



# Sun StorEdge™ 6020 and 6120 Arrays System Manual

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# Preface

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The *Sun StorEdge 6020 and 6120 Arrays System Manual* describes how to configure, monitor, and service a Sun StorEdge™ 6120 array using the array's telnet command-line interface (CLI). An array that is part of a Sun StorEdge 6320 system is called a Sun StorEdge 6020 array. Both arrays are signified by the term *array* in this book.

The array is delivered with a default configuration of parameter settings. The *Sun StorEdge 6120 Array Installation Guide* discusses the installation of the array with its default settings. This document discusses reconfiguring parameter settings and creating storage volumes for use in your particular environment following installation.

This document is written for an experienced system administrator of the Solaris™ operating system (Solaris OS) and related disk storage systems. This document provides information on commands that are specific to the array and is not intended as a reference for general operating system commands.

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## Before You Read This Book

The service section of this document contains information for replacing field replaceable units (FRU). Before attempting to service the hardware of the array, read and become familiar with the contents of the *Sun StorEdge 6120 Array Regulatory and Safety Compliance Manual*.

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# How This Book Is Organized

[Chapter 1](#) presents general information about the array and its features.

[Chapter 2](#) discusses the reconfiguration of the array. Topics discussed include array communication topology, error notification, network time protocol, and battery configuration.

[Chapter 3](#) describes procedures for creating a volume and for changing existing volume configuration.

[Chapter 4](#) discusses volume slicing, LUN mapping, and LUN masking.

[Chapter 5](#) describes how to use the telnet CLI to monitor the array.

[Chapter 6](#) describes basic array troubleshooting and replacement procedures for serviceable parts.

[Chapter 7](#) presents procedures for reconfiguring arrays and for adding and removing disk trays.

[Appendix A](#) contains a list of errors that can be reported by the array and error definitions.

[Appendix B](#) is a complete listing of telnet CLI commands for the array.

[Appendix C](#) contains part numbers and illustrations for all field-replaceable units (FRUs) in the array.

[Glossary](#) is a list of words and phrases and their definitions.

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# Typographic Conventions

Typeface <sup>1</sup>	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.
<b>AaBbCc123</b>	What you type, when contrasted with on-screen computer output	% <b>su</b> 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> .
[] Brackets	Indicates optional arguments.	<code>abort [-y] [u&lt;1-8&gt;]</code>
Pipe	Separates mutually exclusive arguments.	<code>enable uencid1[1 2]</code>

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<sup>1</sup> The settings on your browser might differ from these settings.

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## Related Documentation

Application	Title	Part Number
man pages	<i>sscs(1M)</i>	not applicable
Release and product information	<i>Sun StorEdge SAN Foundation 4.2 Release Notes</i>	817-1246
	<i>Sun StorEdge Traffic Manager Software Release Notes</i>	817-0385
	<i>Sun StorEdge 6120 Array Release Notes</i>	817-0201
	<i>Sun StorEdge 6320 System Release Notes</i>	816-7880
Installation	<i>Sun StorEdge SAN Foundation Installation Guide</i>	817-1244
	<i>Sun StorEdge SAN Foundation Configuration Guide</i>	817-1245
	<i>Sun StorEdge 6120 Array Installation Guide</i>	817-0199
	<i>Sun StorEdge 6320 System Installation Guide</i>	816-7878
System administration	<i>Sun StorEdge 6020 and 6120 Arrays System Manual</i>	817-0200
	<i>Sun StorEdge 6320 System Reference and Service Manual</i>	816-7879
User and diagnostic	<i>Storage Automated Diagnostic Environment 2.2 User's Guide</i>	817-0822
	<i>Storage Automated Diagnostic Environment 2.2 Device Edition Release Notes</i>	817-0823
	<i>Sun StorEdge 6120 Array Start Here</i>	817-0198
	<i>Sun StorEdge 6120 Array Regulatory and Safety Compliance Manual</i>	817-0961
	<i>Sun StorEdge 6120 Array Site Preparation Guide</i>	817-0960
	<i>Sun StorEdge 6120 Array Troubleshooting Guide</i>	817-0828
	<i>Sun StorEdge 6320 System Start Here</i>	816-7875
	<i>Sun StorEdge 6320 System Regulatory and Safety Compliance Manual</i>	816-7876
	<i>Sun StorEdge 6320 System Site Preparation Guide</i>	816-7877
	<i>Sun StorEdge 6320 System Troubleshooting Guide</i>	816-7881

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# Using UNIX Commands

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

See one or more of the following for this information:

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

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# 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	#
Sun StorEdge 6120 array	: / :

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## Array Overview

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This chapter provides an introduction to the array. It includes an overview of the array's available hardware configurations, a description of the default configuration, an explanation of the logical structure of the array's storage, and other general information about the array.

Topics in this chapter include:

- [“Array Description” on page 1](#)
- [“Array Storage Organization” on page 2](#)
- [“User Interfaces” on page 6](#)
- [“Supported Configurations” on page 7](#)
- [“Default Configuration Settings” on page 7](#)
- [“Array Battery Information” on page 10](#)
- [“Array Temperature Monitoring” on page 14](#)
- [“Service Indicator Standard LEDs” on page 15](#)

---

## Array Description

The array is a high-performance, modular, scalable storage device. The array can contain from 1 to 6 disk trays each of which can have from 7 to 14 disk drives. The disk drives can have a capacity as high as 146 GBytes. A disk tray is either a *master unit* or an *expansion unit*. A master unit includes a controller card.

The array includes 2-Gbit/sec Fibre Channel connectivity to hosts. Extensive reliability, availability, and serviceability (RAS) features include redundant components, notification of failed components, and the ability to replace components while the unit is online.

The array is mounted in a rack and can be interconnected with other arrays of the same type.

The data and administrative paths in the array are completely independent for reliability, security, serviceability, and ease of use. The network-based administrative path enables centralized configuration and monitoring of large numbers of array configurations, providing storage to multiple application servers.

Each disk drive has a drive label, a small portion of which is reserved for the *system area*. Approximately 200 Mbytes is reserved for the system area, which contains the configuration data, boot firmware, and file system information. The system area information is mirrored across all fourteen drives for redundancy so that data can be recovered from the other functional drives.

The switched-loop architecture of the array provides the flexibility to configure multiple units together for scalability and availability. Loops can be reconfigured dynamically for diagnosis and recovery in case of loop-related failures.

Some additional characteristics of the array are:

- RAID levels 0, 1, and 5 are supported
- 1 Gbyte of data cache memory is provided
- Administrative path is network-based (Ethernet) and serial-based (RS-232)
- Two separate serial buses support control and sense operations

The array is delivered with a default configuration of system settings (see [“Default Configuration Settings” on page 7](#)). These system settings determine how the array operates. You might have to change some or all of these array system settings for use in your storage environment.

The Sun StorEdge 6120 array is delivered with no volumes configured. For information about the Sun StorEdge 6020 array and its delivered configuration, see the *Sun StorEdge 6320 Series Reference and Service Manual*.

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## Array Storage Organization

A SAN or direct-attached host sees an array as raw storage that appears as a disk drive on the network. This raw storage is called a *logical unit*, or *LUN*. The capacity of this LUN can be the entire capacity of one tray of disks or it can be a smaller portion of the array's capacity. A LUN is seen only by the host or hosts that are given permission to access that LUN. *LUN masking* is the term used for assigning LUN permissions (read-only, read/write, or none) to a host. Hosts on the network that are not given permission to access the LUN cannot access it. An array of any configuration can provide a maximum of 64 LUNs (see [“Supported Configurations” on page 7](#)).

Each LUN is *mapped* to a single *slice* of storage within the array. Each slice is part of a *volume* that you create on the array.

# Volumes

In an array disk tray, which contains from 7 to 14 disk drives, you can configure either one or two volumes. A volume can include from 1 to 14 drives, depending on RAID level, which must be in adjacent positions in the disk tray. When you create a volume, you specify the drives to be included, the RAID level, and whether a hot spare is to be used.

Drives in an array are numbered sequentially from one to fourteen and from left to right when viewed from the front of the array. You can assign adjacent drives to a volume, for example: assign drives 1–9 to volume 1 and drives 10–14 to volume 2. You cannot assign drives 1–5 and drive 8 to a single volume because they are not adjacent.

Configure the RAID level when you configure the volume. The array supports RAID level 0, RAID level 1, and RAID level 5.

You also configure the hot spare when you create the volume. Drive 14 is always the hot spare if a hot spare is configured. The hot spare's purpose is to act as a temporary disk until the failed disk is replaced. You can configure the hot spare to one or both volumes in a disk tray.

