably run OpenBoot Diagnostics commands following an operating system halt, since the halt leaves system memory in an unpredictable state. Best practice is to reset the system before running these commands.

What OpenBoot Diagnostics Error Messages Tell You

OpenBoot Diagnostics error messages 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. CODE EXAMPLE 2-2 displays a sample OpenBoot Diagnostics error message, one that suggests a failure of the IDE controller.

CODE EXAMPLE 2-2   OpenBoot Diagnostics Error Message

```
Testing /pci@1e,600000/ide@d

    ERROR   : IDE device did not reset, busy bit not set
    DEVICE  : /pci@1e,600000/ide@d
    DEVICE  : /pci@1e,600000/ide@d
    ex MACHINE : Sun Fire V440
    SERIAL# : 51994289
    DATE    : 10/17/2002 20:17:43  GMT
    CONTR0LS: diag-level=min test-args=

Error: /pci@1e,600000/ide@d selftest failed, return code = 1
Selftest at /pci@1e,600000/ide@d (errors=1) .......................... failed
```

I^{2}C Bus Device Tests

The `i2c@0,320` OpenBoot Diagnostics test examines and reports on environmental monitoring and control devices connected to the Sun Fire V440 server's Inter-Integrated Circuit (I^{2}C) bus.

Error and status messages from the `i2c@0,320` OpenBoot Diagnostics test include the hardware addresses of I^{2}C bus devices.

```
Testing /pci@1e,600000/isa@7/i2c@0,320/dimm-spd@0,b6
```

The I^{2}C device address is given at the very end of the hardware path. In this example, the address is `0,b6`, which indicates a device located at hexadecimal address b6 on segment 0 of the I^{2}C bus.

To decode this device address, see "Reference for Decoding I^{2}C Diagnostic Test Messages" on page 49. Using TABLE 2-14, you can see that `dimm-spd@0,b6` corresponds to DIMM 0 on CPU/memory module 0. If the `i2c@0,320` test were to report an error against `dimm-spd@0,b6`, you would need to replace this DIMM.

Other OpenBoot Commands

Beyond the formal firmware-based diagnostic tools, there are a few commands you can invoke from the `ok` prompt. These OpenBoot commands display information that can help you assess the condition of a Sun Fire V440 server. These include the following:

- `printenv` command
- `probe-scsi` and `probe-scsi-all` commands
- `probe-ide` command
- `show-devs` command

The following sections describe the information these commands give you. For instructions on using these commands, turn to "How to Use OpenBoot Information Commands" on page 94, or look up the appropriate man page.

`printenv` *Command*

The `printenv` command displays the OpenBoot configuration variables. The display includes the current values for these variables as well as the default values. For details, see "How to View and Set OpenBoot Configuration Variables" on page 54.

For a list of some important OpenBoot configuration variables, see TABLE 2-1.

`probe-scsi` *and* `probe-scsi-all` *Commands*

The `probe-scsi` and `probe-scsi-all` commands diagnose problems with attached and internal SCSI devices.

Caution – If you used the `halt` command or the L1-A (Stop-A) key sequence to reach the `ok` prompt, then issuing the `probe-scsi` or `probe-scsi-all` command can hang the system.

The `probe-scsi` command communicates with all SCSI devices connected to on-board SCSI controllers. The `probe-scsi-all` command additionally accesses devices connected to any host adapters installed in PCI slots.

For any SCSI device that is connected and active, the `probe-scsi` and `probe-scsi-all` commands display its target and unit numbers, and a device description that includes type and manufacturer.

The following is sample output from the `probe-scsi` command.

CODE EXAMPLE 2-3   `probe-scsi` Command Output

```
ok probe-scsi
Target 0
  Unit 0   Disk      FUJITSU MAN3367M SUN36G 1502     71132959 Blocks, 34732 MB
Target 1
  Unit 0   Disk      FUJITSU MAN3367M SUN36G 1502     71132959 Blocks, 34732 MB
```

The following is sample output from the `probe-scsi-all` command.

CODE EXAMPLE 2-4   `probe-scsi-all` Command Output

```
ok probe-scsi-all
/pci@1f,700000/scsi@2,1

/pci@1f,700000/scsi@2
Target 0
  Unit 0   Disk      FUJITSU MAN3367M SUN36G 1502     71132959 Blocks, 34732 MB
Target 1
  Unit 0   Disk      FUJITSU MAN3367M SUN36G 1502     71132959 Blocks, 34732 MB
```

`probe-ide` *Command*

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-ROM drive.

⚠ **Caution –** If you used the `halt` command or the L1-A (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 2-5   `probe-ide` Command Output

```
ok probe-ide
Device 0  ( Primary Master )
        Removable ATAPI Model: TOSHIBA DVD-ROM SD-C2512

  Device 1  ( Primary Slave )
          Not Present
```

show-devs *Command*

The show-devs command lists the hardware device paths for each device in the
firmware device tree. CODE EXAMPLE 2-6 shows some sample output (edited for
brevity).

CODE EXAMPLE 2-6   show-devs Command Output

```
ok show-devs
/i2c@1f,464000
/pci@1f,700000
/ppm@1e,0
/pci@1e,600000
/pci@1d,700000
/ppm@1c,0
/pci@1c,600000
/memory-controller@2,0
/SUNW,UltraSPARC-IIIi@2,0
/virtual-memory
/memory@m0,10
/aliases
/options
/openprom
/packages
/i2c@1f,464000/idprom@0,50
```

Stage Three: The Operating Environment

If a system passes OpenBoot Diagnostics tests, it normally attempts to boot its
multiuser operating environment. For most Sun systems, this means the Solaris
operating environment. Once the server is running in multiuser mode, you have
recourse to software-based diagnostic tools, like SunVTS™ and Sun™ Management
Center software. These tools can help you with more advanced monitoring,
exercising, and fault isolating capabilities.

Note – If you set the auto-boot? OpenBoot configuration variable to false, the
operating environment does *not* boot following completion of the firmware-based
tests.

In addition to the formal tools that run on top of Solaris operating environment
software, there are other resources that you can use when assessing or monitoring
the condition of a Sun Fire V440 server. These resources include the following:

■ Error and system message log files
■ Solaris system information commands

Error and System Message Log Files

Error and other system messages are saved in the file `/var/adm/messages`.
Messages are logged to this file from many sources, including the operating system,
the environmental control subsystem, and various software applications.

In the case of Solaris operating environment software, the `syslogd` daemon and its
configuration file (`/etc/syslogd.conf`) control how error messages are handled.

For information about `/var/adm/messages` and other sources of system
information, refer to "How to Customize System Message Logging" in the *System
Administration Guide: Advanced Administration*, which is part of the Solaris System
Administration Collection.

Solaris System Information Commands

Some Solaris commands display data that you can use when assessing the condition
of a Sun Fire V440 server. These commands include the following:

- `prtconf` command
- `prtdiag` command
- `prtfru` command
- `psrinfo` command
- `showrev` command

The following sections describe the information these commands give you. For
instructions on using these commands, turn to "How to Use Solaris System
Information Commands" on page 93, or look up the appropriate man page.

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, that only the operating environment software "knows" about. The output of
`prtconf` also includes the total amount of system memory. CODE EXAMPLE 2-7 shows
an excerpt of `prtconf` output (edited for brevity).

CODE EXAMPLE 2-7   `prtconf` Command Output

```
System Configuration:  Sun Microsystems   sun4u
Memory size: 16384 Megabytes
System Peripherals (Software Nodes):

SUNW,Sun-Fire-V440
    packages (driver not attached)
        SUNW,builtin-drivers (driver not attached)
        deblocker (driver not attached)
        disk-label (driver not attached)

[...]

    pci, instance #1
    pci, instance #2
        isa, instance #0
            flashprom (driver not attached)
            rtc (driver not attached)
            i2c, instance #0
                i2c-bridge (driver not attached)
                i2c-bridge (driver not attached)
                temperature, instance #3 (driver not attached)
```

The `prtconf` command's `–p` option produces output similar to the OpenBoot `show-devs` command (see "`show-devs` Command" on page 23). This output lists only those devices compiled by the system firmware.

`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 operating environment is running on your system. Following are several excerpts of the output produced by `prtdiag` on a "healthy" Sun Fire V440 server running Solaris 8 software.

CODE EXAMPLE 2-8   prtdiag CPU and I/O Output

```
System Configuration: Sun Microsystems  sun4u Sun Fire V440
System clock frequency: 183 MHZ
Memory size: 16GB


==================================== CPUs ====================================
              E$          CPU                  CPU
CPU   Freq    Size        Implementation       Mask    Status      Location
---   --------  ----------  -------------------  -----   ------      --------
  0   1281 MHz  1MB         SUNW,UltraSPARC-IIIi  2.3     online      -
  1   1281 MHz  1MB         SUNW,UltraSPARC-IIIi  2.3     online      -
  2   1281 MHz  1MB         SUNW,UltraSPARC-IIIi  2.3     online      -
  3   1281 MHz  1MB         SUNW,UltraSPARC-IIIi  2.3     online      -


============================== IO Devices ==================================
Bus    Freq       Slot +  Name +
Type   MHz        Status  Path                            Model
----   ----    ----------  --------------------------  --------------------
pci    66             MB  pci108e,abba (network)          SUNW,pci-ce
                  okay  /pci@1c,600000/network@2

pci    33             MB  isa/su (serial)
                  okay  /pci@1e,600000/isa@7/serial@0,3f8

pci    33             MB  isa/su (serial)
                  okay  /pci@1e,600000/isa@7/serial@0,2e8

pci    66             MB  pci108e,abba (network)          SUNW,pci-ce
                  okay  /pci@1f,700000/network@1

pci    66             MB  scsi-pci1000,30 (scsi-2)      LSI,1030
                  okay  /pci@1f,700000/scsi@2
```

The prtdiag command produces a great deal of output about the system memory configuration. Another excerpt follows.

CODE EXAMPLE 2-9 `prtdiag` Memory Configuration Output

```
=========================== Memory Configuration ============================
Segment Table:
-----------------------------------------------------------------------
Base Address        Size          Interleave Factor  Contains
-----------------------------------------------------------------------
0x0                 4GB                  16           BankIDs 0,1,2,3, ... ,15
0x1000000000        4GB                  16           BankIDs 16,17,18, ... ,31
0x2000000000        4GB                  16           BankIDs 32,33,34, ... ,47
0x3000000000        4GB                  2            BankIDs 48,49

Bank Table:
---------------------------------------------------------------
         Physical       Location
ID       ControllerID   GroupID   Size          Interleave Way
---------------------------------------------------------------
0        0              0         256MB         0,1,2,3, ... ,15
1        0              0         256MB

[...]

48       3              0         2GB           0,1
49       3              0         2GB

Memory Module Groups:
--------------------------------------------------------
ControllerID   GroupID  Labels         Status
--------------------------------------------------------
0              0        C0/P0/B0/D0
0              0        C0/P0/B0/D1

[...]

3              0        C3/P0/B0/D1
```

In addition to the preceding information, `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 2-10 `prtdiag` Verbose Output

```
Temperature sensors:
---------------------------------------------------------------
Location    Sensor      Temperature  Lo LoWarn HiWarn  Hi Status
---------------------------------------------------------------
SCSIBP      T_AMB          26C         -11C    0C   65C    75C okay
C0/P0       T_CORE         55C         -10C    0C   97C   102C okay
```

In the event of an overtemperature condition, `prtdiag` reports `warning` or `failed` in the Status column.

CODE EXAMPLE 2-11   `prtdiag` Overtemperature Indication Output

```
Temperature sensors:
---------------------------------------------------------------
Location    Sensor        Temperature  Lo LoWarn HiWarn  Hi Status
---------------------------------------------------------------
SCSIBP      T_AMB           26C         -11C    0C   65C    75C okay
C0/P0       T_CORE          99C         -10C    0C   97C   102C failed
```

Similarly, if there is a failure of a particular component, `prtdiag` reports a fault in the appropriate Status column.

CODE EXAMPLE 2-12   `prtdiag` Fault Indication Output

```
Fan Status:
--------------------------------------
Location        Sensor        Status
--------------------------------------
FT1/F0          F0            failed (0 rpm)
```

Here is an example of how the `prtdiag` command displays the status of system LEDs.

CODE EXAMPLE 2-13   `prtdiag` LED Status Display

```
Led State:
--------------------------------------------------
Location    Led                  State      Color
--------------------------------------------------
MB          ACT                  on         green
MB          SERVICE              on         amber
MB          LOCATE               off        white
PS0         POK                  off        green
PS0         STBY                 off        green
```

`prtfru` *Command*

The Sun Fire V440 server maintains a hierarchical list of all field-replaceable units (FRUs) in the system, as well as specific information about various FRUs.

The `prtfru` command can display this hierarchical list, as well as data contained in the serial electrically-erasable programmable read-only memory (SEEPROM) devices located on many FRUs. CODE EXAMPLE 2-14 shows an excerpt of a hierarchical list of FRUs generated by the `prtfru` command with the `-l` option.

CODE EXAMPLE 2-14   `prtfru -l` Command Output

```
/frutree
/frutree/chassis (fru)
/frutree/chassis/SC?Label=SC
/frutree/chassis/SC?Label=SC/system-controller (container)
/frutree/chassis/MB?Label=MB
/frutree/chassis/MB?Label=MB/system-board (container)
/frutree/chassis/MB?Label=MB/system-board/BAT?Label=BAT
[...]
/frutree/chassis/PS0?Label=PS0
/frutree/chassis/PS0?Label=PS0/power-supply (container)
/frutree/chassis/PS1?Label=PS1
/frutree/chassis/HDD0?Label=HDD0
/frutree/chassis/HDD0?Label=HDD0/disk (fru)
[...]
/frutree/chassis/PCI0?Label=PCI0
/frutree/chassis/PCI1?Label=PCI1
/frutree/chassis/PCI2?Label=PCI2
```

CODE EXAMPLE 2-15 shows an excerpt of SEEPROM data generated by the `prtfru` command with the `-c` option.

CODE EXAMPLE 2-15   `prtfru -c` Command Output

```
/frutree/chassis/SC?Label=SC/system-controller (container)
   SEGMENT: SD
      /ManR
      /ManR/UNIX_Timestamp32: Wed Dec 31 19:00:00 EST 1969
      /ManR/Fru_Description: ASSY,CHLPA,RMC
      /ManR/Manufacture_Loc:
      /ManR/Sun_Part_No: 5016346
      /ManR/Sun_Serial_No:
      /ManR/Vendor_Name: NO JEDEC CODE FOR THIS VENDOR
      /ManR/Initial_HW_Dash_Level: 03
      /ManR/Initial_HW_Rev_Level:
      /ManR/Fru_Shortname: CHLPA_RMC
      /SpecPartNo: 885-0084-03
/frutree/chassis/MB?Label=MB/system-board (container)
   SEGMENT: SD
      /ManR
      /ManR/UNIX_Timestamp32: Mon Nov  4 15:35:24 EST 2002
      /ManR/Fru_Description: ASSY,CHLPA,MOTHERBOARD
      /ManR/Manufacture_Loc: Celestica,Toronto,Ontario
```

```
/ManR/Sun_Part_No: 5016344
/ManR/Sun_Serial_No: 000001
/ManR/Vendor_Name: Celestica
/ManR/Initial_HW_Dash_Level: 03
/ManR/Initial_HW_Rev_Level: 06
/ManR/Fru_Shortname: CHLPA_MB
/SpecPartNo: 885-0060-02
```

The `prtfru` command displays varied data depending on the type of FRU. In general, this information includes:

- FRU description
- Manufacturer name and location
- Part number and serial number
- Hardware revision levels

Information about the following Sun Fire V440 server FRUs is displayed by the `prtfru` command:

- ALOM card
- CPU modules
- DIMMs
- Motherboard
- SCSI backplane
- Power supplies

Similar information is provided by the ALOM system controller `showfru` command. For more information about `showfru` and other ALOM commands, see "How to Monitor the System Using Sun Advanced Lights Out Manager" on page 79.

`psrinfo` *Command*

The `psrinfo` command displays the date and time each CPU came online. With the verbose option (`-v`), 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 2-16 `psrinfo –v` Command Output

```
Status of processor 0 as of: 04/11/03 12:03:45
  Processor has been on-line since 04/11/03 10:53:03.
  The sparcv9 processor operates at 1280 MHz,
        and has a sparcv9 floating point processor.
Status of processor 1 as of: 04/11/03 12:03:45
  Processor has been on-line since 04/11/03 10:53:05.
  The sparcv9 processor operates at 1280 MHz,
        and has a sparcv9 floating point processor.
```

`showrev` *Command*

The `showrev` command displays revision information for the current hardware and software. CODE EXAMPLE 2-17 shows sample output of the `showrev` command.

CODE EXAMPLE 2-17 `showrev` Command Output

```
Hostname: wgs94-111
Hostid: 83195f01
Release: 5.8
Kernel architecture: sun4u
Application architecture: sparc
Hardware provider: Sun_Microsystems
Domain: Ecd.East.Sun.COM
Kernel version: SunOS 5.8 chalupa28_11:12/03/02 2002
    SunOS Internal Development: root 12/03/02 [chalupa28-gate]
```

When used with the `–p` option, this command displays installed patches. CODE EXAMPLE 2-18 shows a partial sample output from the `showrev` command with the `–p` option.

CODE EXAMPLE 2-18 `showrev –p` Command Output

```
Patch: 112663-01 Obsoletes:  Requires: 108652-44 Incompatibles:  Packages:
SUNWxwplt
Patch: 111382-01 Obsoletes:  Requires:  Incompatibles:  Packages: SUNWxwplt
Patch: 111626-02 Obsoletes:  Requires:  Incompatibles:  Packages: SUNWolrte,
SUNWolslb
Patch: 111741-02 Obsoletes:  Requires:  Incompatibles:  Packages: SUNWxwmod,
SUNWxwmox
Patch: 111844-02 Obsoletes:  Requires:  Incompatibles:  Packages: SUNWxwopt
Patch: 112781-01 Obsoletes:  Requires:  Incompatibles:  Packages: SUNWxwopt
Patch: 108714-07 Obsoletes:  Requires:  Incompatibles:  Packages: SUNWdtbas,
SUNWdtbax
```

Tools and the Boot Process: A Summary

Different diagnostic tools are available to you at different stages of the boot process. TABLE 2-3 summarizes what tools are available to you and when they are available.

TABLE 2-3   Diagnostic Tool Availability

| Stage | Available Diagnostic Tools | | |
	Fault Isolation	System Monitoring	System Exercising
Before the operating system starts	- LEDs - POST - OpenBoot Diagnostics	- ALOM - OpenBoot commands	–none–
After the operating system starts	- LEDs	- ALOM - Sun Management Center - Solaris info commands	- SunVTS - Hardware Diagnostic Suite
When the system is turned off but standby power is available	–none–	- ALOM	–none–

About Isolating Faults in the System

Each of the tools available for fault isolation discloses faults in different field-replaceable units (FRUs). The row headings along the left of TABLE 2-4 list the FRUs in a Sun Fire V440 server. The available diagnostic tools are shown in column headings across the top. A check mark in this table indicates that a fault in a particular FRU can be isolated by a particular diagnostic.

TABLE 2-4   FRU Coverage of Fault Isolating Tools

| FRU | ALOM | LEDs | | OpenBoot Diags | POST |
		Enclosure	On FRU		
ALOM card	✓		✓	✓	
Connector board assembly	No coverage. See TABLE 2-5 for fault isolation hints.				
CPU/memory module	✓	✓			✓
DIMMs		✓			✓
Disk drive	✓	✓	✓	✓	
DVD-ROM drive			✓	✓	

TABLE 2-4 FRU Coverage of Fault Isolating Tools *(Continued)*

FRU	ALOM	LEDs		OpenBoot Diags	POST
		Enclosure	On FRU		
Fan tray 0 (PCI fan)	✓	✓			
Fan tray 1 (CPU fans)	✓	✓			
Motherboard	✓	✓		✓	✓
Power supply	✓	✓	✓		
SCSI backplane	No coverage. See TABLE 2-5 for fault isolation hints.				
System configuration card reader	No coverage. See TABLE 2-5 for fault isolation hints.				
System configuration card	No coverage. See TABLE 2-5 for fault isolation hints.				

In addition to the FRUs listed in TABLE 2-4, there are several minor replaceable system components—mostly cables—that cannot directly be isolated by any system diagnostic. For the most part, you determine when these components are faulty by eliminating other possibilities. Some of these FRUs are listed in TABLE 2-5, along with hints on how to discern problems with them.

TABLE 2-5 FRUs Not Directly Isolated by Fault Isolating Tools

FRU	Diagnostic Hints
Connector board assembly	This is difficult to distinguish from problems with similar symptoms. The firmware generates many error messages about being unable to access OpenBoot configuration variables, for example: "`Could not read diag-level from NVRAM!`" ALOM shows the front panel Service Required indicator is lit.
Connector board power cable	If ALOM is able to read the system keyswitch position, but reports that none of the fans are spinning, you should suspect that this cable is loose or defective.
DVD-ROM drive cable	If OpenBoot Diagnostics tests indicate a problem with the CD/DVD drive, but replacing the drive does not fix the problem, you should suspect (primarily) that this cable is either defective or improperly connected, or (secondarily) that there is a problem with the motherboard.
SCSI backplane	Though not an exhaustive diagnostic, some SunVTS tests (`i2c2test` and `disktest`) exercise certain SCSI backplane paths. You can also monitor the backplane's ambient temperature using the ALOM system controller `showenvironment` command (see "How to Monitor the System Using Sun Advanced Lights Out Manager" on page 79).

TABLE 2-5 FRUs Not Directly Isolated by Fault Isolating Tools *(Continued)*

FRU	Diagnostic Hints
SCSI data cable	This is difficult to distinguish from problems with similar symptoms. The firmware generates many error messages about being unable to access OpenBoot configuration variables, for example: "`Could not read diag-level from NVRAM!`" ALOM shows the front panel Service Required indicator is lit.
System configuration card reader –and– System configuration card reader cable	If the system control keyswitch and Power button appear unresponsive, and if the power supplies are known to be good, you should suspect the SCC reader and its cable. To test these components, access ALOM, issue the `resetsc` command, log in again to ALOM, and remove the system controller card. If an alert message appears ("`SCC card has been removed`"), it means the card reader is functioning and the cable is intact.
System control keyswitch cable	If the system control keyswitch appears unresponsive (ALOM cannot read keyswitch position), but the Power button works and the system stays powered on, you should suspect either that this cable is loose or defective, or (less likely) that there is a problem with the system configuration card reader.

Note – Most replacement cables for the Sun Fire V440 server are available only as part of a cable kit, Sun part number 560-2713.

About Monitoring the System

Sun provides two tools that can give you advance warning of difficulties and prevent future downtime. These tools are:

- Sun™ Advanced Lights Out Manager (ALOM)
- Sun Management Center

These monitoring tools let you specify system criteria that bear watching. For instance, you can enable alerts for system events (such as excessive temperatures, power supply or fan failures, system resets), and be notified if those events occur. Warnings can be reported by icons in the software's graphical user interface, or you can be notified by email whenever a problem occurs.

Monitoring the System Using Sun Advanced Lights Out Manager

Sun Advanced Lights Out Manager (ALOM) enables you to monitor and control your server over a serial port or a network interface. The ALOM system controller provides a command-line interface that enables you to administer the server from remote locations. This may be especially useful when servers are geographically distributed or physically inaccessible.

ALOM also lets you remotely access the system console and run diagnostics (like POST) that would otherwise require physical proximity to the server's serial port. ALOM can send email notification of hardware failures or other server events.

The ALOM system controller runs independently, and uses standby power from the server. Therefore, ALOM firmware and software continue to be effective when the server operating system goes offline, or when power to the server itself is turned off.

ALOM lets you monitor the following on the Sun Fire V440 server.

TABLE 2-6   What ALOM Monitors

Item Monitored	What ALOM Reveals	Command to Type
Disk drives	Whether each slot has a drive present, and whether the drive reports OK status	`showenvironment`
Fans and fan trays	Fan speed and whether the fan trays report OK status	`showenvironment`
CPU/memory modules	The presence of a CPU/memory module and the temperature measured at each CPU, as well as any thermal warning	`showenvironment`
Operating system status	Whether the operating system is running, stopped, initializing, or in some other state	`showplatform`
Power supplies	Whether each bay has a power supply present, and whether the power supply reports OK status	`showenvironment`
System temperature	Ambient and CPU core temperatures as measured at several locations in the system, as well as any thermal warning	`showenvironment`
Server front panel	System control keyswitch position and status of LEDs	`showenvironment`
User sessions	Which users are logged in to ALOM, and via which connections	`showusers`

For instructions on using ALOM to monitor a Sun Fire V440 system, see "How to Monitor the System Using Sun Advanced Lights Out Manager" on page 79.

Monitoring the System Using 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.

Individual devices are divided into three categories: physical, logical, and environmental. Sun Management Center lets you monitor the following devices on the Sun Fire V440 server.

TABLE 2-7 What Sun Management Center Monitors

Device Monitored	Device Category	What Sun Management Center Reveals
CPUs	Logical	CPU presence and status
	Environmental	CPU temperature and thermal warnings
DIMMs	Physical	Module presence and error information
Disk drives	Logical	Drive presence, status, and error information
Indicators (LEDs)	Logical	Indicator status
Fans	Physical	Fan presence and status
	Environmental	Fan speed
Network interfaces	Logical	Device presence, status, and error information
PCI cards	Physical	Card presence
Power supplies	Physical	Power supply presence and status
	Environmental	System voltages and currents

How Sun Management Center Reports Status

For each device in a monitored Sun Fire V440 server, Sun Management Center distinguishes between and reports the statuses given in TABLE 2-8.

TABLE 2-8 Device Status Reported by Sun Management Center

Status	Meaning
Degraded	Device is operating at less than peak performance
Error	Problem detected
Failure Predicted	Available statistics suggest that device failure is imminent

TABLE 2-8   Device Status Reported by Sun Management Center *(Continued)*

Status	Meaning
Lost Comms	Communications were lost between Sun Management Center and the device in question
OK	Device is operating properly with no problems detected
Stopped	Device is not running
Unknown	Sun Management Center cannot determine device status

How Sun Management Center Works

The Sun Management Center product comprises three software entities:

- Agent layer
- Server layer
- Console layer

You install *agent layer modules* on systems to be monitored. The modules collect system status information from log files, device trees, and platform-specific sources, and report that data to the server component.

The *server* layer 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 operating system parameters like load, resource usage, and disk space. You can create alarm thresholds and be notified when these thresholds are exceeded.

The *console* layer presents the collected data to you in a standard format. Sun Management Center software provides both standalone Java™ graphical user interface (GUI) and command-line interface (CLI) applications and a Web browser-based interface. The Java interfaces afford physical and logical views of the system for highly intuitable monitoring.

Other Sun Management Center Features

Sun Management Center software provides you with many additional tools including an informal tracking mechanism, an optional add-on diagnostics suite, and a report-generation tool. In a heterogeneous computing environment, the product can interoperate with management utilities made by other companies.

Informal Tracking

Sun Management Center agent software must be loaded on any server you want to monitor. However, the product lets you 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 server to a list in the Sun Management Center interface, have Sun Management Center periodically check whether the server is up and running, and notify you if the server stops responding.

Add-On Diagnostic Suite

The *Hardware Diagnostic Suite* is available as a premium package you can purchase as an add-on to the Sun Management Center product. This suite lets you exercise a system while it is still up and running in a production environment. See "Exercising the System Using the Hardware Diagnostic Suite" on page 42 for more information.

Report Generation Tool

The *Performance Reporting Manager* is a Sun Management Center add-on that allows you to create reports detailing the status of your machines. The tool generates report data on performance, hardware, configurations, software packages, patches, and alarms for an arbitrary subset of managed systems in your data center.

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 may be able to take advantage of Sun Management Center software's support for Tivoli Enterprise Console, BMC Patrol, and HP Openview.

Who Should Use Sun Management Center?

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 operating environment.
For instructions, see "How to Monitor the System Using Sun Management Center"
on page 74. For detailed information about the product, see the *Sun Management
Center Software User's Guide.*

Obtaining the Latest Information

For the latest information about this product, go to the Sun Management Center Web
site: `http://www.sun.com/sunmanagementcenter`.

About Exercising the System

It is relatively easy to detect when a system component fails outright. However,
when a system has an intermittent problem or seems to be "behaving strangely," a
software tool that stresses or exercises the computer's many subsystems can help
disclose the source of the emerging problem and prevent long periods of reduced
functionality or system downtime.

Sun provides two tools for exercising Sun Fire V440 servers:

- SunVTS software
- Hardware Diagnostic Suite software

TABLE 2-9 shows the FRUs that each system exercising tool is capable of isolating.
Note that individual tools do not necessarily test *all* the components or paths of a
particular FRU.

TABLE 2-9   FRU Coverage of System Exercising Tools

FRU	SunVTS	Hardware Diagnostic Suite
ALOM card	✓	
Connector board assembly	No coverage. See TABLE 2-5 for fault isolation hints.	
CPU/memory module	✓	✓
DIMMs	✓	✓
Disk drive	✓	✓
DVD-ROM drive	✓	
Fan tray 0 (PCI fan)	No coverage. See TABLE 2-10 for fault isolation hints.	
Fan tray 1 (CPU fans)	No coverage. See TABLE 2-10 for fault isolation hints.	

