



Sun SPARC Enterprise™ T2000 Server Administration Guide

Sun Microsystems, Inc.
www.sun.com

Part No. 819-7990-10
April 2007, Revision A

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Preface

The *SPARC Enterprise T2000 Server System Administration Guide* is for experienced system administrators. The guide includes general descriptive information about the SPARC Enterprise™ T2000 server, and detailed instructions for configuring and administering the server. To use the information in this manual, you must have working knowledge of computer network concepts and terms, and advanced familiarity with the Solaris™ Operating System (Solaris OS).

Note – For information about changing the hardware configuration of your server, or about running diagnostics, see the service manual for your server.

How This Book Is Organized

The *SPARC Enterprise T2000 Server System Administration Guide* is divided into the following chapters:

- Chapter 1 describes the system console and how to access it.
- Chapter 2 describes the tools used to configure system firmware, including system controller environmental monitoring, automatic system recovery (ASR), and multipathing software. In addition, the chapter describes how to unconfigure and reconfigure a device manually.
- Chapter 3 describes redundant array of independent disks (RAID) concepts, and how to configure and manage RAID disk volumes using the your server's onboard serial attached SCSI (SAS) disk controller.

This manual also includes the following reference appendix:

- Appendix A provides a list of all OpenBoot™ configuration variables and a short description of each.

Using UNIX Commands

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

- Software documentation that you received with your system
- Solaris OS documentation

Shell Prompts

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

Typographic Conventions

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

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

Related Documentation

The documents listed as online are available at:

<http://www.sun.com/documentation>

Title	Description	Part Number
<i>Sun SPARC Enterprise T2000 Server Product Notes</i>	Information about the latest product updates and issues	819-7992
<i>Sun SPARC Enterprise T2000 Server Product Overview Guide</i>	Product features	819-7986
<i>Sun SPARC Enterprise T2000 Server Site Planning Guide</i>	Server specifications for site planning	819-7987
<i>Sun SPARC Enterprise T2000 Server Installation Guide</i>	Detailed rackmounting, cabling, power on, and configuring information	819-7988
<i>Advanced Lights Out Manager (ALOM) CMT v1.x User's Guide</i>	How to use the Advanced Lights Out Manager (ALOM) software	Varies based on version
<i>Sun SPARC Enterprise T2000 Server Service Manual</i>	How to run diagnostics to troubleshoot the server, and how to remove and replace parts in the server	819-7989
<i>Sun SPARC Enterprise T2000 Server Safety and Compliance manual</i>	Safety and compliance information about this server	819-7993

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Configuring the System Console

This chapter explains what the system console is, describes the different ways of configuring it on a SPARC Enterprise T2000 server, and helps you understand the system console's relation to the system controller.

- [“Communicating With the System” on page 1](#)
- [“Accessing the System Controller” on page 7](#)
- [“Switching Between the System Controller and the System Console” on page 18](#)
- [“ALOM CMT `sc>` Prompt” on page 19](#)
- [“OpenBoot `ok` Prompt” on page 21](#)
- [“System Console OpenBoot Configuration Variable Settings” on page 26](#)

Note – For information about changing the hardware configuration of your server, or about running diagnostics, see the service manual for your server.

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

TABLE 1-1 Ways of Communicating With the System

Devices Available	During Installation	After Installation	Further Information
A terminal server attached to the serial management port (SER MGT).	X	X	“Accessing the System Controller” on page 7
	X	X	“Accessing the System Console Through a Terminal Server” on page 10
	X	X	“System Console OpenBoot Configuration Variable Settings” on page 26
An alphanumeric terminal or similar device attached to the serial management port (SER MGT).	X	X	“Accessing the System Controller” on page 7
	X	X	“Accessing the System Console Through an Alphanumeric Terminal” on page 15
	X	X	“System Console OpenBoot Configuration Variable Settings” on page 26
A Tip line attached to the serial management port (SER MGT).	X	X	“Accessing the System Controller” on page 7
	X	X	“Accessing the System Console Through a Tip Connection” on page 12
		X	“Modifying the /etc/remote File” on page 13
	X	X	“System Console OpenBoot Configuration Variable Settings” on page 26
An Ethernet line connected to the network management port (NET MGT).			

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

Devices Available	During Installation	After Installation	Further Information
A local graphics monitor (graphics accelerator card, graphics monitor, mouse, and keyboard).		X	“Activating the Network Management Port” on page 8
		X	“Accessing the System Console Through a Local Graphics Monitor” on page 15
		X	“System Console OpenBoot Configuration Variable Settings” on page 26

What the System Console Does

The system console displays status and error messages generated by firmware-based tests during system startup. After those tests run, you can enter special commands that affect the firmware and alter system behavior. For more information about tests that run during the boot process, refer to the service manual for your server.

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

Using the System Console

To use the system console, you need to attach an input/output device to the system. Initially, you might have to configure that hardware, and load and configure appropriate software as well.

You must also ensure that the system console is directed to the appropriate port on the SPARC Enterprise T2000 server's back panel—generally, the one to which your hardware console device is attached (see [FIGURE 1-1](#)). You do this by setting the `input-device` and `output-device` OpenBoot configuration variables.

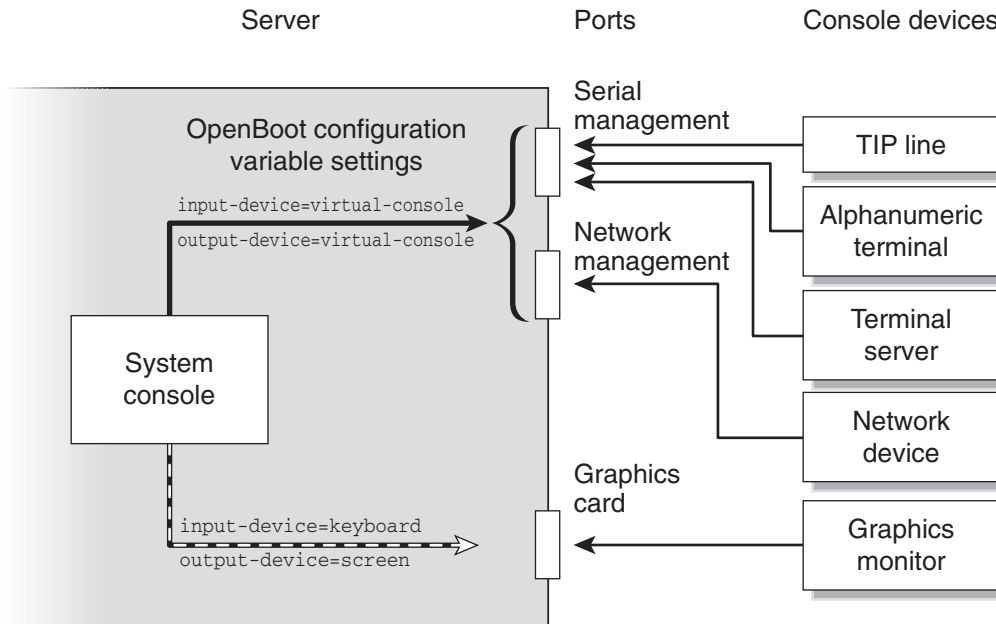


FIGURE 1-1 Directing the System Console

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

On your server, the system console comes preconfigured to allow input and output only by means of the system controller. The system controller must be accessed either through the serial management port (SER MGT) or the network management port (NET MGT). By default, the network management port is configured to retrieve network configuration using DHCP and to allow connections using SSH. You can modify the network management port configuration after connecting to ALOM CMT through either the serial or network management ports.

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

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

These constraints provide for secure access at the installation site.