For example, the following command line creates a volume named `v1` with data drives 1 to 8 inclusive in unit 2, as a RAID 5 volume, and with a hot spare in unit 2 drive 14:

```
6120:: vol add v1 data u2d1-8 raid 5 standby u2d14
```

In a high-availability (HA) array configuration with 6 array disk trays, you can create as many as 12 volumes (two per tray) or as few as 6 volumes (1 per tray).

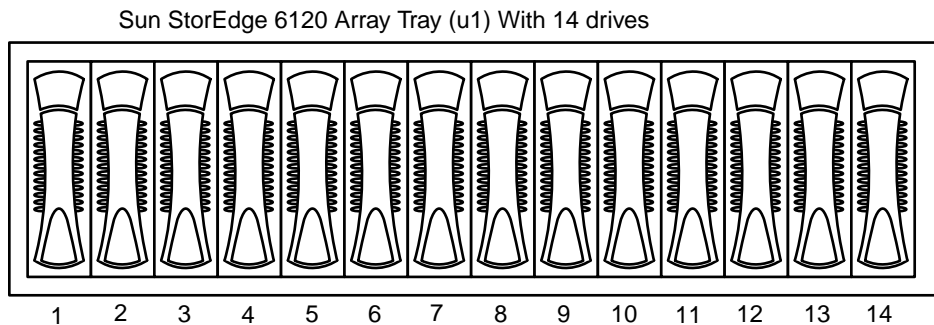


FIGURE 1-1 Examples of Disks Used to Create Volumes in One Tray

**TABLE 1-1** Examples of Volumes and Included Disks

Example No.	VOLUME 1 Disks	Standby Disk	VOLUME 2 Disks	Standby Disk
1	disks u1d1-5		disks u1d6-14	
2	disk u1d1		disks u1d2-14	
3	disks u1d1-6	disk u1d14	disks u1d7-13	
4	disks u1d1-7	disk u1d14	disks u1d8-13	disk u1d14
5	disks u1d1-14			
6	disks u1d1-13	disk u1d14		

## Volume Slices

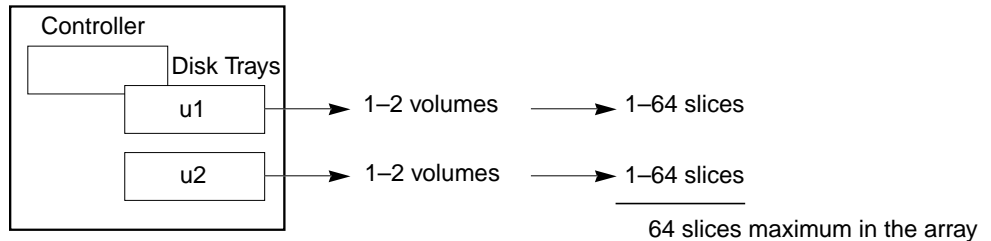
Any array configuration can have up to 64 *slices* created from its configured volumes (see [“Supported Configurations” on page 7](#)). Each slice can be mapped to 1 specific LUN number with *LUN mapping*, which means that there is also a maximum of 64 LUNs that any array configuration can make available to hosts.

All the volumes in an array can be sliced into a maximum of 64 slices. In the case of a single array with 1 disk tray, you can create 1 or 2 volumes and up to a total of 64 slices. In the case of a HA configuration, with 6 disk trays, you can create up to 12 volumes and slice these volumes into 64 slices total. Note that a volume exists wholly within one tray of disk drives and so any slice also exists wholly within one tray of disks: You cannot include portions of more than one tray in any volume or slice.

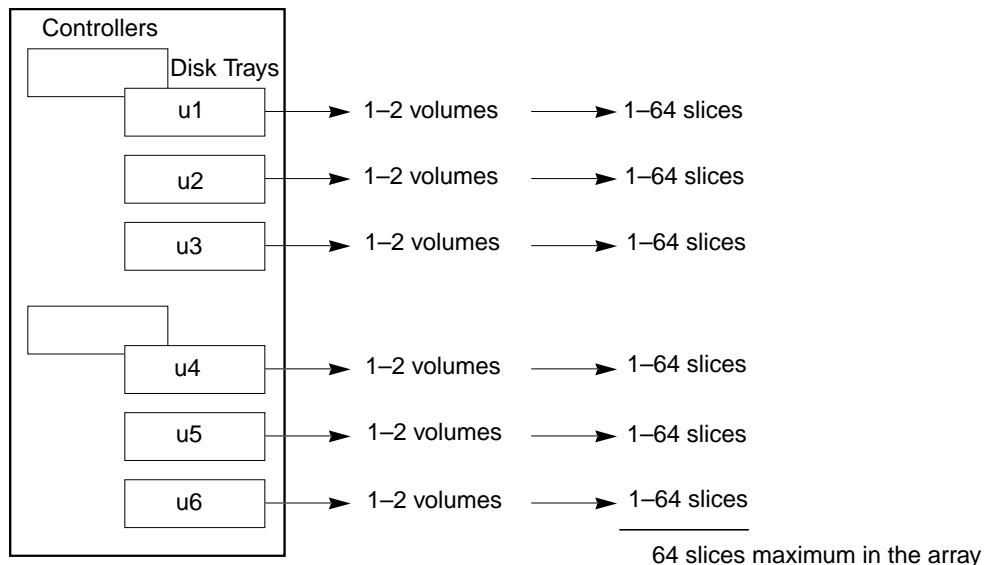
Array with 1 controller and 1 disk tray



Array with 1 controller and 2 disk trays



Array with 2 controllers and 6 disk trays



**FIGURE 1-2** Slice Creation in the Array

LUN access can then be controlled to external hosts, giving the hosts access to the LUNs and to the storage of their mapped slices. For a host to be allowed to access any particular LUN, the world wide name, or WWN, of the host's host bus adapter (HBA) must be given permission to access the LUN with *LUN masking*. LUN masking provides security by servicing host I/O only if the host's WWN matches the WWN in the LUN's mask.

For example, to provide storage capacity to a host on the Fibre Channel network:

1. Create a volume, `v1`, on array `u2`.

```
6120:// vol add v1 data u2d1-8 raid 5 standby u2d14
```

2. Create slice `s6` on volume `v1`.

```
6120:// volslice create s6 -s 1024 -z 5GB v1
```

3. Map slice `s6` to `lun 3`.

```
6120:// lun map add lun 3 slice 6
```

4. Mask `lun 3` to the host whose HBA has the WWN `20020da445678901`.

```
6120:// lun perm lun 3 rw wwn 20020da445678901
```

The host would now have read and write privileges to the storage in slice `s6`. See [“CLI Commands” on page 181](#) for detailed information about these commands.

---

## User Interfaces

You can configure the array using three different interfaces:

- Array telnet command line interface (CLI)
- Sun StorEdge Configuration Service web browser user interface (UI)
- Sun StorEdge Configuration Service CLI

The array’s CLI is part of the array itself. All the examples in this book demonstrate the array’s CLI. The Sun StorEdge Configuration Service UI and CLI reside on an external host. This host can be any host configured to communicate with the array through a telnet session.

For information about the Sun StorEdge Configuration Service UI and CLI, see [“Related Documentation” on page xxii](#).

---

# Supported Configurations

The array supports attaching controller-less arrays to arrays that have controllers. These controller-less trays are referred to as expansion units. The naming convention used in the configuration is: controller x trays (controller by trays). A 2x2 configuration means there are two controllers and two trays. A 2x4 configuration means two controllers and four trays.

The following array configurations are supported:

- High-availability (HA) configurations

Dual-controller arrays with expansion capability to provide additional capacity:

- Array with two controllers and two disk trays (2x2)
- Array with two controllers and four disk trays (2x4)
- Array, with two controllers and six disk trays (2x6)

- Non-HA configurations

Single-controller arrays with expansion capability to provide additional capacity:

- Array with a single controller and a single disk tray (1x1)
- Array with a single controller and two disk trays (1x2)
- Array with a single controller and three disk trays (1x3)

---

# Default Configuration Settings

A new array is delivered with default settings for system, boot, volume, and port management parameters. During installation the default configuration and some or all of these settings might have been changed. To modify these settings, see [“Reconfiguring the Array” on page 17](#), [“Creating and Reconfiguring a Volume” on page 45](#), and [“CLI Commands” on page 181](#).

# Default System Parameters

TABLE 1-2 shows the default system parameter settings.

**TABLE 1-2** Default System Parameter Settings

System Parameter	Default Value
controller	2.5 (controller version)
blocksize	16k
cache	auto
mirror	auto
mp_support	mpxio
naca	off
rd_ahead	on
recon_rate	med
sys memsize	256 MBytes
cache memsize	1024 MBytes
fc_topology	auto
fc_speed	2Gb

See [“Setting Global Parameters” on page 17](#) for detailed information about these parameters.