TABLE 2-9 FRU Coverage of System Exercising Tools *(Continued)*

FRU	SunVTS	Hardware Diagnostic Suite
Motherboard	✓	✓
Power supply	✓	
SCSI backplane	✓	
System configuration card reader	No coverage. See TABLE 2-5 for fault isolation hints.	
System configuration card	✓	

Some FRUs are not isolated by any system exercising tool.

TABLE 2-10 FRUs Not Directly Isolated by System Exercising Tools

FRU	Diagnostic Hints
Connector board assembly	See TABLE 2-5.
DVD/CD-ROM drive cable	See TABLE 2-5.
Fan tray 0 (PCI fan)	If this FRU fails, ALOM issues an alert message: `SC Alert: PCI_FAN @ FT0 Failed.`
Fan tray 1 (CPU fan)	If this FRU fails, ALOM issues an alert message: `SC Alert: CPU_FAN @ FT1 Failed.`
SCSI data cable	See TABLE 2-5.
Connector board power cable	See TABLE 2-5.

Exercising the System Using SunVTS Software

SunVTS software validation test suite 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 five different test modes:

- *Connection mode* – SunVTS software verifies the presence of device controllers on all subsystems. This typically takes no more than a few minutes and is a good way to "sanity check" system connections.

- *Functional mode* – SunVTS software exercises only the specific subsystems you choose. This is the default mode. In Functional mode, selected tests are run in parallel. This mode uses system resources heavily, so you should not run any other applications at the same time.

- *Auto Config mode* – SunVTS software automatically detects all subsystems and exercises them in one of two ways:
  - *Confidence testing* – SunVTS software performs one pass of tests on all subsystems, and then stops. For typical system configurations, this requires one or two hours.
  - *Comprehensive testing* – SunVTS software exhaustively and repeatedly tests all subsystems for up to 24 hours.
- *Exclusive mode* – SunVTS software exercises only the specific subsystems you choose. Selected tests are run one at a time. A few tests are *only* available in this mode, including: `l1dcachetest`, `l2cachetest`, `l2sramtest`, `mpconstest`, `mptest`, and `systest`.
- *Online mode* – SunVTS software exercises only the specific subsystems you choose. Selected tests are run one at a time until one complete system pass is achieved. This mode is useful for performing tests while other applications are running.

Since SunVTS software can run many tests in parallel and can consume many system resources, you should take care when using it on a production system. If you are stress-testing a system using SunVTS software's Comprehensive test mode, you should not run anything else on that system at the same time.

The Sun Fire V440 server to be tested must be up and running if you want to use SunVTS software, since it relies on the Solaris operating environment. Since SunVTS software packages are optional, they may not be installed on your system. Turn to "How to Check Whether SunVTS Software Is Installed" on page 100 for instructions.

It is important to use the most up-to-date version of SunVTS available, to ensure that you have the latest suite of tests. To download the most recent SunVTS software, point your Web browser to: `http://www.sun.com/oem/products/vts/`.

For instructions on running SunVTS software to exercise the Sun Fire V440 server, see "How to Exercise the System Using SunVTS Software" on page 96. For more information about the product, see:

- *SunVTS User's Guide* – Describes SunVTS features as well as how to start and control the various user interfaces.
- *SunVTS Test Reference Manual* – Describes each SunVTS test, option, and command-line argument.
- *SunVTS Quick Reference Card* – Gives an overview of the main features of the graphical user interface (GUI).
- *SunVTS Documentation Supplement* – Describes the latest product enhancements and documentation updates not included in the *SunVTS User's Guide* and *SunVTS Test Reference Manual.*

These documents are available on the Solaris Supplement CD and on the Web at: `http://www.sun.com/documentation`. You should also consult the SunVTS README file located at `/opt/SUNWvts/`. This document provides late-breaking information about the installed version of the product.

SunVTS Software and Security

During SunVTS software installation, you must choose between Basic or Sun Enterprise Authentication Mechanism (SEAM) 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. SEAM security is based on Kerberos—the standard network authentication protocol—and provides secure user authentication, data integrity, and privacy for transactions over networks.

If your site uses SEAM security, you must have the SEAM client and server software installed in your networked environment and configured properly in both Solaris and SunVTS software. If your site does not use SEAM security, do not choose the SEAM option during SunVTS software installation.

If you enable the wrong security scheme during installation, or if you improperly configure the security scheme you chose, you may find yourself unable to run SunVTS tests. For more information, see the *SunVTS User's Guide* and the instructions accompanying the SEAM software.

Exercising the System Using the Hardware Diagnostic Suite

The Sun Management Center product features the 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 software, which stresses a server by consuming its resources with many parallel tests (see "Exercising the System Using SunVTS Software" on page 40), the Hardware Diagnostic Suite lets the server run other applications while testing proceeds.

When to Run the 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 server. Examples include questionable disk drives or memory modules on a server 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 server 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, the entire diagnose-and-repair cycle can be completed with minimal impact to system users.

Requirements for Using the Hardware Diagnostic Suite

Since it is a part of Sun Management Center, you can only run the 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 can be found in the *Sun Management Center Software User's Guide*. Information about the Hardware Diagnostic Suite can be found in the *Sun Management Center Hardware Diagnostic Suite User's Guide*.

Reference for Identifying Memory Modules

System firmware, including POST, has multiple ways of referring to memory. In most cases, such as when running tests or displaying configuration information, firmware refers to memory "banks." These are *logical* and not physical banks (see CODE EXAMPLE 2-19).

CODE EXAMPLE 2-19   POST Reference to Logical Memory Banks

```
0>Memory interleave set to 0
0>    Bank 0   512MB : 00000000.00000000 -> 00000000.20000000.
0>    Bank 1   512MB : 00000001.00000000 -> 00000001.20000000.
0>    Bank 2   512MB : 00000002.00000000 -> 00000002.20000000.
0>    Bank 3   512MB : 00000003.00000000 -> 00000003.20000000.
```

However, in POST error output (see CODE EXAMPLE 2-20), the firmware provides a memory slot identifier (`B0/D1 J0602`). Note that `B0/D1` identifies the memory slot and is visible on the circuit board when the DIMM is installed. The label `J0602` also identifies the memory slot, but is not visible unless you remove the DIMM from the slot.

CODE EXAMPLE 2-20   POST Reference to Physical ID and Logical Bank

```
1>H/W under test = CPU3 B0/D1 J0602 side 1 (Bank 1), CPU Module C3
```

Adding to the potential confusion, when configuring system memory, you must also contend with the separate notion of *physical memory banks*: DIMMs must be installed as pairs of the same capacity and type within each physical bank.

The following sections clarify how memory is identified.

Physical Identifiers

Each CPU/memory module's circuit board contains silk-screened labels that uniquely identify every DIMM on that board. Each label is in this form:

B*x*/D*y*

where *x* indicates the physical bank, and *y* the DIMM number within the bank.

In addition, a "J" number silk-screened on the circuit board uniquely identifies each DIMM slot. However, this slot number is not readily visible unless the DIMM is removed from the slot.

If you run POST and it finds a memory error, the error message will include the physical ID of the failed DIMM and the "J" number of the failed DIMM's slot, making it easy to determine which parts you need to replace.

Note – To ensure compatibility and maximize system uptime, you should replace DIMMs in pairs. Treat both DIMMs in a physical bank as one FRU.

Logical Banks

Logical banks reflect the system's internal memory architecture and not the architecture of the system's field-replaceable units. In the Sun Fire V440 server, each logical bank spans two physical DIMMs. Since firmware-generated status messages

refer only to logical banks, it is not possible to use these status messages to isolate a memory problem to a single failed DIMM. POST error messages, on the other hand, specify failures to the FRU level.

Note – To isolate faults in the memory subsystem, run POST diagnostics.

Correspondence Between Logical and Physical Banks

TABLE 2-11 shows the logical-to-physical memory bank mapping for the Sun Fire V440 server.

TABLE 2-11   Logical and Physical Memory Banks in a Sun Fire V440 Server

Logical Bank (As Given in Firmware Output)	Physical Identifiers (As Shown on Circuit Board)	Physical Bank
Bank 0	B0/D0 and B0/D1	Bank 0
Bank 1		
Bank 2	B1/D0 and B1/D1	Bank 1
Bank 3		

FIGURE 2-4 depicts the same mapping graphically.
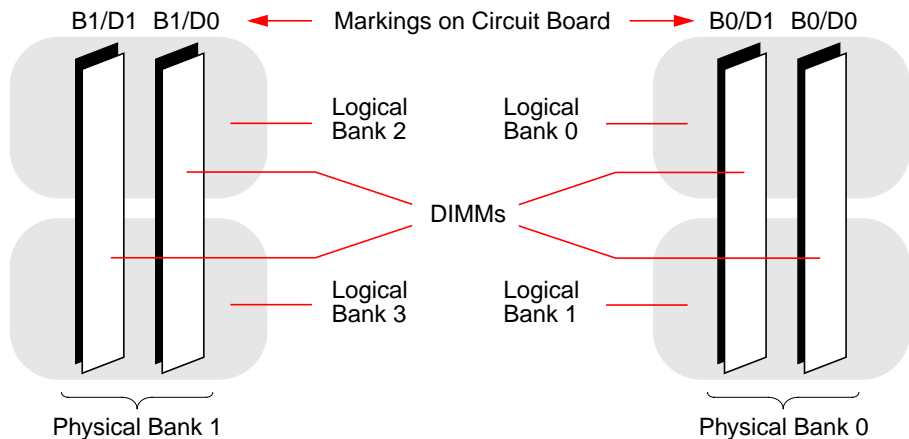
FIGURE 2-4   How Logical Memory Banks Map to DIMMs

Identifying CPU/Memory Modules

Since each CPU/memory module has its own set of DIMMs, you need to determine the CPU/memory module in which a faulty DIMM resides. This information is given in the POST error message:

```
1>H/W under test = CPU3 B0/D1 J0602 side 1 (Bank 1), CPU Module C3
```

In this example, the cited module is CPU Module C3.

The processors are numbered according to the slot in which they are installed, and these slots are numbered 0 to 3, left to right, as you look down on the Sun Fire V440 server's chassis from the front (see FIGURE 2-5).
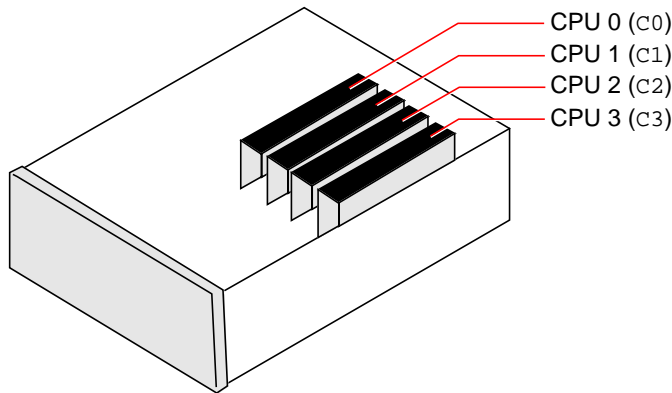
FIGURE 2-5   CPU/Memory Module Numbering

For example, if a Sun Fire V440 server has only two CPU/memory modules installed, and if those are located in the left most and right most slots, then the firmware will refer to the two system processors as CPU 0 and CPU 3.

The failed DIMM called out by the previous POST error message, then, resides in the right most CPU/memory module (C3), and is labeled B0/D1 on that module's circuit board.

Reference for OpenBoot Diagnostics Test Descriptions

This section describes the OpenBoot Diagnostics tests and commands available to you. For background information about these tests, see "Stage Two: OpenBoot Diagnostics Tests" on page 15.

TABLE 2-12 OpenBoot Diagnostics Menu Tests

Test Name	What It Does	FRU(s) Tested
flashprom@2,0	Performs a checksum test on the boot PROM	Motherboard
i2c@0,320	Tests the I^{2}C environmental monitoring subsystem, which includes various temperature and other sensors located on the motherboard and on other FRUs	Motherboard, power supplies, SCSI disks, CPU/memory modules
ide@d	Tests the on-board IDE controller and IDE bus subsystem that controls the DVD-ROM drive	Motherboard, DVD-ROM drive
network@1	Tests the on-board Ethernet controller, running internal loopback tests. Can also run external loopback tests, but only if you install a loopback connector (not provided)	Motherboard
network@2	Same as above, for the other on-board Ethernet controller	Motherboard
rmc-comm@0,3e8	Tests communication with the ALOM system controller, and requests that ALOM diagnostics run	ALOM card
rtc@0,70	Tests the registers of the real-time clock and verifies that it is running	Motherboard
scsi@2	Tests internal SCSI disk drives	Motherboard, SCSI backplane, SCSI disks
scsi@2,1	Tests any external SCSI disk drives attached	Motherboard, SCSI cable, SCSI disks
serial@0,3f8 serial@0,2e8	Tests all possible baud rates supported by the ttya and ttyb serial lines. Performs internal and external loopback tests on each line at each speed	Motherboard
usb@a usb@b	Tests the writable registers of the USB open host controller	Motherboard

TABLE 2-13 describes the commands you can type from the obdiag> prompt.

TABLE 2-13 OpenBoot Diagnostics Test Menu Commands

Command	Description
exit	Exits OpenBoot Diagnostics tests and returns to the ok prompt
help	Displays a brief description of each OpenBoot Diagnostics command and OpenBoot configuration variable
set-default *variable*	Restores the default value of an OpenBoot configuration variable
setenv *variable* *value*	Sets the value for an OpenBoot configuration variable (also available from the ok prompt)
test-all	Tests all devices displayed in the OpenBoot Diagnostics test menu (also available from the ok prompt)
test #	Tests only the device identified by the menu entry number. (A similar function is available from the ok prompt. See "From the ok Prompt: The test and test-all Commands" on page 19.)
test #,#	Tests only the devices identified by the menu entry numbers
except #,#	Tests all devices in the OpenBoot Diagnostics test menu except those identified by the menu entry numbers
what #,#	Displays selected properties of the devices identified by the menu entry numbers. The information provided varies according to device type

Reference for Decoding I^{2}C Diagnostic Test Messages

TABLE 2-14 describes each I^{2}C device in a Sun Fire V440 server, and helps you associate each I^{2}C address with the proper FRU. For more information about I^{2}C tests, see "I^{2}C Bus Device Tests" on page 20.

TABLE 2-14   I^{2}C Bus Devices in a Sun Fire V440 Server

Address	Associated FRU	What the Device Does
`clock-generator@0,d2`	Motherboard	Controls PCI bus clock
`cpu-fru-prom@0,de`	CPU 2	Contains FRU configuration information
`dimm-spd@0,d6`	CPU/memory module 2, DIMM 0	Contains FRU configuration information
`dimm-spd@0,d8`	CPU/memory module 2, DIMM 1	Contains FRU configuration information
`dimm-spd@0,da`	CPU/memory module 2, DIMM 2	Contains FRU configuration information
`dimm-spd@0,dc`	CPU/memory module 2, DIMM 3	Contains FRU configuration information
`cpu-fru-prom@0,ce`	CPU 1	Contains FRU configuration information
`dimm-spd@0,c6`	CPU/memory module 1, DIMM 0	Contains FRU configuration information
`dimm-spd@0,c8`	CPU/memory module 1, DIMM 1	Contains FRU configuration information
`dimm-spd@0,ca`	CPU/memory module 1, DIMM 2	Contains FRU configuration information
`dimm-spd@0,cc`	CPU/memory module 1, DIMM 3	Contains FRU configuration information
`scsi-fru-prom@0,a8`	SCSI backplane	Contains FRU configuration information
`rmc-fru-prom@0,a6`	ALOM card	Contains FRU configuration information
`power-supply-fru-prom@0,a4`	Power supply	Contains FRU configuration information

TABLE 2-14 I^{2}C Bus Devices in a Sun Fire V440 Server *(Continued)*

Address	Associated FRU	What the Device Does
`motherboard-fru-prom@0,a2`	Motherboard	Contains FRU configuration information
`temperature-sensor@0,9c`	SCSI backplane	Senses system ambient temperature
`temperature@0,80`	CPU 2	Senses CPU die temperature
`temperature@0,64`	CPU 1	Senses CPU die temperature
`hardware-monitor@0,5c`	Motherboard	Monitors temperatures, voltages, and fan speeds
`gpio@0,48`	Motherboard	Drives system LEDs and CPU overtemperature indication
`gpio@0,46`	SCSI backplane	Indicates disk status and drives fault and Ok-to-Remove indicators
`gpio@0,44`	Motherboard	Indicates power supply and CPU status
`gpio@0,42`	SCSI backplane	Indicates keyswitch status and drives Activity LEDs
`i2c-bridge@0,18`	Motherboard	Translates I^{2}C bus addresses and isolates bus devices
`i2c-bridge@0,16`	Motherboard	Translates I^{2}C bus addresses and isolates bus devices
`temperature@0,30`	CPU 0	Senses CPU die temperature
`cpu-fru-prom@0,be`	CPU 0	Contains FRU configuration information
`dimm-spd@0,b6`	CPU/memory module 0, DIMM 0	Contains FRU configuration information
`dimm-spd@0,b8`	CPU/memory module 0, DIMM 1	Contains FRU configuration information
`dimm-spd@0,ba`	CPU/memory module 0, DIMM 2	Contains FRU configuration information
`dimm-spd@0,bc`	CPU/memory module 0, DIMM 3	Contains FRU configuration information
`temperature@0,90`	CPU 3	Senses CPU die temperature
`cpu-fru-prom@0,ee`	CPU 3	Contains FRU configuration information
`dimm-spd@0,e6`	CPU/memory module 3, DIMM 0	Contains FRU configuration information

TABLE 2-14   I²C Bus Devices in a Sun Fire V440 Server   *(Continued)*

Address	Associated FRU	What the Device Does
`dimm-spd@0,e8`	CPU/memory module 3, DIMM 1	Contains FRU configuration information
`dimm-spd@0,ea`	CPU/memory module 3, DIMM 2	Contains FRU configuration information
`dimm-spd@0,ec`	CPU/memory module 3, DIMM 3	Contains FRU configuration information

Reference for Terms in Diagnostic Output

The status and error messages displayed by POST diagnostics and OpenBoot Diagnostics tests occasionally include acronyms or abbreviations for hardware subcomponents. TABLE 2-15 is included to assist you in decoding this terminology and associating the terms with specific FRUs, where appropriate.

TABLE 2-15   Abbreviations or Acronyms in Diagnostic Output

Term	Description	Associated FRU(s)
ADC	Analog-to-Digital Converter	Motherboard
APC	Advanced Power Control – A function provided by the Southbridge integrated circuit	Motherboard
Bell	A repeater circuit element that forms part of the system bus	Motherboard
CRC	Cyclic Redundancy Check	Not applicable
DMA	Direct Memory Access – In diagnostic output, usually refers to a controller on a PCI card	PCI card
HBA	Host Bus Adapter	Motherboard, various others
I²C	Inter-Integrated Circuit (also written as I2C) – A bidirectional, two-wire serial data bus. Used mainly for environmental monitoring and control	Various, see TABLE 2-14
IO-Bridge	System bus to PCI bridge integrated circuit (same as "Tomatillo")	Motherboard
JBus	The system interconnect architecture—that is, the data and address buses	Motherboard

TABLE 2-15 Abbreviations or Acronyms in Diagnostic Output *(Continued)*

Term	Description	Associated FRU(s)
JTAG	Joint Test Access Group – An IEEE subcommittee standard (1149.1) for scanning system components	Not applicable
MAC	Media Access Controller – Hardware address of a device connected to a network	Motherboard
MII	Media Independent Interface – Part of the Ethernet controller	Motherboard
NVRAM	Refers to the system configuration card (SCC)	System configuration card
OBP	Refers to OpenBoot firmware	Not applicable
PHY	Physical Interface – Part of the Ethernet control circuit	Motherboard
POST	Power-On Self-Test	Not applicable
RTC	Real-Time Clock	Motherboard
RX	Receive – Communication protocol	Motherboard
Scan	A means for monitoring and altering the content of ASICs and system components, as provided for in the IEEE 1149.1 standard	Not applicable
Southbridge	Integrated circuit that controls the ALOM UART port and more	Motherboard
Tomatillo	System bus to PCI bridge integrated circuit	Motherboard
TX	Transmit – Communication protocol	Motherboard
UART	Universal Asynchronous Receiver Transmitter – Serial port hardware	Motherboard, ALOM card
UIE	Update-ended Interrupt Enable – A function provided by the real-time clock	Motherboard
XBus	A byte-wide bus for low-speed devices	Motherboard

CHAPTER **3**

Isolating Failed Parts

The most important use of diagnostic tools is to isolate a failed hardware component so that you can quickly remove and replace it. Because servers are complex machines with many failure modes, there is no single diagnostic tool that can isolate all hardware faults under all conditions. However, Sun provides a variety of tools that can help you discern what component needs replacing.

This chapter guides you in choosing the best tools and describes how to use these tools to reveal a failed part in your Sun Fire V440 server. It also explains how to use the Locator LED to isolate a failed system in a large equipment room.

Tasks covered in this chapter include:

- "How to View and Set OpenBoot Configuration Variables" on page 54
- "How to Operate the Locator LED" on page 55
- "How to Put the System in Diagnostics Mode" on page 57
- "How to Bypass Firmware Diagnostics" on page 58
- "How to Bypass Diagnostics Temporarily" on page 59
- "How to Maximize Diagnostic Testing" on page 61
- "How to Isolate Faults Using LEDs" on page 62
- "How to Isolate Faults Using POST Diagnostics" on page 65
- "How to Isolate Faults Using Interactive OpenBoot Diagnostics Tests" on page 67
- "How to View Diagnostic Test Results After the Fact" on page 70

Other information in this chapter includes:

- "Reference for Choosing a Fault Isolation Tool" on page 70

If you want *background information* about the tools, turn to the section:

- "About Isolating Faults in the System" on page 32

Note – Many of the procedures in this chapter assume that you are familiar with the OpenBoot firmware and that you know how to access the `ok` prompt. For background information, see "About the `ok` Prompt" on page 171. For instructions, see "How to Get to the `ok` Prompt" on page 176.

How to View and Set OpenBoot Configuration Variables

Switches and OpenBoot configuration variables stored in the system configuration card 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 2-1.

Before You Begin

Suspend the server's operating system software to reach the `ok` prompt. See:

■ "How to Get to the `ok` Prompt" on page 176

What to Do

● **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.

```
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.**

```
ok setenv diag-level max
diag-level =         max
```

- **To set OpenBoot configuration variables that accept multiple keywords, separate keywords with a space.**

```
ok setenv post-trigger power-on-reset error-reset
post-trigger = power-on-reset error-reset
```

Note – The `test-args` variable operates differently from other OpenBoot configuration variables. It requires a single argument consisting of a comma-separated list of keywords. For details, see "Controlling OpenBoot Diagnostics Tests" on page 16.

Changes to OpenBoot configuration variables usually take effect on the next reboot.

How to Operate the Locator LED

The Locator LED helps you to quickly find a specific system among numerous systems in a room. For background information about system LEDs, see the *Sun Fire V440 Server Administration Guide*.

You can turn the Locator LED on and off either from the system console, or by using the Sun Advanced Lights Out Manager (ALOM) command-line interface.

Note – It is also possible to use Sun Management Center software to turn the Locator LED on and off. Consult Sun Management Center documentation for details.

Before You Begin

Access either the system console or the system controller. For instructions, see

- "How to Get to the ok Prompt" on page 176
- "About Switching Between the ALOM System Controller and the System Console" on page 175

What to Do

1. Determine the current state of the Locator LED.

Do one of the following:

■ **From the system console, type:**

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

■ **From the ALOM system controller, type:**

```
sc> showlocator
Locator LED is ON
```

2. Turn the Locator LED *on.*

Do one of the following:

■ **From the system console, type:**

```
# /usr/sbin/locator -n
```

■ **From the ALOM system controller, type:**

```
sc> setlocator on
```

3. Turn the Locator LED *off.*

Do one of the following:

■ **From the system console, type:**

```
# /usr/sbin/locator -f
```

■ **From the system controller, type:**

```
sc> setlocator off
```

How to Put the System in Diagnostics Mode

Firmware-based diagnostic tests can be bypassed to expedite the server's startup process. The following procedure ensures that POST and OpenBoot Diagnostics tests *do run* during startup. For background information, see:

■ "Diagnostics: Reliability versus Availability" on page 14

Before You Begin

Log in to the system console and access the `ok` prompt. For instructions, see:

■ "How to Get to the `ok` Prompt" on page 176

What to Do

1. **Do one of the following, whichever is more convenient:**

   ■ **Set the server's system control keyswitch to the Diagnostics position.**

   You can do this at the machine's front panel or, if you are running your test session remotely from console display, via the ALOM interface.

   ■ **Set the** `diag-switch?` **variable. Type:**

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

2. **Set the OpenBoot configuration** `diag-script` **variable to** `normal`**. Type:**

   ```
   ok setenv diag-script normal
   ```

   This allows OpenBoot Diagnostics tests to run automatically on all motherboard components.

Note – If you prefer that OpenBoot Diagnostics examine all IEEE 1275-compatible devices (not just those on the motherboard), set the `diag-script` variable to `all`.

---

3. **Set OpenBoot configuration variables to trigger diagnostic tests. Type:**

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

4. **Set the maximum POST diagnostic test level. Type:**

```
ok setenv diag-level max
```

This ensures the most thorough power-on self-test possible. The maximum testing level requires considerably longer to complete than the minimum. Depending on system configuration, you may need to wait an additional 10 to 20 minutes for the server to boot.

How to Bypass Firmware Diagnostics

POST and OpenBoot Diagnostics tests can be bypassed to expedite the server's startup process. For background information, see:

- "Diagnostics: Reliability versus Availability" on page 14

Caution – Bypassing diagnostic tests sacrifices system reliability by allowing a system to attempt to boot when it may have a serious hardware problem.

Before You Begin

Log in to the system console and access the `ok` prompt. For instructions, see:

- "How to Get to the `ok` Prompt" on page 176

What to Do

1. **Make sure that the server's system control keyswitch is set to the Normal position.**

   Setting the keyswitch to the Diagnostics position overrides the OpenBoot configuration variable settings and causes diagnostic tests to run.

2. Turn off the `diag-switch?` **and** `diag-script` **variables. Type:**

```
ok setenv diag-switch? false
ok setenv diag-script none
```

3. Set OpenBoot configuration trigger variables to bypass diagnostics. Type:

```
ok setenv post-trigger none
ok setenv obdiag-trigger none
```

What Next

The Sun Fire V440 server is now configured to minimize the time it takes to reboot. If you change your mind and want to force diagnostic tests to run, see:

- "How to Put the System in Diagnostics Mode" on page 57

How to Bypass Diagnostics Temporarily

Before You Begin

The ALOM system controller provides a "back-door" method of skipping diagnostic tests and booting the system. This procedure is only of assistance in those unusual circumstances where:

- The system is configured to run diagnostic tests automatically on power up.
- The hardware is functional and capable of booting, but is precluded from doing so by a firmware malfunction or incompatibility.

What to Do

1. Log in to the ALOM system controller and access the `sc>` **prompt.**

2. **Type:**

```
sc> bootmode skip_diag
```

This command temporarily configures the system to skip its firmware-based diagnostic tests, regardless of how the OpenBoot configuration variables are set.

3. **Within 10 minutes, power cycle the system. Type:**

```
sc> poweroff
Are you sure you want to power off the system [y/n]? y
sc> poweron
```

You must execute the above commands within 10 minutes of using ALOM to change the boot mode. Ten minutes after you issue the ALOM `bootmode` command, the system reverts back to its default boot mode as governed by the current settings of OpenBoot configuration variables, including `diag-switch`, `post-trigger`, and `obdiag-trigger`.

For more information about OpenBoot configuration variables and how they affect diagnostics, see "Controlling POST Diagnostics" on page 13.

What Next

If you suspect an incompatible or corrupted firmware image caused the problems you observed with firmware diagnostics, you should now restore the system firmware to a reliable state.

For more information about restoring the system firmware, contact your authorized service provider.

How to Maximize Diagnostic Testing

To maximize system reliability, it is useful to have POST and OpenBoot Diagnostics tests trigger in the event of an operating system panic or any reset, and to run automatically the most comprehensive tests possible. For background information, see:

- "Diagnostics: Reliability versus Availability" on page 14

Before You Begin

Log in to the system console and access the `ok` prompt. For instructions, see:

- "How to Get to the `ok` Prompt" on page 176

What to Do

1. **Do one of the following, whichever is more convenient:**

   - **Set the server's system control keyswitch to the Diagnostics position.**

     You can do this at the server's front panel or, if you are running your test session remotely from console display, via the ALOM interface.

   - **Set the** `diag-switch?` **variable to** `true`**. Type:**

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

2. **Set the OpenBoot configuration** `diag-script` **variable to** `all`**. Type:**

   ```
   ok setenv diag-script all
   ```

   This allows OpenBoot Diagnostics tests to run automatically on all motherboard components and IEEE 1275-compatible devices.

   Note – If you prefer that OpenBoot Diagnostics examine only motherboard-based devices, set the `diag-script` variable to `normal`.

   ---

3. **Set OpenBoot configuration variables to trigger diagnostic tests. Type:**