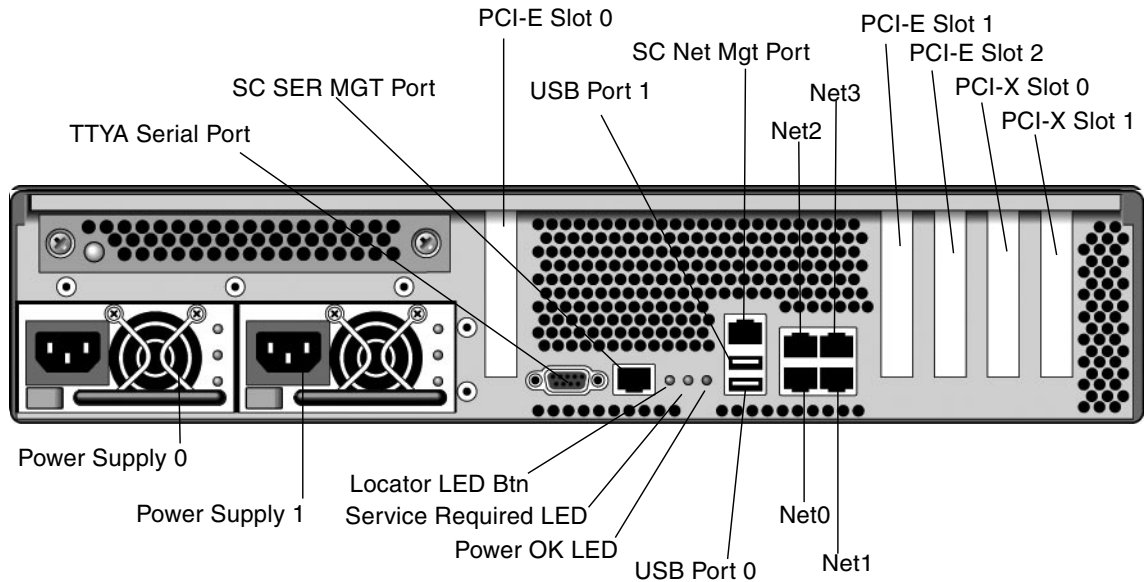


FIGURE 1-2 Rear I/O panel of the chassis—SC Serial Management Port Is The Default Console Connection

Note – USB ports 2 and 3 are located on the front panel

Using a Tip line enables you to use windowing and operating system features on the system making the connection to the SPARC Enterprise T2000 server.

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 standard 9-pin serial port on the back panel of the SPARC Enterprise T2000. The Solaris OS sees this port as `ttya`.

For instructions on accessing the system console through a terminal server, see [“Accessing the System Console Through a Terminal Server”](#) on page 10.

For instructions on accessing the system console through an alphanumeric terminal, see [“Accessing the System Console Through an Alphanumeric Terminal”](#) on page 15.

For instructions on accessing the system console through a Tip line, see [“Accessing the System Console Through a Tip Connection”](#) on page 12.

On your server, the system console comes preconfigured to allow input and output only by means of the system controller. The system controller must be accessed either through the serial management port (SER MGT) or the network management port (NET MGT). By default, the network management port is configured to retrieve network configuration using DHCP and to allow connections using SSH. You can modify the network management port configuration after connecting to ALOM CMT through either the serial or network management ports. For more information, see [“Activating the Network Management Port”](#) on page 8.

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 a graphics card’s port.

For the following reasons, the best practice is to leave the console port in its default configuration:

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

You change the system console configuration by setting OpenBoot configuration variables. See [“System Console OpenBoot Configuration Variable Settings”](#) on page 26.

Accessing the System Console Through a Graphics Monitor

The SPARC Enterprise T2000 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 graphics accelerator card into a PCI slot, and attach a monitor, mouse, and keyboard to the appropriate front or rear USB ports.

After starting the system, you might need to install the correct software driver for the PCI card you have installed. For detailed hardware instructions, see [“Accessing the System Console Through a Local Graphics Monitor”](#) on page 15.

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

Accessing the System Controller

The following sections describe ways of accessing the system controller.

Using the Serial Management Port

This procedure assumes that the system console uses 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, you first access the ALOM CMT system controller and its `sc>` prompt. After connecting to the ALOM CMT system controller, you can switch to the system console.

For more information about the ALOM CMT system controller card, refer to the ALOM CMT guide for your server.

▼ To Use the Serial Management Port

1. **Ensure that the serial port on your connecting device is set to the following parameters:**
 - 9600 baud
 - 8 bits
 - No parity

- 1 stop bit
 - No handshaking
2. **Establish an ALOM CMT session.**
See the ALOM CMT guide for your server for instructions.
 3. **To connect to the system console, at the ALOM CMT command prompt, type:**

```
sc> console
```

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

4. **To switch back to the `sc>` prompt, type the `#.` (Pound-Period) escape sequence.**

```
ok #.
```

Characters are not echoed to the screen.

For instructions on how to use the ALOM CMT system controller, refer to the ALOM CMT guide for your server.

Activating the Network Management Port

The network management port is configured by default to retrieve network settings using DHCP and allow connections using SSH. You may need to modify these settings for your network. If you are unable to use DHCP and SSH on your network, you must connect to the system controller using the serial management port to reconfigure the network management port. See [“Using the Serial Management Port” on page 7](#)

Note – There is no default password when connecting to the system controller for the first time using the serial management port. When connecting to the system controller using the network management port for the first time, the default password is the last 8 digits of the Chassis Serial Number. The Chassis Serial Number can be found printed on the back of the server or in the printed system information sheet which shipped with your server. You must assign a password during initial system configuration. For more information, refer to your server installation guide and the ALOM CMT guide for your server.

You can assign the network management port a static IP address or you can configure the port to obtain an IP address using the Dynamic Host Configuration Protocol (DHCP) from another server. The network management port can be configured to accept connections from Telnet clients or SSH clients, but not both.

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 10/100 BASE-T port. The IP address assigned to the network management port is a unique IP address, separate from the main SPARC Enterprise T2000 server IP address, and is dedicated for use only with the ALOM CMT system controller.

▼ To Activate the Network Management Port

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

For more information about connecting to the serial management port, see [“Accessing the System Controller” on page 7](#).

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-netmask
sc> setsc netsc_ipgateway ip-address
```

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

```
sc> setsc netsc_dhcp true
```

4. **Type one of the following commands:**

- **If you intend to use Secure Shell (SSH) to connect to the system controller:**

```
sc> setsc if_connection ssh
```

- - If you intend to use Telnet to connect to the system controller:

```
sc> setsc if_connection telnet
```

5. Reset the system controller so that the new settings take affect:

```
sc> resetsc
```

6. After the system controller resets, log in to the system controller and issue the `shoynetwork` command to verify network settings:

```
sc> shownetwork
```

To connect through the network management port, use the `telnet` or `ssh` (based on the value you provided in Step 4) commands to the IP address you specified in [Step 3](#) of the preceding procedure.

Accessing the System Console Through a Terminal Server

The following procedure assumes that you are accessing the system console by connecting a terminal server to the serial management port (SER MGT) of the SPARC Enterprise T2000 server.

▼ To Access The System Console Through a Terminal Server

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

The serial management port on the SPARC Enterprise T2000 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 SPARC Enterprise T2000 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 SPARC Enterprise T2000 server. See [“Accessing the System Controller”](#) on page 7.

- Connect a serial interface breakout cable to a patch panel and use the straight-through patch cable (supplied by your server's manufacturer) to connect the patch panel to the server.

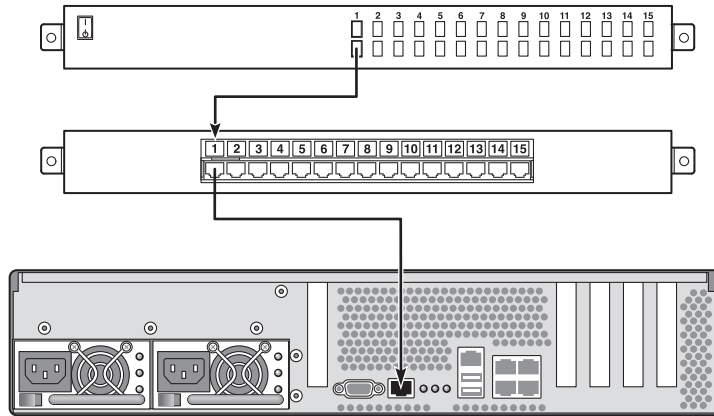


FIGURE 1-3 Patch Panel Connection Between a Terminal Server and a SPARC Enterprise T2000 Server

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 SPARC Enterprise T2000 server serial management port to the corresponding pin in the terminal server's serial port.

[TABLE 1-2](#) shows the crossovers that the cable must perform.

TABLE 1-2 Pin Crossovers for Connecting to a Typical Terminal Server

SPARC Enterprise T2000 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 SPARC Enterprise T2000 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
```

Accessing the System Console Through a Tip Connection

Use this procedure to access the SPARC Enterprise T2000 server system console by connecting the serial management port (SER MGT) to the serial port of another system (FIGURE 1-4).