# Default Boot Parameter Settings

TABLE 1-3 shows the default boot parameter settings.

---

**Note** – If you change the array’s network settings, make sure that your network’s physical connectivity and settings match these new array settings.

---

**TABLE 1-3** Default Boot Parameter Settings

Boot Parameter	Default Value
bootmode	auto
bootdelay	3
sn	XXXXXX
ip	0.0.0.0
netmask	255.255.255.0
gateway	0.0.0.0
tftpghost	0.0.0.0
tftpfile	<NULL>
hostname	<NULL>
vendor	301
model	501-5710-01(50)
revision	300
logto	/syslog
loglevel	3
rarp	on
mac	X:X:X:X:X:X

See “set” on page 228 for information about these settings and how to modify them.

# Miscellaneous Configuration Parameters

TABLE 1-4 shows the default `vol` parameter settings.

**TABLE 1-4** Default `vol` Parameter Settings

<code>vol</code> Parameter	Default Value
<code>vol init</code>	<code>rate=16</code>
<code>vol verify</code>	<code>rate=1</code>

See “`vol`” on page 242 for information about these settings and how to modify them.

TABLE 1-5 shows the default `port` parameter settings.

**TABLE 1-5** Default `port` Parameter Settings

<code>port</code> Parameter	Default Value
<code>port host</code>	<code>sun</code>

See “`port`” on page 222 for information about this setting and how to modify it.

---

## Array Battery Information

The array’s power and cooling units (PCU) include batteries with sufficient capacity to allow an orderly shutdown in the event of an AC power failure. Each tray contains two PCUs and two batteries. The array incorporates automatic testing to help ensure that these batteries remain fully charged and in optimum condition.

This section discusses the battery system and the automatic tests in a general way. For specific information about setting up the test schedule, see [“Battery Configuration” on page 42](#).

## Battery Health Check

The array firmware performs battery health tests on a regular basis. To do this, the array periodically reads each battery field-replaceable unit (FRU) status to determine, among other things, the date of the last health test and whether the warranty life of the battery has expired. This data is stored in the FRU identification module located in each battery pack, which the system can query.

Within an array, the system performs parallel battery refresh tests, when needed, allowing one health test at a time per tray. See [“Supported Configurations” on page 7](#).

To ensure one fully charged battery is always available within each tray, battery health checks on the second PCU within a tray are only started if:

- The first battery health test is complete
- The first battery has passed the health test
- The first battery has been completely returned to a fully charged state

In a large configuration, such as an HA array with six disk trays, it is possible to have as many as six battery health tests in process with one running on each tray.

During a battery health check, the system cache, if set to `auto` remains in write-behind mode if no other FRU failures are detected. This ensures continued optimal performance during the battery health test procedures.

## Battery Hold-Time Test

Periodically the array firmware schedules each battery pack for a hold-time test. This test determines each battery’s ability to provide power to a fully populated array in the case of a loss of AC power.

The system runs the array from the battery being tested for approximately six minutes, which is the estimated worst case time it would take to flush dirty data in cache to disk and perform a graceful shutdown of the system. If the battery is able to sustain the system for the full six minutes, the battery FRU information is updated indicating when the test was performed and that the test passed. Within a tray, the same test is performed on the redundant battery after the first battery has been completely charged to full capacity.

The array’s battery charging facility recharges discharged batteries in an average of 90 to 140 minutes, depending on the age and strength of the battery.

## Battery Management Daemon Configuration File

The battery management daemon is responsible for checking and updating array battery status on a weekly basis. The day of the week and the time at which the battery hold-time test is launched are specified in a file located on the master tray in each array group. This file is located in the tray’s `/etc` directory and is named `bat.conf`. The default time for the battery daemon to run is 2:00 a.m. on Sunday. See [“Battery Configuration” on page 42](#) for information about changing these settings.

The battery refresh facility uses the `/etc/bat.conf` file to determine when to launch the battery refresh daemon. The battery refresh daemon's role is to determine if any battery in the array is due for a battery refresh cycle. The daemon performs this check on a case by case basis for each battery, using each battery's FRUId information.

Battery refresh cycles are required every 28 days. If any battery's FRUId information indicates that it has exceeded its 28 day refresh cycle, then a refresh cycle is started (assuming the tray in question is in an optimal state).

After a health check test is run on one battery, it is run on the other battery in the same tray even if the second battery isn't due for a battery health test. This ensures that both batteries in a tray have synchronized battery health test dates.

## Battery Temperature Monitoring

The array's PCU contains multiple temperature sensors. If the firmware detects any given PCU temperature to be greater than or equal to 44 degrees Centigrade at the beginning of a battery health test, that health test is not run on either battery. Appropriate `syslog` messages are issued to indicate the detected overtemperature condition and the skipped battery health test. All battery FRUs remain online.

When a battery overtemperature condition is detected, a battery error message is sent to the `syslog` facility for each sensor in the PCU that detects the overtemperature condition. A maximum of six notice-level messages might be sent to the `syslog` facility for a given tray (three messages per PCU). In addition, one warning-level message per PCU is also logged indicating this condition. These messages are only recorded if an overtemperature condition is detected when the battery management daemon is launched once a week. The array has other temperature monitoring facilities that become active if an overtemperature condition is detected at any time during operation of the array.

If an overtemperature condition is detected on a tray, then battery health checks are skipped on that tray but proceed on other trays in the array.

## Battery Warranty Check

Each battery in an array is warranted for two years from the date the battery is first installed in a running system. When the battery warranty has expired, a message is logged indicating that the warranty has expired. This message includes a recommendation to replace the battery to ensure optimal performance of the system. This is a one-time message that is repeated only if the array is rebooted.

The warranty date on each battery in an array is checked each day at 1:00 a.m. In addition, battery warranty dates are checked when a PCU is inserted into an array.

If a battery warranty has expired, the array takes no action other than to log the message. The array's cache mode is not changed, and the service LED on the PCU housing the battery does not indicate a FRU failure. The array considers a battery with an expired warranty date to be good as long as that battery continues to pass the battery health checks.

## Shelf-Life Check

The array also performs two battery shelf-life checks at the same time that it performs the warranty checks. The purpose of the shelf-life checks is to detect the installation of a battery that hasn't been used for an extended period of time, which leaves the batteries in an unknown state.

The first shelf-life check validates that the time between the date of manufacture and the current system date is less than three years. This ensures that the battery is less than three years old.

The second check detects batteries that have not been charged for eight months or longer, which can adversely affect the long term health of a battery. Sun inventory control keeps batteries in stock fully charged for immediate use. This second test applies only to batteries that have an active `Start Date` field on the battery FRU. A battery `Start Date` is registered the first time the battery is installed in an array. Batteries from Sun have a cleared `Start Date` field. Therefore, this test detects and fails only batteries that have been installed in an active array that has not been in operation for more than eight months.

If either of the shelf-life checks fails, the array marks the battery as failed and system facilities (such as system cache mode) react as they would with any FRU failure. If this occurs, the array operator will be notified to replace the battery immediately.

## Battery Replacement

Battery replacement procedures are straightforward and can be performed on a live system. Because this procedure involves removing a power and cooling unit (PCU), the system automatically reverts to write-through cache mode when either PCU is removed (assuming the cache mode is set to the factory default value of `auto`). If optimal system performance is necessary and the battery has not failed, but needs to be replaced, schedule this procedure during a time when system latencies are less critical.

---

**Note** – Following battery FRU replacement, the tray remains in write-through mode until the newly installed battery is fully charged.

---

Once a battery has been physically replaced in a given PCU and that PCU has been reinstalled in the tray, no further action is required. The system updates the battery FRU information as needed without operator intervention.

---

## Array Temperature Monitoring

The array is capable of monitoring internal components for overtemperature conditions. The system is designed to tolerate missing FRUs for an indefinite period of time, although a missing FRU such as a missing PCU, may cause the system to go to write-through mode.

When a FRU is removed from an array, the internal monitoring facilities will detect and log a message indicating a FRU is missing. It will continue to write a single message for each missing FRU every 10 minutes.

If the temperature in the array reaches 65 degrees Centigrade, a warning message will be logged indicating this condition. If the internal array temperature reaches 75 degrees Centigrade, the system will consider this a critical overtemperature condition. At this temperature, a log message will be generated and a graceful shutdown procedure will be initiated.

In the case of disk drives, if an individual disk drive reaches a temperature within 10 degrees Centigrade of the drive manufacturer's preset overtemperature threshold specification, the system will begin generating log messages referencing the disk drive experiencing the problem. When the individual disk drive has reached the drive manufacturer's critical temperature threshold, the system will log that event, and proceed to spindown the overheated disk drive.

---

## Service Indicator Standard LEDs

The array incorporates a number of light-emitting diode (LED) indicators that are used to assist in determining the status of the array as well as in repairing it. The LED colors have the following general meanings:

- Green indicates whether the unit is running.