```
ok setenv post-trigger all-resets
ok setenv obdiag-trigger all-resets
```

4. **Set the maximum POST diagnostic test level. Type:**

```
ok setenv diag-level max
```

This ensures the most thorough testing possible. The maximum testing level requires considerably longer to complete than the minimum. Depending on system configuration, you may need to wait an additional 10 to 20 minutes for the server to boot.

How to Isolate Faults Using LEDs

While not a comprehensive diagnostic tool, LEDs located on the chassis and on selected system components can serve as front-line indicators of a limited set of hardware failures.

Before You Begin

You can view LED status by direct inspection of the system's front and back panels. You can also view the status of certain LEDs from the ALOM system controller command-line interface.

Note – Most LEDs available on the front panel are also duplicated on the back panel.

You can also view LED status remotely using Sun Management Center software, if you set up this tool ahead of time. For details on setting up Sun Management Center software, see:

■ *Sun Management Center Software User's Guide*

What to Do

1. **Check the system LEDs.**

   There is a group of three LEDs located near the top left corner of the front panel and duplicated on the back panel. Their status can tell you the following.

LED Name (location; color)	Indicates	Action
Locator (left; white)	A system administrator can turn this on to flag a system that needs attention.	Identify a particular system among many.
Service Required (middle; amber)	If lit, hardware or software has detected a problem with the system.	Check other LEDs or run diagnostics to determine the problem source.
System Activity (right; green)	If blinking, operating system is in the process of booting. If off, operating system has stopped.	Not applicable.

   The Locator and Service Required LEDs are powered by the system's 5-volt standby power source and remain lit for any fault condition that results in a system shutdown.

   Note – To view the status of system LEDs from ALOM, type `showenvironment` from the `sc>` prompt.

2. **Check the power supply LEDs.**

   Each power supply has a set of four LEDs located on the front panel and duplicated on the back panel. Their status can tell you the following.

LED Name (location; color)	Indicates	Action
OK-to-Remove (top; blue)	If lit, power supply can safely be removed.	Remove power supply as needed.
	Note: Remove a failed power supply only when you are ready to install its replacement. Both power supplies must remain in place to ensure proper air circulation and chassis cooling.	

LED Name (location; color)	Indicates	Action
Service Required (2nd from top; amber)	If lit, there is a problem with the power supply or its internal fan.	Replace the power supply.
Power OK (3rd from top; green)	If off, inadequate DC power is being produced by the supply.	Remove and reseat the power supply. If this does not help, replace the supply.
Standby Available (bottom; green)	If off, either AC power is not reaching the supply, or the supply is not producing adequate 5V standby power.	Check the power cord and the outlet to which it connects. If necessary, replace the supply.

3. **Check the disk drive LEDs.**

   Disk drive LEDs are located behind the left system door. Just to the right of each disk drive is a set of three LEDs. Their status can tell you the following.

LED Name (location; color)	Indicates	Action
OK-to-Remove (top; blue)	If lit, disk can safely be removed.	Remove disk as needed.
Service Required (middle; amber)	This LED is reserved for future use.	Not applicable.
Activity (bottom; green)	If lit or blinking, disk is operating normally.	Not applicable.

4. **Check the DVD-ROM LED.**

   The DVD-ROM drive features a Power/Activity LED that tells you the following.

LED Name (color)	Indicates	Action
Power/Activity (green)	If lit or blinking, drive is operating normally.	If this LED is off, and you know the system is receiving power, check the DVD-ROM drive and its cables.

5. Check the Ethernet port LEDs.

Two Ethernet port LEDs are located on the system back panel.

LED Name (color)	Indicates	Action
Link/Activity (green)	If lit, a link is established. If blinking, there is activity. Both states indicate normal operation.	If this LED is off and you know a link is being attempted, check the Ethernet cables.
Speed (amber)	If lit, a Gigabit Ethernet connection is established. If off, a 10/100-Mbps Ethernet connection is established.	

What Next

If LEDs do not disclose the source of a suspected problem, try putting the affected server in Diagnostics mode. See:

■

You can also run power-on self-test (POST) diagnostics. See:

■

How to Isolate Faults Using POST Diagnostics

This section explains how to run power-on self-test (POST) diagnostics to isolate faults in a Sun Fire V440 server. For background information about POST diagnostics and the boot process, see Chapter 2.

Before You Begin

Log in to the system console and access the ok prompt. For instructions, see:

■

This procedure assumes that the system is in diagnostics mode. See:

■ "How to Put the System in Diagnostics Mode" on page 57

The procedure also assumes that the system console is in its default configuration, so that you are able to switch between the system controller and the system console. See:

■ "About Communicating With the System" on page 164
■ "Access Through the Network Management Port" on page 168

What to Do

1. **(Optional) Set the OpenBoot configuration variable** `diag-level` **to** `max`**. Type:**

```
ok setenv diag-level max
diag-level =     max
```

This provides the most extensive diagnostic testing.

2. **Power on the server. Do one of the following:**
   ■ **Press the Power button at the server's front panel.**
   ■ **Access the ALOM system controller and type:**

```
ok #.
sc>
```

Then, from the `sc>` prompt, type:

```
sc> poweron
sc> console
ok
```

The system runs the POST diagnostics and displays status and error messages via the local serial terminal.

Note – You will not see any POST output if you remain at the `sc>` prompt. You must return to the `ok` prompt by typing the `console` command as shown above.

---

3. **Examine the POST output.**

Each POST error message includes a "best guess" as to which field-replaceable unit (FRU) was the source of failure. In some cases, there may be more than one possible source, and these are listed in order of decreasing likelihood.

Note – Should the POST output contain code names and acronyms with which you are unfamiliar, see TABLE 2-15 in "Reference for Terms in Diagnostic Output" on page 51.

What Next

Try replacing the FRU or FRUs indicated by POST error messages, if any. For replacement instructions, see:

■ *Sun Fire V440 Server Parts Installation and Removal Guide*

If the POST diagnostics did not turn up any problems, but your system does not start up, try running the interactive OpenBoot Diagnostics tests. See:

■ "How to Isolate Faults Using Interactive OpenBoot Diagnostics Tests" on page 67

How to Isolate Faults Using Interactive OpenBoot Diagnostics Tests

Before You Begin

Log in to the system console and access the `ok` prompt. For instructions, see:

■ "How to Get to the `ok` Prompt" on page 176

Because OpenBoot Diagnostics tests require access to some of the same hardware resources used by the operating system, the tests cannot be run reliably after an operating system halt or L1-A (Stop-A) key sequence. You need to reset the system before running OpenBoot Diagnostics tests, and then reset the system again after testing. Instructions for doing this follow.

What to Do

1. **Set the** `auto-boot?` **OpenBoot configuration variable to** `false`**. Type:**

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

2. **Reset or power cycle the system.**

3. **Invoke the OpenBoot Diagnostics tests. Type:**

```
ok obdiag
```

   The `obdiag>` prompt and test menu appear. The menu is shown in FIGURE 2-3.

4. *(Optional)* **Set the desired test level.**

   You may want to perform the most extensive testing possible by setting the `diag-level` OpenBoot configuration variable to `max`:

```
obdiag> setenv diag-level max
```

   Note – If `diag-level` is set to `off`, OpenBoot firmware returns a passed status for all core tests, but performs no testing.

   You can set any OpenBoot configuration variable (see TABLE 2-1) from the `obdiag>` prompt in the same way.

5. **Type the appropriate command and numbers for the tests you want to run.**

   For example, to run all available OpenBoot Diagnostics tests, type:

```
obdiag> test-all
```

   To run a particular test, type:

```
obdiag> test  #
```

   where # represents the number of the desired test.

   For a list of OpenBoot Diagnostics test commands, see "Interactive OpenBoot Diagnostics Commands" on page 18. The menu of numbered tests is shown in FIGURE 2-3.

6. **When you are done running OpenBoot Diagnostics tests, exit the test menu. Type:**

```
obdiag> exit
```

The `ok` prompt reappears.

7. **Set the `auto-boot?` OpenBoot configuration variable back to `true`. Type:**

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

This allows the operating system to resume starting up automatically after future system resets or power cycles.

8. **To reboot the system, type:**

```
ok reset-all
```

The system stores the OpenBoot configuration variable settings and boots automatically when the `auto-boot?` variable is set to `true`.

What Next

Try replacing the FRU or FRUs indicated by OpenBoot Diagnostics error messages, if any. For FRU replacement instructions, see:

■ *Sun Fire V440 Server Parts Installation and Removal Guide*

How to View Diagnostic Test Results After the Fact

Summaries of the results from the most recent power-on self-test (POST) and OpenBoot Diagnostics tests are saved across power cycles.

Before You Begin

Log in to the system console and access the `ok` prompt. For instructions, see:

- "How to Get to the `ok` Prompt" on page 176

What to Do

- **To see a summary of the last execution of POST diagnostics, type:**

```
ok show-post-results
```

- **To see a summary of the last execution of OpenBoot Diagnostics tests, type:**

```
ok show-obdiag-results
```

You should see a system-dependent list of hardware components, along with an indication of which components passed and which failed POST or OpenBoot Diagnostics tests.

Reference for Choosing a Fault Isolation Tool

This section helps you choose the right tool to isolate a failed part in a Sun Fire V440 server. Consider the following questions when selecting a tool.

1. Have you checked the LEDs?

Certain system components have built-in LEDs that can alert you when that component requires replacement. For detailed instructions, see "How to Isolate Faults Using LEDs" on page 62.

2. Does the system boot?

■ If the system *cannot* boot, you have to run firmware-based diagnostics that do not depend on the operating system.

■ If the system *can* boot, you should use a more comprehensive tool. The typical fault isolation process is illustrated in FIGURE 3-1).

3. Do you intend to run the tests remotely?

Both Sun Management Center and ALOM system controller software enable you to run tests from a remote server. In addition, ALOM provides a means of redirecting system console output, allowing you to remotely view and run tests—like POST diagnostics—that usually require physical proximity to the serial port on the server's back panel.

SunVTS software, a system exercising tool, also enables you to run tests remotely using either the product's graphical interface, or tty-mode via remote log in or Telnet session.

4. Will the tool test the suspected source(s) of the problem?

Perhaps you already have some idea of what the problem is. If so, you want to use a diagnostic tool capable of testing the suspected problem sources.

■ TABLE 2-4 tells you which replaceable hardware parts can be isolated by each fault isolating tool.

■ TABLE 2-9 tells you which replaceable hardware parts are covered by each system exercising tool.

5. Is the problem intermittent or software-related?

If a problem is not caused by a clearly defective hardware component, then you may want to use a system exerciser tool rather than a fault isolation tool. See Chapter 2 for instructions and "About Exercising the System" on page 39 for background information.
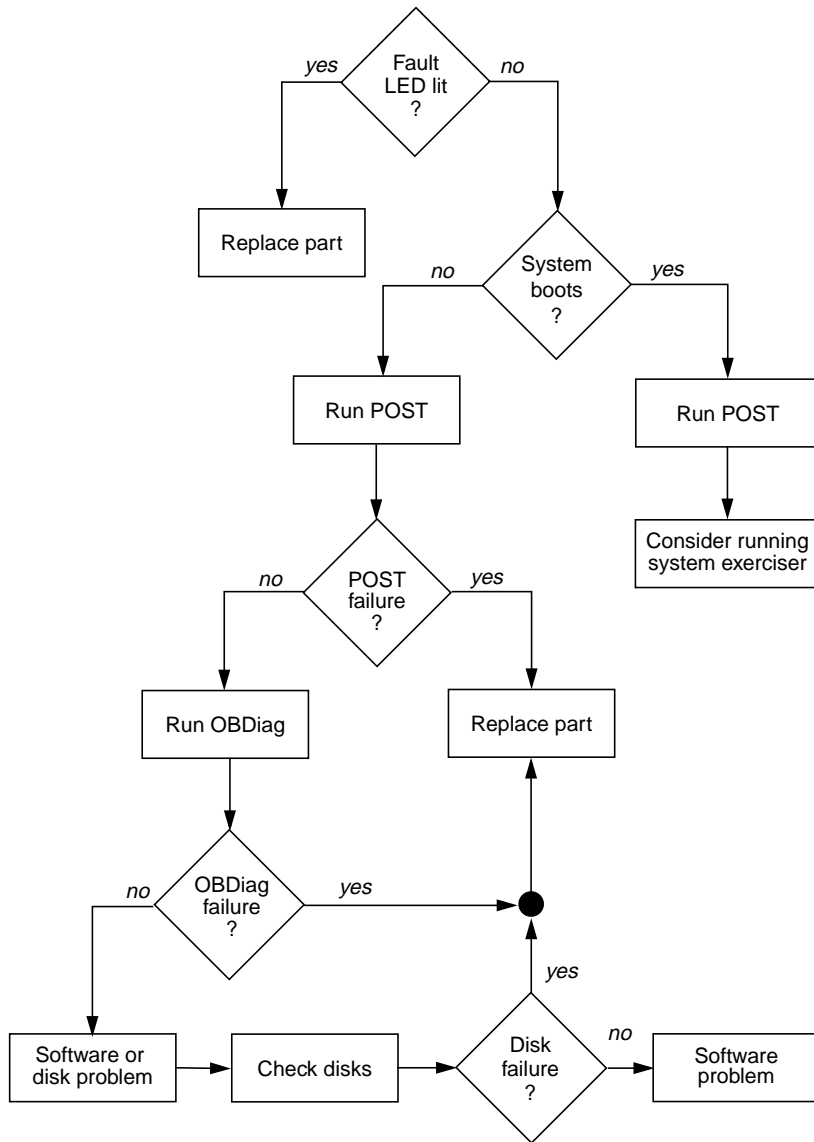
FIGURE 3-1   Choosing a Tool to Isolate Hardware Faults

Monitoring the System

When something goes wrong with the system, diagnostic tools can help you figure out what caused the problem. Indeed, this is the principal use of most diagnostic tools. However, this approach is inherently reactive. It means waiting until a component fails outright.

Some diagnostic tools allow you to be more proactive by monitoring the system while it is still "healthy." Monitoring tools give administrators early warning of imminent failure, thereby allowing planned maintenance and better system availability. Remote monitoring also allows administrators the convenience of checking on the status of many machines from one centralized location.

Sun provides two tools that you can use to monitor servers:

- Sun Management Center
- Sun Advanced Lights Out Manager (ALOM)

In addition to these tools, Sun provides software-based and firmware-based commands that display various kinds of system information. While not strictly a monitoring tool, these commands enable you to review at a glance the status of different system aspects and components.

This chapter describes the tasks necessary to use these tools to monitor your Sun Fire V440 server.

Tasks covered in this chapter include:

- "How to Monitor the System Using Sun Management Center" on page 74
- "How to Monitor the System Using Sun Advanced Lights Out Manager" on page 79
- "How to Use Solaris System Information Commands" on page 93
- "How to Use OpenBoot Information Commands" on page 94

If you want *background information* about the tools, turn to Chapter 2.

How to Monitor the System Using Sun Management Center

Sun Management Center software is a flexible product with many features and options. How you use it depends on the specifics of your network as well as your needs and preferences. You must decide what role or roles you want your Sun Fire V440 system to play within the Sun Management Center domain. See "Monitoring the System Using Sun Management Center" on page 36 for details.

Before You Begin

This procedure assumes that you intend to load Sun Management Center agent software on the Sun Fire V440 system so as to be able to monitor it, and gives you some guidance on how to accomplish this goal.

This procedure also assumes that you have set up or will set up one or more computers to function as Sun Management Center servers and consoles. Servers and consoles are part of the infrastructure that enables you to monitor systems using Sun Management Center software. Typically, you would install the server and console software on machines other than the Sun Fire V440 systems you intend to monitor. For details, see:

■ *Sun Management Center Software User's Guide*

To complete this procedure, you need both the original Sun Management Center software distribution, and the appropriate supplement for the Sun Fire V440 system. You can download the latter from the Web as described in the procedure.

If you intend to set up your Sun Fire V440 system as a Sun Management Center server or console, see:

■ *Sun Management Center Software Installation Guide*
■ *Sun Management Center Software User's Guide*

Also see the other documents accompanying the Sun Management Center software.

> **Note –** Sun Management Center software provides both standalone and browser-based console interfaces. This procedure assumes that you are using the standalone Java technology-based graphical console. The Web browser console interface, which differs somewhat in design and capabilities, is covered in the *Sun Management Center Software User's Guide*.

What to Do

1. **Download the correct Sun Management Center supplement for the Sun Fire V440 system.**

   Look for the *Sun Management Center 3.x Supplement for Sun Fire, Sun Blade and Netra Systems*, available for free download from this Web site:

   `http://www.sun.com/sunmanagementcenter`

2. **On the Sun Fire V440 system, install Sun Management Center agent software.**

   You must install the agent components from both the original Sun Management Center distribution, and from the supplement. For instructions, see the documentation accompanying the distribution and the supplement.

3. **On the Sun Fire V440 system, run the setup utility to configure agent software.**

   The setup utility is part of the Sun Management Center distribution. For more information, see the *Sun Management Center Software User's Guide*.

4. **On the Sun Management Center server, install the supplement software.**

   You must install the server supplement components in order to monitor a Sun Fire V440 system.

5. **On the Sun Management Center server, run the setup utility.**

   The setup utility is part of the Sun Management Center distribution. For more information, see the *Sun Management Center Software User's Guide*.

6. **On the Sun Management Center server, add the Sun Fire V440 system to an administrative domain.**

   You can do this automatically using the Discovery Manager tool, or manually by creating an object from the console's Edit menu. For specific instructions, see the *Sun Management Center Software User's Guide*.

7. **On a Sun Management Center console, double-click the icon representing the Sun Fire V440 system.**

   The Details window appears.

8. **Click the Hardware tab.**

Details window

Hardware tab

Views menu

Physical and logical views
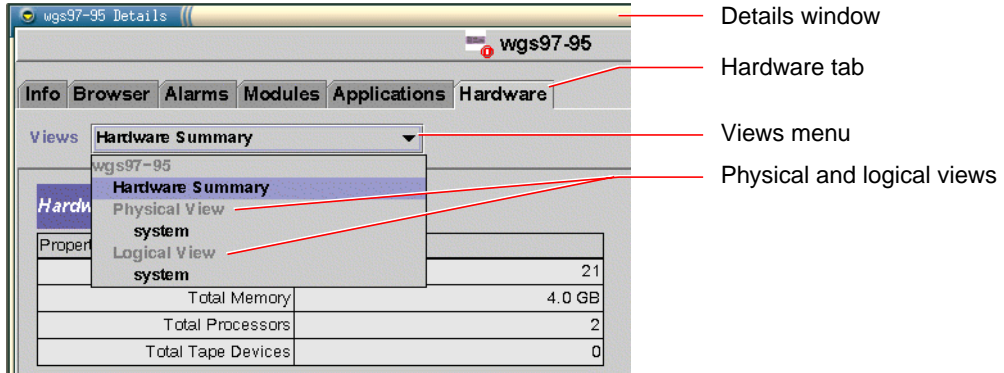
9. **Monitor the Sun Fire V440 system using physical and logical views.**

    a. **Select "Physical View: system" from the Views menu.**

    The physical view lets you interact with photo-realistic views of the Sun Fire V440 system as seen from the front, rear, and top. As you highlight individual hardware components and features, status and manufacturing information about each component appears to the right.

Photo-realistic view (front)

Highlighted component (disk drive)

Information about disk drive
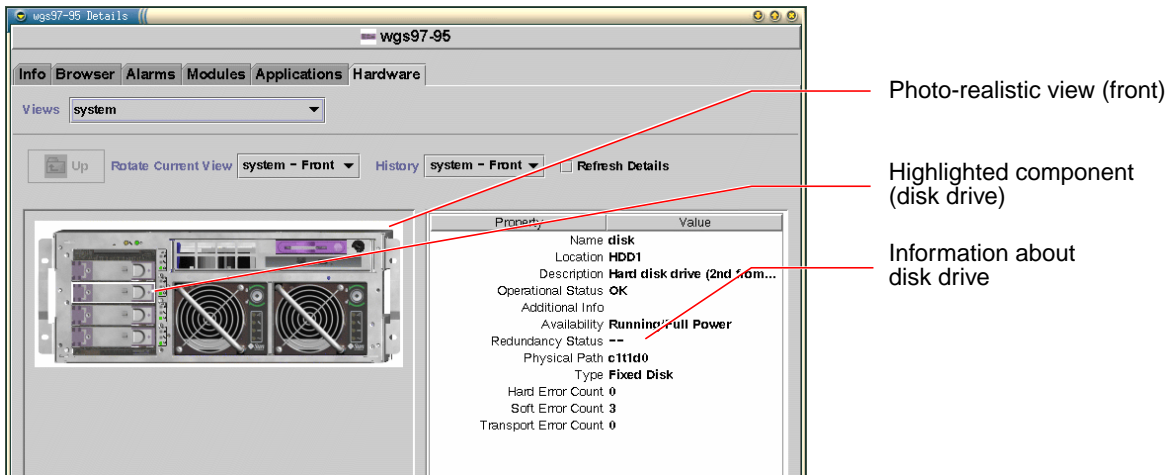
b. Select "Logical View: system" from the Views menu.

The logical view lets you browse a hierarchy of system components, arranged as a tree of nested folders.

Logical view

Selected component
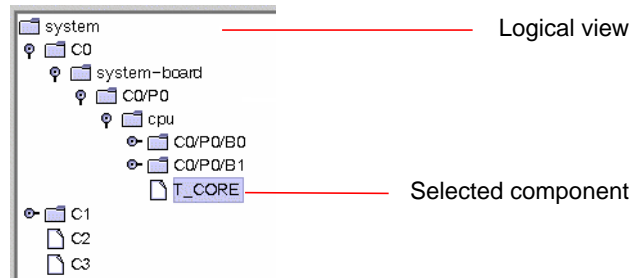
As you highlight a hardware component, status and manufacturing information about that component appears in a property table to the right.


Status information about selected component

Note – The logical view hierarchy is based on the FRU device tree, and the names shown in this hierarchy are the same as those displayed by the `prtfru` command. For more information, see "`prtfru` Command" on page 28.

For more information about physical and logical views, see the *Sun Management Center Software User's Guide.*

10. **Monitor the Sun Fire V440 system using Config-Reader data property tables. To access this information:**

    a. **Click the Browser tab.**

    b. **Click the Hardware icon in the hierarchy view.**
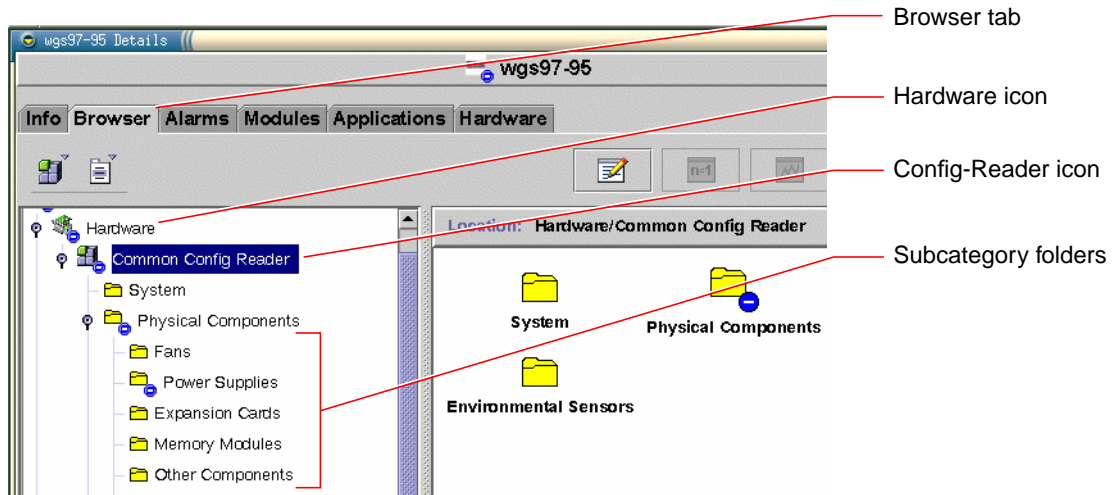
c. **Open the Config-Reader icon in the hierarchy view.**

   Under the Config-Reader icon you find folder icons for the Physical, Logical, and Sensor data categories.

d. **Open the Physical Components folder icon.**

   Under this folder you find subfolders for various component subcategories, including Fans, Power Supplies, and the like.

e. **Open a subcategory folder.**

   Under this folder you find icons for individual data property tables.

f. **Click a data property table's icon to see status information for that hardware component.**

   These tables give you the name, location, and description of each device, along with its operational status and many kinds of device-dependent information.

   For more information about the Config-Reader data property tables, see the *Sun Management Center 3.x Supplement for Sun Fire, Sun Blade and Netra Systems.*

What Next

There is much more to Sun Management Center software than what is detailed in this manual. In particular, you may be interested in setting alarms and administering security. These topics and many others are covered in the *Sun Management Center Software User's Guide*, as well as the other documents accompanying the Sun Management Center software.

How to Monitor the System Using Sun Advanced Lights Out Manager

This section explains how to use Sun Advanced Lights Out Manager (ALOM) to monitor a Sun Fire V440 server, and steps you through some of the tool's most important features.

For background information about ALOM, see:

- "Monitoring the System Using Sun Advanced Lights Out Manager" on page 35
- *Sun Advanced Lights Out Manager (ALOM) Online Help.*

Before You Begin

Log in to the system console and access the `ok` prompt. For instructions, see:

- "How to Get to the `ok` Prompt" on page 176

There are several ways to connect to and use the ALOM system controller, depending on how your data center and its network are set up. This procedure assumes that you intend to monitor the Sun Fire V440 system by way of an alphanumeric terminal or terminal server connected to the server's SERIAL MGT port, or by using a `telnet` connection to the NET MGT port.

The procedure also assumes that the system console is in its default configuration, so that you are able to switch between the system controller and the system console. See:

- "About Communicating With the System" on page 164
- "Access Through the Network Management Port" on page 168

What to Do

1. **If necessary, type the system controller escape sequence.**

   If you are not already seeing the sc> prompt, type the system controller escape sequence. By default, this sequence is #. (pound-period).

   ```
   ok #.
   ```

2. **If necessary, log in to ALOM.**

   If you are not logged in to ALOM, you will be prompted to do so:

   ```
   Please login: admin
   Please Enter password: ******
   ```

   Enter the admin account login name and password, or the name and password of a different login account if one has been set up for you. For the purposes of this procedure, your account should have full privileges.

   Note – The first time you access ALOM, there is no admin account password. You are instructed to provide one the first time you attempt to execute a privileged command. Note the password you enter and retain it for future use.

   The sc> prompt appears:

   ```
   sc>
   ```

   This prompt indicates that you now have access to the ALOM system controller command-line interface.

3. **At the sc> prompt, type the showenvironment command.**

   ```
   sc> showenvironment
   ```

   This command displays a great deal of useful data, starting with temperature readings from a number of thermal sensors.

CODE EXAMPLE 4-1   ALOM Reports on System Temperatures

```
============== Environmental Status ==============


-------------------------------------------------------------------------------
System Temperatures (Temperatures in Celsius):
-------------------------------------------------------------------------------
Sensor          Status    Temp LowHard LowSoft LowWarn HighWarn HighSoft HighHard
-------------------------------------------------------------------------------
--
C0.P0.T_CORE    OK          43     -20     -10       0       97      102      120
C1.P0.T_CORE    OK          50     -20     -10       0       97      102      120
C2.P0.T_CORE    OK          56     -20     -10       0       97      102      120
C0.T_AMB        OK          26     -20     -10       0       60       65       75
C1.T_AMB        OK          27     -20     -10       0       60       65       75
C2.T_AMB        OK          26     -20     -10       0       60       65       75
SCSIBP.T_AMB    OK          23     -18     -10       0       65       75       85
MB.T_AMB        OK          28     -18     -10       0       65       75       85
```

Note – The warning and soft graceful shutdown thresholds noted in
CODE EXAMPLE 4-1 are set at the factory and cannot be modified.

The sensors labeled T_AMB in CODE EXAMPLE 4-1 measure ambient temperatures at
the CPU/memory modules, the motherboard, and the SCSI backplane. The sensors
labeled T_CORE measure the internal temperatures of the processor chips
themselves.

In the output shown in CODE EXAMPLE 4-1, MB refers to the motherboard, and C*n*
refers to a particular CPU. For information about identifying CPU modules, see
"Identifying CPU/Memory Modules" on page 46.

The showenvironment command also gives the position of the system control keyswitch and the condition of the three LEDs on the front panel.

CODE EXAMPLE 4-2   ALOM Reports on Keyswitch Position and System Status LEDs

```
-------------------------------------
Front Status Panel:
-------------------------------------
Keyswitch position: NORMAL