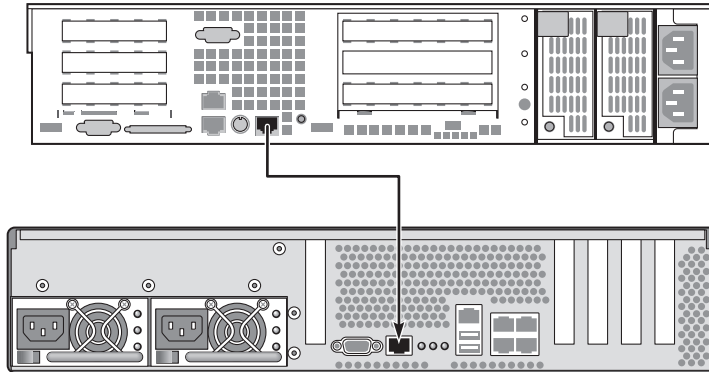


FIGURE 1-4 Tip Connection Between a SPARC Enterprise T2000 Server and Another System

▼ To Access the System Console Through the Tip Connection

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

The cable and adapter connect between another system's serial port (typically TTYB) and the serial management port on the back panel of the SPARC Enterprise T2000 server. Pinouts, part numbers, and other details about the serial cable and adapter are provided in the service manual for your server.

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

Most releases of Solaris OS software shipped since 1992 contain an `/etc/remote` file with the appropriate `hardware` entry. However, if the system is running an older version of Solaris OS software, or if the `/etc/remote` file has been modified, you might need to edit it. See [“Modifying the `/etc/remote` File” on page 13](#) for details.

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

```
% tip hardware
```

The system responds by displaying:

```
connected
```

The shell tool is now a Tip window directed to the SPARC Enterprise T2000 server through the system’s serial port. This connection is established and maintained even when the SPARC Enterprise T2000 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.

Modifying the `/etc/remote` File

This procedure might be necessary if you are accessing the SPARC Enterprise T2000 server using a Tip connection from a system running an older version of the Solaris OS software. You might also need to perform this procedure if the `/etc/remote` file on the system has been altered and no longer contains an appropriate `hardware` entry.

Log in as superuser to the system console of a system that you intend to use to establish a Tip connection to the SPARC Enterprise T2000 server.

▼ To Modify the `/etc/remote` File

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

```
# uname -r
```

The system responds with a release number.

2. Take one of the following actions, depending on the number displayed.

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

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

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

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

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

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

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

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

The `/etc/remote` file is now properly configured. Continue establishing a Tip connection to the SPARC Enterprise T2000 server system console. See [“Accessing the System Console Through a Tip Connection”](#) on page 12.

If you have redirected the system console to TTYB and want to change the system console settings back to use the serial management and network management ports, see [“System Console OpenBoot Configuration Variable Settings”](#) on page 26.

Accessing the System Console Through an Alphanumeric Terminal

Use this procedure when you are accessing the SPARC Enterprise T2000 server system console by connecting the serial port of an alphanumeric terminal to the serial management port (SER MGT) of the SPARC Enterprise T2000 server.

▼ To Access the System Console Through an Alphanumeric Terminal

- 1. Attach one end of the serial cable to the alphanumeric terminal's serial port.**
Use a null modem serial cable or an RJ-45 serial cable and null modem adapter. Connect this cable to the terminal's serial port connector.
- 2. Attach the opposite end of the serial cable to the serial management port on the SPARC Enterprise T2000 server.**
- 3. Connect the alphanumeric terminal's power cord to an AC outlet.**
- 4. Set the alphanumeric terminal to receive:**
 - 9600 baud
 - 8 bits
 - No parity
 - 1 stop bit
 - No handshake protocol

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

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 CMT system controller, refer to the ALOM CMT guide for your server.

Accessing the System Console Through a Local Graphics Monitor

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

To install a local graphics monitor, you must have the following items:

- Supported PCI-based graphics frame buffer card and software driver
- Monitor with appropriate resolution to support the frame buffer
- Supported USB keyboard
- Supported USB mouse and mouse pad

▼ To Access the System Console Through a Local Graphics Monitor

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

Installation must be performed by a qualified service provider. For further information, refer to the service manual for your server or contact your qualified service provider.

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

Tighten the thumbscrews to secure the connection.

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

4. Connect the USB keyboard cable to one USB port and the USB mouse cable to the other USB port on the SPARC Enterprise T2000 server back panel (FIGURE 1-2).

5. Get to the `ok` prompt.

For more information, see [“Getting to the `ok` Prompt” on page 24](#).

6. Set OpenBoot configuration variables appropriately.

From the existing system console, type:

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

Note – There are many other system configuration variables. Although these variables do not affect which hardware device is used to access the system console, some of them affect which diagnostic tests the system runs and which messages the system displays at its console. For details, refer to the service manual for your server.

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

```
ok reset-all
```

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

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

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

If you want to redirect the system console back to the serial management and network management ports, see [“System Console OpenBoot Configuration Variable Settings”](#) on page 26.

Switching Between the System Controller and the System Console

The system controller features two management ports, labeled SER MGT and NET MGT, located on the server's back panel. If the system console is directed to use the serial management and network management ports (the default configuration), these ports provide access to both the system console and the ALOM CMT command-line interface (the ALOM CMT prompt), each on a separate channel (see [FIGURE 1-5](#)).

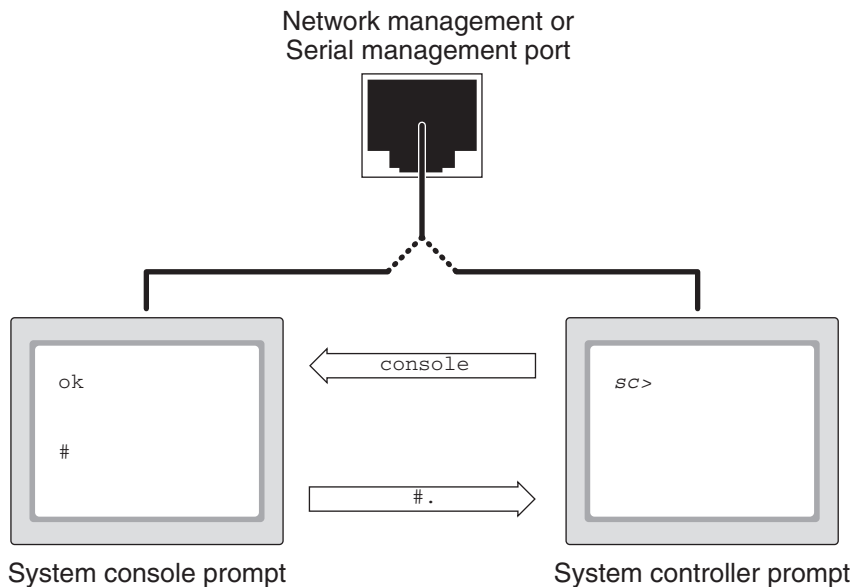


FIGURE 1-5 Separate System Console and System Controller Channels

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

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

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

Note – If no text or prompt appears, it might be 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 system controller,

- Type the `console` command at the `sc>` prompt.

To reach the system controller from the system console,

- Type the system controller escape sequence,
By default, the escape sequence is #. (Pound-Period).

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

- [“Communicating With the System” on page 1](#)
- [“ALOM CMT sc> Prompt” on page 19](#)
- [“OpenBoot ok Prompt” on page 21](#)
- [“Accessing the System Controller” on page 7](#)
- The ALOM CMT guide for your server

ALOM CMT sc> Prompt

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

Note – To view ALOM CMT system controller boot messages, you must connect an alphanumeric terminal to the serial management port *before* connecting the AC power cords to the SPARC Enterprise T2000 server.

You can log in to the ALOM CMT 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 CMT prompt (`sc>`) from the OpenBoot `ok` prompt or from the Solaris `#` or `%` prompt, provided the system console is configured to be accessible through the serial management and network management ports.

The `sc>` prompt indicates that you are interacting with the ALOM CMT 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 CMT system controller for the first time and you issue an administrative command, the controller forces you to create a password (for the default username: `admin`) for subsequent access. After this initial configuration, you will be prompted to enter a user name and password every time you access the ALOM CMT system controller.