- Amber indicates that the unit requires service.
- Blue means that it is safe to remove the unit and to replace it.
- White is used to identify the location of the unit.

A white, or locator, LED is implemented on the array tray front and rear. No other field-replaceable unit (FRU) within the array has a white LED. The white LED is used to lead the service person to the correct array. LEDs on FRUs, within the array whose white LED is lit, show the service person which FRU requires service and the current status of the FRU.

Each LED color is accompanied by a small pictorial indicator that is positioned near the LED.

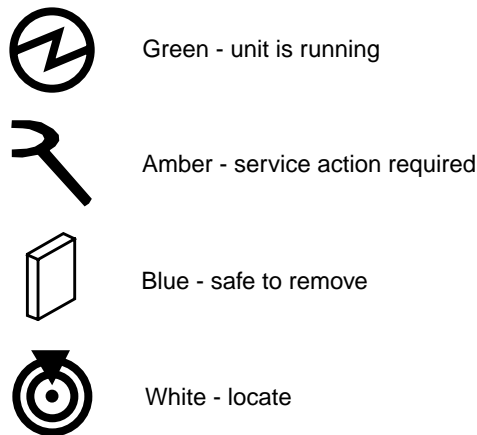


FIGURE 1-3 LED Pictorial

See [“Servicing the Array” on page 87](#) for additional information about the LEDs. That chapter also includes procedures that use the LEDs to service the array.

---

**Note** – The following issue is under investigation:

In cases where a disk drive is undergoing data reconstruction, the system will erroneously illuminate the blue Ready-to-Replace LED on that drive. The blue LED will no longer be lit after the reconstruction has completed however. As a general rule, do not remove any disk drive from the system if there is a flashing green LED indicating I/O to the disks is in progress, regardless of the state of the blue Ready-to-Replace LED. Drives that are truly ready to be swapped will not have any I/O activity as evidenced by the green LED.

---

---

**Note** – The following issue is under investigation:

During the process of booting a 6120 controller, if either the Power-on Self Test or Built-in Self Test firmware detects a fatal problem with the hardware, the system will prevent the faulty controller from going online. If this should occur, the system does not illuminate the amber LED on the controller (normally used to indicating the hardware is faulty). System users should allow enough time for newly inserted controllers to boot followed by inspection of the controller status through the Sun Storage Configuration Service interface. Should a controller not come online, it may be that the inserted controller is bad and should be replaced.

---



---

# Reconfiguring the Array

---

This chapter discusses how to reconfigure the array. The array is delivered with a default system configuration from the factory (see [“Default Configuration Settings” on page 7](#)), which might have been modified upon installation. The instructions in this chapter describe how to make changes to the system configuration subsequent to installation.

See [“Creating and Reconfiguring a Volume” on page 45](#) for information about reconfiguring the storage structure of the array.

Topics in this chapter include:

- [“Setting Global Parameters” on page 17](#)
- [“Specifying Fibre Channel Topology” on page 26](#)
- [“Specifying the Network Time Protocol” on page 27](#)
- [“Configuring the Array for Remote System Logging” on page 30](#)
- [“Configuring the Array for SNMP Notification” on page 37](#)
- [“Battery Configuration” on page 42](#)

---

## Setting Global Parameters

This section contains information about modifying array settings within an *administrative domain*. An administrative domain can be either a single array (1 x 1) or an HA configuration that shares common administration through a master controller. Each of the configurations listed in [“Supported Configurations” on page 7](#) comprises an administrative domain. Change these settings to configure your array to suit your application and recovery needs.

---

**Note** – You must set the cache segment size before you create volumes. Thereafter, you must remove volumes before you can change the cache segment block size.

---

The steps to set the global parameters are as follows:

- “To Set the Cache Block Size” on page 18
- “To Enable Multipathing” on page 20
- “To Set the Cache Mode” on page 21
- “To Enable Mirrored Cache” on page 21
- “To Set the LUN Reconstruction Rate” on page 22
- “To Perform Volume Verification” on page 23
- “To Set the Cache Read-Ahead Threshold” on page 24
- “To Set the IP Address” on page 25

## ▼ To Set the Cache Block Size



---

**Caution** – Changing the cache segment block size requires that you delete the existing volume. Deleting a volume destroys the data. Back up all data before beginning this procedure.

---

The *data block size* is the amount of data written to each drive when striping data across drives. (The block size is also known as the *stripe unit size*.) The block size can be changed only when no volumes are defined. The block size can be configured as 4 Kbytes, 8 Kbytes, 16 Kbytes, 32 Kbytes, or 64 Kbytes. The default block size is 64 Kbytes.

A cache segment is the amount of data being read into cache. A cache segment is 1/8 of a data block. Therefore, cache segments can be 2 Kbytes, 4 Kbytes, or 8 Kbytes. Because the default block size is 64 Kbytes, the default cache segment size is 8 Kbytes.

---

**Note** – To optimize performance, host stripe size should be equal to a multiple of the number of data drives times the cache block size:

host data stripe size = # of drives in volume \* array block size

Note that in a RAID 5 volume, one drive is used for parity:

host data stripe size = ((# of drives in volume) - 1) \* array block size

You can also use a multiple of these calculated values.

---

Cache block size is universal throughout an administrative domain. Therefore, you cannot change it after you have created a volume. The only way to change the cache block size is to delete a volume, change the block size, and then create a new volume.

---

**Note** – Some operating system utilities, such as `format`, only support a 1 Tbyte size limit, so you must ensure that all LUN sizes are less than 1 Tbyte. For example, in a system with 146 Gbyte drives, the total available capacity of the fourteen 146 Gbyte drives is approximately 2.0 Tbytes. Therefore, you must create two volumes, with each having less than 1 Tbyte.

---

**1. From the array, delete any existing volume as follows:**

```
6120:/:<#> vol list

volume          capacity  raid  data  standby
v0              143.2 GB   5     uld1-9  none
6120:/:<#> vol unmount volume-name

6120:/:<#> vol remove volume-name
```

**2. Type `sys list` to display the current cache segment size in blocks.**

Cache segment size is shown as `blocksize`.

```
6120:/:<#> sys list
controller      : 2.5
blocksize       : 16k
cache           : auto
mirror          : auto
mp_support      : mpzio
naca            : off
rd_ahead        : on
recon_rate      : med
sys memsize     : 128 MBytes
cache memsize   : 1024 MBytes
fc_topology     : auto
fc_speed        : 2Gb
```

**3. Specify and confirm the `blocksize` setting using the `sys` command.**

- a. Type `sys blocksize n` to change the blocksize, where  $n = 4K, 8K, 16K, 32K,$  or  $64K$ .**

**b. Type `sys list` to display the revised block size.**

For example:

```
6120:/:<#> sys blocksize 64k
6120:/:<#> sys list
controller          : 2.5
blocksize           : 64k
cache               : auto
mirror              : auto
mp_support          : mpzio
naca                : off
rd_ahead            : on
recon_rate          : med
sys memsize         : 128 MBytes
cache memsize       : 1024 MBytes
fc_topology         : auto
fc_speed            : 2Gb
```

## ▼ To Enable Multipathing

This task applies only when two controller units are configured as an HA configuration. For VERITAS Dynamic Multipathing (DMP) by VERITAS Volume Manager and the Sun StorEdge Traffic Manager software to function properly, you must enable multipathing support on the array for array HA configurations.

- **On the array, enable multipathing support by typing the following:**

- For DMP:

```
6120:/:<#> sys mp_support rw
```

- For Sun StorEdge Traffic Manager software:

```
6120:/:<#> sys mp_support mpzio
```

---

**Note** – If you are using Sun StorEdge Traffic Manager software for your multipathing software, type `sys mp_support mpzio` to select the correct array setting to support this software.

---

## ▼ To Set the Cache Mode

Write caching improves performance for applications because the data is written to fast memory as opposed to slower disk storage devices. The cache is protected with redundant battery systems that ensure the data is written to disk in the event of an AC power loss.

The cache mode options are:

- Auto (default)
- Write-behind
- Write-through
- Off

The default cache setting on the array is auto, which enables write-behind caching as long as there are no FRU failures.

- **Type** `sys cache cache-mode`.

For example, if you are setting the cache mode to `auto`, you would type:

```
6120:/:<#> sys cache auto
```



---

**Caution** – Data loss can occur in the write-behind cache mode if the units are not configured as a fully redundant HA configurations and an array system failure occurs. Use the auto cache mode for the highest degree of data protection.