-----------------------------------------------------
System Indicator Status:
-----------------------------------------------------
SYS_FRONT.LOCATE     SYS_FRONT.SERVICE     SYS_FRONT.ACT
-----------------------------------------------------
OFF                  OFF                   OFF
```

The showenvironment command reports the status of system disks and fans.

CODE EXAMPLE 4-3   ALOM Reports on System Disks and Fans

```
---------------------------------------------
System Disks:
---------------------------------------------
Disk   Status           Service  OK-to-Remove
---------------------------------------------
HDD0   OK               OFF      OFF
HDD1   OK               OFF      OFF
HDD2   OK               OFF      OFF
HDD3   OK               OFF      OFF


------------------------------------------------------------
Fans (Speeds Revolution Per Minute):
------------------------------------------------------------
Fan               Status         Speed   Low
------------------------------------------------------------
FT0.F0            OK             3729    750
FT0.F1            OK             3688    750
F0                OK             3214    750
```

Voltage sensors located on the motherboard monitor important system voltages, and showenvironment reports these.

CODE EXAMPLE 4-4   ALOM Reports on Motherboard Voltages

```
----------------------------------------------------------------------------------
--
Voltage sensors (in Volts):
----------------------------------------------------------------------------------
--
Sensor          Status       Voltage LowSoft LowWarn HighWarn HighSoft
----------------------------------------------------------------------------------
--
MB.V_+1V5       OK              1.48    1.20    1.27     1.72    1.80
MB.V_VCCTM      OK              2.51    2.00    2.12     2.87    3.00
MB.V_NET0_1V2D  OK              1.25    0.96    1.02     1.38    1.44
MB.V_NET1_1V2D  OK              1.26    0.96    1.02     1.38    1.44
MB.V_NET0_1V2A  OK              1.26    0.96    1.02     1.38    1.44
MB.V_NET1_1V2A  OK              1.26    0.96    1.02     1.38    1.44
MB.V_+3V3       OK              3.34    2.64    2.80     3.79    3.96
MB.V_+3V3STBY   OK              3.33    2.64    2.80     3.79    3.96
MB.BAT.V_BAT    OK              3.26      --    2.25       --      --
MB.V_SCSI_CORE  OK              1.79    1.53    1.62     1.98    2.07
MB.V_+5V        OK              5.04    4.25    4.50     5.50    5.75
MB.V_+12V       OK             12.00   10.20   10.80    13.20   13.80
MB.V_-12V       OK            -12.04  -13.80  -13.20   -10.80  -10.20
```

Note – The warning and soft graceful shutdown thresholds noted in
CODE EXAMPLE 4-4 are set at the factory and cannot be modified.

The showenvironment command tells you the status of each power supply, and the state of the four LEDs located on each supply.

CODE EXAMPLE 4-5   ALOM Reports on Power Supply Status

```
Power Supply Indicators:
----------------------------------------------------
Supply    POK       STBY    Service    OK-to-Remove
----------------------------------------------------
PS0       ON        ON      OFF        OFF
PS1       ON        ON      OFF        OFF
---------------------
Power Supplies:
---------------------
Supply   Status
PS0      OK
PS1      OK
```

Finally, this command reports on the status of motherboard circuit breakers (labeled MB.FF_SCSI*x*) and CPU module DC-to-DC converters (labeled C*n*.P0.FF_POK).

CODE EXAMPLE 4-6   ALOM Reports on Circuit Breakers and DC-to-DC Converters

```
----------------------
Current sensors:
----------------------
Sensor          Status
----------------------
MB.FF_SCSIA      OK
MB.FF_SCSIB      OK
MB.FF_POK        OK
C0.P0.FF_POK     OK
C1.P0.FF_POK     OK
C2.P0.FF_POK     OK
C3.P0.FF_POK     OK
```

4. **Type the** showfru **command.**

```
sc> showfru
```

This command, like the Solaris operating environment command prtfru -c, displays static FRU-ID information as available for several system FRUs. The specific information provided includes the date and location of manufacture, and the Sun part number.

CODE EXAMPLE 4-7   ALOM Reports on FRU Identification Information

```
FRU_PROM at PSO.SEEPROM
  Timestamp: MON SEP 16 16:47:05 2002
  Description: PWR SUPPLY, CHALUPA,75%-EFF,H-P
  Manufacture Location: DELTA ELECTRONICS CHUNGLI TAIWAN
  Sun Part No: 3001501
  Sun Serial No: T00065
  Vendor JDEC code: 3AD
  Initial HW Dash Level: 01
  Initial HW Rev Level: 02
  Shortname: PS
```

5. **Type the** `showlogs` **command.**

```
sc> showlogs
```

This command shows a history of noteworthy system events, the most recent being listed last.

CODE EXAMPLE 4-8　　ALOM Reports on Logged Events

```
FEB 28 19:45:06 myhost: 0006001a: "SC Host Watchdog Reset Disabled"
FEB 28 19:45:06 myhost: 00060003: "SC System booted."
FEB 28 19:45:43 myhost: 00060000: "SC Login: User admin Logged on."
FEB 28 19:45:51 myhost: 0004000e: "SC Request to Power Off Host Immediately."
FEB 28 19:45:55 myhost: 00040002: "Host System has Reset"
FEB 28 19:45:56 myhost: 00040029: "Host system has shut down."
FEB 28 19:46:16 myhost: 00040001: "SC Request to Power On Host."
FEB 28 19:46:18 myhost: 0004000b: "Host System has read and cleared bootmode."
FEB 28 19:55:17 myhost: 00060000: "SC Login: User admin Logged on."
FEB 28 19:56:59 myhost: 00060000: "SC Login: User admin Logged on."
FEB 28 20:27:06 myhost: 0004004f: "Indicator SYS_FRONT.ACT is now ON"
FEB 28 20:40:47 myhost: 00040002: "Host System has Reset"
```

Note – The ALOM log messages are written into a so-called "circular buffer" of limited length (64 kilobytes). Once the buffer is filled, the oldest messages are overwritten by the newest ones.

6. **Examine the ALOM run log. Type:**

```
sc> consolehistory run -v
```

This command shows the log containing the most recent system console output from POST, OpenBoot PROM, and Solaris boot messages. In addition, this log records output from the server's operating environment.

CODE EXAMPLE 4-9　　`consolehistory run -v` Command Output

```
May  9 14:48:22 Sun-SFV440-a rmclomv: SC Login: User admin Logged on.

#
# init 0
#
INIT: New run level: 0
The system is coming down.  Please wait.
System services are now being stopped.
Print services stopped.
```

```
May  9 14:49:18 Sun-SFV440-a last message repeated 1 time

May  9 14:49:38 Sun-SFV440-a syslogd: going down on signal 15

The system is down.
syncing file systems... done
Program terminated
{1} ok boot disk

Sun Fire V440, No Keyboard
Copyright 1998-2003 Sun Microsystems, Inc.  All rights reserved.
OpenBoot 4.10.3, 4096 MB memory installed, Serial #53005571.
Ethernet address 0:3:ba:28:cd:3, Host ID: 8328cd03.

Initializing     1MB of memory at addr        123fecc000 -

Initializing     1MB of memory at addr        123fe02000 -

Initializing    14MB of memory at addr        123f002000 -

Initializing    16MB of memory at addr        123e002000 -

Initializing   992MB of memory at addr         1200000000 -

Initializing  1024MB of memory at addr         1000000000 -

Initializing  1024MB of memory at addr          200000000 -

Initializing  1024MB of memory at addr                  0 -

Rebooting with command: boot disk
Boot device: /pci@1f,700000/scsi@2/disk@0,0  File and args:
\
SunOS Release 5.8 Version Generic_114696-04 64-bit
Copyright 1983-2003 Sun Microsystems, Inc.  All rights reserved.
Hardware watchdog enabled
Indicator SYS_FRONT.ACT is now ON
configuring IPv4 interfaces: ce0.
Hostname: Sun-SFV440-a
The system is coming up.  Please wait.
NIS domainname is Ecd.East.Sun.COM
Starting IPv4 router discovery.
starting rpc services: rpcbind keyserv ypbind done.
Setting netmask of lo0 to 255.0.0.0
Setting netmask of ce0 to 255.255.255.0
Setting default IPv4 interface for multicast: add net 224.0/4: gateway Sun-
SFV440-a
```

```
syslog service starting.
Print services started.
volume management starting.
The system is ready.

Sun-SFV440-a console login: May  9 14:52:57 Sun-SFV440-a rmclomv: NOTICE:
keyswitch change event - state = UNKNOWN

May  9 14:52:57 Sun-SFV440-a rmclomv: Keyswitch Position has changed to Unknown
state.

May  9 14:52:58 Sun-SFV440-a rmclomv: NOTICE: keyswitch change event - state =
LOCKED

May  9 14:52:58 Sun-SFV440-a rmclomv: KeySwitch Position has changed to Locked
State.

May  9 14:53:00 Sun-SFV440-a rmclomv: NOTICE: keyswitch change event - state =
NORMAL

May  9 14:53:01 Sun-SFV440-a rmclomv: KeySwitch Position has changed to On State.

sc>
```

7. **Examine the ALOM boot log. Type:**

```
sc> consolehistory boot -v
```

The ALOM boot log contains boot messages from POST, OpenBoot firmware, and Solaris software from the host server's most recent reset.

The following sample output shows the boot messages from POST.

CODE EXAMPLE 4-10   `consolehistory boot -v` Command Output (Boot Messages From POST)

```
Keyswitch set to diagnostic position.
@(#)OBP 4.10.3 2003/05/02 20:25 Sun Fire V440
Clearing TLBs
Power-On Reset
Executing Power On SelfTest

0>@(#) Sun Fire[TM] V440 POST 4.10.3 2003/05/04 22:08
       /export/work/staff/firmware_re/post/post-build-
4.10.3/Fiesta/chalupa/integrated  (firmware_re)
0>Hard Powerup RST thru SW
0>CPUs present in system: 0 1
```

CODE EXAMPLE 4-10 `consolehistory boot -v` Command Output (Boot Messages
From POST) *(Continued)*

```
0>OBP->POST Call with %o0=00000000.01012000.
0>Diag level set to MIN.
0>MFG scrpt mode set NORM
0>I/O port set to TTYA.
0>
0>Start selftest...
1>Print Mem Config
1>Caches : Icache is ON, Dcache is ON, Wcache is ON, Pcache is ON.
1>Memory interleave set to 0
1>      Bank 0 1024MB : 00000010.00000000 -> 00000010.40000000.
1>      Bank 2 1024MB : 00000012.00000000 -> 00000012.40000000.
0>Print Mem Config
0>Caches : Icache is ON, Dcache is ON, Wcache is ON, Pcache is ON.
0>Memory interleave set to 0
0>      Bank 0 1024MB : 00000000.00000000 -> 00000000.40000000.
0>      Bank 2 1024MB : 00000002.00000000 -> 00000002.40000000.
0>INFO:
0>      POST Passed all devices.
0>
0>POST: Return to OBP.
```

The following sample output shows the initialization of the OpenBoot PROM.

CODE EXAMPLE 4-11 `consolehistory boot -v` Command Output (OpenBoot PROM Initialization)

```
Keyswitch set to diagnostic position.
@(#)OBP 4.10.3 2003/05/02 20:25 Sun Fire V440
Clearing TLBs
POST Results: Cpu 0000.0000.0000.0000
  %o0 = 0000.0000.0000.0000 %o1 = ffff.ffff.f00a.2b73 %o2 = ffff.ffff.ffff.ffff
POST Results: Cpu 0000.0000.0000.0001
  %o0 = 0000.0000.0000.0000 %o1 = ffff.ffff.f00a.2b73 %o2 = ffff.ffff.ffff.ffff
Membase: 0000.0000.0000.0000
MemSize: 0000.0000.0004.0000
Init CPU arrays Done
Probing /pci@1d,700000 Device 1  Nothing there
Probing /pci@1d,700000 Device 2  Nothing there
```

The following sample output shows the system banner.

CODE EXAMPLE 4-12 `consolehistory boot -v` Command Output (System Banner Display)

```
Sun Fire V440, No Keyboard
Copyright 1998-2003 Sun Microsystems, Inc.  All rights reserved.
OpenBoot 4.10.3, 4096 MB memory installed, Serial #53005571.
Ethernet address 0:3:ba:28:cd:3, Host ID: 8328cd03.
```

The following sample output shows OpenBoot Diagnostics testing.

CODE EXAMPLE 4-13 `consolehistory boot -v` Command Output (OpenBoot Diagnostics Testing)

```
Running diagnostic script obdiag/normal

Testing /pci@1f,700000/network@1
Testing /pci@1e,600000/ide@d
Testing /pci@1e,600000/isa@7/flashprom@2,0
Testing /pci@1e,600000/isa@7/serial@0,2e8
Testing /pci@1e,600000/isa@7/serial@0,3f8
Testing /pci@1e,600000/isa@7/rtc@0,70
Testing /pci@1e,600000/isa@7/i2c@0,320:tests=
{gpio@0.42,gpio@0.44,gpio@0.46,gpio@0.48}
Testing /pci@1e,600000/isa@7/i2c@0,320:tests={hardware-monitor@0.5c}
Testing /pci@1e,600000/isa@7/i2c@0,320:tests={temperature-sensor@0.9c}
Testing /pci@1c,600000/network@2
Testing /pci@1f,700000/scsi@2,1
Testing /pci@1f,700000/scsi@2
```

The following sample output shows memory initialization by the OpenBoot PROM.

CODE EXAMPLE 4-14 `consolehistory boot -v` Command Output (Memory Initialization)

```
Initializing    1MB of memory at addr       123fe02000 -

Initializing   12MB of memory at addr       123f000000 -

Initializing  1008MB of memory at addr      1200000000 -

Initializing  1024MB of memory at addr      1000000000 -

Initializing  1024MB of memory at addr       200000000 -

Initializing  1024MB of memory at addr               0 -

{1} ok boot disk
```

The following sample output shows the system booting and loading Solaris software.

CODE EXAMPLE 4-15   `consolehistory boot -v` Command Output (System Booting and Loading Solaris Software)

```
Rebooting with command: boot disk
Boot device: /pci@1f,700000/scsi@2/disk@0,0  File and args:
Loading ufs-file-system package 1.4 04 Aug 1995 13:02:54.
FCode UFS Reader 1.11 97/07/10 16:19:15.
Loading: /platform/SUNW,Sun-Fire-V440/ufsboot
Loading: /platform/sun4u/ufsboot
\
SunOS Release 5.8 Version Generic_114696-04 64-bit
Copyright 1983-2003 Sun Microsystems, Inc.  All rights reserved.
Hardware watchdog enabled
sc>
```

8. **Type the** `showusers` **command.**

```
sc> showusers
```

This command displays all the users currently logged in to ALOM.

CODE EXAMPLE 4-16   ALOM Reports on Active User Sessions

```
username         connection         login time        client IP addr
console

--------         ----------         ----------        --------------
admin             serial             FEB 28 19:45       system
admin             net-1              MAR 03 14:43       129.111.111.111
sc>
```

In this case, notice that there are two separate simultaneous administrative users. The first is logged in via the SERIAL MGT port and has access to the system console. The second user is logged in via `telnet` connection from another host to the NET MGT port. The second user can view the system console session but cannot input console commands.

9. **Type the** `showplatform` **command.**

```
sc> showplatform
```

This command displays the status of the operating system, which may be Running, Stopped, Initializing, or in a handful of other states.

CODE EXAMPLE 4-17   ALOM Reports on Operating System Status

```
Domain    Status
------    ------
myhost    OS Running


sc>
```

10. **Use ALOM to run POST diagnostics.**

    Doing this involves several steps.

    a. **Type:**

    ```
    sc> bootmode diag
    ```

    This command temporarily overrides the server's OpenBoot Diagnostics `diag-switch?` setting, forcing power-on self-test (POST) diagnostics to run when power is cycled off and on. If the server is not power cycled within 10 minutes, it reverts back to its defaults.

    b. **Power cycle the system. Type:**

    ```
    sc> poweroff

    Are you sure you want to power off the system [y/n]? y

    sc> poweron
    ```

    POST diagnostics begin to run as the system reboots. However, you will see no messages until you switch from ALOM to the system console. For details, see "About Switching Between the ALOM System Controller and the System Console" on page 175.

c. Switch to the system console. Type:

```
sc> console
Enter #. to return to ALOM.

0>@(#) Sun Fire[TM] V440 POST 4.10.0 2003/04/01 22:28

/export/work/staff/firmware_re/post/post-build-
4.10.0/Fiesta/chalupa/integrated  (firmware_re)
0>Hard Powerup RST thru SW
0>CPUs present in system: 0 1 2 3
0>OBP->POST Call with %o0=00000000.01008000.
```

You should begin seeing console output and POST messages. The exact text that appears on your screen depends on the state of your Sun Fire V440 server, and on how long you delay between powering on the system and switching to the system console.

Note – Any system console or POST messages you might miss are preserved in the ALOM boot log. To access the boot log, type `consolehistory boot -v` from the `sc>` prompt.

What Next

For more information about ALOM command-line functions, see:

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

For more information about controlling POST diagnostics, see:

■ "Controlling POST Diagnostics" on page 13

For information about interpreting POST error messages, see:

■ "What POST Error Messages Tell You" on page 11

How to Use Solaris System Information Commands

This section explains how to run Solaris system information commands on a Sun Fire V440 server. To find out what these commands tell you, see "Solaris System Information Commands" on page 24, or see the appropriate man pages.

Before You Begin

The operating system must be up and running.

What to Do

1. **Decide what kind of system information you want to display.**

   For more information, see "Solaris System Information Commands" on page 24.

2. **Type the appropriate command at a system console prompt. See** TABLE 4-1**.**

TABLE 4-1   Using Solaris System Information Commands

Command	What It Displays	What to Type	Notes
prtconf	System configuration information	/usr/sbin/prtconf	—
prtdiag	Diagnostic and configuration information	/usr/platform/ `uname -i`/ sbin/prtdiag	Use the -v option for additional detail.
prtfru	FRU hierarchy and SEEPROM memory contents	/usr/sbin/prtfru	Use the -l option to display hierarchy. Use the -c option to display SEEPROM data.
psrinfo	Date and time each CPU came online; processor clock speed	/usr/sbin/psrinfo	Use the -v option to obtain clock speed and other data.
showrev	Hardware and software revision information	/usr/bin/showrev	Use the -p option to show software patches.

How to Use OpenBoot Information Commands

This section explains how to run OpenBoot commands that display different kinds of system information about a Sun Fire V440 server. To find out what these commands tell you, see "Other OpenBoot Commands" on page 21, or refer to the appropriate man pages.

Before You Begin

As long as you can get to the ok prompt, you can use OpenBoot information commands. This means the commands are usually accessible even when your system cannot boot its operating environment software.

What to Do

1. **If necessary, shut down the system to reach the ok prompt.**

   How you do this depends on the system's condition. If possible, you should warn users and shut down the system gracefully. For information, see "About the ok Prompt" on page 171.

2. **Decide what kind of system information you want to display.**

   For more information, see "Other OpenBoot Commands" on page 21.

3. **Type the appropriate command at a system console prompt. See** TABLE 4-2.

   TABLE 4-2   Using OpenBoot Information Commands

Command to Type	What It Displays
printenv	OpenBoot configuration variable defaults and settings
probe-scsi probe-scsi-all probe-ide	Target address, unit number, device type, and manufacturer name of active SCSI and IDE devices
show-devs	Hardware device paths of all devices in the system configuration

Exercising the System

Sometimes a server exhibits a problem that cannot be isolated definitively to a particular hardware or software component. In such cases, it may be useful to run a diagnostic tool that stresses the system by continuously running a comprehensive battery of tests. Sun provides two such tools that you can use with the Sun Fire V440 server:

- SunVTS software
- Hardware Diagnostic Suite

Hardware Diagnostic Suite is a product you can purchase as an enhancement to Sun Management Center software. Instructions for using the Hardware Diagnostic Suite can be found in the *Sun Management Center Software User's Guide*.

This chapter describes the tasks necessary to use SunVTS software to exercise your Sun Fire V440 server.

Tasks covered in this chapter include:

If you want *background information* about the tools and when to use them, turn to Chapter 1 and Chapter 2.

Note – The procedures in this chapter assume that you are familiar with the OpenBoot firmware and that you know how to access the ok prompt. For background information, see "About the ok Prompt" on page 171. For instructions, see "How to Get to the ok Prompt" on page 176.

How to Exercise the System Using SunVTS Software

Before You Begin

The Solaris operating environment must be running. You also need to make sure that SunVTS validation test software is installed on your system. See:

- "How to Check Whether SunVTS Software Is Installed" on page 100

SunVTS software requires that you use one of two security schemes. The security scheme you choose must be properly configured in order for you to perform this procedure. For details, see:

- *SunVTS User's Guide*
- "SunVTS Software and Security" on page 42

SunVTS software features both character-based and graphics-based interfaces. This procedure assumes that you are using the graphical user interface (GUI) on a system running the Common Desktop Environment (CDE). For more information about the character-based SunVTS TTY interface, and specifically for instructions on accessing it by `tip` or `telnet` commands, see the *SunVTS User's Guide.*

SunVTS software can be run in several modes. This procedure assumes that you are using the default Functional mode. For a synopsis of the modes, see:

- "Exercising the System Using SunVTS Software" on page 40

This procedure also assumes that the Sun Fire V440 server is "headless"—that is, it is not equipped with a monitor capable of displaying bitmapped graphics. In this case, you access the SunVTS GUI by logging in remotely from a machine that has a graphics display.

Finally, this procedure describes how to run SunVTS tests in general. Individual tests may presume the presence of specific hardware, or may require specific drivers, cables, or loopback connectors. For information about test options and prerequisites, see:

- *SunVTS Test Reference Manual*
- *SunVTS Documentation Supplement*

What to Do

1. **Log in as superuser to a system with a graphics display.**

   The display system should be one with a frame buffer and monitor capable of displaying bitmapped graphics such as those produced by the SunVTS GUI.

2. **Enable remote display. On the display system, type:**

   ```
   # /usr/openwin/bin/xhost + test-system
   ```

   where *test-system* is the name of the Sun Fire V440 server being tested.

3. **Remotely log in to the Sun Fire V440 server as superuser.**

   Use a command such as `rlogin` or `telnet`.

4. **Start SunVTS software. Type:**

   ```
   # /opt/SUNWvts/bin/sunvts -display display-system:0
   ```

   where *display-system* is the name of the machine through which you are remotely logged in to the Sun Fire V440 server.

   If you have installed SunVTS software in a location other than the default `/opt` directory, alter the path in the above command accordingly.

The SunVTS GUI appears on the display system's screen.
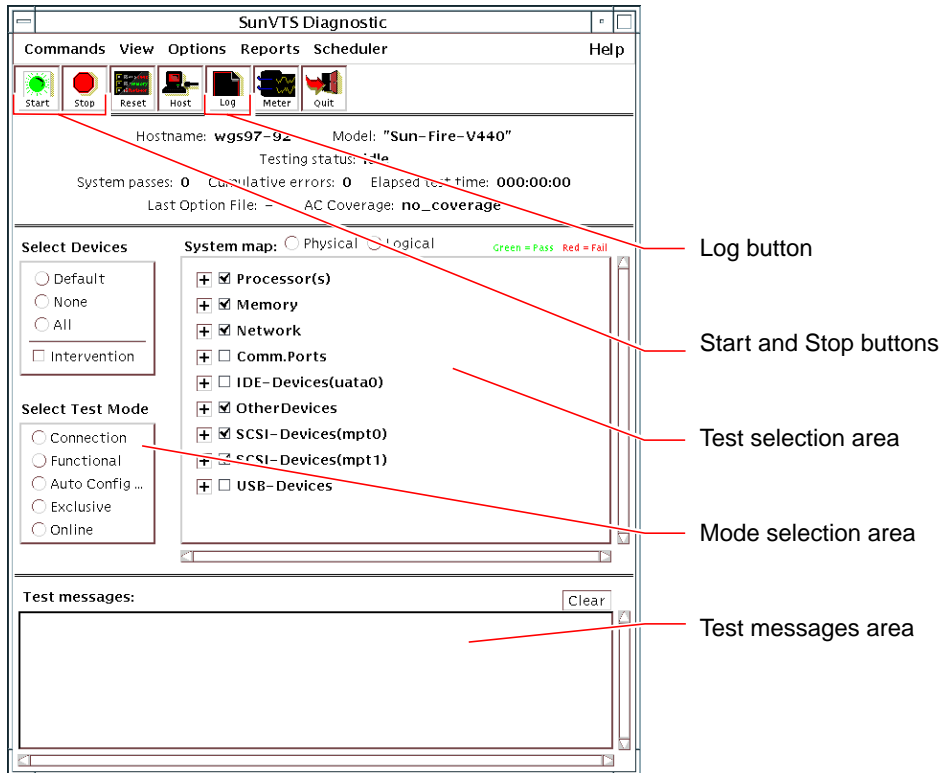
5. Expand the test lists to see the individual tests.

The interface's test selection area lists tests in categories, such as "Network," as shown below. To expand a category, right-click the ⊞ icon to the left of the category name.
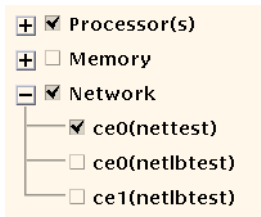
6. (*Optional*) **Select the tests you want to run.**

Certain tests are enabled by default, and you can choose to accept these.

Alternatively, you can enable and disable individual tests or blocks of tests by clicking the checkbox next to the test name or test category name. Tests are enabled when checked, and disabled when not checked. TABLE 5-1 lists tests that are especially useful to run on a Sun Fire V440 server.

Note – TABLE 5-1 lists FRUs in order of the likelihood they caused the test to fail.

---

7. (*Optional*) **Customize individual tests.**

You can customize individual tests by right-clicking on the name of the test. For instance, in the illustration under Step 5, right-clicking on the text string `ce0(nettest)` brings up a menu that lets you configure this Ethernet test.

TABLE 5-1   Useful SunVTS Tests to Run on a Sun Fire V440 Server

SunVTS Tests	FRUs Exercised by Tests
`cputest`, `fputest`, `iutest`, `l1dcachetest` — *indirectly*: `l2cachetest`, `l2sramtest`, `mptest`, `mpconstest`, `systest`	CPU/memory module, motherboard
`disktest`	Disks, cables, SCSI backplane
`dvdtest`, `cdtest`	DVD device, cable, motherboard
`env6test`, `i2c2test`	Power supplies, fan trays, LEDs, motherboard, ALOM card, system configuration card (SCC), CPU/memory module, DIMMs, SCSI backplane
`nettest`, `netlbtest`	Network interface, network cable, motherboard
`pmemtest`, `vmemtest`	DIMMs, CPU/memory module, motherboard
`ssptest`	ALOM card
`sutest`	Motherboard (serial port `ttyb`)
`usbkbtest`, `disktest`	USB devices, cable, motherboard (USB controller)

8. **Start testing.**

Click the Start button, located at the top left of the SunVTS window, to begin running the tests you enabled. Status and error messages appear in the test messages area located across the bottom of the window. You can stop testing at any time by clicking the Stop button.

What Next

During testing, SunVTS software logs all status and error messages. To view these, click the Log button or select Log Files from the Reports menu. This opens a log window from which you can choose to view the following logs:

- *Information* – Detailed versions of all the status and error messages that appear in the test messages area.
- *Test Error* – Detailed error messages from individual tests.
- *VTS Kernel Error* – Error messages pertaining to SunVTS software itself. You should look here if SunVTS software appears to be acting strangely, especially when it starts up.
- *UNIX Messages* (`/var/adm/messages`) – A file containing messages generated by the operating system and various applications.
- *Log Files* (`/var/opt/SUNWvts/logs`) – A directory containing the log files.

For further information, see the manuals that accompany SunVTS software. These are listed in the section "Related Documentation" on page xiv.

How to Check Whether SunVTS Software Is Installed

SunVTS software consists of optional packages that may or may not have been loaded when your system software was installed.

In addition to the SunVTS packages themselves, SunVTS software starting with version 5.1 requires certain XML and run-time library packages that may not be installed by default on Solaris 8 software.

Before You Begin

This procedure assumes that the Solaris operating environment is running on the Sun Fire V440 server, and that you have access to the Solaris command line. For more information, see:

- "About Communicating With the System" on page 164

What to Do

1. Check for the presence of SunVTS packages. Type:

```
% pkginfo -l SUNWvts SUNWvtsx SUNWvtsmn
```

- ■ If SunVTS software is loaded, information about the packages is displayed.
- ■ If SunVTS software is not loaded, you see an error message for each missing package.