For more information, see the following:

[“Getting to the `ok` Prompt” on page 24](#)

[“Switching Between the System Controller and the System Console” on page 18](#)

Access Through Multiple Controller Sessions

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

[“Accessing the System Controller” on page 7](#)

[“Activating the Network Management Port” on page 8](#)

Any additional ALOM CMT 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 ALOM CMT guide for your server.

Reaching the `sc>` Prompt

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

- If the system console is directed to the serial management and network management ports, you can type the ALOM CMT escape sequence (`#.`).
 - You can log in directly to the system controller from a device connected to the serial management port. See [“Accessing the System Controller” on page 7](#).
 - You can log in directly to the system controller using a connection through the network management port. See [“Activating the Network Management Port” on page 8](#).
-

OpenBoot `ok` Prompt

A SPARC Enterprise T2000 server with the Solaris OS installed operates at different *run levels*. For a full description of run levels, refer to the Solaris system administration documentation.

Most of the time, you operate a SPARC Enterprise T2000 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 SPARC Enterprise T2000 server is at run level 0, the `ok` prompt appears. This prompt indicates that the OpenBoot firmware is in control of the system.

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

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

- When you deliberately place the system under firmware control in order to execute firmware-based commands.

It is the last of these scenarios which most often concerns you as an administrator, since there will be times when you need to reach the `ok` prompt. Several ways to do this are outlined in [“Reaching the `ok` Prompt” on page 22](#). For detailed instructions, see [“Getting to the `ok` Prompt” on page 24](#).

Reaching the `ok` Prompt

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

- Graceful shutdown
- ALOM CMT `break` and `console` command pair
- L1-A (Stop-A) keys or Break key
- Manual system reset

A discussion of each method follows. For step-by-step instructions, see [“Getting to the `ok` Prompt” on page 24](#).

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

Graceful Shutdown

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

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

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

ALOM CMT break or console Command

Typing `break` from the `sc>` prompt forces a running SPARC Enterprise T2000 server to drop into OpenBoot firmware control. If the operating system is already halted, you can use the `console` command instead of `break` to reach the `ok` prompt.

Note – 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 the keyboard. If you have an alphanumeric terminal attached to the SPARC Enterprise T2000 server, press the Break key.

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

Note – These methods of reaching the `ok` prompt will only work if the system console has been redirected to the appropriate port. For details, see [“System Console OpenBoot Configuration Variable Settings” on page 26](#).

Manual System Reset



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.

Use the ALOM CMT `reset` command, or `poweron` and `poweroff` commands, to reset the server. Reaching the `ok` prompt by performing a manual system reset or by power-cycling the system should be the method of last resort. Using these commands result 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 – Accessing the `ok` prompt suspends the Solaris OS.

When you access the `ok` prompt from a functioning SPARC Enterprise T2000 server, you are suspending the Solaris OS and placing the system under firmware control. Any processes that were running under the operating system are also suspended, and *the state of such processes might not be recoverable*.

The commands you run from the `ok` prompt have the potential to affect the state of the system. This means that it is not always possible to resume execution of the operating system from the point at which it was suspended. Although the `go` command will resume execution in most circumstances, in general, each time you drop the system down to the `ok` prompt, you should expect to have to reboot the system to get back to the operating system.

For More Information

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

Getting to the `ok` Prompt

This procedure provides several ways of reaching the `ok` prompt. The methods are not equally desirable. For details about when to use each method, see [“OpenBoot `ok` Prompt” on page 21](#).



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

▼ To Obtain the ok Prompt

1. **Decide which method you need to use to reach the ok prompt.**
See “OpenBoot ok Prompt” on page 21 for details.
2. **Follow the appropriate instructions in TABLE 1-3.**

TABLE 1-3 Ways of Accessing the ok Prompt

Access Method	What to Do
Graceful shutdown of the Solaris OS	From a shell or command tool window, issue an appropriate command (for example, the <code>shutdown</code> or <code>init</code> command) as described in Solaris system administration documentation.
L1-A (Stop-A) keys or Break key	<ul style="list-style-type: none">• From a keyboard connected directly to the SPARC Enterprise T2000 server, press the Stop and A keys simultaneously.* –or–• From an alphanumeric terminal configured to access the system console, press the Break key.
ALOM CMT <code>break</code> and <code>console</code> commands	From the <code>sc></code> prompt, type the <code>break</code> command. Then issue the <code>console</code> command, provided the operating system software is not running and the server is already under OpenBoot firmware control.
Manual system reset	From the <code>sc></code> prompt, type: <pre>sc> bootmode bootscript="setenv auto-boot? false"</pre> Press Enter. then type: <pre>sc> reset</pre>

* Requires the OpenBoot configuration variable `input-device=keyboard`. For more information, see “Accessing the System Console Through a Local Graphics Monitor” on page 15 and “System Console OpenBoot Configuration Variable Settings” on page 26.

System Console OpenBoot Configuration Variable Settings

The SPARC Enterprise T2000 system console is directed to the serial management and network management ports (SER MGT and NET MGT) by default. However, you can redirect the system console 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, or a local graphics monitor as the system console connection.

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

OpenBoot Configuration Variable Name	Setting for Sending System Console Output to:	
	Serial and Network Management Ports	Local Graphics Monitor/USB Keyboard and Mouse*
output-device	virtual-console	screen
input-device	virtual-console	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 does not function as a standard serial connection. (If you want to connect a conventional serial device (such as a printer) to the system, you must connect it to `ttya` not the serial management port.)

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

In addition to the OpenBoot configuration variables described in [TABLE 1-4](#), there are other variables that affect and determine system behavior. These variables are discussed in more detail in [Appendix A](#).

Managing RAS Features and System Firmware

This chapter describes how to manage reliability, availability, and serviceability (RAS) features and system firmware, including ALOM CMT on the system controller, and automatic system recovery (ASR). In addition, this chapter describes how to unconfigure and reconfigure a device manually, and introduces multipathing software.

This chapter contains the following sections:

- [“ALOM CMT and The System Controller” on page 27](#)
- [“OpenBoot Emergency Procedures” on page 33](#)
- [“Automatic System Recovery” on page 35](#)
- [“Unconfiguring and Reconfiguring Devices” on page 40](#)
- [“Displaying System Fault Information” on page 41](#)
- [“Multipathing Software” on page 42](#)
- [“Storing FRU Information” on page 43](#)

Note – This chapter does not cover detailed troubleshooting and diagnostic procedures. For information about fault isolation and diagnostic procedures, refer to the service manual for your server.

ALOM CMT and The System Controller

The ALOM CMT system controller supports a total of nine concurrent sessions per server, eight connections available through the network management port and one connection through the serial management port.

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

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

Logging In To ALOM CMT

All environmental monitoring and control is handled by ALOM CMT on the ALOM CMT system controller. The ALOM CMT command prompt (`sc>`) provides you with a way of interacting with ALOM CMT. For more information about the `sc>` prompt, see [“ALOM CMT `sc>` Prompt” on page 19](#).

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

- [“Accessing the System Controller” on page 7](#)
- [“Activating the Network Management Port” on page 8](#)

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

▼ To Log In To ALOM CMT

1. **If you are logged in to the system console, type #. (Pound-Period) to get to the sc> prompt.**

Press the Pound key, followed by the Period key. Then press the Return key.

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

The default login name is admin.

```
Advanced Lights Out Manager 1.4
Please login: admin
```

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

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

Note – There is no default password. You must assign a password during initial system configuration. For more information, refer to the installation guide and ALOM CMT guide for your server.



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

Using the ALOM CMT system controller, you can monitor the system, turn the Locator LED on and off, or perform maintenance tasks on the ALOM CMT system controller card itself. For more information, refer to the ALOM CMT guide for your server.

▼ To View Environmental Information

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

The information this command can display includes temperature, power supply status, front panel LED status, and so on.

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

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

Interpreting System LEDs

The behavior of LEDs on the SPARC Enterprise T2000 Server conform to the American National Standards Institute (ANSI) Status Indicator Standard (SIS). These standard LED behaviors are described in [TABLE 2-1](#).

TABLE 2-1 LED Behavior and Meaning

LED Behavior	Meaning
Off	The condition represented by the color is not true.
Steady on	The condition represented by the color is true.
Standby blink	The system is functioning at a minimal level and ready to resume full function.
Slow blink	Transitory activity or new activity represented by the color is taking place.
Fast blink	Attention is required.
Feedback flash	Activity is taking place commensurate with the flash rate (such as disk drive activity).

The LEDs have assigned meanings, described in [TABLE 2-2](#).