---

---

**Tip** – You can view the actual cache status in use on a per-volume basis by typing `vol mode`.

---

```
6120:/:<#> vol mode
volume      mounted cache      mirror
v0          yes    writebehind on
v1          yes    writebehind on
v2          yes    writebehind on
```

## ▼ To Enable Mirrored Cache

Mirrored cache can safeguard cached data when a controller fails in an HA configuration. When enabled, cache data is copied to a cache mirror segment on the alternate controller before the write is acknowledged to the host.

---

**Note** – Cache mirroring impacts performance because the data is written to two separate controller caches.

---

● **Type:**

```
6120:/:<#> sys mirror auto
```

---

**Note** – The `auto` setting enables cache mirroring only when array health and conditions are optimal.

---

## ▼ To Set the LUN Reconstruction Rate

You can configure the LUN reconstruction rate so application performance is not impacted. The reconstruction rate options are high, medium, and low.

---

**Note** – You cannot change the reconstruction rate while disk drive reconstruction is in progress.

---

1. Use the `sys list` command to check the current reconstruction rate (`recon_rate`).

```
6120:/:<#> sys list
controller      : 2.5
blocksize       : 16k
cache           : auto
mirror          : auto
mp_support      : mpxio
naca            : off
rd_ahead        : on
recon_rate      : med
sys memsize     : 128 MBytes
cache memsize   : 1024 MBytes
fc_topology     : auto
fc_speed        : 2Gb
```

2. Use the `sys` command to specify and confirm the reconstruction rate.

- a. Type `sys recon_rate` and either `high`, `med`, or `low` to change the reconstruction rate.

**b. Type `sys list` to display the revised rate.**

For example:

```
6120:/:<#> sys recon_rate low
6120:/:<#> sys list
controller          : 2.5
blocksize           : 16k
cache               : auto
mirror              : auto
mp_support          : mpxio
naca                : off
rd_ahead            : on
recon_rate          : low
sys memsize         : 128 MBytes
cache memsize       : 1024 MBytes
fc_topology         : auto
fc_speed            : 2Gb
```

## ▼ To Perform Volume Verification

The `vol verify` command executes manual parity checks on existing volumes. Parity checking applies only to RAID 1 and RAID 5 volumes. You check data parity using the `vol verify` command before performing tape-backup overwrite cycles, approximately once every 30 days.

---

**Note** – Verify that the system health is in optimal condition before you run the `vol verify` command. For example, ensure that no LUNs are under reconstruction, that the status of all disks is `mounted` (which can be checked using the `vol stat` command), and that other similar conditions are resolved.

---

---

**Note** – The `vol verify` operation can take up to several hours to run, depending on system activity and the verification rate selected. Executing this command can affect system performance, depending on these factors.

---

- **Use the `vol verify` command to set parity check rate** (*volume-name* is the name of the volume to verify).

```
6120:/:<#> vol verify volume-name [fix] rate n
```

---

**Note** – The volume name is a name internal to the array and is not seen by the host.

---

The `[fix]` option corrects parity errors on RAID 5 volumes and corrects mirrored data errors on RAID 1 volumes. If `fix` is *not* specified, `vol verify` reports errors but does not correct them. If the `fix` option is specified and an error is detected, the `vol verify` command regenerates parity from the existing data on the volume.

The verification rate is *n*, where *n* equals any number from 1 to 8. The default rate is 1, which has the minimum performance impact on the data host.

---

**Note** – Within an HA configuration, the `vol verify` command can be run on only one volume at a time.

---

## ▼ To Set the Cache Read-Ahead Threshold

Setting read caching can reduce disk I/O by reading data for future retrieval. This refers to the number of sequential reads in a chunk of data. The two cache read-ahead threshold options are `on` and `off`. The default setting for the array is `on`.

1. Use the `sys list` command to check the current cache read-ahead threshold (`rd_ahead`).

```
6120:/:<#> sys list
controller      : 2.5
blocksize       : 16k
cache           : auto
mirror          : auto
mp_support      : mpxio
naca            : off
rd_ahead        : on
recon_rate      : med
sys memsize     : 128 MBytes
cache memsize   : 1024 MBytes
fc_topology     : auto
fc_speed        : 2Gb
```



2. Use the `sys rdAhead` command to set the default threshold to `off` and confirm the setting using the `sys list` command.

For example:

```
6120:/:<#> sys rdAhead off
6120:/:<#> sys list
controller      : 2.5
blocksize       : 16k
cache           : auto
mirror          : auto
mp_support      : mpxio
naca            : off
rdAhead         : off
recon_rate      : med
sys memsize     : 128 MBytes
cache memsize   : 1024 MBytes
fc_topology     : auto
fc_speed        : 2Gb
```

## ▼ To Set the IP Address

You can set the IP address on an array with either of the following methods:

- Edit the host files on a Reverse Address Resolution Protocol (RARP) server with IP address information.

This option enables the IP address to be downloaded automatically, after the array is first installed and powered on, and then receives a RARP request from the host. If you move the array to another network, it receives its IP information from the RARP server on that network. Thus, the host files of the new RARP server must be updated to include the new array. To set the array IP address by editing the host files, refer to the instructions in the installation section of the *Sun StorEdge 6120 Array Installation Guide*.

- Use the array `set ip` command.

This option can be used only if the array is online and already connected to an Ethernet network, which would be possible only if the array IP address had been assigned using the RARP server previously. Use this option if you are moving the array to a network without a RARP server.

- Type `set ip IP-address` to assign the array IP network address:

```
6120:/:<#> set ip IP-address
```



---

**Caution** – If you are moving the array to a network with a RARP server and if the array reboots, the array can pick up another IP address from the RARP server that will override the IP address you assigned with the `set ip` command. To avoid this, always assign the IP address by editing the host files on a RARP server.

---

## Specifying Fibre Channel Topology

The array supports both point-to-point topology and loop topology. This means that an array can connect directly to a switch, hub, or host, with full fabric connectivity.

For more information on the individual commands, see [“CLI Commands” on page 181](#). The section contains the following topics:

- [“To Determine the Topology Firmware Mode” on page 26](#)
- [“To Change the Topology Firmware Mode” on page 27](#)

### ▼ To Determine the Topology Firmware Mode

- Use the `sys list` command to determine the topology firmware mode setting of the array.

```
6120:/:<#> sys list
controller      : 2.5
blocksize       : 16k
cache           : auto
mirror          : auto
mp_support      : mpxio
naca            : off
rd_ahead        : on
recon_rate      : med
sys memsize     : 128 MBytes
cache memsize   : 1024 MBytes
fc_topology     : auto
fc_speed        : 2Gb
```

In this example, the array Fibre Channel topology mode is set to automatic sense and set. This is the default setting. See TABLE 2-1 for an explanation of the various mode settings. For a full explanation of the `fc_topology` command, see [“CLI Commands” on page 181](#).

**TABLE 2-1** fc\_topology Mode Settings

Parameter	Function
auto	Enables the controller firmware to automatically determine and set the topology firmware mode.
loop	Sets the loop topology firmware mode.
fabric_p2p	Sets the point-to-point topology firmware mode.

## ▼ To Change the Topology Firmware Mode

You should not need to perform this task except for troubleshooting purposes.

1. Set the topology firmware driver of the array as desired. For example, to set the driver to point-to-point, type:

```
6120:/:<#> sys fc_topology fabric_p2p
```

2. Wait at least 10 seconds before querying the current negotiated topology.
3. Use the `sys fc_topology` command to verify the current negotiated topology.

```
6120:/:<#> sys fc_topology
Host port ulp1 Current Negotiated Topology=Fabric
Point to Point, Port ID=100300
```

---

## Specifying the Network Time Protocol

The Network Time Protocol (NTP) support feature enables a network system of arrays to automatically synchronize their internal system time with a designated NTP master array.

To set the time zone, see “set timezone” on page 230. For more information about all commands, see “CLI Commands” on page 181.

## ▼ To Set Up the NTP Server

1. Use the `set timezone` command to establish the time zone.

```
6120:/:<#> set timezone :America/Los_Angeles
```

2. Use the `set` command to confirm the time zone region setting.

```
6120:/:<#> set
bootmode auto
bootdelay 3
ip <omitted..>
netmask 255.255.255.0
gateway <omitted..>
tftpghost <omitted..>
tftpfile <omitted..>
hostname 6120
timezone :America/Los_Angeles
logto *
loglevel 3
rarp on
mac 00:03:ba:27:d4:df
```

3. Use the `ntp server` command to set the IP address of the server that is running the NTP daemon.

```
6120:/:<#> ntp server nnn.nnn.nnn.nnn
```

4. Use the `ntp interval` command to set up the polling interval, in minutes, of an NTP client to the NTP server.

```
6120:/:<#> ntp interval 5
```

In this example, the array polls the NTP server (updates the synchronization) every 5 minutes.