```
ERROR: information for "SUNWvts" was not found
ERROR: information for "SUNWvtsx" was not found
...
```

The pertinent packages are as follows.

Package	Description
SUNWvts	SunVTS kernel, user interface, and 32-bit binary tests
SUNWvtsx	SunVTS 64-bit binary tests and kernel
SUNWvtsmn	SunVTS man pages

2. (*Solaris 8 only*) Check for additional needed software.

This applies only if you intend to install and run SunVTS 5.1 software (or later compatible versions) under the Solaris 8 operating environment.

SunVTS 5.1 software requires additional packages that may not be installed with Solaris 8 software. To find out, type the following:

```
% pkginfo -l SUNWlxml SUNWlxmlx SUNWzlib SUNWzlibx
```

This tests for the presence of the following packages.

Package	Description	Notes
SUNXlxml	XML library (32-bit)	Required by SunVTS 5.1
SUNWlxmlx	XML library (64-bit)	
SUNWzlib	Zip compression library (32-bit)	Needed by XML libraries
SUNWzlibx	Zip compression library (64-bit)	

3. **If necessary, load any missing packages.**

   Use the `pkgadd` utility to load onto your system any SunVTS and support packages that you determined you needed in Step 1 or Step 2.

   For the Solaris 8 operating environment, the SunVTS and XML packages are included on the Software Supplement CD. The `zlib` packages are included on the Solaris primary installation CD in the Entire Solaris Software Group.

   Note that `/opt/SUNWvts` is the default directory for installing SunVTS software.

4. **Load SunVTS patches, if appropriate.**

   Patches to SunVTS software are available periodically on the SunSolve Online℠ Web site. These patches provide enhancements and bug fixes. In some cases, there are tests that will not run properly unless the patches are installed.

What Next

For installation information, refer to the *SunVTS User's Guide*, the appropriate Solaris documentation, and the `pkgadd` man page.

PART II Troubleshooting

The following chapters within this part of the *Sun Fire V440 Server Diagnostics and Troubleshooting Guide* provide you with approaches for avoiding and troubleshooting problems that might arise from hardware defects.

For background information about diagnostic tools, as well as detailed instructions on how to use the tools, see the chapters in Part I – Diagnostics.

Chapters included in Part II are:

- Chapter 6 – Troubleshooting Options
- Chapter 7 – Troubleshooting Hardware Problems

Troubleshooting Options

There are several troubleshooting options that you can implement when you set up and configure the Sun Fire V440 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:

- "How to Enable the Core Dump Process" on page 113
- "How to Test the Core Dump Setup" on page 116

Other information in this chapter includes:

- "About Updated Troubleshooting Information" on page 105
- "About Firmware and Software Patch Management" on page 107
- "About Sun Install Check Tool" on page 107
- "About Sun Explorer Data Collector" on page 108
- "About Configuring the System for for Troubleshooting" on page 109

About Updated Troubleshooting Information

Sun will continue to gather and publish information about the Sun Fire V440 server long after the initial system documentation is shipped. You can obtain the most current server troubleshooting information in the Product Notes and at Sun Web sites. These resources can help you understand and diagnose problems that you might encounter.

Product Notes

Sun Fire V440 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

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, operating environment, 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 V440 server.

■ Support documents, security bulletins, and related links.

The SunSolve Online Web site is at:

```
http://sunsolve.sun.com
```

Big Admin. This Web 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 operating environment current with the latest recommended and required patches can help you avoid problems that others might have already discovered and solved.

Firmware and operating environment 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 V440 server at the Web sites listed in "Web Sites" on page 106.

About Sun Install Check Tool

When you install the Sun[SM] 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 V440 server installation has been completed optimally. Together, they can evaluate your system for the following:

- Minimum required operating environment 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 108.

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 SPARC and x86 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 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 operating system is running. If the system hangs, the operating system 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 operating environment 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 "Hardware Watchdog Mechanism and XIR" in the *Sun Fire V440 Server Administration Guide.*

For information about troubleshooting system hangs: see:

- "Responding to System Hang States" on page 123
- "How to Troubleshoot a System That Is Hanging" on page 160

Automatic System Recovery Settings

The Automatic System Recovery (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 6-1.

TABLE 6-1 OpenBoot Configuration Variable Settings to Enable Automatic System Recovery

Variable	Setting
`auto-boot?`	`true`
`auto-boot-on-error?`	`true`
`diag-level`	`max`
`diag-switch?`	`true`
`diag-trigger`	`all-resets`
`post-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 the *Sun Fire V440 Server Administration Guide.*

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 lets you do the following:

- Turn system power on and off
- Control the Locator LED
- 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 operating environment output
- View POST output
- Issue firmware commands at the `ok` prompt
- View error events when the Solaris operating environment terminates abruptly

For more information about ALOM, see:

- "Monitoring the System Using Sun Advanced Lights Out Manager" on page 35
- "How to Monitor the System Using Sun Advanced Lights Out Manager" on page 79
- *Sun Advanced Lights Out Manager (ALOM) Online Help*

For more information about the system console, see Appendix A.

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 operating environment terminates abruptly, and although it sends messages to the system console, the

operating environment software does not log any messages in traditional file system locations like the `/var/adm/messages` file. The following is an excerpt from the `/var/adm/messages` file.

CODE EXAMPLE 6-1   `/var/adm/messages` File Information

```
May  9 08:42:17 Sun-SFV440-a SUNW,UltraSPARC-IIIi: [ID 904467 kern.info] NOTICE:
[AFT0] Corrected memory (RCE) Event detected by CPU0 at TL=0, errID
0x0000005f.4f2b0814
May  9 08:42:17 Sun-SFV440-a       AFSR 0x00100000<PRIV>.82000000<RCE> AFAR
0x00000023.3f808960
May  9 08:42:17 Sun-SFV440-a       Fault_PC <unknown> J_REQ 2
May  9 08:42:17 Sun-SFV440-a       MB/P2/B0: J0601 J0602
May  9 08:42:17 Sun-SFV440-a unix: [ID 752700 kern.warning] WARNING: [AFT0]
Sticky Softerror encountered on Memory Module MB/P2/B0: J0601 J0602
May  9 08:42:19 Sun-SFV440-a SUNW,UltraSPARC-IIIi: [ID 263516 kern.info] NOTICE:
[AFT0] Corrected memory (CE) Event detected by CPU2 at TL=0, errID
0x0000005f.c52f509c
```

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. You can direct where these 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 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 108.

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 Appendix A.

About the 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 "How to Enable the Core Dump Process" on page 113 for instructions on how to calculate the amount of available swap space.

How to Enable the Core Dump Process

This is normally a task that you would complete just prior to placing a system into the production environment.

Before You Begin

Access the system console. See:

- "About Communicating With the System" on page 164

What to Do

1. **Check that the core dump process is enabled. As root, type the** `dumpadm` **command.**

```
# dumpadm
Dump content: kernel pages
Dump device: /dev/dsk/c0t0d0s1 (swap)
Savecore directory: /var/crash/machinename
Savecore enabled: yes
```

By default, the core dump process is enabled in the Solaris 8 operating environment.

2. **Verify that there is sufficient swap space to dump memory. Type the** `swap -l` **command.**

```
# swap -l
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 x 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.**

```
# df -k /var/crash/`uname -n`
```

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`.

```
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.**

```
# df -kl
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.**

```
# dumpadm -s /export/home/
      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.

How to Test 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.

Before You Begin

Back up all your data and access the system console. See:

■ "About Communicating With the System" on page 164

What to Do

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 "How to Enable the Core Dump Process" on page 113.

Troubleshooting Hardware Problems

The term *troubleshooting* refers to the act of applying diagnostic tools—often heuristically and accompanied by common sense—to determine the causes of system problems.

Each system problem must be treated on its own merits. It is not possible to provide a cookbook of actions that resolve each problem. However, this chapter provides some approaches and procedures, which used in combination with experience and common sense, can resolve many problems that might arise.

Tasks covered in this chapter include:

- "How to Troubleshoot a System With the Operating System Responding" on page 126
- "How to Troubleshoot a System After an Unexpected Reboot" on page 131
- "How to Troubleshoot Fatal Reset Errors and RED State Exceptions" on page 142
- "How to Troubleshoot a System That Does Not Boot" on page 154
- "How to Troubleshoot a System That Is Hanging" on page 160

Other information in this chapter includes:

- "About the Information to Gather During Troubleshooting" on page 120
- "About System Error States" on page 123
- "About Unexpected Reboots" on page 126

About the Information to Gather During Troubleshooting

Familiarity with a wide variety of equipment, and experience with a particular machine's common failure modes can be invaluable when troubleshooting system problems. Establishing a systematic approach to investigating and solving a particular system's problems can help ensure that you can quickly identify and remedy most issues as they arise.

The Sun Fire V440 server indicates and logs events and errors in a variety of ways. Depending on the system's configuration and software, certain types of errors are captured only temporarily. Therefore, you must observe and record all available information immediately before you attempt any corrective action. POST, for instance, accumulates a list of failed components across resets. However, failed component information is cleared after a system reset. Similarly, the state of LEDs in a hung system is lost when the system reboots or resets.

If you encounter any system problems that are not familiar to you, gather as much information as you can before you attempt any remedial actions. The following task listing outlines a basic approach to information gathering.

- Gather as much error information (error indications and messages) as you can *from* the system. See "Error Information From the ALOM System Controller" on page 121, "Error Information From Sun Management Center" on page 121, and "Error Information From the System" on page 121 for more information about sources of error indications and messages.

- Gather as much information as you can *about* the system by reviewing and verifying the system's operating environment, firmware, and hardware configuration. To accurately analyze error indications and messages, you or a Sun support services engineer must know the system's operating environment and patch revision levels as well as the specific hardware configuration. See "Recording Information About the System" on page 122.

- Compare the specifics of your situation to the latest published information about your system. Often, unfamiliar problems you encounter have been seen, diagnosed, and fixed by others. This information might help you avoid the unnecessary expense of replacing parts that are not actually failing. See "About Updated Troubleshooting Information" on page 105 for information sources.

Error Information From the ALOM System Controller

In most troubleshooting situations, you can use the ALOM system controller as the primary source of information about the system. On the Sun Fire V440 server, the ALOM system controller provides you with access to a variety of system logs and other information about the system, even when the system is powered off. For more information about ALOM, see:

- "Monitoring the System Using Sun Advanced Lights Out Manager" on page 35
- "How to Monitor the System Using Sun Advanced Lights Out Manager" on page 79
- *Sun Advanced Lights Out Manager (ALOM) Online Help*

Error Information From Sun Management Center

If Sun Management Center software is installed and the system and operating environment are running, Sun Management Center lets you monitor the status of various components in the system. For more information, see:

- "Monitoring the System Using Sun Management Center" on page 36
- "How to Monitor the System Using Sun Management Center" on page 74

Error Information From the System

Depending on the state of the system, you should check as many of the following sources as possible for error indications and record the information found.

- *Output from the* `prtdiag -v` *command* – If Solaris software is running, issue the `prtdiag -v` command to capture information stored by OpenBoot Diagnostics and POST tests. Any information from these tests about the current state of the system is lost when the system is reset. See "How to Troubleshoot a System With the Operating System Responding" on page 126.

- *Output from* `show-post-results` *and* `show-obdiag-results` *commands* – From the `ok` prompt, issue the `show-post-results` command or `show-obdiag-results` command to view summaries of the results from the most recent POST and OpenBoot Diagnostics tests, respectively. The test results are saved across power cycles and provide an indication of which components passed and which components failed POST or OpenBoot Diagnostics tests. See "How to View Diagnostic Test Results After the Fact" on page 70.

- *State of system LEDs* – The system LEDs can be viewed in various locations on the system or by using the ALOM system controller. Be sure to check any network port LEDs for activity as you examine the system. Any information about the state of the system from the LEDs is lost when the system is reset. For more information about using LEDs to troubleshoot system problems, see "How to Isolate Faults Using LEDs" on page 62.

- *Solaris logs* – If Solaris software is running, check the message files in the `/var/adm/messages` file. For more information, see "How to Customize System Message Logging" in the *Solaris System Administration Guide: Advanced Administration Guide*, which is part of the Solaris System Administrator Collection.

- *System console* – You can access system console messages from OpenBoot Diagnostics and POST using the ALOM system controller, provided the system console has not been redirected. The system controller also provides you access to boot log information from the latest system reset. For more information about the system console, see Appendix A.

- *Core files generated from panics* – These files are located in the `/var/crash` directory. See "About the Core Dump Process" on page 113 for more information.

Recording Information About the System

As part of your standard operating procedures, it is important to have the following information about your system readily available:

- Current patch levels for the system firmware and operating environment
- Solaris operating environment version
- Specific hardware configuration information
- Optional equipment and driver information
- Recent service records

Having all of this information available and verified makes it easier for you to recognize any problems already identified by others. This information is also required if you contact Sun support or your authorized support provider.

It is vital to know the version and patch revision levels of the system's operating environment, patch revision levels of the firmware, and your specific hardware configuration before you attempt to fix any problems. Problems often occur after changes have been made to the system. Some errors are caused by hardware and software incompatibilities and interactions. If you have all system information available, you might be able to quickly fix a problem by simply updating the system's firmware. Knowing about recent upgrades or component replacements might help you avoid replacing components that are not faulty.

About System Error States

When troubleshooting, it is important to understand what kind of error has occurred, to distinguish between real and apparent system hangs, and to respond appropriately to error conditions so as to preserve valuable information.

Responding to System Error States

Depending on the severity of a system error, a Sun Fire V440 server might or might not respond to commands you issue to the system. Once you have gathered all available information, you can begin taking action. Your actions depend on the information you have already gathered and the state of the system.

Guidelines to remember:

- Avoid power cycling the system until you have gathered all the information you can. Error information might be lost when power cycling the system.
- If your system appears to be hung, attempt multiple approaches to get the system to respond. See "Responding to System Hang States" on page 123.

Responding to System Hang States

Troubleshooting a hanging system can be a difficult process because the root cause of the hang might be masked by false error indications from another part of the system. Therefore, it is important that you carefully examine all the information sources available to you before you attempt any remedy. Also, it is helpful to understand the type of hang the system is experiencing. This hang state information is especially important to Sun support services engineers, should you contact them.

A *system soft hang* can be characterized by any of the following symptoms:

- Usability or performance of the system gradually decreases.
- New attempts to access the system fail.
- Some parts of the system appear to stop responding.
- You can drop the system into the OpenBoot `ok` prompt level.

Some soft hangs might dissipate on their own, while others will require that the system be interrupted to gather information at the OpenBoot prompt level. A soft hang should respond to a break signal that is sent via the system console.

A *system hard hang* leaves the system unresponsive to a system break sequence. You will know that a system is in a hard hang state when you have attempted all the soft hang remedies with no success.

See "How to Troubleshoot a System That Is Hanging" on page 160.

Responding to Fatal Reset Errors and RED State Exceptions

Fatal Reset errors and RED State Exceptions are most often caused by hardware problems. Hardware Fatal Reset errors are the result of an "illegal" hardware state that is detected by the system. A hardware Fatal Reset error can either be a transient error or a hard error. A *transient error* causes intermittent failures. A *hard error* causes persistent failures that occur in the same way. CODE EXAMPLE 7-1 shows a sample Fatal Reset error alert from the system console.

CODE EXAMPLE 7-1   Fatal Reset Error Alert

```
Sun-SFV440-a console login:

Fatal Error Reset
CPU 0000.0000.0000.0002 AFSR 0210.9000.0200.0000  JETO PRIV OM TO
AFAR 0000.0280.0ec0.c180
SC Alert: Host System has Reset

SC Alert: Host System has read and cleared bootmode.
```

A RED State Exception condition is most commonly a hardware fault that is detected by the system. There is no recoverable information that you can use to troubleshoot a RED State Exception. The Exception causes a loss of system integrity, which would jeopardize the system if Solaris software continued to operate. Because of this, Solaris software terminates ungracefully without logging any details of the RED State Exception error in the /var/adm/messages file. CODE EXAMPLE 7-2 shows a sample RED State Exception alert from the system console.

CODE EXAMPLE 7-2   RED State Exception Alert

```
Sun-SFV440-a console login:

RED State Exception
Error enable reg: 0000.0001.00f0.001f
ECCR: 0000.0000.02f0.4c00
CPU: 0000.0000.0000.0002
TL=0000.0000.0000.0005  TT=0000.0000.0000.0010
   TPC=0000.0000.0100.4200  TnPC=0000.0000.0100.4204  TSTATE=
0000.0044.8200.1507
```

```
TL=0000.0000.0000.0004  TT=0000.0000.0000.0010
   TPC=0000.0000.0100.4200  TnPC=0000.0000.0100.4204  TSTATE=
0000.0044.8200.1507
TL=0000.0000.0000.0003  TT=0000.0000.0000.0010
   TPC=0000.0000.0100.4680  TnPC=0000.0000.0100.4684  TSTATE=
0000.0044.8200.1507
TL=0000.0000.0000.0002  TT=0000.0000.0000.0034
   TPC=0000.0000.0100.7164  TnPC=0000.0000.0100.7168  TSTATE=
0000.0044.8200.1507
TL=0000.0000.0000.0001  TT=0000.0000.0000.004e
   TPC=0000.0001.0001.fd24  TnPC=0000.0001.0001.fd28  TSTATE=
0000.0000.8200.1207

SC Alert: Host System has Reset

SC Alert: Host System has read and cleared bootmode.
```

In some isolated cases, software can cause a Fatal Reset error or RED State
Exception. Typically, these are device driver problems that can be identified easily.
You can obtain this information via SunSolve Online (see "Web Sites" on page 106),
or by contacting Sun or the third-party driver vendor.

The most important pieces of information to gather when diagnosing a Fatal Reset
error or RED State Exception are:

- System console output at the time of the error
- Recent service history of systems that encounter Fatal Reset errors or RED State
  Exceptions

Capturing system console indications and messages at the time of the error can help
you isolate the true cause of the error. In some cases, the true cause of the original
error might be masked by false error indications from another part of the system.
For example, POST results (shown by the output from the `prtdiag` command)
might indicate failed components, when, in fact, the "failed" components are not the
actual cause of the Fatal Reset error. In most cases, a good component will actually
report the Fatal Reset error.

By analyzing the system console output at the time of the error, you can avoid
replacing components based on these false error indications. In addition, knowing
the service history of a system experiencing transient errors can help you avoid
repeatedly replacing "failed" components that do not fix the problem.

About Unexpected Reboots

Sometimes, a system might reboot unexpectedly. In that case, ensure that the reboot was not caused by a panic. For example, L2-cache errors, which occur in user space (not kernel space), might cause Solaris software to log the L2-cache failure data and reboot the system. The information logged might be sufficient to troubleshoot and correct the problem. If the reboot was not caused by a panic, it might be caused by a Fatal Reset error or a RED State Exception. See "How to Troubleshoot Fatal Reset Errors and RED State Exceptions" on page 142.

Also, system ASR and POST settings can determine the system response to certain error conditions. If POST is not invoked during the reboot process, or if the system diagnostics level is not set to `max`, you might need to run system diagnostics at a higher level of coverage to determine the source of the reboot if the system message and system console files do not clearly indicate the source of the reboot.

How to Troubleshoot a System With the Operating System Responding

Before You Begin

Log in to the system controller and access the `sc>` prompt. For information, see:

■ "About the `sc>` Prompt" on page 169

This procedure assumes that the system console is in its default configuration, so that you are able to switch between the system controller and the system console. See:

■ "About Communicating With the System" on page 164
■ "Access Through the Network Management Port" on page 168

What to Do

1. Examine the ALOM event log. Type:

```
sc> showlogs
```

The ALOM event log shows system events such as reset events and LED indicator state changes that have occurred since the last system boot. CODE EXAMPLE 7-3 shows a sample event log, which indicates that the front panel Service Required LED is ON.

CODE EXAMPLE 7-3 `showlogs` Command Output

```
MAY 09 16:54:27 Sun-SFV440-a: 00060003: "SC System booted."
MAY 09 16:54:27 Sun-SFV440-a: 00040029: "Host system has shut down."
MAY 09 16:56:35 Sun-SFV440-a: 00060000: "SC Login: User admin Logged on."
MAY 09 16:56:54 Sun-SFV440-a: 00060000: "SC Login: User admin Logged on."
MAY 09 16:58:11 Sun-SFV440-a: 00040001: "SC Request to Power On Host."
MAY 09 16:58:11 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 16:58:13 Sun-SFV440-a: 0004000b: "Host System has read and cleared
                                          bootmode."
MAY 09 16:58:13 Sun-SFV440-a: 0004004f: "Indicator PS0.POK is now ON"
MAY 09 16:58:13 Sun-SFV440-a: 0004004f: "Indicator PS1.POK is now ON"
MAY 09 16:59:19 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:00:46 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:01:51 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.SERVICE is now ON"
MAY 09 17:03:22 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:03:22 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.SERVICE is now OFF"
MAY 09 17:03:24 Sun-SFV440-a: 0004000b: "Host System has read and cleared
                                          bootmode."
MAY 09 17:04:30 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:05:59 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:06:40 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.SERVICE is now ON"
MAY 09 17:07:44 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.ACT is now ON"
sc>
```

Note – Time stamps for ALOM logs reflect UTC (Universal Time Coordinated) time, while time stamps for the Solaris operating environment reflect local (server) time. Therefore, a single event might generate messages that appear to be logged at different times in different logs.

2. **Examine system environment status. Type:**

```
sc> showenvironment
```

The showenvironment command reports much useful data such as temperature readings; state of system and component LEDs; motherboard voltages; and status of system disks, fans, motherboard circuit breakers, and CPU module DC-to-DC converters. CODE EXAMPLE 7-4, an excerpt of output from the showenvironment command, indicates that the front panel Service Required LED is ON. When reviewing the complete output from the showenvironment command, check the state of all Service Required LEDs and verify that all components show a status of OK. See CODE EXAMPLE 4-1 for a sample of complete output from the showenvironment command.

CODE EXAMPLE 7-4   showenvironment Command Output

```
System Indicator Status:
-------------------------------------------------------
SYS_FRONT.LOCATE       SYS_FRONT.SERVICE      SYS_FRONT.ACT
-------------------------------------------------------
OFF                    ON                     ON
.
.
.
sc>
```

3. **Examine the output of the** prtdiag -v **command. Type:**

```
sc> console
Enter #. to return to ALOM.
# /usr/platform/'uname -i'/sbin/prtdiag -v
```

The prtdiag -v command provides access to information stored by POST and OpenBoot Diagnostics tests. Any information from this command about the current state of the system is lost if the system is reset. When examining the output to identify problems, verify that all installed CPU modules, PCI cards, and memory modules are listed; check for any Service Required LEDs that are ON; and verify that the system PROM firmware is the latest version. CODE EXAMPLE 7-5 shows an excerpt

of output from the `prtdiag –v` command. See CODE EXAMPLE 2-8 through
CODE EXAMPLE 2-13 for the complete `prtdiag –v` output from a "healthy" Sun Fire
V440 server.

CODE EXAMPLE 7-5   `prtdiag –v` Command Output

```
System Configuration: Sun Microsystems  sun4u Sun Fire V440
System clock frequency: 177 MHZ
Memory size: 4GB

================================= CPUs =================================
                  E$          CPU    CPU      Temperature      Fan
      CPU  Freq    Size       Impl.  Mask   Die    Ambient  Speed  Unit
      ---  -------  ---------  ------ ----  --------  --------  -----  ----
       0  1062 MHz  1MB         US-IIIi  2.3     -       -
       1  1062 MHz  1MB         US-IIIi  2.3     -       -

============================ IO Devices ============================
     Bus   Freq
Brd  Type  MHz   Slot        Name                           Model
---  ----  ----  ----------  -------------------------  --------------------
 0   pci   66            MB  pci108e,abba (network)        SUNW,pci-ce
 0   pci   33            MB  isa/su (serial)
 0   pci   33            MB  isa/su (serial)
.
.
.

Memory Module Groups:
--------------------------------------------------
ControllerID   GroupID  Labels
--------------------------------------------------
0              0        C0/P0/B0/D0,C0/P0/B0/D1
0              1        C0/P0/B1/D0,C0/P0/B1/D1

Memory Module Groups:
--------------------------------------------------
ControllerID   GroupID  Labels
--------------------------------------------------
1              0        C1/P0/B0/D0,C1/P0/B0/D1
1              1        C1/P0/B1/D0,C1/P0/B1/D1
.
.
.
System PROM revisions:
----------------------
OBP 4.10.3 2003/05/02 20:25 Sun Fire V440
OBDIAG 4.10.3 2003/05/02 20:26
#
```

4. **Check the system LEDs.**

5. **Check the** `/var/adm/messages` **file.**

    The following are clear indications of a failing part:

    - Warning messages from Solaris software about any hardware or software components
    - ALOM environmental messages about a failing part, including a fan or power supply

    If there is no clear indication of a failing part, investigate the installed applications, the network, or the disk configuration.

What Next

If you have clear indications that a part has failed or is failing, replace that part as soon as possible.

If the problem is a confirmed environmental failure, replace the fan or power supply as soon as possible.

A system with a redundant configuration might still operate in a degraded state, but the stability and performance of the system will be affected. Since the system is still operational, attempt to isolate the fault using several methods and tools to ensure that the part you suspect as faulty really is causing the problems you are experiencing. See:

- "About Isolating Faults in the System" on page 32

For information about installing and replacing field-replaceable parts, see:

- *Sun Fire V440 Server Parts Installation and Removal Guide*

How to Troubleshoot a System After an Unexpected Reboot

Before You Begin

Log in to the system controller and access the `sc>` prompt. For information, see:

■ "About the `sc>` Prompt" on page 169

This procedure assumes that the system console is in its default configuration, so that you are able to switch between the system controller and the system console. See:

■ "About Communicating With the System" on page 164
■ "Access Through the Network Management Port" on page 168

What to Do

1. Examine the ALOM event log. Type:

```
sc> showlogs
```

The ALOM event log shows system events such as reset events and LED indicator state changes that have occurred since the last system boot. CODE EXAMPLE 7-6 shows a sample event log, which indicates that the front panel Service Required LED is ON.

CODE EXAMPLE 7-6   `showlogs` Command Output

```
MAY 09 16:54:27 Sun-SFV440-a: 00060003: "SC System booted."
MAY 09 16:54:27 Sun-SFV440-a: 00040029: "Host system has shut down."
MAY 09 16:56:35 Sun-SFV440-a: 00060000: "SC Login: User admin Logged on."
MAY 09 16:56:54 Sun-SFV440-a: 00060000: "SC Login: User admin Logged on."
MAY 09 16:58:11 Sun-SFV440-a: 00040001: "SC Request to Power On Host."
MAY 09 16:58:11 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 16:58:13 Sun-SFV440-a: 0004000b: "Host System has read and cleared
                                         bootmode."
MAY 09 16:58:13 Sun-SFV440-a: 0004004f: "Indicator PS0.POK is now ON"
MAY 09 16:58:13 Sun-SFV440-a: 0004004f: "Indicator PS1.POK is now ON"
MAY 09 16:59:19 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:00:46 Sun-SFV440-a: 00040002: "Host System has Reset"
```

CODE EXAMPLE 7-6   `showlogs` Command Output *(Continued)*

```
MAY 09 17:01:51 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.SERVICE is now ON"
MAY 09 17:03:22 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:03:22 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.SERVICE is now OFF"
MAY 09 17:03:24 Sun-SFV440-a: 0004000b: "Host System has read and cleared
                                          bootmode."
MAY 09 17:04:30 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:05:59 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:06:40 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.SERVICE is now ON"
MAY 09 17:07:44 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.ACT is now ON"
sc>
```

Note – Time stamps for ALOM logs reflect UTC (Universal Time Coordinated) time, while time stamps for the Solaris operating environment reflect local (server) time. Therefore, a single event might generate messages that appear to be logged at different times in different logs.

2. **Examine the ALOM run log. Type:**

```
sc> consolehistory run -v
```

This command shows the log containing the most recent system console output of boot messages from the Solaris operating environment. When troubleshooting, examine the output for hardware or software errors logged by the operating environment on the system console. CODE EXAMPLE 7-7 shows sample output from the `consolehistory run -v` command.

CODE EXAMPLE 7-7   `consolehistory run -v` Command Output

```
May  9 14:48:22 Sun-SFV440-a rmclomv: SC Login: User admin Logged on.

#
# init 0
#
INIT: New run level: 0
The system is coming down.  Please wait.
System services are now being stopped.
Print services stopped.
May  9 14:49:18 Sun-SFV440-a last message repeated 1 time

May  9 14:49:38 Sun-SFV440-a syslogd: going down on signal 15

The system is down.
syncing file systems... done
Program terminated
```

CODE EXAMPLE 7-7 `consolehistory run -v` Command Output *(Continued)*

```
{1} ok boot disk

Sun Fire V440, No Keyboard
Copyright 1998-2003 Sun Microsystems, Inc.  All rights reserved.
OpenBoot 4.10.3, 4096 MB memory installed, Serial #53005571.
Ethernet address 0:3:ba:28:cd:3, Host ID: 8328cd03.

Initializing     1MB of memory at addr        123fecc000 -

Initializing      1MB of memory at addr       123fe02000 -

Initializing     14MB of memory at addr       123f002000 -

Initializing     16MB of memory at addr       123e002000 -

Initializing    992MB of memory at addr       1200000000 -

Initializing   1024MB of memory at addr       1000000000 -

Initializing   1024MB of memory at addr        200000000 -

Initializing   1024MB of memory at addr                0 -

Rebooting with command: boot disk
Boot device: /pci@1f,700000/scsi@2/disk@0,0  File and args:
\
SunOS Release 5.8 Version Generic_114696-04 64-bit
Copyright 1983-2003 Sun Microsystems, Inc.  All rights reserved.
Hardware watchdog enabled
Indicator SYS_FRONT.ACT is now ON
configuring IPv4 interfaces: ce0.
Hostname: Sun-SFV440-a
The system is coming up.  Please wait.
NIS domainname is Ecd.East.Sun.COM
Starting IPv4 router discovery.
starting rpc services: rpcbind keyserv ypbind done.
Setting netmask of lo0 to 255.0.0.0
Setting netmask of ce0 to 255.255.255.0
Setting default IPv4 interface for multicast: add net 224.0/4: gateway Sun-
SFV440-a
syslog service starting.
Print services started.
volume management starting.
The system is ready.