TABLE 2-2 LED Behaviors with Assigned Meanings

Color	Behavior	Definition	Description
White	Off	Steady state	
	Fast blink	4Hz repeating sequence, equal intervals On and Off.	This indicator helps you to locate a particular enclosure, board, or subsystem. For example, the Locator LED.
Blue	Off	Steady state	

TABLE 2-2 LED Behaviors with Assigned Meanings (*Continued*)

Color	Behavior	Definition	Description
	Steady On	Steady State	If blue is on, a service action can be performed on the applicable component with no adverse consequences. For example: the OK-to-Remove LED
Yellow/Amber	Off	Steady State	
	Slow Blink	1Hz repeating sequence, equal intervals On and Off.	This indicator signals new fault conditions. Service is required. For example: the Service Required LED.
	Steady On	Steady State	The amber indicator stays on until the service action is completed and the system returns to normal function.
Green	Off	Steady State	
	Standby Blink	Repeating sequence consisting of a brief (0.1 sec.) ON flash followed by a long OFF period (2.9 sec.)	The system is running at a minimum level and is ready to be quickly revived to full function. For example: the System Activity LED
	Steady On	Steady State	Status normal; system or component functioning with no service actions required
	Slow Blink		A transitory (temporary) event is taking place for which direct proportional feedback is not needed or not feasible.

Controlling the Locator LED

You control the Locator LED from the `sc>` prompt or by the locator button on the front of the chassis.

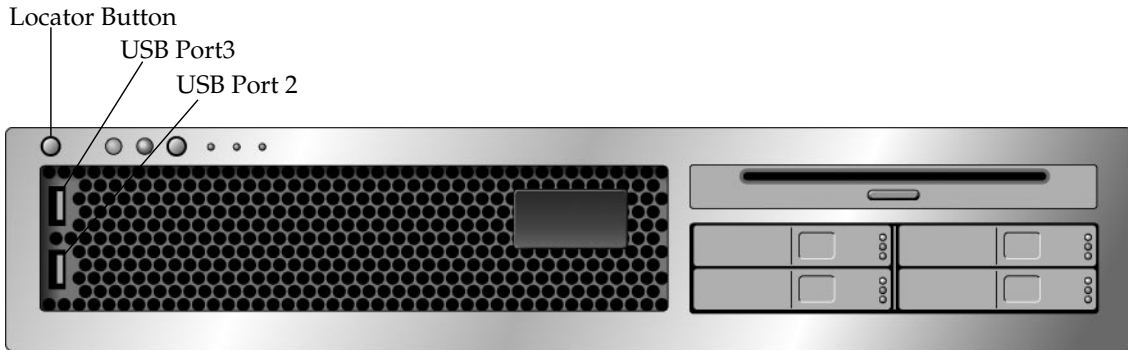


FIGURE 2-1 LocatorButton on SPARC Enterprise T2000 Chassis

- To turn on the Locator LED, from the ALOM CMT command prompt, type:

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

- To turn off the Locator LED, from the ALOM CMT command prompt, type:

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

- To display the state of the Locator LED, from the ALOM CMT command prompt, type:

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

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

OpenBoot Emergency Procedures

The introduction of Universal Serial Bus (USB) keyboards with the newest systems has made it necessary to change some of the OpenBoot emergency procedures. Specifically, the `Stop-N`, `Stop-D`, and `Stop-F` commands that were available on systems with non-USB keyboards are not supported on systems that use USB keyboards, such as the Sun SPARC Enterprise T2000 Server. If you are familiar with the earlier (non-USB) keyboard functionality, this section describes the analogous OpenBoot emergency procedures available in newer systems that use USB keyboards.

OpenBoot Emergency Procedures for SPARC Enterprise T2000 Systems

The following sections describe how to perform the functions of the `Stop` commands on systems that use USB keyboards, such as the Sun SPARC Enterprise T2000 Server server. These same functions are available through Advanced Lights Out Manager (ALOM) system controller software.

Stop-A Functionality

`Stop-A` (Abort) key sequence works the same as it does on systems with standard keyboards, except that it does not work during the first few seconds after the server is reset. In addition, you can issue the ALOM CMT `break` command. For more information, see [“Reaching the ok Prompt” on page 22](#).

Stop-N Functionality

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

▼ To Restore OpenBoot Configuration Defaults

1. **Log in to the ALOM CMT system controller.**

2. Type the following command:

```
sc> bootmode reset_nvram
sc> bootmode bootscript="setenv auto-boot? false"
sc>
```

Note – If you do not issue the `poweroff` and `poweron` commands or the `reset` command within 10 minutes, the host server ignores the `bootmode` command.

You can issue the `bootmode` command without arguments to display the current setting

```
sc> bootmode
Bootmode: reset_nvram
Expires WED SEP 09 09:52:01 UTC 2005
bootscript="setenv auto-boot? false"
```

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

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

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

```
sc> console
ok
```

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

Stop-F Functionality

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

Stop-D Functionality

The Stop-D (Diags) key sequence is not supported on systems with USB keyboards. However, the Stop-D functionality can be closely emulated by setting the virtual keyswitch to `diag`, using the ALOM CMT `setkeyswitch` command. For more information, refer to the ALOM CMT guide for your server.

Automatic System Recovery

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

Automatic system recovery functionality enables the system to resume operation after experiencing certain nonfatal hardware faults or failures. When ASR is enabled, the system's firmware diagnostics automatically detect failed hardware components. An auto-configuring capability designed into the system firmware enables the system to unconfigure failed components and to restore system operation. As long as the system is capable of operating without the failed component, the ASR features enable the system to reboot automatically, without operator intervention.

Note – ASR is not activated until you enable it. See [“Enabling and Disabling Automatic System Recovery”](#) on page 38.

For more information about ASR, refer to the service manual for your server.

Auto-Boot Options

The system firmware stores a configuration variable called `auto-boot?`, which controls whether the firmware will automatically boot the operating system after each reset. The default setting for SPARC Enterprise platforms is `true`.

Normally, if a system fails power-on diagnostics, `auto-boot?` is ignored and the system does not boot unless an operator boots the system manually. An automatic boot is generally not acceptable for booting a system in a degraded state. Therefore, the Sun SPARC Enterprise T2000 Server OpenBoot firmware provides a second setting, `auto-boot-on-error?`. This setting controls whether the system will

attempt a degraded boot when a subsystem failure is detected. Both the `auto-boot?` and `auto-boot-on-error?` switches must be set to `true` to enable an automatic degraded boot. To set the switches, type:

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

Note – The default setting for `auto-boot-on-error?` is `false`. The system will not attempt a degraded boot unless you change this setting to `true`. In addition, the system will not attempt a degraded boot in response to any fatal nonrecoverable error, even if degraded booting is enabled. For examples of fatal nonrecoverable errors, see [“Error Handling Summary” on page 36](#).

Error Handling Summary

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

- If no errors are detected by POST or OpenBoot firmware, the system attempts to boot if `auto-boot?` is `true`.
- If only nonfatal errors are detected by POST or OpenBoot firmware, the system attempts to boot if `auto-boot?` is `true` and `auto-boot-on-error?` is `true`. Nonfatal errors include the following:
 - SAS subsystem failure. In this case, a working alternate path to the boot disk is required. For more information, see [“Multipathing Software” on page 42](#).
 - Ethernet interface failure.
 - USB interface failure.
 - Serial interface failure.
 - PCI card failure.
 - Memory failure. Given a failed DIMM, the firmware will unconfigure the entire logical bank associated with the failed module. Another nonfailing logical bank must be present in the system for the system to attempt a degraded boot.

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

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

For more information about troubleshooting fatal errors, refer to the service manual for your server.

Reset Scenarios

Three ALOM CMT configuration variables, `diag_mode`, `diag_level`, and `diag_trigger`, control whether the system runs firmware diagnostics in response to system reset events.

The standard system reset protocol bypasses POST completely unless the virtual keyswitch or ALOM CMT variables are set as follows:

TABLE 2-3 Virtual Keyswitch Setting for Reset Scenario

Keyswitch	Value
virtual keyswitch	diag

TABLE 2-4 ALOM CMT Variable Settings for Reset Scenario

Variable	Value
<code>diag_mode</code>	normal or service
<code>diag_level</code>	min or max
<code>diag_trigger</code>	power-on-reset error-reset

The default settings for these variables are:

- `diag_mode` = normal
- `diag_level` = min
- `diag_trigger` = power-on-reset

Therefore, ASR is enabled by default. For instructions, see [“Enabling and Disabling Automatic System Recovery” on page 38](#).