5. Use the `ntp` command to verify that the server and polling interval are set correctly.

```
6120:/:<#> ntp
server          nnn.nnn.nnn.nnn
poll            off
interval        5
```

The example above shows the NTP server's IP address, that polling is turned off, and that the polling interval is set at 5 minutes.

6. Use the `ntp poll` command to turn on the NTP polling, if required.

```
6120:/:<#> ntp poll unicast
```

7. Use the `ntp stats` command to verify the NTP client (array) status.

```
6120:/:<#> ntp stats
lastpollTue Feb 19 21:07:32 GMT 2002
server nnn.nnn.nnn.nnn
offset + 0.00413176
status Successfully adjusted the time.
```

This example shows the time of the last poll, the NTP server's IP address, the adjustment made to the array's internal clock, and the clock set success statement.

---

# Configuring the Array for Remote System Logging

Configuring the array consists of editing the `/etc/syslog.conf` and the `/etc/hosts` files on the array. Editing these files enables system messages to be logged and directed to a management host. Because you cannot edit files on the array, you must use FTP to transfer them to a host, make the edits on the host, and then transfer them back to the array.

This procedure consists of the following tasks:

- [“To Transfer the Array Files to the Management Host” on page 30](#)
- [“To Edit the Array `/etc/syslog.conf` File” on page 32](#)
- [“To Edit the Array `/etc/hosts` File” on page 33](#)
- [“To Transfer Files Back to the Array” on page 34](#)
- [“To Edit the Management Host `/etc/syslog.conf` File” on page 35](#)

## ▼ To Transfer the Array Files to the Management Host

---

**Note** – For this procedure to work properly, you must have the root password set.

---

### 1. Start an ftp session from the management host to the array.

For example:

```
host#<15>ftp nnn.nnn.nnn.nnn
Connected to nnn.nnn.nnn.nnn.
220 chon-ji FTP server (SunOS 5.7) ready.
Name (nnn.nnn.nnn.nnn:root):
```

### 2. Log in to the array by typing `root` and your password at the prompts.

```
Name (nnn.nnn.nnn.nnn:root): root

331 Password required for root.
Password: password
230 User root logged in.
ftp>
```

### 3. Move to your working directory on the management host.

For example:

```
ftp> lcd /tmp
Local directory now /tmp
ftp>
```

### 4. Move to the /etc directory on the array.

```
ftp> cd /etc
250 CWD command successful.
ftp>
```

### 5. Copy the syslog.conf file from the /etc directory on the array to your working directory.

```
ftp> get syslog.conf
200 PORT command successful.
150 Binary data connection for syslog.conf (nnn.nnn.nnn.nnn,1031) (162 bytes).
226 Binary Transfer complete.
162 bytes received in 1 seconds (0 Kbytes/s)
ftp>
```

### 6. Copy the hosts file from the /etc directory on the array to your working directory.

```
ftp> get hosts
200 PORT command successful.
150 Binary data connection for hosts (nnn.nnn.nnn.nnn,1034) (47 bytes).
226 Binary Transfer complete.
47 bytes received in 1 seconds (0 Kbytes/s)
ftp>
```

### 7. Exit the ftp session.

```
ftp>
quit
221 Goodbye.
mngt_host:/:
```

## ▼ To Edit the Array `/etc/syslog.conf` File

You must edit the `/etc/syslog.conf` file to include the category of messages that you want to have logged with the IP address and host name of the management host that will be logging these messages.

1. **Determine the IP address and host name of the management host that will be logging messages.**
2. **Determine which category of messages you would like to receive from the array.**

Messages generated by the array are grouped into four categories in the order of severity, as described in TABLE 2-2.

TABLE 2-2 Message Categories

Category	Description
Error	Indicates a critical system event that requires immediate user intervention or attention. For example, inability to flush the write-behind cache.
Warning	Indicates a serious system event that requires eventual user intervention. For example, a disk drive being disabled.
Notice	Indicates a system event that may lead to a more serious condition in the future. For example, the occurrence of hard errors corrected via parity replacement.
Information	Indicates a system event that has no consequence on the running health of the system. For example, user login notifications.

---

**Note** – The message categories are cumulative. For example, if you specify that you want to be notified about `notice` messages, you will also receive notification of `error` and `warning` messages. If you specify that you want to be notified about `information` messages, you will receive messages from all categories.

---



**3. On the management host, use a text editor to edit the `syslog.conf` file in the working directory.**

Use tab spaces to separate field entries when editing the `/etc/syslog.conf` file. If you use spaces rather than tab spaces to separate field entries, the array will not recognize your edits.

```
# syslog.conf
# facility.level action
# messages to local syslog file
*.notice /syslog

# messages to syslogd on another host Remote system logging
*.warn @remote-host
*.warn @nnn.nnn.nnn.nnn

# messages sent as SNMP traps
*.warn | snmp_trap nnn.nnn.nnn.nnn
```

---

**Note** – Use the IP address in the `syslog.conf` file. If you want to add a host name, you must add a corresponding entry to the array’s `/etc/hosts` file as described in the following section. The entry in the array’s `/etc/hosts` file is used only for `syslog` control features on the array. Array utilities such as `ping` do not reference the array’s `/etc/hosts` file. Therefore, IP addresses must be used with these utilities.

---

## ▼ To Edit the Array `/etc/hosts` File

You must edit the `/etc/hosts` file to add the name and IP address of the management host.

- **On the management host, use a text editor to edit the `/etc/hosts` file in the working directory.**

Separate the IP address from the name with a tab space.

```
#hosts
#ip-address name
nnn.nnn.nnn.nnn host-name
```

## ▼ To Transfer Files Back to the Array

After editing the `/etc/syslog.conf` and `/etc/hosts` files, transfer the files from the management host back to the array.

### 1. Start an ftp session from the management host to the array.

For example:

```
host#<15>ftp nnn.nnn.nnn.nnn
Connected to nnn.nnn.nnn.nnn.
220 chon-ji FTP server (SunOS 5.7) ready.
Name (nnn.nnn.nnn.nnn:root):
```

### 2. Log in to the array by typing `root` and your password at the prompts.

```
Name (nnn.nnn.nnn.nnn:root): root
331 Password required for root.
Password: password
230 User root logged in.
ftp>
```

### 3. Move to the `/etc` directory on the array.

```
ftp> cd /etc
250 CWD command successful.
ftp>
```

### 4. Copy the edited `syslog.conf` file from your working directory to the `/etc` directory on the array.

```
ftp> put syslog.conf
200 PORT command successful.
150 Binary data connection for syslog.conf (nnn.nnn.nnn.nnn,1031) (162 bytes).
226 Binary Transfer complete.
162 bytes received in 1 seconds (0 Kbytes/s)
ftp>
```

5. Copy the edited `hosts` file from your working directory to the `/etc` directory on the array.

```
ftp> put hosts
200 PORT command successful.
150 Binary data connection for hosts (nnn.nnn.nnn.nnn,1034) (47 bytes).
226 Binary Transfer complete.
47 bytes received in 1 seconds (0 Kbytes/s)
ftp>
```

6. Exit the ftp session.

```
ftp>
quit
221 Goodbye.
host#
```

7. On the array, start message traffic to the host.

The `syslogd` will reexamine the `syslog.conf` file at the array.

```
6120:/:<#> set logto *
```

## ▼ To Edit the Management Host `/etc/syslog.conf` File

You must edit the `/etc/syslog.conf` file on the management host (the host used for monitoring and administering one or more arrays through the Ethernet connection) to include a log file for capturing error messages.

- On the management host, add a line with the name of the host's log file to the host's `/etc/syslog.conf` file, as shown in bold type in the following example:

---

**Note** – You must use a tab space between *log-filename* and `/var/adm/messages`.

---

```
#ident "@(#)syslog.conf1.496/10/11 SMI"/* SunOS 5.0 */
#
# Copyright (c) 1991-2001, by Sun Microsystems, Inc.
#
# syslog configuration file.
#
# This file is processed by m4 so be careful to quote (``) names
# that match m4 reserved words. Also, within ifdef's, arguments
# containing commas must be quoted.
#
*.err;kern.notice;auth.notice/dev/console
*.err;kern.debug;daemon.notice;mail.crit/var/adm/messages

*.alert;kern.err;daemon.erroperator
*.alert                                root

*.emerg                                *

# if a non-loghost machine chooses to have authentication messages
# sent to the loghost machine, un-comment out the following line:
#auth.notice  ifdef(`LOGHOST', /var/log/authlog, @loghost)

mail.debug    ifdef(`LOGHOST', /var/log/syslog, @loghost)

#
# non-loghost machines will use the following lines to cause "user"
# log messages to be logged locally.
#
ifdef(`LOGHOST', ,
user.err          /dev/console
user.err          /var/adm/messages
user.alert        `root, operator'
user.emerg        *
)
local7.notice    /var/adm/messages.6120
```

In this example, all arrays that use this host for logging will have their messages dumped to `/var/adm/messages.6120`. The file name of the log file might be different depending on the type of array management software you are using.