Sun-SFV440-a console login: May  9 14:52:57 Sun-SFV440-a rmclomv: NOTICE:
keyswitch change event - state = UNKNOWN
```

CODE EXAMPLE 7-7   `consolehistory run -v` Command Output *(Continued)*

```
May  9 14:52:57 Sun-SFV440-a rmclomv: Keyswitch Position has changed to Unknown
state.

May  9 14:52:58 Sun-SFV440-a rmclomv: NOTICE: keyswitch change event - state =
LOCKED

May  9 14:52:58 Sun-SFV440-a rmclomv: KeySwitch Position has changed to Locked
State.

May  9 14:53:00 Sun-SFV440-a rmclomv: NOTICE: keyswitch change event - state =
NORMAL

May  9 14:53:01 Sun-SFV440-a rmclomv: KeySwitch Position has changed to On State.

sc>
```

3. **Examine the ALOM boot log. Type:**

```
sc> consolehistory boot -v
```

The ALOM boot log contains boot messages from POST, OpenBoot firmware, and
Solaris software from the server's most recent reset. When examining the output to
identify a problem, check for error messages from POST and OpenBoot Diagnostics
tests.

CODE EXAMPLE 7-8 shows the boot messages from POST. Note that POST returned no
error messages. See "What POST Error Messages Tell You" on page 11 for a sample
POST error message and more information about POST error messages.

CODE EXAMPLE 7-8   `consolehistory boot -v` Command Output
(Boot Messages From POST)

```
Keyswitch set to diagnostic position.
@(#)OBP 4.10.3 2003/05/02 20:25 Sun Fire V440
Clearing TLBs
Power-On Reset
Executing Power On SelfTest
0>@(#) Sun Fire[TM] V440 POST 4.10.3 2003/05/04 22:08
      /export/work/staff/firmware_re/post/post-build-
4.10.3/Fiesta/chalupa/integrated  (firmware_re)
0>Hard Powerup RST thru SW
0>CPUs present in system: 0 1
0>OBP->POST Call with %o0=00000000.01012000.
0>Diag level set to MIN.
0>MFG scrpt mode set NORM
0>I/O port set to TTYA.
```

```
0>Start selftest...
1>Print Mem Config
1>Caches : Icache is ON, Dcache is ON, Wcache is ON, Pcache is ON.
1>Memory interleave set to 0
1>       Bank 0 1024MB : 00000010.00000000 -> 00000010.40000000.
1>       Bank 2 1024MB : 00000012.00000000 -> 00000012.40000000.
0>Print Mem Config
0>Caches : Icache is ON, Dcache is ON, Wcache is ON, Pcache is ON.
0>Memory interleave set to 0
0>       Bank 0 1024MB : 00000000.00000000 -> 00000000.40000000.
0>       Bank 2 1024MB : 00000002.00000000 -> 00000002.40000000.
0>INFO:
0>       POST Passed all devices.
0>POST: Return to OBP.
```

CODE EXAMPLE 7-9 shows the initialization of the OpenBoot PROM.

CODE EXAMPLE 7-9   `consolehistory boot -v` Command Output (OpenBoot PROM Initialization)

```
Keyswitch set to diagnostic position.
@(#)OBP 4.10.3 2003/05/02 20:25 Sun Fire V440
Clearing TLBs
POST Results: Cpu 0000.0000.0000.0000
  %o0 = 0000.0000.0000.0000 %o1 = ffff.ffff.f00a.2b73 %o2 = ffff.ffff.ffff.ffff
POST Results: Cpu 0000.0000.0000.0001
  %o0 = 0000.0000.0000.0000 %o1 = ffff.ffff.f00a.2b73 %o2 = ffff.ffff.ffff.ffff
Membase: 0000.0000.0000.0000
MemSize: 0000.0000.0004.0000
Init CPU arrays Done
Probing /pci@1d,700000 Device 1  Nothing there
Probing /pci@1d,700000 Device 2  Nothing there
```

The following sample output shows the system banner.

CODE EXAMPLE 7-10   `consolehistory boot -v` Command Output (System Banner Display)

```
Sun Fire V440, No Keyboard
Copyright 1998-2003 Sun Microsystems, Inc.  All rights reserved.
OpenBoot 4.10.3, 4096 MB memory installed, Serial #53005571.
Ethernet address 0:3:ba:28:cd:3, Host ID: 8328cd03.
```

The following sample output shows OpenBoot Diagnostics testing. See "What OpenBoot Diagnostics Error Messages Tell You" on page 20 for a sample OpenBoot Diagnostics error message and more information about OpenBoot Diagnostics error messages.

CODE EXAMPLE 7-11 `consolehistory boot -v` Command Output (OpenBoot Diagnostics Testing)

```
Running diagnostic script obdiag/normal

Testing /pci@1f,700000/network@1
Testing /pci@1e,600000/ide@d
Testing /pci@1e,600000/isa@7/flashprom@2,0
Testing /pci@1e,600000/isa@7/serial@0,2e8
Testing /pci@1e,600000/isa@7/serial@0,3f8
Testing /pci@1e,600000/isa@7/rtc@0,70
Testing /pci@1e,600000/isa@7/i2c@0,320:tests=
{gpio@0.42,gpio@0.44,gpio@0.46,gpio@0.48}
Testing /pci@1e,600000/isa@7/i2c@0,320:tests={hardware-monitor@0.5c}
Testing /pci@1e,600000/isa@7/i2c@0,320:tests={temperature-sensor@0.9c}
Testing /pci@1c,600000/network@2
Testing /pci@1f,700000/scsi@2,1
Testing /pci@1f,700000/scsi@2
```

The following sample output shows memory initialization by the OpenBoot PROM.

CODE EXAMPLE 7-12 `consolehistory boot -v` Command Output (Memory Initialization)

```
Initializing     1MB of memory at addr        123fe02000 -

Initializing    12MB of memory at addr        123f000000 -

Initializing  1008MB of memory at addr        1200000000 -

Initializing  1024MB of memory at addr        1000000000 -

Initializing  1024MB of memory at addr         200000000 -

Initializing  1024MB of memory at addr                 0 -

{1} ok boot disk
```

The following sample output shows the system booting and loading Solaris software

CODE EXAMPLE 7-13   `consolehistory boot -v` Command Output (System Booting and Loading Solaris Software)

```
Rebooting with command: boot disk
Boot device: /pci@1f,700000/scsi@2/disk@0,0  File and args:
Loading ufs-file-system package 1.4 04 Aug 1995 13:02:54.
FCode UFS Reader 1.11 97/07/10 16:19:15.
Loading: /platform/SUNW,Sun-Fire-V440/ufsboot
Loading: /platform/sun4u/ufsboot
\
SunOS Release 5.8 Version Generic_114696-04 64-bit
Copyright 1983-2003 Sun Microsystems, Inc.  All rights reserved.
Hardware watchdog enabled
sc>
```

4. **Check the** /var/adm/messages **file for indications of an error.**

   Look for the following information about the system's state:

   - Any large gaps in the time stamp of Solaris software or application messages
   - Warning messages about any hardware or software components
   - Information from last root logins to determine whether any system administrators might be able to provide any information about the system state at the time of the hang

5. **If possible, check whether the system saved a core dump file.**

   Core dump files provide invaluable information to your support provider to aid in diagnosing any system problems. For further information about core dump files, see "About the Core Dump Process" on page 113 and "Managing System Crash Information" in the *Solaris System Administration Guide*.

6. **Check the system LEDs.**

   You can use the ALOM system controller to check the state of the system LEDs. See the *Sun Fire V440 Server Administration Guide* for information about system LEDs.

7. **Examine the output of the** `prtdiag -v` **command. Type:**

```
sc> console
Enter #. to return to ALOM.
# /usr/platform/'uname -i'/sbin/prtdiag -v
```

   The `prtdiag -v` command provides access to information stored by POST and OpenBoot Diagnostics tests. Any information from this command about the current state of the system is lost if the system is reset. When examining the output to identify problems, verify that all installed CPU modules, PCI cards, and memory

modules are listed; check for any Service Required LEDs that are ON; and verify that the system PROM firmware is the latest version. CODE EXAMPLE 7-14 shows an excerpt of output from the prtdiag -v command. See CODE EXAMPLE 2-8 through CODE EXAMPLE 2-13 for the complete prtdiag -v output from a "healthy" Sun Fire V440 server.

CODE EXAMPLE 7-14 prtdiag -v Command Output

```
System Configuration: Sun Microsystems   sun4u Sun Fire V440
System clock frequency: 177 MHZ
Memory size: 4GB

=================================== CPUs ===================================
                        E$          CPU     CPU      Temperature         Fan
        CPU   Freq      Size        Impl.   Mask     Die   Ambient  Speed  Unit
        ---   --------  ----------  ------  ----     ------  -------- -----  ----
         0    1062 MHz  1MB         US-IIIi  2.3      -       -
         1    1062 MHz  1MB         US-IIIi  2.3      -       -

============================== IO Devices ===============================
      Bus    Freq
 Brd  Type   MHz   Slot          Name                         Model
 ---  ----   ----  ----------  ------------------------    --------------------
  0   pci    66            MB  pci108e,abba (network)        SUNW,pci-ce
  0   pci    33            MB  isa/su (serial)
  0   pci    33            MB  isa/su (serial)


.
.
.
Memory Module Groups:
--------------------------------------------------
ControllerID   GroupID  Labels
--------------------------------------------------
0              0        C0/P0/B0/D0,C0/P0/B0/D1
0              1        C0/P0/B1/D0,C0/P0/B1/D1
.
.
.
System PROM revisions:
----------------------
OBP 4.10.3 2003/05/02 20:25 Sun Fire V440
OBDIAG 4.10.3 2003/05/02 20:26
#
```

8. **Verify that all user and system processes are functional. Type:**

```
# ps -ef
```

Output from the `ps -ef` command shows each process, the start time, the run time, and the full process command-line options. To identify a system problem, examine the output for missing entries in the CMD column. CODE EXAMPLE 7-15 shows the `ps -ef` command output of a "healthy" Sun Fire V440 server.

CODE EXAMPLE 7-15   `ps -ef` Command Output

```
     UID   PID  PPID  C    STIME TTY       TIME CMD
    root     0     0  0 14:51:32 ?        0:17 sched
    root     1     0  0 14:51:32 ?        0:00 /etc/init -
    root     2     0  0 14:51:32 ?        0:00 pageout
    root     3     0  0 14:51:32 ?        0:02 fsflush
    root   291     1  0 14:51:47 ?        0:00 /usr/lib/saf/sac -t 300
    root   205     1  0 14:51:44 ?        0:00 /usr/lib/lpsched
    root   312   148  0 14:54:33 ?        0:00 in.telnetd
    root   169     1  0 14:51:42 ?        0:00 /usr/lib/autofs/automountd
   user1   314   312  0 14:54:33 pts/1    0:00 -csh
    root    53     1  0 14:51:36 ?        0:00 /usr/lib/sysevent/syseventd
    root    59     1  0 14:51:37 ?        0:02 /usr/lib/picl/picld
    root   100     1  0 14:51:40 ?        0:00 /usr/sbin/in.rdisc -s
    root   131     1  0 14:51:40 ?        0:00 /usr/lib/netsvc/yp/ypbind -broadcast
    root   118     1  0 14:51:40 ?        0:00 /usr/sbin/rpcbind
    root   121     1  0 14:51:40 ?        0:00 /usr/sbin/keyserv
    root   148     1  0 14:51:42 ?        0:00 /usr/sbin/inetd -s
    root   218     1  0 14:51:44 ?        0:00 /usr/lib/power/powerd
    root   199     1  0 14:51:43 ?        0:00 /usr/sbin/nscd
    root   162     1  0 14:51:42 ?        0:00 /usr/lib/nfs/lockd
  daemon   166     1  0 14:51:42 ?        0:00 /usr/lib/nfs/statd
    root   181     1  0 14:51:43 ?        0:00 /usr/sbin/syslogd
    root   283     1  0 14:51:47 ?        0:00 /usr/lib/dmi/snmpXdmid -s Sun-
SFV440-a
    root   184     1  0 14:51:43 ?        0:00 /usr/sbin/cron
    root   235   233  0 14:51:44 ?        0:00 /usr/sadm/lib/smc/bin/smcboot
    root   233     1  0 14:51:44 ?        0:00 /usr/sadm/lib/smc/bin/smcboot
    root   245     1  0 14:51:45 ?        0:00 /usr/sbin/vold
    root   247     1  0 14:51:45 ?        0:00 /usr/lib/sendmail -bd -q15m
    root   256     1  0 14:51:45 ?        0:00 /usr/lib/efcode/sparcv9/efdaemon
    root   294   291  0 14:51:47 ?        0:00 /usr/lib/saf/ttymon
    root   304   274  0 14:51:51 ?        0:00 mibiisa -r -p 32826
    root   274     1  0 14:51:46 ?        0:00 /usr/lib/snmp/snmpdx -y -c
/etc/snmp/conf
    root   334   292  0 15:00:59 console  0:00 ps -ef
#
```

9. **Verify that all I/O devices and activities are still present and functioning. Type:**

```
# iostat -xtc
```

This command shows all I/O devices and reports activity for each device. To identify a problem, examine the output for installed devices that are not listed. CODE EXAMPLE 7-16 shows the `iostat -xtc` command output from a "healthy" Sun Fire V440 server.

CODE EXAMPLE 7-16   `iostat -xtc` Command Output

```
                extended device statistics                      tty          cpu
 device    r/s    w/s    kr/s   kw/s wait actv  svc_t  %w  %b  tin tout  us sy wt id
 sd0       0.0    0.0    0.0    0.0  0.0  0.0    0.0    0   0    0  183   0  2  2 96
 sd1       6.5    1.2    49.5   7.9  0.0  0.2    24.6   0   3
 sd2       0.2    0.0    0.0    0.0  0.0  0.0    0.0    0   0
 sd3       0.2    0.0    0.0    0.0  0.0  0.0    0.0    0   0
 sd4       0.2    0.0    0.0    0.0  0.0  0.0    0.0    0   0
 nfs1      0.0    0.0    0.0    0.0  0.0  0.0    0.0    0   0
 nfs2      0.0    0.0    0.1    0.0  0.0  0.0    9.6    0   0
 nfs3      0.1    0.0    0.6    0.0  0.0  0.0    1.4    0   0
 nfs4      0.0    0.0    0.1    0.0  0.0  0.0    5.1    0   0
 #
```

10. **Examine errors pertaining to I/O devices. Type:**

```
# iostat -E
```

This command reports on errors for each I/O device. To identify a problem, examine the output for any type of error that is more than 0. For example, in CODE EXAMPLE 7-17, `iostat -E` reports Hard Errors: 2 for I/O device sd0.

CODE EXAMPLE 7-17   `iostat -E` Command Output

```
sd0       Soft Errors: 0 Hard Errors: 2 Transport Errors: 0
Vendor: TOSHIBA   Product: DVD-ROM SD-C2612 Revision: 1011 Serial No: 04/17/02
Size: 18446744073.71GB <-1 bytes>
Media Error: 0 Device Not Ready: 2 No Device: 0 Recoverable: 0
Illegal Request: 0 Predictive Failure Analysis: 0
sd1       Soft Errors: 0 Hard Errors: 0 Transport Errors: 0
Vendor: SEAGATE   Product: ST336607LSUN36G  Revision: 0207 Serial No:
3JA0BW6Y00002317
Size: 36.42GB <36418595328 bytes>
Media Error: 0 Device Not Ready: 0 No Device: 0 Recoverable: 0
Illegal Request: 0 Predictive Failure Analysis: 0
sd2       Soft Errors: 0 Hard Errors: 0 Transport Errors: 0
```

```
Vendor: SEAGATE  Product: ST336607LSUN36G  Revision: 0207 Serial No:
3JA0BRQJ00007316
Size: 36.42GB <36418595328 bytes>
Media Error: 0 Device Not Ready: 0 No Device: 0 Recoverable: 0
Illegal Request: 0 Predictive Failure Analysis: 0
sd3      Soft Errors: 0 Hard Errors: 0 Transport Errors: 0
Vendor: SEAGATE  Product: ST336607LSUN36G  Revision: 0207 Serial No:
3JA0BWL000002318
Size: 36.42GB <36418595328 bytes>
Media Error: 0 Device Not Ready: 0 No Device: 0 Recoverable: 0
Illegal Request: 0 Predictive Failure Analysis: 0
sd4      Soft Errors: 0 Hard Errors: 0 Transport Errors: 0
Vendor: SEAGATE  Product: ST336607LSUN36G  Revision: 0207 Serial No:
3JA0AGQS00002317
Size: 36.42GB <36418595328 bytes>
Media Error: 0 Device Not Ready: 0 No Device: 0 Recoverable: 0
Illegal Request: 0 Predictive Failure Analysis: 0
#
```

11. **Verify that any mirrored RAID devices are functioning. Type:**

```
# raidctl
```

This command shows the status of RAID devices. To identify a problem, examine the output for Disk Status that is not OK. For more information about configuring mirrored RAID devices, see "About Hardware Disk Mirroring" in the *Sun Fire V440 Server Administration Guide*.

CODE EXAMPLE 7-18 raidctl Command Output

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

12. **Run an exercising tool such as Sun VTS software or Hardware Diagnostic Suite.**

See Chapter 5 for information about exercising tools.

13. **If this is the first occurrence of an unexpected reboot and the system did not run POST as part of the reboot process, run POST.**

   If ASR is not enabled, now is a good time to enable ASR. ASR runs POST and OpenBoot Diagnostics tests automatically at reboot. With ASR enabled, you can save time diagnosing problems since POST and OpenBoot Diagnostics test results are already available after an unexpected reboot. See the *Sun Fire V440 Server Administration Guide* for more information about ASR and complete instructions for enabling ASR.

What Next

Schedule maintenance as necessary for any service actions.

How to Troubleshoot Fatal Reset Errors and RED State Exceptions

Before You Begin

Log in to the system controller and access the `sc>` prompt. For information, see:

- "About the `sc>` Prompt" on page 169

This procedure assumes that the system console is in its default configuration, so that you are able to switch between the system controller and the system console. See:

- "About Communicating With the System" on page 164
- "Access Through the Network Management Port" on page 168

For more information about Fatal Reset errors and RED State Exceptions, see "Responding to Fatal Reset Errors and RED State Exceptions" on page 124. For a sample Fatal Reset error message, see CODE EXAMPLE 7-1. For a sample RED State Exception message, see CODE EXAMPLE 7-2.

What to Do

1. **Examine the ALOM event log. Type:**

```
sc> showlogs
```

The ALOM event log shows system events such as reset events and LED indicator state changes that have occurred since the last system boot. CODE EXAMPLE 7-19 shows a sample event log, which indicates that the front panel Service Required LED is ON.

CODE EXAMPLE 7-19 `showlogs` Command Output

```
MAY 09 16:54:27 Sun-SFV440-a: 00060003: "SC System booted."
MAY 09 16:54:27 Sun-SFV440-a: 00040029: "Host system has shut down."
MAY 09 16:56:35 Sun-SFV440-a: 00060000: "SC Login: User admin Logged on."
MAY 09 16:56:54 Sun-SFV440-a: 00060000: "SC Login: User admin Logged on."
MAY 09 16:58:11 Sun-SFV440-a: 00040001: "SC Request to Power On Host."
MAY 09 16:58:11 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 16:58:13 Sun-SFV440-a: 0004000b: "Host System has read and cleared
                                        bootmode."
MAY 09 16:58:13 Sun-SFV440-a: 0004004f: "Indicator PS0.POK is now ON"
MAY 09 16:58:13 Sun-SFV440-a: 0004004f: "Indicator PS1.POK is now ON"
MAY 09 16:59:19 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:00:46 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:01:51 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.SERVICE is now ON"
MAY 09 17:03:22 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:03:22 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.SERVICE is now OFF"
MAY 09 17:03:24 Sun-SFV440-a: 0004000b: "Host System has read and cleared
                                        bootmode."
MAY 09 17:04:30 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:05:59 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:06:40 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.SERVICE is now ON"
MAY 09 17:07:44 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.ACT is now ON"
sc>
```

Note – Time stamps for ALOM logs reflect UTC (Universal Time Coordinated) time, while time stamps for the Solaris operating environment reflect local (server) time. Therefore, a single event might generate messages that appear to be logged at different times in different logs.

2. **Examine the ALOM run log. Type:**

```
sc> consolehistory run -v
```

This command shows the log containing the most recent system console output of boot messages from the Solaris software. When troubleshooting, examine the output for hardware or software errors logged by the operating environment on the system console. CODE EXAMPLE 7-20 shows sample output from the `consolehistory run -v` command.

CODE EXAMPLE 7-20   `consolehistory run -v` Command Output

```
May  9 14:48:22 Sun-SFV440-a rmclomv: SC Login: User admin Logged on.

#
# init 0
#
INIT: New run level: 0
The system is coming down.  Please wait.
System services are now being stopped.
Print services stopped.
May  9 14:49:18 Sun-SFV440-a last message repeated 1 time

May  9 14:49:38 Sun-SFV440-a syslogd: going down on signal 15

The system is down.
syncing file systems... done
Program terminated
{1} ok boot disk

Sun Fire V440, No Keyboard
Copyright 1998-2003 Sun Microsystems, Inc.  All rights reserved.
OpenBoot 4.10.3, 4096 MB memory installed, Serial #53005571.
Ethernet address 0:3:ba:28:cd:3, Host ID: 8328cd03.

Initializing      1MB of memory at addr        123fecc000 -

Initializing      1MB of memory at addr        123fe02000 -

Initializing     14MB of memory at addr        123f002000 -

Initializing     16MB of memory at addr        123e002000 -

Initializing    992MB of memory at addr        1200000000 -

Initializing   1024MB of memory at addr        1000000000 -
```

CODE EXAMPLE 7-20 `consolehistory run -v` Command Output *(Continued)*

```
Initializing  1024MB of memory at addr       200000000 -

Initializing  1024MB of memory at addr             0 -

Rebooting with command: boot disk
Boot device: /pci@1f,700000/scsi@2/disk@0,0  File and args:
\
SunOS Release 5.8 Version Generic_114696-04 64-bit
Copyright 1983-2003 Sun Microsystems, Inc.  All rights reserved.
Hardware watchdog enabled
Indicator SYS_FRONT.ACT is now ON
configuring IPv4 interfaces: ce0.
Hostname: Sun-SFV440-a
The system is coming up.  Please wait.
NIS domainname is Ecd.East.Sun.COM
Starting IPv4 router discovery.
starting rpc services: rpcbind keyserv ypbind done.
Setting netmask of lo0 to 255.0.0.0
Setting netmask of ce0 to 255.255.255.0
Setting default IPv4 interface for multicast: add net 224.0/4: gateway Sun-
SFV440-a
syslog service starting.
Print services started.
volume management starting.
The system is ready.

Sun-SFV440-a console login: May  9 14:52:57 Sun-SFV440-a rmclomv: NOTICE:
keyswitch change event - state = UNKNOWN

May  9 14:52:57 Sun-SFV440-a rmclomv: Keyswitch Position has changed to Unknown
state.

May  9 14:52:58 Sun-SFV440-a rmclomv: NOTICE: keyswitch change event - state =
LOCKED

May  9 14:52:58 Sun-SFV440-a rmclomv: KeySwitch Position has changed to Locked
State.

May  9 14:53:00 Sun-SFV440-a rmclomv: NOTICE: keyswitch change event - state =
NORMAL

May  9 14:53:01 Sun-SFV440-a rmclomv: KeySwitch Position has changed to On State.

sc>
```

3. **Examine the ALOM boot log. Type:**

```
sc> consolehistory boot -v
```

The ALOM boot log contains boot messages from POST, OpenBoot firmware, and Solaris software from the server's most recent reset. When examining the output to identify a problem, check for error messages from POST and OpenBoot Diagnostics tests.

CODE EXAMPLE 7-21 shows the boot messages from POST. Note that POST returned no error messages. See "What POST Error Messages Tell You" on page 11 for a sample POST error message and more information about POST error messages.

CODE EXAMPLE 7-21 `consolehistory boot -v` Command Output (Boot Messages From POST)

```
Keyswitch set to diagnostic position.
@(#)OBP 4.10.3 2003/05/02 20:25 Sun Fire V440
Clearing TLBs
Power-On Reset
Executing Power On SelfTest

0>@(#) Sun Fire[TM] V440 POST 4.10.3 2003/05/04 22:08
       /export/work/staff/firmware_re/post/post-build-
4.10.3/Fiesta/chalupa/integrated  (firmware_re)
0>Hard Powerup RST thru SW
0>CPUs present in system: 0 1
0>OBP->POST Call with %o0=00000000.01012000.
0>Diag level set to MIN.
0>MFG scrpt mode set NORM
0>I/O port set to TTYA.
0>
0>Start selftest...
1>Print Mem Config
1>Caches : Icache is ON, Dcache is ON, Wcache is ON, Pcache is ON.
1>Memory interleave set to 0
1>      Bank 0 1024MB : 00000010.00000000 -> 00000010.40000000.
1>      Bank 2 1024MB : 00000012.00000000 -> 00000012.40000000.
0>Print Mem Config
0>Caches : Icache is ON, Dcache is ON, Wcache is ON, Pcache is ON.
0>Memory interleave set to 0
0>      Bank 0 1024MB : 00000000.00000000 -> 00000000.40000000.
0>      Bank 2 1024MB : 00000002.00000000 -> 00000002.40000000.
0>INFO:
0>      POST Passed all devices.
0>
0>POST: Return to OBP.
```

The following output shows the initialization of the OpenBoot PROM.

CODE EXAMPLE 7-22 `consolehistory boot -v` Command Output (OpenBoot PROM Initialization)

```
Keyswitch set to diagnostic position.
@(#)OBP 4.10.3 2003/05/02 20:25 Sun Fire V440
Clearing TLBs
POST Results: Cpu 0000.0000.0000.0000
  %o0 = 0000.0000.0000.0000 %o1 = ffff.ffff.f00a.2b73 %o2 = ffff.ffff.ffff.ffff
POST Results: Cpu 0000.0000.0000.0001
  %o0 = 0000.0000.0000.0000 %o1 = ffff.ffff.f00a.2b73 %o2 = ffff.ffff.ffff.ffff
Membase: 0000.0000.0000.0000
MemSize: 0000.0000.0004.0000
Init CPU arrays Done
Probing /pci@1d,700000 Device 1  Nothing there
Probing /pci@1d,700000 Device 2  Nothing there
```

The following sample output shows the system banner.

CODE EXAMPLE 7-23 `consolehistory boot -v` Command Output (System Banner Display)

```
Sun Fire V440, No Keyboard
Copyright 1998-2003 Sun Microsystems, Inc.  All rights reserved.
OpenBoot 4.10.3, 4096 MB memory installed, Serial #53005571.
Ethernet address 0:3:ba:28:cd:3, Host ID: 8328cd03.
```

The following sample output shows OpenBoot Diagnostics testing. See "What OpenBoot Diagnostics Error Messages Tell You" on page 20 for a sample OpenBoot Diagnostics error message and more information about OpenBoot Diagnostics error messages.

CODE EXAMPLE 7-24 `consolehistory boot -v` Command Output (OpenBoot Diagnostics Testing)

```
Running diagnostic script obdiag/normal

Testing /pci@1f,700000/network@1
Testing /pci@1e,600000/ide@d
Testing /pci@1e,600000/isa@7/flashprom@2,0
Testing /pci@1e,600000/isa@7/serial@0,2e8
Testing /pci@1e,600000/isa@7/serial@0,3f8
Testing /pci@1e,600000/isa@7/rtc@0,70
Testing /pci@1e,600000/isa@7/i2c@0,320:tests=
{gpio@0.42,gpio@0.44,gpio@0.46,gpio@0.48}
Testing /pci@1e,600000/isa@7/i2c@0,320:tests={hardware-monitor@0.5c}
Testing /pci@1e,600000/isa@7/i2c@0,320:tests={temperature-sensor@0.9c}
Testing /pci@1c,600000/network@2
Testing /pci@1f,700000/scsi@2,1
Testing /pci@1f,700000/scsi@2
```

The following sample output shows memory initialization by the OpenBoot PROM.

CODE EXAMPLE 7-25 `consolehistory boot -v` Command Output (Memory Initialization)

```
Initializing    1MB of memory at addr       123fe02000 -

Initializing   12MB of memory at addr       123f000000 -

Initializing 1008MB of memory at addr       1200000000 -

Initializing 1024MB of memory at addr       1000000000 -

Initializing 1024MB of memory at addr        200000000 -

Initializing 1024MB of memory at addr                0 -

{1} ok boot disk
```

The following sample output shows the system booting and loading the Solaris software.

CODE EXAMPLE 7-26 `consolehistory boot -v` Command Output (System Booting and Loading Solaris Software)