Automatic System Recovery User Commands

The ALOM CMT commands are available for obtaining ASR status information and for manually unconfiguring or reconfiguring system devices. For more information, see:

- [“Unconfiguring and Reconfiguring Devices” on page 40](#)
- [“To Reconfigure a Device Manually” on page 41](#)
- [“Obtaining Automatic System Recovery Information” on page 39](#)

Enabling and Disabling Automatic System Recovery

The automatic system recovery (ASR) feature is not activated until you enable it. Enabling ASR requires changing configuration variables in ALOM CMT as well as OpenBoot.

▼ To Enable Automatic System Recovery

1. At the `sc>` prompt, type:

```
sc> setsc diag_mode normal  
sc> setsc diag_level max  
sc> setsc diag_trigger power-on-reset
```

2. At the `ok` prompt, type:

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

Note – For more information about OpenBoot configuration variables, refer to the service manual for your server.

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

```
ok reset-all
```

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

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

▼ To Disable Automatic System Recovery

1. At the `ok` prompt, type:

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

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

```
ok reset-all
```

The system permanently stores the parameter change.

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

After you disable the automatic system recovery (ASR) feature, it is not activated again until you re-enable it.

Obtaining Automatic System Recovery Information

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

- At the `sc>` prompt, type:

```
sc> showcomponent
```

In the `showcomponent` command output, any devices marked disabled have been manually unconfigured using the system firmware. The `showcomponent` command also lists devices that have failed firmware diagnostics and have been automatically unconfigured by the system firmware.

For more information, see:

- “Automatic System Recovery” on page 35
- “Enabling and Disabling Automatic System Recovery” on page 38
- “To Disable Automatic System Recovery” on page 39
- “Unconfiguring and Reconfiguring Devices” on page 40
- “To Reconfigure a Device Manually” on page 41

Unconfiguring and Reconfiguring Devices

To support a degraded boot capability, the ALOM CMT firmware provides the `disablecomponent` command, which enables you to unconfigure system devices manually. This command “marks” the specified device as *disabled* by creating an entry in the ASR database. Any device marked `disabled`, whether manually or by the system’s firmware diagnostics, is removed from the system’s machine description prior to the hand-off to other layers of system firmware, such as OpenBoot PROM.

▼ To Unconfigure a Device Manually

- At the `sc>` prompt, type:

```
sc> disablecomponent asr-key
```

Where the *asr-key* is one of the device identifiers from [TABLE 2-5](#)

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

TABLE 2-5 Device Identifiers and Devices

Device Identifiers	Devices
<code>MB/CMPcpu_number/Pstrand_number</code>	CPU Strand (Number: 0-31)
<code>PCIEslot_number</code>	PCI-E Slot (Number: 0-2)
<code>PCIXslot_number</code>	PCI-X (Number: 0-1):
<code>IOBD/PCIEa</code>	PCI-E leaf A (/pci@780)

TABLE 2-5 Device Identifiers and Devices (*Continued*)

Device Identifiers (<i>Continued</i>)	Devices (<i>Continued</i>)
IOBD/PCIEb	PCI-E leaf B (/pci@7c0)
TTYA	DB9 Serial Port
MB/CMP0/CHchannel_number/Rrank_number/Ddimm_number	DIMMS

▼ To Reconfigure a Device Manually

1. At the `sc>` prompt, type:

```
sc> enablecomponent asr-key
```

where the *asr-key* is any device identifier from [TABLE 2-5](#)

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

You can use the ALOM CMT `enablecomponent` command to reconfigure any device that you previously unconfigured with the `disablecomponent` command.

Displaying System Fault Information

ALOM CMT software lets you display current valid system faults. The `showfaults` command displays the fault ID, the faulted FRU device, and the fault message to standard output. The `showfaults` command also displays POST results. For example:

```
sc> showfaults
ID FRU          Fault
 0 FT0.FM2     SYS_FAN at FT0.FM2 has FAILED.
```

Adding the `-v` option displays the time:

```
sc> showfaults -v
ID Time          FRU          Fault
 0 MAY 20 10:47:32 FT0.FM2     SYS_FAN at FT0.FM2 has FAILED.
```

For more information about the `showfaults` command, refer to the ALOM CMT guide for your server.

▼ To Display System Fault Information

- At the `sc>` prompt type:

```
sc> showfaults -v
```

Multipathing Software

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

For the Sun SPARC Enterprise T2000 Server, three different types of multipathing software are available:

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

For More Information

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

For information about VVM and its DMP feature, refer to the documentation provided with the VERITAS Volume Manager software.

For information about Sun StorEdge Traffic Manager, refer to your Solaris OS documentation.

Storing FRU Information

▼ To Store Information in Available FRU PROMs

- At the `sc>` prompt type:

```
setfru -c data
```


Managing Disk Volumes

This document describes redundant array of independent disks (RAID) concepts, and how to configure and manage RAID disk volumes using the SPARC Enterprise T2000 server's onboard serial attached SCSI (SAS) disk controller.

This chapter contains the following sections:

- "Requirements" on page 45
- "Disk Volumes" on page 45
- "RAID Technology" on page 46
- "Hardware Raid Operations" on page 48

Requirements

To configure and use RAID disk volumes on the SPARC Enterprise T2000 server, you must install the appropriate patches. For the latest information on patches for the SPARC Enterprise T2000 server, see the latest product notes for your system. Patches are available for download from <http://www.sun.com/sunsolve>. Installation procedures for patches are included in text README files that accompany the patches.

Disk Volumes

From the perspective of the SPARC Enterprise T2000 server's on-board disk controller, *disk volumes* are logical disk devices comprising one or more complete physical disks.

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

The onboard disk controller of the SPARC Enterprise T2000 server provides for the creation of as many as two hardware RAID volumes. The controller supports either two-disk RAID 1 (integrated mirror, or IM) volumes, or two-, three- or four-disk RAID 0 (integrated stripe, or IS) volumes.

Note – Due to the volume initialization that occurs on the disk controller when a new volume is created, properties of the volume such as geometry and size are unknown. RAID volumes created using the hardware controller must be configured and labeled using `format(1M)` prior to use with the Solaris Operating System. See [“To Configure and Label a Hardware RAID Volume for Use in the Solaris Operating System” on page 55](#), or the `format(1M)` man page for further details.

Volume migration (relocating all RAID volume disk members from one SPARC Enterprise T2000 chassis to another) is not supported. If this operation must be performed, please contact your service provider.

RAID Technology

RAID technology allows for the construction of a logical volume, made up of several physical disks, in order to provide data redundancy, increased performance, or both. The SPARC Enterprise T2000 server’s on-board disk controller supports both RAID 0 and RAID 1 volumes.

This section describes the RAID configurations supported by the onboard disk controller:

- Integrated stripe, or IS volumes (RAID 0)
- Integrated mirror, or IM volumes (RAID 1)

Integrated Stripe Volumes (RAID 0)

Integrated Stripe volumes are configured by initializing the volume across two or more physical disks, and sharing the data written to the volume across each physical disk in turn, or *striping* the data across the disks.

Integrated Stripe volumes provide for a logical unit (LUN) that is equal in capacity to the sum of all its member disks. For example, a three-disk IS volume configured on 72 GB drives will have a 216 GB capacity.

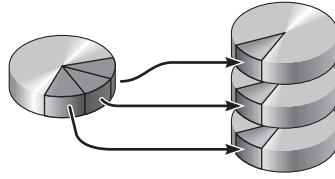


FIGURE 3-1 Graphical Representation of Disk Striping



Caution – There is no data redundancy in an IS volume configuration. Thus, if a single disk fails, the entire volume fails, and all data is lost. If an IS volume is manually deleted, all data on the volume is lost.

IS volumes are likely to provide better performance than IM volumes or single disks. Under certain workloads, particularly some write or mixed read-write workloads, I/O operations complete faster because the I/O operations are being handled in a round-robin fashion, with each sequential block being written to each member disk in turn.