---

**Note** – If you are using the Storage Automated Diagnostic Environment in the Solaris OS to monitor the array, verify that you are using the correct `/var/adm/messages` file name. Refer to the Storage Automated Diagnostic Environment documentation for the name of this message file.

---

---

## Configuring the Array for SNMP Notification

The array can provide remote notification of array events to designated hosts using Simple Network Management Protocol (SNMP) traps. To enable SNMP notification, you must edit files on the array to configure system message logging. Because you cannot edit files on the array, you must use the `ftp` command to send them to a host to make the edits and then use the `ftp` command to return them to the array.

This procedure consists of the following tasks:

- [“To Transfer the Array Files to the Management Host” on page 37](#)
- [“To Edit the Array `/etc/syslog.conf` File” on page 39](#)
- [“To Edit the Array `/etc/hosts` File” on page 40](#)
- [“To Transfer Files Back to the Array” on page 41](#)

### ▼ To Transfer the Array Files to the Management Host

---

**Note** – For this procedure to work properly, you must have the root password set.

---

#### 1. Start an `ftp` session from the management host to the array.

For example:

```
host#<15>ftp nnn.nnn.nnn.nnn
Connected to nnn.nnn.nnn.nnn.
220 chon-ji FTP server (SunOS 5.7) ready.
Name (nnn.nnn.nnn.nnn:root):
```

**2. Log in to the array by typing `root` and your password at the prompts.**

```
Name (nnn.nnn.nnn.nnn:root): root
331 Password required for root.
Password: password
230 User root logged in.
ftp>
```

**3. Move to your working directory on the management host.**

For example:

```
ftp> lcd /tmp
Local directory now /tmp
ftp>
```

**4. Move to the `/etc` directory on the array.**

```
ftp> cd /etc
250 CWD command successful.
ftp>
```

**5. Copy the `syslog.conf` file from the `/etc` directory on the array to your working directory.**

```
ftp> get syslog.conf
200 PORT command successful.
150 Binary data connection for syslog.conf (nnn.nnn.nnn.nnn,1031) (162 bytes).
226 Binary Transfer complete.
162 bytes received in 1 seconds (0 Kbytes/s)
ftp>
```

**6. Copy the `hosts` file from the `/etc` directory on the array to your working directory.**

```
ftp> get hosts
200 PORT command successful.
150 Binary data connection for hosts (nnn.nnn.nnn.nnn,1034) (47 bytes).
226 Binary Transfer complete.
47 bytes received in 1 seconds (0 Kbytes/s)
ftp>
```

## 7. Exit the ftp session.

```
ftp>  
quit  
221 Goodbye.  
host#
```

## ▼ To Edit the Array `/etc/syslog.conf` File

You must edit the `/etc/syslog.conf` file to include the category of messages that you want to have logged with the IP address of the management host that will be receiving these messages.

1. Determine the IP address and host name of the management host that will be logging messages.
2. Determine which category of messages you would like to receive from the array.

Messages generated by the array are grouped into four categories in the order of severity, as described in TABLE 2-3.

TABLE 2-3 Message Categories

Category	Description
Error	Indicates a critical system event requiring immediate user intervention or attention, such as the inability to flush the write-behind cache.
Warning	Indicates a serious system event requiring eventual user intervention. An example would be a disk drive being disabled.
Notice	Indicates a system event that may lead to a more serious condition in the future. An example would be the occurrence of hard errors corrected via parity replacement.
Information	Indicates a system event that has no consequence on the running health of the system. An example would be user login notifications.

---

**Note** – The message categories are cumulative. For example, if you specify that you want to be notified about `notice` messages, you will also receive notification of error and warning messages. If you specify that you want to be notified about information messages, you will receive messages from all categories.

---



---

**Caution** – Use tab spaces to separate field entries when editing the `/etc/syslog.conf` file. If you use spaces rather than tab spaces to separate field entries, the array will not recognize your edits.

---

**3. On the management host, use a text editor to edit the `syslog.conf` file in the working directory.**

Separate entries with tab spaces. Edits are highlighted in the following example:

```
# syslog.conf
# facility.level action
# messages to local syslog file
*.notice /syslog

# messages to syslogd on another host
*.warn @remote-host
*.warn @nnn.nnn.nnn.nnn

# messages sent as SNMP traps
*.warn | snmp_trap nnn.nnn.nnn.nnn
```

SNMP notification

---

**Note** – You can use either the IP address or a host name in the `syslog.conf` file. If you use a host name, a corresponding entry must be present on the array's `/etc/hosts` file, as described in the next section.

---

## ▼ To Edit the Array `/etc/hosts` File

You must edit the `/etc/hosts` file to add the name and IP address of the management host.

● **On the management host, use a text editor to edit the `/etc/hosts` file in the working directory.**

Separate the IP address from the name with a tab space.

```
#hosts
#ip-address name
nnn.nnn.nnn.nnn host-name
```

IP address



## ▼ To Transfer Files Back to the Array

After editing the `/etc/syslog.conf` and `/etc/hosts` files, transfer the files from the management host back to the array.

### 1. Start an ftp session from the management host to the array.

For example:

```
host#<15>ftp nnn.nnn.nnn.nnn
Connected to nnn.nnn.nnn.nnn.
220 chon-ji FTP server (SunOS 5.7) ready.
Name (nnn.nnn.nnn.nnn:root):
```

### 2. Log in to the array by typing `root` and your password at the prompts.

```
Name (nnn.nnn.nnn.nnn:root): root

331 Password required for root.
Password: password
230 User root logged in.
ftp>
```

### 3. Move to the `/etc` directory on the array.

```
ftp> cd /etc
250 CWD command successful.
ftp>
```

### 4. Copy the edited `syslog.conf` file from your working directory to the `/etc` directory on the array.

```
ftp> put syslog.conf
200 PORT command successful.
150 Opening ASCII mode data connection for syslog.conf
226 Transfer complete.
local: syslog.conf remote: syslog.conf
155 bytes sent in 0.00049 seconds (307.66 Kbytes/s)
ftp>
```

5. Copy the edited `hosts` file from your working directory to the `/etc` directory on the array.

```
ftp> put hosts
200 PORT command successful.
150 Opening ASCII mode data connection for hosts
226 Transfer complete.
local: hosts remote: hosts
47 bytes sent in 0.00024 seconds (307.66 Kbytes/s)
ftp>
```

6. Exit the ftp session.

```
ftp>
quit
221 Goodbye.
host#
```

7. On the array, start message traffic to the host.

The `syslogd` will reexamine the `syslog.conf` file at the array.

```
6120:/:<#> set logto *
```

---

## Battery Configuration

The battery management daemon is responsible for checking and updating the array's battery status on a weekly basis. The daemon is launched on the day of the week and at the time specified in a file located on the master tray in each array. This file, `/etc/bat.conf`, consists of the following required three data fields:

```
DAY 0
HOURL 2
MINUTE 0
```

Permissible values for the three fields in the file are as follows:

- DAY is entered as a number:

0 = Sunday, 1 = Monday, 2 = Tuesday, 3 = Wednesday, 4 = Thursday, 5 = Friday, 6 = Saturday.

- HOUR is entered as 0 to 23.
- MINUTE is entered as 0 to 59.

The battery refresh daemon's role is to determine if any battery in the array is due for a battery refresh cycle. The daemon performs this check on all batteries, using each battery's FRU id information. Battery refresh cycles are required every 28 days. If a given battery's FRU information indicates that the battery has exceeded its 28 day refresh cycle, a refresh cycle is started (assuming the tray in question is in an optimal state).

After the completion of a battery's health check test, the other battery in the same tray is also tested even if the second battery isn't due for a battery health test. This ensures that both batteries in a tray have synchronized battery health test dates.

To initialize changes made to the `/etc/bat.conf` file type:

```
6120:/:<#> refresh -i
```

If the `bat.conf` file doesn't exist, contains an invalid setting, or is incomplete, an error message is logged to the array's `syslog` facility, and the system launches the battery management daemon on Sundays at 2:00 a.m. The system error message indicates the problem with the `bat.conf` syntax. To verify any change you make to the `bat.conf` file, check the `syslog` files for messages.



# Creating and Reconfiguring a Volume

---

Use the instructions in this chapter to create a volume or to change the volume configuration.

See also [“Reconfiguring the Array” on page 17](#), which discusses reconfiguring the array itself, not its included volumes.

---

**Note** – You must set the cache block size before you configure volumes. See [“To Set the Cache Block Size” on page 18](#).