```
Rebooting with command: boot disk
Boot device: /pci@1f,700000/scsi@2/disk@0,0  File and args:
Loading ufs-file-system package 1.4 04 Aug 1995 13:02:54.
FCode UFS Reader 1.11 97/07/10 16:19:15.
Loading: /platform/SUNW,Sun-Fire-V440/ufsboot
Loading: /platform/sun4u/ufsboot
\
SunOS Release 5.8 Version Generic_114696-04 64-bit
Copyright 1983-2003 Sun Microsystems, Inc.  All rights reserved.
Hardware watchdog enabled
sc>
```

4. **Check the** /var/adm/messages **file for indications of an error.**

   Look for the following information about the system's state:

   ■ Any large gaps in the time stamp of Solaris software or application messages

   ■ Warning messages about any hardware or software components

   ■ Information from last root logins to determine whether any system administrators might be able to provide any information about the system state at the time of the hang

5. **If possible, check whether the system saved a core dump file.**

   Core dump files provide invaluable information to your support provider to aid in diagnosing any system problems. For further information about core dump files, see "About the Core Dump Process" on page 113 and "Managing System Crash Information" in the *Solaris System Administration Guide.*

6. **Check the system LEDs.**

   You can use the ALOM system controller to check the state of the system LEDs. See the *Sun Fire V440 Server Administration Guide* for information about system LEDs.

7. **Examine the output of the** prtdiag -v **command. Type:**

```
sc> console
Enter #. to return to ALOM.
# /usr/platform/`uname -i`/sbin/prtdiag -v
```

   The `prtdiag -v` command provides access to information stored by POST and OpenBoot Diagnostics tests. Any information from this command about the current state of the system is lost if the system is reset. When examining the output to

identify problems, verify that all installed CPU modules, PCI cards, and memory modules are listed; check for any Service Required LEDs that are ON; and verify that the system PROM firmware is the latest version. CODE EXAMPLE 7-27 shows an excerpt of output from the `prtdiag -v` command. See CODE EXAMPLE 2-8 through CODE EXAMPLE 2-13 for the complete `prtdiag -v` output from a "healthy" Sun Fire V440 server.

CODE EXAMPLE 7-27   `prtdiag -v` Command Output

```
System Configuration: Sun Microsystems  sun4u Sun Fire V440
System clock frequency: 177 MHZ
Memory size: 4GB


================================= CPUs =================================
                    E$          CPU    CPU       Temperature         Fan
       CPU   Freq   Size        Impl.  Mask    Die    Ambient   Speed  Unit
       ---   ------ ----------  ------ ----    -------- -------- -----  ----
        0  1062 MHz  1MB         US-IIIi  2.3     -       -
        1  1062 MHz  1MB         US-IIIi  2.3     -       -


============================= IO Devices =============================
     Bus   Freq
Brd  Type  MHz   Slot        Name                          Model
---  ----  ----  ----------  ----------------------------  --------------------
 0   pci   66          MB  pci108e,abba (network)        SUNW,pci-ce
 0   pci   33          MB  isa/su (serial)
 0   pci   33          MB  isa/su (serial)
.
.
.
Memory Module Groups:
--------------------------------------------------
ControllerID   GroupID  Labels
--------------------------------------------------
0              0        C0/P0/B0/D0,C0/P0/B0/D1
0              1        C0/P0/B1/D0,C0/P0/B1/D1
.
.
.
System PROM revisions:
----------------------
OBP 4.10.3 2003/05/02 20:25 Sun Fire V440
OBDIAG 4.10.3 2003/05/02 20:26
#
```

8. **Verify that all user and system processes are functional. Type:**

```
# ps -ef
```

Output from the `ps -ef` command shows each process, the start time, the run time, and the full process command-line options. To identify a system problem, examine the output for missing entries in the CMD column. CODE EXAMPLE 7-28 shows the `ps -ef` command output of a "healthy" Sun Fire V440 server.

CODE EXAMPLE 7-28   `ps -ef` Command Output

```
     UID    PID  PPID  C     STIME TTY       TIME CMD
    root      0     0  0 14:51:32 ?        0:17 sched
    root      1     0  0 14:51:32 ?        0:00 /etc/init -
    root      2     0  0 14:51:32 ?        0:00 pageout
    root      3     0  0 14:51:32 ?        0:02 fsflush
    root    291     1  0 14:51:47 ?        0:00 /usr/lib/saf/sac -t 300
    root    205     1  0 14:51:44 ?        0:00 /usr/lib/lpsched
    root    312   148  0 14:54:33 ?        0:00 in.telnetd
    root    169     1  0 14:51:42 ?        0:00 /usr/lib/autofs/automountd
   user1    314   312  0 14:54:33 pts/1    0:00 -csh
    root     53     1  0 14:51:36 ?        0:00 /usr/lib/sysevent/syseventd
    root     59     1  0 14:51:37 ?        0:02 /usr/lib/picl/picld
    root    100     1  0 14:51:40 ?        0:00 /usr/sbin/in.rdisc -s
   root     131     1  0 14:51:40 ?        0:00 /usr/lib/netsvc/yp/ypbind -broadcast
    root    118     1  0 14:51:40 ?        0:00 /usr/sbin/rpcbind
    root    121     1  0 14:51:40 ?        0:00 /usr/sbin/keyserv
    root    148     1  0 14:51:42 ?        0:00 /usr/sbin/inetd -s
    root    226     1  0 14:51:44 ?        0:00 /usr/lib/utmpd
    root    218     1  0 14:51:44 ?        0:00 /usr/lib/power/powerd
    root    199     1  0 14:51:43 ?        0:00 /usr/sbin/nscd
    root    162     1  0 14:51:42 ?        0:00 /usr/lib/nfs/lockd
  daemon    166     1  0 14:51:42 ?        0:00 /usr/lib/nfs/statd
    root    181     1  0 14:51:43 ?        0:00 /usr/sbin/syslogd
    root    283     1  0 14:51:47 ?        0:00 /usr/lib/dmi/snmpXdmid -s Sun-
SFV440-a
    root    184     1  0 14:51:43 ?        0:00 /usr/sbin/cron
    root    235   233  0 14:51:44 ?        0:00 /usr/sadm/lib/smc/bin/smcboot
    root    233     1  0 14:51:44 ?        0:00 /usr/sadm/lib/smc/bin/smcboot
    root    245     1  0 14:51:45 ?        0:00 /usr/sbin/vold
    root    247     1  0 14:51:45 ?        0:00 /usr/lib/sendmail -bd -q15m
    root    256     1  0 14:51:45 ?        0:00 /usr/lib/efcode/sparcv9/efdaemon
    root    294   291  0 14:51:47 ?        0:00 /usr/lib/saf/ttymon
    root    304   274  0 14:51:51 ?        0:00 mibiisa -r -p 32826
    root    274     1  0 14:51:46 ?        0:00 /usr/lib/snmp/snmpdx -y -c
/etc/snmp/conf
    root    334   292  0 15:00:59 console  0:00 ps -ef
```

CODE EXAMPLE 7-28   `ps -ef` Command Output *(Continued)*

```
    root    281    1   0 14:51:47 ?         0:00 /usr/lib/dmi/dmispd
    root    282    1   0 14:51:47 ?         0:00 /usr/dt/bin/dtlogin -daemon
    root    292    1   0 14:51:47 console   0:00 -sh
    root    324  314   0 14:54:51 pts/1     0:00 -sh
#
```

9. **Verify that all I/O devices and activities are still present and functioning. Type:**

```
# iostat -xtc
```

This command shows all I/O devices and reports activity for each device. To identify a problem, examine the output for installed devices that are not listed. CODE EXAMPLE 7-29 shows the `iostat -xtc` command output from a "healthy" Sun Fire V440 server.

CODE EXAMPLE 7-29   `iostat -xtc` Command Output

			extended device statistics							tty		cpu			
device	r/s	w/s	kr/s	kw/s	wait	actv	svc_t	%w	%b	tin	tout	us	sy	wt	id
sd0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	183	0	2	2	96
sd1	6.5	1.2	49.5	7.9	0.0	0.2	24.6	0	3						
sd2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0	0						
sd3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0	0						
sd4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0	0						
nfs1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0						
nfs2	0.0	0.0	0.1	0.0	0.0	0.0	9.6	0	0						
nfs3	0.1	0.0	0.6	0.0	0.0	0.0	1.4	0	0						
nfs4	0.0	0.0	0.1	0.0	0.0	0.0	5.1	0	0						

```
#
```

10. **Examine errors pertaining to I/O devices. Type:**

```
# iostat -E
```

This command reports on errors for each I/O device. To identify a problem, examine the output for any type of error that is more than 0. For example, in CODE EXAMPLE 7-30, `iostat -E` reports `Hard Errors: 2` for I/O device `sd0`.

CODE EXAMPLE 7-30   `iostat -E` Command Output

```
sd0      Soft Errors: 0 Hard Errors: 2 Transport Errors: 0
Vendor: TOSHIBA  Product: DVD-ROM SD-C2612 Revision: 1011 Serial No: 04/17/02
Size: 18446744073.71GB <-1 bytes>
Media Error: 0 Device Not Ready: 2 No Device: 0 Recoverable: 0
Illegal Request: 0 Predictive Failure Analysis: 0
sd1      Soft Errors: 0 Hard Errors: 0 Transport Errors: 0
Vendor: SEAGATE  Product: ST336607LSUN36G  Revision: 0207 Serial No:
3JA0BW6Y00002317
Size: 36.42GB <36418595328 bytes>
Media Error: 0 Device Not Ready: 0 No Device: 0 Recoverable: 0
Illegal Request: 0 Predictive Failure Analysis: 0
sd2      Soft Errors: 0 Hard Errors: 0 Transport Errors: 0
Vendor: SEAGATE  Product: ST336607LSUN36G  Revision: 0207 Serial No:
3JA0BRQJ00007316
Size: 36.42GB <36418595328 bytes>
Media Error: 0 Device Not Ready: 0 No Device: 0 Recoverable: 0
Illegal Request: 0 Predictive Failure Analysis: 0
sd3      Soft Errors: 0 Hard Errors: 0 Transport Errors: 0
Vendor: SEAGATE  Product: ST336607LSUN36G  Revision: 0207 Serial No:
3JA0BWL000002318
Size: 36.42GB <36418595328 bytes>
Media Error: 0 Device Not Ready: 0 No Device: 0 Recoverable: 0
Illegal Request: 0 Predictive Failure Analysis: 0
sd4      Soft Errors: 0 Hard Errors: 0 Transport Errors: 0
Vendor: SEAGATE  Product: ST336607LSUN36G  Revision: 0207 Serial No:
3JA0AGQS00002317
Size: 36.42GB <36418595328 bytes>
Media Error: 0 Device Not Ready: 0 No Device: 0 Recoverable: 0
Illegal Request: 0 Predictive Failure Analysis: 0
#
```

11. **Check your system Product Notes and the SunSolve Online Web site for the latest information, driver updates, and Free Info Docs for the system.**

12. **Check the system's recent service history.**

    A system that has had several recent Fatal Reset errors and subsequent FRU replacements should be monitored closely to determine whether the recently replaced parts were, in fact, not faulty, and whether the actual faulty hardware has gone undetected.

How to Troubleshoot a System That Does Not Boot

A system might be unable to boot due to hardware or software problems. If you suspect that the system is unable to boot for software reasons, refer to "Troubleshooting Miscellaneous Software Problems" in the *Solaris System Administration Guide: Advanced Administration*. If you suspect the system is unable to boot due to a hardware problem, use the following procedure to determine the possible causes.

Before You Begin

Log in to the system controller and access the `sc>` prompt. For information, see:

- "About the `sc>` Prompt" on page 169

This procedure assumes that the system console is in its default configuration, so that you are able to switch between the system controller and the system console. See:

- "About Communicating With the System" on page 164
- "Access Through the Network Management Port" on page 168

What to Do

1. **Examine the ALOM event log. Type:**

```
sc> showlogs
```

The ALOM event log shows system events such as reset events and LED indicator state changes that have occurred since the last system boot. To identify problems, examine the output for Service Required LEDs that are ON. CODE EXAMPLE 7-31 shows a sample event log, which indicates that the front panel Service Required LED is ON.

CODE EXAMPLE 7-31 `showlogs` Command Output

```
MAY 09 16:54:27 Sun-SFV440-a: 00060003: "SC System booted."
MAY 09 16:54:27 Sun-SFV440-a: 00040029: "Host system has shut down."
MAY 09 16:56:35 Sun-SFV440-a: 00060000: "SC Login: User admin Logged on."
MAY 09 16:56:54 Sun-SFV440-a: 00060000: "SC Login: User admin Logged on."
MAY 09 16:58:11 Sun-SFV440-a: 00040001: "SC Request to Power On Host."
MAY 09 16:58:11 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 16:58:13 Sun-SFV440-a: 0004000b: "Host System has read and cleared
                                         bootmode."
MAY 09 16:58:13 Sun-SFV440-a: 0004004f: "Indicator PS0.POK is now ON"
MAY 09 16:58:13 Sun-SFV440-a: 0004004f: "Indicator PS1.POK is now ON"
MAY 09 16:59:19 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:00:46 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:01:51 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.SERVICE is now ON"
MAY 09 17:03:22 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:03:22 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.SERVICE is now OFF"
MAY 09 17:03:24 Sun-SFV440-a: 0004000b: "Host System has read and cleared
                                         bootmode."
MAY 09 17:04:30 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:05:59 Sun-SFV440-a: 00040002: "Host System has Reset"
MAY 09 17:06:40 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.SERVICE is now ON"
MAY 09 17:07:44 Sun-SFV440-a: 0004004f: "Indicator SYS_FRONT.ACT is now ON"
sc>
```

2. **Examine the ALOM run log. Type:**

```
sc> consolehistory run -v
```

This command shows the log containing the most recent system console output of boot messages from the Solaris operating environment. When troubleshooting, examine the output for hardware or software errors logged by the operating environment on the system console. CODE EXAMPLE 7-32 shows sample output from the `consolehistory run -v` command.

CODE EXAMPLE 7-32 `consolehistory run -v` Command Output

```
May  9 14:48:22 Sun-SFV440-a rmclomv: SC Login: User admin Logged on.

#
# init 0
#
INIT: New run level: 0
The system is coming down.  Please wait.
System services are now being stopped.
Print services stopped.
May  9 14:49:18 Sun-SFV440-a last message repeated 1 time
```

```
May  9 14:49:38 Sun-SFV440-a syslogd: going down on signal 15

The system is down.
syncing file systems... done
Program terminated
{1} ok boot disk

Sun Fire V440, No Keyboard
Copyright 1998-2003 Sun Microsystems, Inc.  All rights reserved.
OpenBoot 4.10.3, 4096 MB memory installed, Serial #53005571.
Ethernet address 0:3:ba:28:cd:3, Host ID: 8328cd03.

Initializing     1MB of memory at addr         123fecc000 -

Initializing     1MB of memory at addr         123fe02000 -

Initializing    14MB of memory at addr         123f002000 -

Initializing    16MB of memory at addr         123e002000 -

Initializing   992MB of memory at addr         1200000000 -

Initializing  1024MB of memory at addr         1000000000 -

Initializing  1024MB of memory at addr          200000000 -

Initializing  1024MB of memory at addr                  0 -

Rebooting with command: boot disk
Boot device: /pci@1f,700000/scsi@2/disk@0,0  File and args:
\
SunOS Release 5.8 Version Generic_114696-04 64-bit
Copyright 1983-2003 Sun Microsystems, Inc.  All rights reserved.
Hardware watchdog enabled
Indicator SYS_FRONT.ACT is now ON
configuring IPv4 interfaces: ce0.
Hostname: Sun-SFV440-a
The system is coming up.  Please wait.
NIS domainname is Ecd.East.Sun.COM
Starting IPv4 router discovery.
starting rpc services: rpcbind keyserv ypbind done.
Setting netmask of lo0 to 255.0.0.0
Setting netmask of ce0 to 255.255.255.0
Setting default IPv4 interface for multicast: add net 224.0/4: gateway Sun-
SFV440-a
syslog service starting.
Print services started.
```

```
volume management starting.
The system is ready.

Sun-SFV440-a console login: May  9 14:52:57 Sun-SFV440-a rmclomv: NOTICE:
keyswitch change event - state = UNKNOWN

May  9 14:52:57 Sun-SFV440-a rmclomv: Keyswitch Position has changed to Unknown
state.

May  9 14:52:58 Sun-SFV440-a rmclomv: NOTICE: keyswitch change event - state =
LOCKED

May  9 14:52:58 Sun-SFV440-a rmclomv: KeySwitch Position has changed to Locked
State.

May  9 14:53:00 Sun-SFV440-a rmclomv: NOTICE: keyswitch change event - state =
NORMAL

May  9 14:53:01 Sun-SFV440-a rmclomv: KeySwitch Position has changed to On State.

sc>
```

Note – Time stamps for ALOM logs reflect UTC (Universal Time Coordinated) time, while time stamps for the Solaris operating environment reflect local (server) time. Therefore, a single event might generate messages that appear to be logged at different times in different logs.

Note – The ALOM system controller runs independently from the system and uses standby power from the server. Therefore, ALOM firmware and software continue to function when power to the machine is turned off.

3. **Examine the ALOM boot log. Type:**

```
sc> consolehistory boot -v
```

The ALOM boot log contains boot messages from POST, OpenBoot firmware, and the Solaris software from the server's most recent reset. When examining the output to identify a problem, check for error messages from POST and OpenBoot Diagnostics tests.

CODE EXAMPLE 7-33 shows the boot messages from POST. Note that POST returned no error messages. See "What POST Error Messages Tell You" on page 11 for a sample POST error message and more information about POST error messages.

CODE EXAMPLE 7-33 `consolehistory boot -v` Command Output (Boot Messages From POST)

```
Keyswitch set to diagnostic position.
@(#)OBP 4.10.3 2003/05/02 20:25 Sun Fire V440
Clearing TLBs
Power-On Reset
Executing Power On SelfTest