Integrated Mirror Volumes (RAID 1)

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

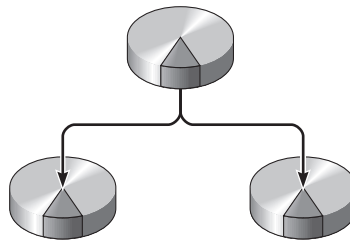


FIGURE 3-2 Graphical Representation of Disk Mirroring

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



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

Hardware Raid Operations

On the SPARC Enterprise T2000 server, the SAS controller supports mirroring and striping using the Solaris OS `raidctl` utility.

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

Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names for Non-RAID Disks

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

These error messages typically refer to a failed hard drive by its physical device name (such as `/devices/pci@1f,700000/scsi@2/sd@1,0`) or by its logical device name (such as `c0t1d0`). In addition, some applications might report a disk slot number (0 through 3).

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

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

Disk Slot Number	Logical Device Name ¹	Physical Device Name
Slot 0	c0t0d0	/devices/pci@780/pci@0/pci@9/scsi@0/sd@0,0
Slot 1	c0t1d0	/devices/pci@780/pci@0/pci@9/scsi@0/sd@1,0
Slot 2	c0t2d0	/devices/pci@780/pci@0/pci@9/scsi@0/sd@2,0
Slot 3	c0t3d0	/devices/pci@780/pci@0/pci@9/scsi@0/sd@3,0

¹ The logical device names might appear differently on your system, depending on the number and type of add-on disk controllers installed.

▼ To Create a Hardware Mirrored Volume

1. **Verify which hard drive corresponds with which logical device name and physical device name. using the `raidctl` command:**

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

See [“Physical Disk Slot Numbers, Physical Device Names, and Logical Device Names for Non-RAID Disks”](#) on page 48.

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

```
# raidctl
RAID   Volume  RAID           RAID           Disk
Volume Type   Status        Disk           Status
-----
c0t0d0 IM     OK            c0t0d0         OK
                   c0t1d0         OK
```

In this example, a single IM volume has been enabled. It is fully synchronized and is online.

The SPARC Enterprise T2000 server’s on-board SAS controller can configure as many as two RAID volumes. Prior to volume creation, ensure that the member disks are available and that there are not two volumes already created.

The RAID status might be OK, indicating that the RAID volume is online and fully synchronized, but also might be RESYNCING in the event that the data between the primary and secondary member disks in an IM are still synchronizing. The RAID status might also be DEGRADED, if a member disk is failed or otherwise offline. Finally, it might be FAILED, indicating that volume should be deleted and reinitialized. This failure can occur when any member disk in an IS volume is lost, or when both disks are lost in an IM volume.

The Disk Status column displays the status of each physical disk. Each member disk might be OK, indicating that it is online and functioning properly, or it might be FAILED, MISSING, or otherwise OFFLINE, indicating that the disk has hardware or configuration issues that need to be addressed.

For example, an IM with a secondary disk that has been removed from the chassis appears as:

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

c0t0d0	IM	DEGRADED	c0t0d0	OK
			c0t1d0	MISSING

See the `raidctl(1M)` man page for additional details regarding volume and disk status.

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

2. Type the following command:

```
# raidctl -c primary secondary
```

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

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

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

```
# raidctl -f -c c0t0d0 c0t1d0  
Volume 'c0t0d0' created  
#
```

When you create a RAID mirror, the secondary drive (in this case, `c0t1d0`) disappears from the Solaris device tree.

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

```
# raidctl  
RAID   Volume  RAID           RAID           Disk  
Volume Type    Status         Disk            Status  
-----  
c0t0d0 IM      RESYNCING     c0t0d0          OK  
                               c0t1d0          OK
```

The preceding example indicates that the RAID mirror is still re-synchronizing with the backup drive.

The following example shows that the RAID mirror is synchronized and online.

```
# raidctl
RAID      Volume  RAID      RAID      Disk
Volume   Type    Status    Disk      Status
-----
c0t0d0   IM      OK        c0t0d0    OK
                   c0t1d0    OK
```

The disk controller synchronizes IM volumes one at a time. If you create a second IM volume before the first IM volume completes its synchronization, the first volume's RAID status will indicate `RESYNCING`, and the second volume's RAID status will indicate `OK`. Once the first volume has completed, its RAID status changes to `OK`, and the second volume automatically starts synchronizing, with a RAID status of `RESYNCING`.

Under RAID 1 (disk mirroring), all data is duplicated on both drives. If a disk fails, replace it with a working drive and restore the mirror. For instructions, see [“To Perform a Mirrored Disk Hot-Plug Operation” on page 60](#).

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

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

Due to the volume initialization that occurs on the disk controller when a new volume is created, the volume must be configured and labeled using the `format(1M)` utility prior to use with the Solaris Operating System (see [“To Configure and Label a Hardware RAID Volume for Use in the Solaris Operating System” on page 55](#)). Because of this limitation, `raidctl(1M)` blocks the creation of a hardware RAID volume if any of the member disks currently have a file system mounted.

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

1. Determine which disk is the default boot device

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

```
ok printenv boot-device
boot-device =          disk

ok devalias disk
disk                  /pci@780/pci@0/pci@9/scsi@0/disk@0,0
```

2. Type the `boot net -s` command

```
ok boot net -s
```

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

See [“To Create a Hardware Mirrored Volume” on page 49](#). For example:

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

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

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

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

▼ To Create a Hardware Striped Volume

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

See [“Disk Slot Numbers, Logical Device Names, and Physical Device Names” on page 49](#).

To verify the current RAID configuration, type:

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

The preceding example indicates that no RAID volume exists.

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

2. Type the following command:

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

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

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

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

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

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

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

```
# raidctl
RAID   Volume  RAID           RAID           Disk
Volume Type    Status        Disk           Status
-----
c0t1d0  IS      OK            c0t1d0         OK
                   c0t2d0         OK
                   c0t3d0         OK
```

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

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

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

▼ To Configure and Label a Hardware RAID Volume for Use in the Solaris Operating System

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

1. Start the `format` utility

```
# format
```

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

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

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

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


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

For example:

```
format> type

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

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

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

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

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

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

```
format> disk

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

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

7. Exit the `format` utility.

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

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

▼ To Delete a Hardware RAID Volume

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

See [“Disk Slot Numbers, Logical Device Names, and Physical Device Names”](#) on page 49.

2. Determine the name of the RAID volume, type:

```
# raidctl
RAID   Volume RAID           RAID           Disk
Volume Type   Status        Disk           Status
-----
c0t0d0 IM     OK            c0t0d0         OK
                   c0t1d0         OK
```

In this example, the RAID volume is `c0t1d0`.

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

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

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

For example:

```
# raidctl -d c0t0d0  
RAID Volume 'c0t0d0' deleted
```

In the event that the RAID volume is an IS volume, the deletion of the RAID volume is interactive, for example:

```
# raidctl -d c0t0d0  
Deleting volume c0t0d0 will destroy all data it contains, proceed  
(yes/no)? yes  
Volume 'c0t0d0' deleted.  
#
```

The deletion of an IS volume results in the loss of all data that it contains. As an alternative, you can use the `-f` option to force the deletion if you are sure that you no longer need the IS volume, or the data it contains. For example:

```
# raidctl -f -d c0t0d0  
Volume 'c0t0d0' deleted.  
#
```

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

```
# raidctl
```

For example:

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

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

▼ To Perform a Mirrored Disk Hot-Plug Operation

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

See “Disk Slot Numbers, Logical Device Names, and Physical Device Names” on page 49.

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

```
# raidctl
```

If the Disk Status is FAILED, then the drive can be removed and a new drive inserted. Upon insertion, the new disk should be OK and the volume should be RESYNCING.

For example:

```
# raidctl
RAID      Volume  RAID      RAID      Disk
Volume   Type    Status    Disk      Status
-----
c0t1d0   IM      DEGRADED  c0t1d0    OK
                               c0t2d0    FAILED
```

This example indicates that the disk mirror has degraded due to a failure in disk c0t2d0.

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

3. Remove the hard drive, as described in the *SPARC Enterprise T2000 Server Service Manual*.

There is no need to issue a software command to bring the drive offline when the drive has failed.

4. Install a new hard drive, as described in the *SPARC Enterprise T2000 Server Service Manual*.

The RAID utility automatically restores the data to the disk.

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

```
# raidctl
```

For example:

```
# raidctl
RAID   Volume  RAID           RAID           Disk
Volume Type    Status         Disk            Status
-----
c0t1d0 IM      RESYNCING      c0t1d0          OK
                               c0t2d0          OK
```

This example indicates that RAID volume `c0t1d0` is resynchronizing.

If you issue the command again once synchronization has completed, it indicates that the RAID mirror is finished resynchronizing and is back online:

```
# raidctl
RAID   Volume  RAID           RAID           Disk
Volume Type    Status         Disk            Status
-----
c0t1d0 IM      OK             c0t1d0          OK
                               c0t2d0          OK
```

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

▼ To Perform a Nonmirrored Disk Hot-Swap Operation

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

See [“Disk Slot Numbers, Logical Device Names, and Physical Device Names”](#) on page 49.

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

2. Type the following command:

```
# cfgadm -al
```

For example:

```
# cfgadm -al
Ap_Id          Type          Receptacle    Occupant      Condition
c0             scsi-bus     connected     configured    unknown
c0::dsk/c0t0d0 disk         connected     configured    unknown
c0::dsk/c0t1d0 disk         connected     configured    unknown
c0::dsk/c0t2d0 disk         connected     configured    unknown
c0::dsk/c0t3d0 disk         connected     configured    unknown
c1             scsi-bus     connected     configured    unknown
c1::dsk/c1t0d0 CD-ROM       connected     configured    unknown
usb0/1         unknown      empty         unconfigured  ok
usb0/2         unknown      empty         unconfigured  ok
usb1/1.1       unknown      empty         unconfigured  ok
usb1/1.2       unknown      empty         unconfigured  ok
usb1/1.3       unknown      empty         unconfigured  ok
usb1/1.4       unknown      empty         unconfigured  ok
usb1/2         unknown      empty         unconfigured  ok
#
```

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

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

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

```
# cfgadm -x remove_device c0::dsk/c0t1d0
Removing SCSI device: /devices/pci@1f,4000/scsi@3/sd@1,0
This operation will suspend activity on SCSI bus: c0
Continue (yes/no)? y
dev = /devices/pci@780/pci@0/pci@9/scsi@0/sd@1,0
cfgadm: Hardware specific failure: failed to suspend:
      Resource                Information
-----
/dev/dsk/c0t0d0s0    mounted filesystem "/"
/dev/dsk/c0t0d0s6    mounted filesystem "/usr"
```

This warning is issued because these commands attempt to quiesce the (SAS) SCSI bus, but the SPARC Enterprise T2000 server firmware prevents it. This warning message can be safely ignored in the SPARC Enterprise T2000 server, but the following step avoids this warning message altogether.

3. Remove the hard drive from the device tree.

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

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

For example:

```
# cfgadm -c unconfigure c0::dsk/c0t3d0
```

This example removes `c0t3d0` from the device tree. The blue OK-to-Remove LED lights.

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

Type the following command:

```
# cfgadm -al
Ap_Id          Type          Receptacle    Occupant      Condition
c0             scsi-bus      connected     configured    unknown
c0::dsk/c0t0d0 disk          connected     configured    unknown
c0::dsk/c0t1d0 disk          connected     configured    unknown
c0::dsk/c0t2d0 disk          connected     configured    unknown
c0::dsk/c0t3d0 unavailable   connected     configured    unknown
c1             scsi-bus      connected     unconfigured  unknown
c1::dsk/c1t0d0 CD-ROM        connected     configured    unknown
usb0/1         unknown       empty         unconfigured  ok
usb0/2         unknown       empty         unconfigured  ok
usb1/1.1       unknown       empty         unconfigured  ok
usb1/1.2       unknown       empty         unconfigured  ok
usb1/1.3       unknown       empty         unconfigured  ok
usb1/1.4       unknown       empty         unconfigured  ok
usb1/2         unknown       empty         unconfigured  ok
#
```

Note that c0t3d0 is now unavailable and unconfigured. The corresponding hard drive OK-to-Remove LED is lit.

5. Remove the hard drive, as described in the *SPARC Enterprise T2000 Server Service Manual*.

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

6. Install a new hard drive, as described in the *SPARC Enterprise T2000 Server Service Manual*.

7. Configure the new hard drive.

Type the following command:

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

For example:

```
# cfgadm -c configure c1::dsk/c0t3d0
```

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

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

Type the following command:

```
# cfdm -al
Ap_Id          Type          Receptacle  Occupant    Condition
c0             scsi-bus     connected   configured  unknown
c0::disk/c0t0d0 disk         connected   configured  unknown
c0::disk/c0t1d0 disk         connected   configured  unknown
c0::disk/c0t2d0 disk         connected   configured  unknown
c0::disk/c0t3d0 disk         connected   configured  unknown
c1             scsi-bus     connected   configured  unknown
c1::disk/c1t0d0 CD-ROM       connected   configured  unknown
usb0/1         unknown      empty       unconfigured ok
usb0/2         unknown      empty       unconfigured ok
usb1/1.1       unknown      empty       unconfigured ok
usb1/1.2       unknown      empty       unconfigured ok
usb1/1.3       unknown      empty       unconfigured ok
usb1/1.4       unknown      empty       unconfigured ok
usb1/2         unknown      empty       unconfigured ok
#
```

Note that c0t3d0 is now listed as configured.

OpenBoot Configuration Variables

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

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

Variable	Possible Values	Default Value	Description
<code>local-mac-address?</code>	<code>true</code> , <code>false</code>	<code>true</code>	If <code>true</code> , network drivers use their own MAC address, not the server MAC address.
<code>fcode-debug?</code>	<code>true</code> , <code>false</code>	<code>false</code>	If <code>true</code> , include name fields for plug-in device FCodes.
<code>scsi-initiator-id</code>	0-15	7	SCSI ID of the Serial Attached SCSI controller.
<code>oem-logo?</code>	<code>true</code> , <code>false</code>	<code>false</code>	If <code>true</code> , use custom OEM logo; otherwise, use the server manufacturer's logo.
<code>oem-banner?</code>	<code>true</code> , <code>false</code>	<code>false</code>	If <code>true</code> , use custom OEM banner.
<code>ansi-terminal?</code>	<code>true</code> , <code>false</code>	<code>true</code>	If <code>true</code> , enable ANSI terminal emulation.
<code>screen-#columns</code>	0-n	80	Sets number of columns on screen.
<code>screen-#rows</code>	0-n	34	Sets number of rows on screen.
<code>ttya-rts-dtr-off</code>	<code>true</code> , <code>false</code>	<code>false</code>	If <code>true</code> , operating system does not assert <code>rts</code> (request-to-send) and <code>dtr</code> (data-transfer-ready) on serial management port.
<code>ttya-ignore-cd</code>	<code>true</code> , <code>false</code>	<code>true</code>	If <code>true</code> , operating system ignores carrier-detect on serial management port.

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

Variable	Possible Values	Default Value	Description
ttys-mode	9600,8,n,1,-	9600,8,n,1,-	Serial management port (baud rate, bits, parity, stop, handshake). The serial management port only works at the default values.
output-device	virtual-console, screen	virtual-console	Power-on output device.
input-device	virtual-console, keyboard	virtual-console	Power-on input device.
auto-boot-on-error?	true, false	false	If true, boot automatically after system error.
load-base	0-n	16384	Address.
auto-boot?	true, false	true	If true, boot automatically after power on or reset.
boot-command	<i>variable-name</i>	boot	Action following a boot command.
use-nvramrc?	true, false	false	If true, execute commands in NVRAMRC during server startup.
nvramrc	<i>variable-name</i>	none	Command script to execute if use-nvramrc? is true.
security-mode	none, command, full	none	Firmware security level.
security-password	<i>variable-name</i>	none	Firmware security password if security-mode is not none (never displayed). <i>Do not set this directly.</i>
security-#badlogins	<i>variable-name</i>	none	Number of incorrect security password attempts.

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

Variable	Possible Values	Default Value	Description
diag-switch?	true, false	false	If true: <ul style="list-style-type: none">• OpenBoot verbosity is set to maximum If false: <ul style="list-style-type: none">• OpenBoot verbosity is set to minimum
error-reset-recovery	boot, sync, none	boot	Command to execute following a system reset generated by an error.
network-boot-arguments	[<i>protocol</i> ,] [<i>key=value</i> ,]	none	Arguments to be used by the PROM for network booting. Defaults to an empty string. <code>network-boot-arguments</code> can be used to specify the boot protocol (RARP/DHCP) to be used and a range of system knowledge to be used in the process. For further information, see the <code>eeprom (1M)</code> man page or your Solaris Reference Manual..

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