0>@(#) Sun Fire[TM] V440 POST 4.10.3 2003/05/04 22:08
        /export/work/staff/firmware_re/post/post-build-
4.10.3/Fiesta/chalupa/integrated  (firmware_re)
0>Hard Powerup RST thru SW
0>CPUs present in system: 0 1
0>OBP->POST Call with %o0=00000000.01012000.
0>Diag level set to MIN.
0>MFG scrpt mode set NORM
0>I/O port set to TTYA.
0>
0>Start selftest...
1>Print Mem Config
1>Caches : Icache is ON, Dcache is ON, Wcache is ON, Pcache is ON.
1>Memory interleave set to 0
1>      Bank 0 1024MB : 00000010.00000000 -> 00000010.40000000.
1>      Bank 2 1024MB : 00000012.00000000 -> 00000012.40000000.
0>Print Mem Config
0>Caches : Icache is ON, Dcache is ON, Wcache is ON, Pcache is ON.
0>Memory interleave set to 0
0>      Bank 0 1024MB : 00000000.00000000 -> 00000000.40000000.
0>      Bank 2 1024MB : 00000002.00000000 -> 00000002.40000000.
0>INFO:
0>      POST Passed all devices.
0>
0>POST: Return to OBP.
```

4. **Turn the system control keyswitch to the Diagnostics position.**

5. **Power on the system.**

   If the system does not boot, the system might have a basic hardware problem. If you have not made any recent hardware changes to the system, contact your authorized service provider.

6. **If the system gets to the `ok` prompt but does not load the operating environment, you might need to change the `boot-device` setting in the system firmware.**

   See "How to Use OpenBoot Information Commands" on page 94 for information about using the `probe` commands. You can use the `probe` commands to display information about active SCSI and IDE devices.

   For information on changing the default boot device, see the *Solaris System Administration Guide: Basic Administration.*

   a. **Try to load the operating environment for a single user from a CD.**

      Place a valid Solaris operating environment CD into the system DVD–ROM or CD–ROM drive and enter `boot cdrom -s` from the `ok` prompt.

   b. **If the system boots from the CD and loads the operating environment, check the following:**

   ■ If the system normally boots from a system hard disk, check the system disk for problems and a valid boot image.
   ■ If the system normally boots from the network, check the system network configuration, the system Ethernet cables, and the system network card.

   c. **If the system gets to the `ok` prompt but does not load the operating environment from the CD, check the following:**

   ■ OpenBoot variable settings (`boot-device`, `diag-device`, and `auto-boot?`).
   ■ OpenBoot PROM device tree. See "`show-devs` Command" on page 23 for more information.
   ■ That the banner was displayed before the `ok` prompt.
   ■ Any diagnostic test failure or other hardware failure message before the `ok` prompt was displayed.

How to Troubleshoot a System That Is Hanging

Before You Begin

This procedure assumes that the system console is in its default configuration, so that you are able to switch between the system controller and the system console. See:

- "About Communicating With the System" on page 164
- "Access Through the Network Management Port" on page 168

What to Do

1. **Verify that the system is hanging.**

   a. **Type the** `ping` **command to determine whether there is any network activity.**

   b. **Type the** `ps -ef` **command to determine whether any other user sessions are active or responding.**

   If another user session is active, use it to review the contents of the `/var/adm/messages` file for any indications of the system problem.

   c. **Try to access the system console through the ALOM system controller.**

   If you can establish a working system console connection, the problem might not be a true hang but might instead be a network-related problem. For suspected network problems, use the `ping`, `rlogin`, or `telnet` commands to reach another system that is on the same sub-network, hub, or router. If NFS services are served by the affected system, determine whether NFS activity is present on other systems.

   d. **Change the system control keyswitch position while observing the system console.**

   For example, turn the keyswitch from the Normal position to the Diagnostics position, or from the Locked position to the Normal position. If the system console logs the change of keyswitch position, the system is not fully hung.

2. **If there are no responding user sessions, record the state of the system LEDs.**

   The system LEDs might indicate a hardware failure in the system. You can use the ALOM system controller to check the state of the system LEDs. Refer to the *Sun Fire V440 Server Administration Guide* for more information about system LEDs.

3. **Attempt to bring the system to the** `ok` **prompt.**

   For instructions, see "How to Get to the `ok` Prompt" on page 176.

   If the system can get to the `ok` prompt, then the system hang can be classified as a soft hang. Otherwise, the system hang can be classified as a hard hang. See "Responding to System Hang States" on page 123 for more information.

4. **If the preceding step failed to bring the system to the** `ok` **prompt, execute an externally initiated reset (XIR).**

   Executing an XIR resets the system and preserves the state of the system before it resets, so that indications and messages about transient errors might be saved.

   An XIR is the equivalent of issuing a direct hardware reset. For further information about XIR, see "Externally Initiated Reset (XIR)" on page 173.

5. **If an XIR brings the system to the** `ok` **prompt, do the following.**

   a. **Issue the** `printenv` **command.**

      This command displays the settings of the OpenBoot configuration variables.

   b. **Set the** `auto-boot?` **variable to** `true`**, the** `diag-switch?` **variable to** `true`**, the** `diag-level` **variable to** `max`**, and the** `post-trigger` **and** `obdiag-trigger` **variables to** `all-resets`**.**

   c. **Issue the** `sync` **command to obtain a core dump file.**

      Core dump files provide invaluable information to your support provider to aid in diagnosing any system problems. For further information about core dump files, see "About the Core Dump Process" on page 113 and "Managing System Crash Information" in the *Solaris System Administration Guide*, which is part of the Solaris System Administrator Collection.

      The system reboots automatically provided that the OpenBoot configuration `auto-boot?` variable is set to `true` (default value).

Note – Steps 3, 4, and 5 occur automatically when the hardware watchdog mechanism is enabled.

---

6. **If an XIR failed to bring the system to the** `ok` **prompt, follow these steps:**

   a. **Turn the system control keyswitch to the Diagnostics position.**

      This forces the system to run POST and OpenBoot Diagnostics tests during system startup.

b. Press the system Power button for five seconds.

This causes an immediate hardware shutdown.

c. Wait at least 30 seconds; then power on the system by pressing the Power button.

Note – You can also use the ALOM system controller to set the POST and OpenBoot Diagnostics levels, and to power off and reboot the system. See the *Sun Advanced Lights Out Manager (ALOM) Online Help*.

---

7. Use the POST and OpenBoot Diagnostics tests to diagnose system problems.

When the system initiates the startup sequence, it will run POST and OpenBoot Diagnostics tests. See "How to Isolate Faults Using POST Diagnostics" on page 65 and "How to Isolate Faults Using Interactive OpenBoot Diagnostics Tests" on page 67.

8. Review the contents of the `/var/adm/messages` **file.**

Look for the following information about the system's state:

- Any large gaps in the time stamp of Solaris software or application messages
- Warning messages about any hardware or software components
- Information from last root logins to determine whether any system administrators might be able to provide any information about the system state at the time of the hang

9. If possible, check whether the system saved a core dump file.

Core dump files provide invaluable information to your support provider to aid in diagnosing any system problems. For further information about core dump files, see "About the Core Dump Process" on page 113 and "Managing System Crash Information" in the *Solaris System Administration Guide*, which is part of the Solaris System Administrator Collection.

Configuring the System Console

This appendix explains what the system console is, describes the different ways of configuring it on a Sun Fire V440 server, and helps you to understand its relation to the system controller.

Tasks covered in this chapter include:

- "How to Get to the `ok` Prompt" on page 176
- "How to Use the Serial Management Port" on page 178
- "How to Activate the Network Management Port" on page 179
- "How to Access the System Console via a Terminal Server" on page 181
- "How to Access the System Console via `tip` Connection" on page 184
- "How to Modify the `/etc/remote` File" on page 187
- "How to Verify Serial Port Settings on `ttyb`" on page 191
- "How to Access the System Console via an Alphanumeric Terminal" on page 189
- "How to Access the System Console via a Local Graphics Monitor" on page 192

Other information in this appendix includes:

- "About Communicating With the System" on page 164
- "About the `sc>` Prompt" on page 169
- "About the `ok` Prompt" on page 171
- "About Switching Between the ALOM System Controller and the System Console" on page 175
- "Reference for System Console OpenBoot Configuration Variable Settings" on page 196

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 A-1 for a summary.

TABLE A-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 the following: • "How to Use the Serial Management Port" on page 178 • "How to Access the System Console via a Terminal Server" on page 181 • "How to Verify Serial Port Settings on `ttyb`" on page 191 • "Reference for System Console OpenBoot Configuration Variable Settings" on page 196	✓	✓
An alphanumeric terminal or similar device attached to the serial management port (SERIAL MGT) port or `ttyb`. See the following: • "How to Use the Serial Management Port" on page 178 • "How to Access the System Console via an Alphanumeric Terminal" on page 189 • "How to Verify Serial Port Settings on `ttyb`" on page 191 • "Reference for System Console OpenBoot Configuration Variable Settings" on page 196	✓	✓

Devices Available for Accessing the System Console	During Installation[*]	After Installation
A `tip` line attached to the serial management port (SERIAL MGT) or `ttyb`. See the following: • "How to Use the Serial Management Port" on page 178 • "How to Access the System Console via `tip` Connection" on page 184 • "How to Modify the `/etc/remote` File" on page 187 • "How to Verify Serial Port Settings on `ttyb`" on page 191 • "Reference for System Console OpenBoot Configuration Variable Settings" on page 196	✓	✓
An Ethernet line connected to the network management port (NET MGT). See the following: • "How to Activate the Network Management Port" on page 179		✓
A local graphics monitor (frame buffer card, graphics monitor, mouse, etc.). See the following: • "How to Access the System Console via a Local Graphics Monitor" on page 192 • "Reference for System Console OpenBoot Configuration Variable Settings" on page 196.		✓

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

What the System Console Does

The system console displays status and error messages generated by firmware-based tests during system startup. After those tests have been run, you can enter special commands that affect the firmware and alter system behavior. For more information about tests that run during the boot process, see "About Diagnostics and the Boot Process" on page 8.

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

Using the System Console

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

You also have to ensure that the system console is directed to the appropriate port on the Sun Fire V440 server's back panel—generally, the one to which your hardware console device is attached. (See FIGURE A-1.) You do this by setting the input-device and output-device OpenBoot configuration variables.
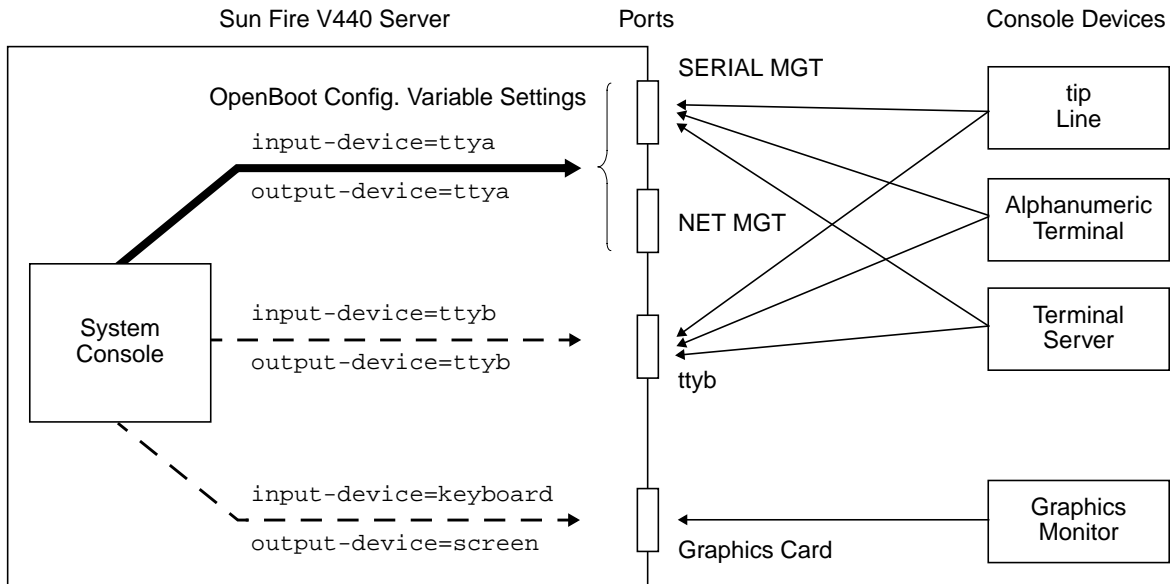
FIGURE A-1   Directing the System Console to Different Ports and Different Devices

The following sections provide background information and references to instructions appropriate for the particular device you choose to access the system console. Instructions for attaching and configuring hardware to access the system console are given later in this appendix.

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

On Sun Fire V440 servers, the system console comes preconfigured to allow input and output only by means of hardware devices connected to the serial or network management ports. However, because the network management port is not available until you assign it an IP address, your first connection must be to the serial management port.

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.

Serial management port ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

Network management port ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

Serial port (ttyb)
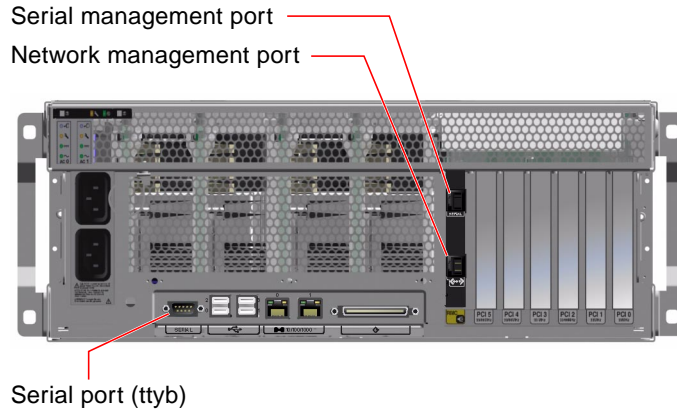
FIGURE A-2 Ports for Connecting Devices to the System Console

Using a `tip` line might be preferable to connecting an alphanumeric terminal, since `tip` lets you use windowing and operating system features on the machine being used to connect to the Sun Fire V440 server.

Although the Solaris operating environment 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 V440. The Solaris operating environment sees this port as `ttyb`.

For instructions on accessing the system console through a terminal server, see "How to Access the System Console via a Terminal Server" on page 181

For instructions on accessing the system console through an alphanumeric terminal, see "How to Use the Serial Management Port" on page 178.

For instructions on accessing the system console via a `tip` line, see "How to Access the System Console via `tip` Connection" on page 184.

Access Through the Network Management Port

Once you have assigned an IP address to the network management port, you can connect an Ethernet-capable device and access the system console through your network. This provides for remote monitoring and control. In addition, up to four simultaneous connections to the system controller `sc>` prompt are available through the network management port. For instructions on setting up the network management port, see "How to Activate the Network Management Port" on page 179.

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

- "About the `sc>` Prompt" on page 169
- "About the `ok` Prompt" on page 171

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.

The chief advantage of setting up the system console in this way 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 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 and network management ports allow 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 and network management ports allow you to switch between viewing system console and system controller output on the same device by typing a simple escape sequence or commands. The escape sequence and commands will not work if the system console is redirected to `ttyb` or to a graphic 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 196.

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

Accessing the System Console Through a Graphics Monitor

The Sun Fire V440 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 "How to Access the System Console via a Local Graphics Monitor" on page 192.

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 V440 server and regardless of system power state. When you connect a Sun Fire V440 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 V440 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 and network management ports. For more information, see the following:

■ "How to Get to the `ok` Prompt" on page 176

■ "About Switching Between the ALOM System Controller and the System Console" on page 175

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 at a time can access the system console, and then only if the system console is configured to be accessible through the serial and network management ports. For more information, see

■ "How to Use the Serial Management Port" on page 178
■ "How to Activate the Network Management Port" on page 179

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 and network management ports, you can type the ALOM system controller escape sequence (**#.**).

- You can log in directly to the ALOM system controller from a device connected to the serial management port. See "How to Use the Serial Management Port" on page 178.

- You can log in directly to the ALOM system controller using a connection through the network management port. See "How to Activate the Network Management Port" on page 179.

About the `ok` Prompt

A Sun Fire V440 server with the Solaris operating environment 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 V440 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 V440 system 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 comes up under OpenBoot firmware control before the operating environment is installed.

- The system boots to the `ok` prompt when the `auto-boot?` OpenBoot configuration variable is set to `false`.

- The system transitions to run level 0 in an orderly way when the operating environment is halted.

- The system reverts to OpenBoot firmware control when the operating environment crashes.

- During the boot process, when there is a serious hardware problem that prevents the operating environment from running, the system reverts to OpenBoot firmware control.

- When a serious hardware problem develops while the system is running, the operating environment transitions smoothly to run level 0.

- You deliberately place the system under firmware control in order to execute firmware-based commands or to run diagnostic tests.

It is the last of these scenarios 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 "Ways of Reaching the ok Prompt" on page 172. For detailed instructions, see "How to Get to the ok Prompt" on page 176.

Ways of Reaching the ok Prompt

There are several ways to get to 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 of the Solaris operating environment
- ALOM system controller break or console command
- L1-A (Stop-A) keys or Break key
- Externally initiated reset (XIR)
- Manual system reset

A discussion of each method follows. For instructions, see "How to Get to the ok Prompt" on page 176.

Graceful Shutdown

The preferred method of reaching the ok prompt is to shut down the operating environment 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 operating environment 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 the *Sun Fire V440 Server Administration Guide*.

ALOM System Controller break or console Command

Typing break from the sc> prompt forces a running Sun Fire V440 system to drop into OpenBoot firmware control. If the operating system is already shut down, you can use the console command instead of break to reach the ok prompt.

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

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

When it is impossible or impractical to shut down the system gracefully, you can get to the `ok` prompt by typing the L1-A (Stop-A) key sequence from a Sun keyboard, or, if you have an alphanumeric terminal attached to the Sun Fire V440 server, by pressing the Break key.

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 196.

If you use these methods to reach the `ok` prompt, be aware that issuing certain OpenBoot commands (like `probe-scsi`, `probe-scsi-all`, or `probe-ide`) might hang the system.

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 about the `reset -x` command, see the *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 `poweroff` and `poweron` commands to reset the server. Reaching the `ok` prompt by performing a manual system reset or by power-cycling the system should be the method of last resort.

Doing this results in the loss of all system coherence and state information. A manual system reset could corrupt the server's file systems, although the fsck command usually restores them. Use this method only when nothing else works.

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

Important: Accessing the ok Prompt Suspends the Solaris Operating Environment

It is important to understand that when you access the ok prompt from a functioning Sun Fire V440 server, you are suspending the Solaris operating environment and placing the system under firmware control. Any processes that were running under the operating environment are also suspended, and *the state of such processes might not be recoverable.*

The diagnostic tests and commands you run from the ok prompt have the potential to affect the state of the system. This means that it is not always possible to resume execution of the operating environment from the point at which it was suspended. Although the go command will resume execution in most circumstances, in general, each time you drop the system down to the ok prompt, you should expect to have to reboot the system to get back to the operating environment.

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

For More Information

For more information about the OpenBoot firmware, 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 V440 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 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" (see FIGURE A-3).
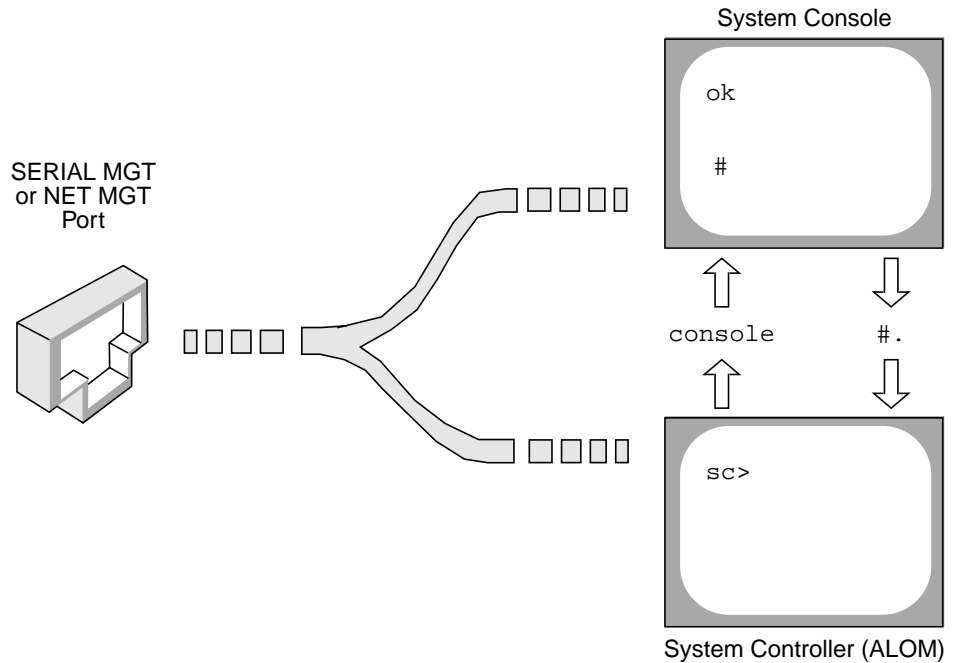
FIGURE A-3   Separate System Console and System Controller "Channels"

If the system console is configured to be accessible from the serial 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 operating environment 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 you are at the ALOM system controller.

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

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

For more information, see the following:
- "About Communicating With the System" on page 164
- "About the sc> Prompt" on page 169
- "About the ok Prompt" on page 171
- "How to Use the Serial Management Port" on page 178
- *Sun Advanced Lights Out Manager (ALOM) Online Help*

How to Get to the ok Prompt

Before You Begin

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 171

Note – Dropping the Sun Fire V440 server to the ok prompt suspends all application and operating system software. After you issue firmware commands and run firmware-based tests from the ok prompt, the system might not be able to resume where it left off.

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

What to Do

1. **Decide which method you need to use to reach the `ok` prompt.**

    See "About the `ok` Prompt" on page 171 for details.

2. **Refer to** TABLE A-2 **for instructions.**

    TABLE A-2   Ways of Accessing the `ok` Prompt

Access Method	What to Do
Graceful shutdown of the Solaris operating environment	• From a shell or command tool window, issue an appropriate command (for example, the `shutdown` or `init` command) as described in Solaris system administration documentation.
ALOM system controller `break` or `console` command	• From the `sc>` prompt, type the ALOM `break` command. The `console` command also works, provided the operating environment software is not running and the server is already under OpenBoot firmware control.
L1-A (Stop-A) keys or Break key	• From a Sun keyboard connected directly to the Sun Fire V440 server, press the Stop and A keys simultaneously.[*] *–or–* • From a connected alphanumeric terminal, press the Break key.
Externally initiated reset (XIR)	• From the `sc>` prompt, type the `reset -x` command.
Manual system reset	• From the `sc>` prompt, type the `reset` command or the `poweroff` and `poweron` commands.

* Requires that the `input-device` OpenBoot configuration variable be set to `keyboard`. For more information, see "How to Access the System Console via a Local Graphics Monitor" on page 192 and "Reference for System Console OpenBoot Configuration Variable Settings" on page 196.

How to Use 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, see:

- "Monitoring the System Using Sun Advanced Lights Out Manager" on page 35
- "How to Monitor the System Using Sun Advanced Lights Out Manager" on page 79
- *Sun Advanced Lights Out Manager (ALOM) Online Help*

Before You Begin

Make sure that your connecting device is set to the following parameters:

- 9600 baud
- 8 bits
- No parity
- 1 stop bit
- No handshaking

What to Do

1. **Establish an ALOM system controller session.**

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

2. **At the ALOM system controller 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.**

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

What Next

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

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

How to Activate the Network Management Port

Before You Begin

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.

Note – The IP address assigned to the network management port is a unique IP address, separate from the main Sun Fire V440 server IP address.

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 and is dedicated for use only with the ALOM system controller. The network management port does not support connections to 100-Mbps or 1-Gbps networks.

What to Do

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 "How to Use the Serial Management Port" on page 178.

3. **Type one of the following commands:**

   ■ **If your network uses static IP addresses, type:**

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

   You can also use the setupsc command.

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

   ```
   sc> setsc netsc_dhcp
   ```

4. **To verify the network settings, type:**

   ```
   sc> shownetwork
   ```

5. **Log out of the ALOM system controller session.**

What Next

To connect to the system console through the network management port, use the telnet command to the IP address you specified in Step 3 of the preceding procedure.

How to Access the System Console via a Terminal Server

Before You Begin

The following procedure assumes that you are accessing the Sun Fire V440 server system console by connecting a terminal server to the serial management port (SERIAL MGT) of the Sun Fire V440 server.

What to Do

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

   The serial management port on the Sun Fire V440 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 V440 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 V440 server. See "How to Use the Serial Management Port" on page 178.
   - 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.
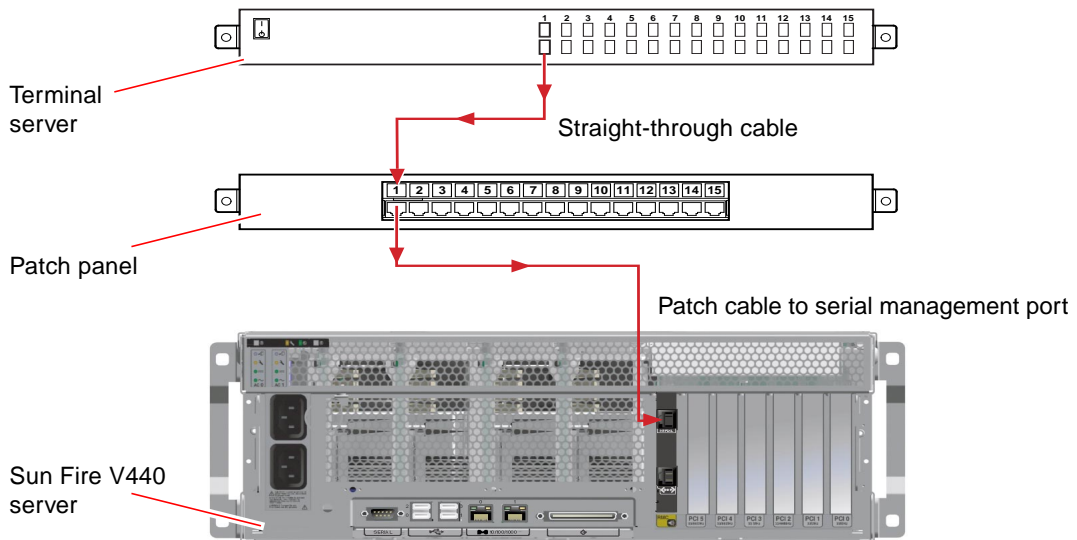
FIGURE A-4 Patch Panel Connection Between a Terminal Server and a Sun Fire V440 Server

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 V440 server serial port to the corresponding pin in the terminal server's serial port.

TABLE A-3 shows the crossovers that the cable must perform.

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

Sun Fire V440 Serial Port (RJ-45 Connector) Pin	Terminal Server Serial Port Pin
Pin 1 (RTS)	Pin 1 (CTS)
Pin 2 (DTR)	Pin 2 (DSR)
Pin 3 (TXD)	Pin 3 (RXD)
Pin 4 (Signal Ground)	Pin 4 (Signal Ground)
Pin 5 (Signal Ground)	Pin 5 (Signal Ground)
Pin 6 (RXD)	Pin 6 (TXD)
Pin 7 (DSR /DCD)	Pin 7 (DTR)
Pin 8 (CTS)	Pin 8 (RTS)

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

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

For example, for a Sun Fire V440 server connected to port 10000 on a terminal server whose IP address is 192.20.30.10, you would type:

```
% telnet 192.20.30.10 10000
```

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

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

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

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

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

Note – There are many other OpenBoot configuration variables. Although these variables do not affect which hardware device is used to access the system console, some of them affect which diagnostic tests the system runs and which messages the system displays at its console. For details, see "Controlling POST Diagnostics" on page 13.

---

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

    ```
    ok power-off
    ```

    The system permanently stores the parameter changes and powers off.

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

---

    c. **Connect the null modem serial cable to the** `ttyb` **port on the Sun Fire V440 server.**

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

d. Power on the system.

See the *Sun Fire V440 Server Administration Guide* 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 console settings back to use the serial and network management ports, see the following:

■ "Reference for System Console OpenBoot Configuration Variable Settings" on page 196

How to Access the System Console via `tip` Connection

Before You Begin

This procedure assumes that you are accessing the Sun Fire V440 server system console by connecting the serial port of another Sun system to the serial management port (SERIAL MGT) of the Sun Fire V440 server.

What to Do

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

The cable and adapter connect between another Sun system's serial port and the serial management port on the back panel of the Sun Fire V440 server. Pinouts, part numbers, and other details about the serial cable and adapter are provided in the *Sun Fire V440 Server Parts Installation and Removal Guide*. See FIGURE A-5.

Serial management port   Serial port

tip connection   Another Sun system
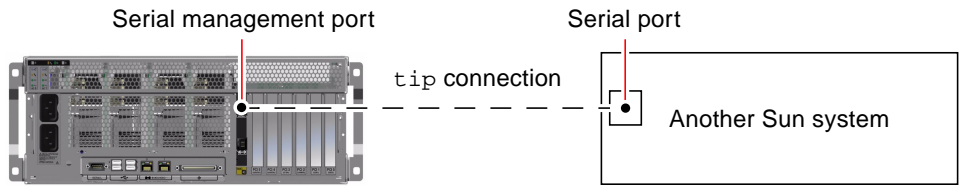
FIGURE A-5   A `tip` Connection Between a Sun Fire V440 Server and Another Sun System

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

   Most releases of Solaris operating environment 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 operating environment software, or if the `/etc/remote` file has been modified, you might need to edit it. See "How to Modify the `/etc/remote` File" on page 187 for details.

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

```
% tip hardwire
```

   The Sun system responds by displaying:

```
connected
```

   The shell tool is now a `tip` window directed to the Sun Fire V440 server via the Sun system's serial port. This connection is established and maintained even when the Sun Fire V440 server is completely powered off or just starting up.

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

---

4. *If you want to use `ttyb` instead of the serial management port*, **do the following:**

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

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

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

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

Note – There are many other OpenBoot configuration variables. Although these variables do not affect which hardware device is used to access the system console, some of them affect which diagnostic tests the system runs and which messages the system displays at its console. For details, see "Controlling POST Diagnostics" on page 13.

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

```
ok power-off
```

The system permanently stores the parameter changes and powers off.

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

c. Connect the null modem serial cable to the ttyb port on the Sun Fire V440 server.

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

d. Power on the system.

See the *Sun Fire V440 Server Administration Guide* for power-on procedures.

What Next

Continue with your installation or diagnostic test session as appropriate. When you are finished using the tip window, end your tip session by typing ~ . (tilde 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 the following:

■ "Reference for System Console OpenBoot Configuration Variable Settings" on page 196

How to Modify the `/etc/remote` File

This procedure might be necessary if you are accessing the Sun Fire V440 server using a `tip` connection from a Sun system running an older version of the Solaris operating environment 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.

Before You Begin

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 V440 server.

What to Do

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

```
# uname -r
```

The system responds with a release number.

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

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

   The server 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.

   CODE EXAMPLE A-1 Entry for `hardwire` in `/etc/remote` File (Recent System Software)

```
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.

CODE EXAMPLE A-2   Entry for hardwire in /etc/remote File (Older System Software)

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

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

What Next

The /etc/remote file is now properly configured. Continue establishing a tip connection to the Sun Fire V440 server's system console. See:

■ "How to Access the System Console via tip Connection" on page 184

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 196

How to Access the System Console via an Alphanumeric Terminal

Before You Begin

This procedure assumes that you are accessing the Sun Fire V440 server system console by connecting the serial port of an alphanumeric terminal to the serial management port (SERIAL MGT) of the Sun Fire V440 server.

What to Do

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

   Use an RJ-45 null modem serial cable or an RJ-45 serial cable and null modem adapter. Plug in this cable to the terminal's serial port connector.

2. **Attach the opposite end of the serial cable to the serial management port on the Sun Fire V440 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.

5. *If you want to use `ttyb` instead of the serial management port*, **do the following:**

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

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

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

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

Note – There are many other OpenBoot configuration variables. Although these variables do not affect which hardware device is used to access the system console, some of them affect which diagnostic tests the system runs and which messages the system displays at its console. For details, see "Controlling POST Diagnostics" on page 13.

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

```
ok power-off
```

The system permanently stores the parameter changes and powers off.

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

c. Connect the null modem serial cable to the `ttyb` port on the Sun Fire V440 server.

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

d. Power on the system.

See the *Sun Fire V440 Server Administration Guide* for power-on procedures.

What Next

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 the following:

■ "Reference for System Console OpenBoot Configuration Variable Settings" on page 196

How to Verify Serial Port Settings on `ttyb`

This procedure lets you verify the baud rate and other serial port settings used by the Sun Fire V440 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.

Before You Begin

You must be logged in to the Sun Fire V440 server, and the server must be running Solaris operating environment software.

What to Do

1. **Open a shell tool window.**

2. **Type:**

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

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

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

   This line indicates that the Sun Fire V440 server's serial port is configured for:

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

What Next

For more information about serial port settings, see the `eeprom` man page. For instructions on setting OpenBoot configuration variables, see :

- "How to View and Set OpenBoot Configuration Variables" on page 54

How to Access the System Console via a Local Graphics Monitor

Before You Begin

After initial system installation, you can install a local graphics monitor and set it up 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. For detailed information about system console options, see:

- "About Communicating With the System" on page 164

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

What to Do

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 V440 Server Parts Installation and Removal 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.
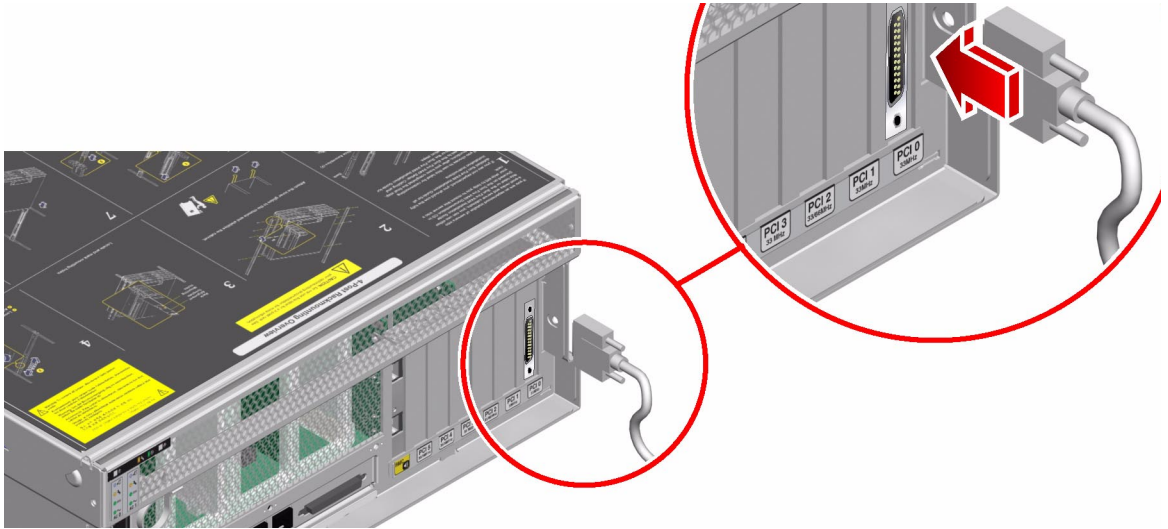
3. Connect the monitor's power cord to an AC outlet.

4. Connect the USB keyboard cable to any USB port on the Sun Fire V440 server back panel.
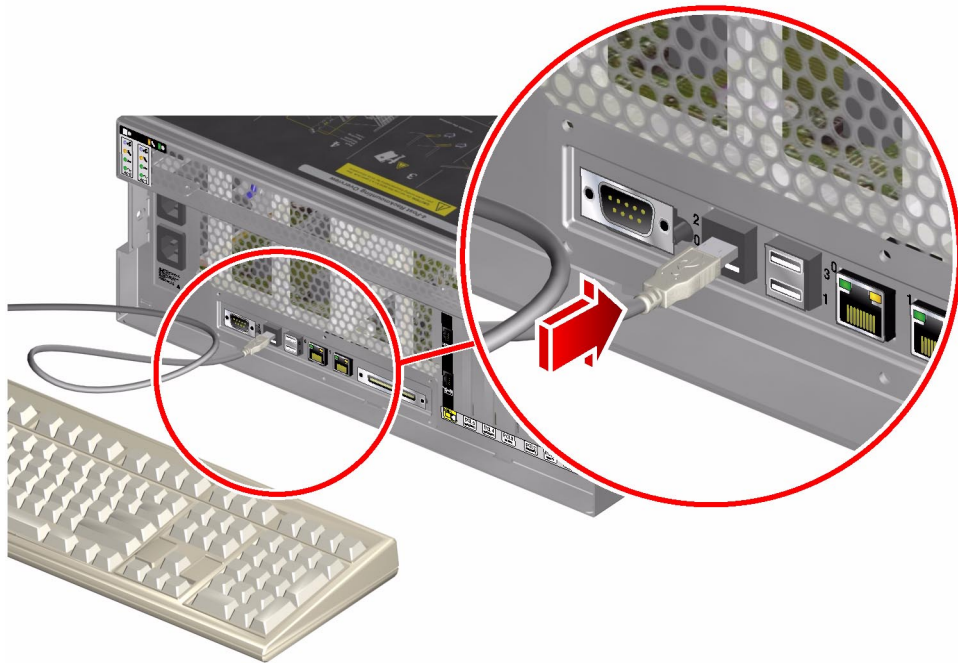
5. **Connect the USB mouse cable to any USB port on the Sun Fire V440 server back panel.**
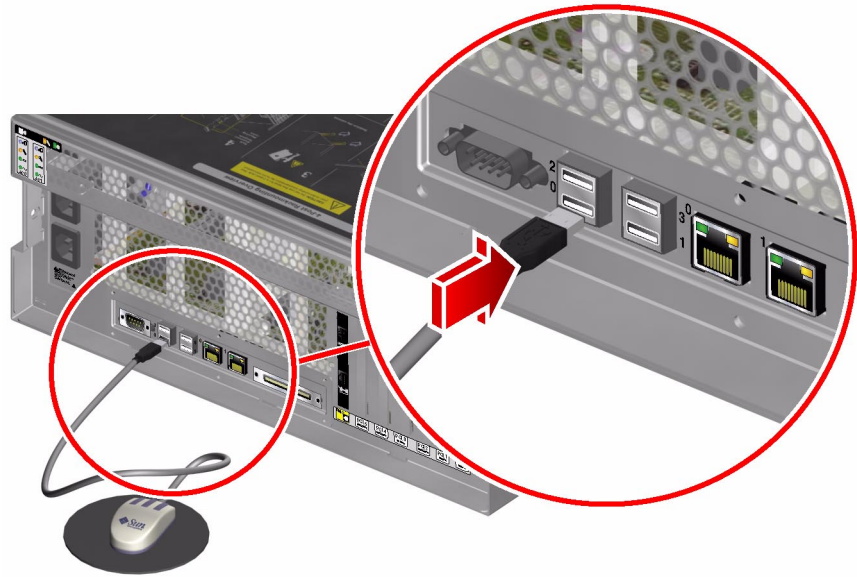
6. **Get to the** ok **prompt.**

   For more information, see "How to Get to the ok Prompt" on page 176.

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. For details, see "Controlling POST Diagnostics" on page 13.

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 front panel Power button.

What Next

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 196

Reference for System Console OpenBoot Configuration Variable Settings

The Sun Fire V440 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 A-4   OpenBoot Configuration Variables That Affect the System Console

OpenBoot Configuration Variable Name	Setting for Sending System Console Output to:		
	Serial and Network Management Ports	Serial Port (`ttyb`)*	Local Graphics Monitor*
`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 represented 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 the *Sun Fire V440 Server Administration Guide* for more information.

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

In addition to the OpenBoot configuration variables described in TABLE A-4, there are other variables that affect and determine system behavior. These variables are discussed in more detail in "Controlling POST Diagnostics" on page 13.

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