---

The topics in this chapter include:

- [“Array Configuration Considerations” on page 45](#)
- [“Volume Configuration Guidelines” on page 46](#)
- [“To Delete a Volume” on page 48](#)
- [“To Create a Volume” on page 49](#)

---

## Array Configuration Considerations

When you are configuring an array, consider these four questions:

1. Will drive 14 be used as a hot-spare?
2. How many volumes do you need per array, one or two? How many drives will be in each volume? Choosing between one or two volumes per array requires balancing considerations of capacity, performance, and availability.

A configuration of a single volume per array provides better performance than two volumes because two volumes require additional administrative management overhead. However, an availability trade-off is associated with

higher performance. For example, a one-volume array might have a RAID 5 stripe of 13 drives. A failure of one of these drives results in a longer reconstruction time than if one drive within one of two RAID 5 volumes were to fail. This also leaves the 13-drive volume in a vulnerable state, because a subsequent failure during the reconstruction of another drive within the same stripe results in a loss of data.

3. What RAID level is desired for each volume? See TABLE 3-1 for details.

**TABLE 3-1** Array Volume and Drive Configurations Available per RAID Level

RAID Level	Volume and Drive Configurations
0	<p>One or two volumes: 14 drives maximum or 13 plus a hot-spare; two drives minimum</p> <p>RAID 0 is advised only where performance is the sole qualifier or in conjunction with an external form of data protection such as using a host-based mirroring scheme across two arrays.</p>
1+0	<p>One or two volumes: 14 drives maximum or 13 plus a hot-spare; 2 drives minimum</p>
5	<ul style="list-style-type: none"> <li>• One volume: 14 drives maximum or 13 plus a hot-spare; 3 drives minimum</li> <li>• Two volumes—Any combination of drives on the two volumes as long as at least 3 drives (exclusive of a hot-spare) are used in any one volume using RAID 5</li> </ul>

4. How many total slices are desired, and how are they to be mapped to LUNs and to hosts? Consider that a failure within a volume affects all slices of that volume.

## Volume Configuration Guidelines

An array consists of from seven to fourteen disk drives that can be configured into one or two volumes. These volumes, after slicing and mapping, are presented to network-attached hosts by the array as logical units, or LUNs, which appear to the hosts as disk drives. The host does not see the underlying hardware structure of the array.

The following rules govern volume creation and reconfiguration.

1. Volumes must consist of whole drives.
2. A drive cannot be partitioned into different volumes.
3. A tray can contain a maximum of two volumes.

4. A volume must equate to one drive group. A drive group is the exact equivalent of one RAID level. A RAID level is either striped (RAID 0 or RAID 5) or striped and mirrored (RAID 1+0). Thus, a drive group using RAID 5 can consist of from three to fourteen drives, and a RAID 1+0 drive group must consist of at least two drives.
5. If drive 14 is used as a hot-spare, it must be specified when a given volume is created. If you create two volumes, they can both use drive 14 as a shared hot-spare if the hot-spare is designated when they are created. If you want to designate a hot-spare for an existing volume, that volume must be deleted and then recreated with a hot-spare (drive 14) designated.

Before creating or reconfiguring volumes in an array, be sure to read [“Volume Slicing Guidelines” on page 52](#) and [“Array Configuration Considerations” on page 45](#). To create a volume, see [“Creating a Volume” on page 48](#).

---

**Note** – If you have an array with less than 14 drives installed, consider not creating the second volume until the tray is fully populated. If you do create two volumes with less than 14 drives installed, then you must backup and restore any data on the array when you install additional disk drives.

---

---

## Deleting a Volume

If you install more drives on an array that has fewer than 14 drives installed, then you can create a volume from these drives without deleting an earlier volume as long as you haven't configured the maximum of two volumes already. If the tray is fully populated and presently contains two volumes, then you must delete an existing volume before you can create a new one.



---

**Caution** – Before you delete a volume and create a new volume, back up all data associated with the volume being deleted. Data that resides in the volume to be deleted is destroyed.

---

Once a volume has been configured, you cannot reconfigure it to change its size, RAID level, or hot-spare configuration. If you install a new drive, any deleted volume must be adjacent to the new drive.

## ▼ To Delete a Volume



---

**Caution** – Deleting a volume destroys your data. Back up all data before beginning this procedure.

---

1. Use the `vol list` command to display the configuration of the current volumes.

```
6120:/:<#> vol list

volume          capacity  raid  data  standby
v0              143.2 GB   5    u1d1-9  none
```

2. Unmount the volume.

```
6120:/:<#> vol unmount volume-name
```

3. Delete the volume.

```
6120:/:<#> vol remove volume-name
```

---

## Creating a Volume

Once a volume has been configured, you cannot reconfigure it to change its size, RAID level, or hot-spare configuration.

Some operating systems utilities only support a specific volume size limit, so you must ensure that all volume sizes are within this limit.



---

**Caution** – Before you delete a volume and create a new volume, back up all data associated with the volume being deleted. Data that resides in a volume is destroyed when the volume is deleted.

---

Creating a new volume involves:

- Creating the volume
- Labeling the volume so that the operating system can recognize it.



## ▼ To Create a Volume

Configuring a hot-spare drive in the volume is optional. If you are configuring a hot spare in the volume, you can use only disk drive `d14` as the hot spare. You can have only one hot spare per disk tray, which can be shared by two volumes.

When configuring a volume, you must define the volume, RAID level, and hot spare at the same time. See “[Volumes](#)” on page 3 for some valid volume configurations.

1. On the array, use the `vol add` command to create the volume as follows:

```
6120:/:<#> vol add volume-name data undn-n raid n standby und14
```

- Define the drives (`data undn-n`) on which the volume will reside
- Define the RAID level (`raid n`), where  $n = 0, 1, \text{ or } 5$ .
- Optional: Define the hot-spare drive (`standby und14`); `d14` is the number of the hot-spare disk drive

```
6120:/:<#> vol add volume-name data undn-n raid n standby und14
```

For example:

```
6120:/:<#> vol add v1 data uld1-8 raid 5 standby uld14
```

2. Check the status of the volumes.

The `vol stat` command shows the drive status. For example:

```
6120:/:<#> vol stat

v1: mounted
  uld01: mounted
  uld02: mounted
  uld03: mounted
  uld04: mounted
  uld05: mounted
  uld06: mounted
  uld07: mounted
  uld08: mounted
Standby: uld14: mounted
```

**3. Use the `vol init` command to initialize the volume.**

Depending on system activity at the time of initialization, it can take a considerable amount of time to initialize a volume. Only one volume can be initialized at a time. For approximate times for the `vol init` command to complete, see “vol” on page 242.

```
6120:/:<#> vol init volume-name data
```

**4. Use the `vol mount` command to mount the volume.**

```
6120:/:<#> vol mount volume-name
```

**5. Use the `vol list` command to confirm that you created the volume correctly.**

For example:

```
6120:/:<#> vol list

volume      capacity  raid  data  standby
v1          125.2 GB  5     u1d1-8  u1d14
```

## Configuring Volumes

---

This chapter discusses volume slicing, LUN mapping, and LUN masking.

The array firmware allows for multiple volume slices (more than one slice per volume) which is similar to partitioning the hard drive of a desktop computer. This feature allows greater flexibility to address storage in smaller increments, takes advantage of larger capacity drives, and provides ease of scaling to suit individual applications.

Topics in this chapter include:

- [“Volume Slicing” on page 51](#)
- [“Specifying LUN Mapping” on page 66](#)
- [“Specifying LUN Masking” on page 67](#)

---

## Volume Slicing

A volume can be partitioned into as many as sixty-four variable-sized slices, which allows multiple LUNs per array configuration. For more information on the individual commands, see [“CLI Commands” on page 181](#).

This section contains the following topics:

- [“To Reconfigure a Volume by Adding Slices” on page 52](#)
- [“To Create a Volume Slice” on page 61](#)
- [“To Remove a Volume Slice” on page 62](#)

# Volume Slicing Guidelines

1. A maximum of 64 slices is allowed per array.
2. The minimum slice size is 10 Mbytes and must be rounded on a RAID stripe boundary.
3. All slice sizes must be in multiples of the minimum slice size.
4. The maximum slice size is dependent on the volume size. All space in a volume need not be used.

---

**Note** – If you have an array with less than fourteen drives installed, consider not creating the second volume until the tray is fully populated. If you do create two volumes with less than fourteen drives installed, then you must backup and restore any data on the array when you install additional disk drives.

---

## ▼ To Reconfigure a Volume by Adding Slices

This procedure assumes the following:

- An HA array with the default configuration (see [“Default Configuration Settings” on page 7](#)).
- Three new slices will be created on volume 0.
- The application host has two HBAs connected, as shown in FIGURE 4-1.

- The array HA configuration is connected via a private loop configuration.

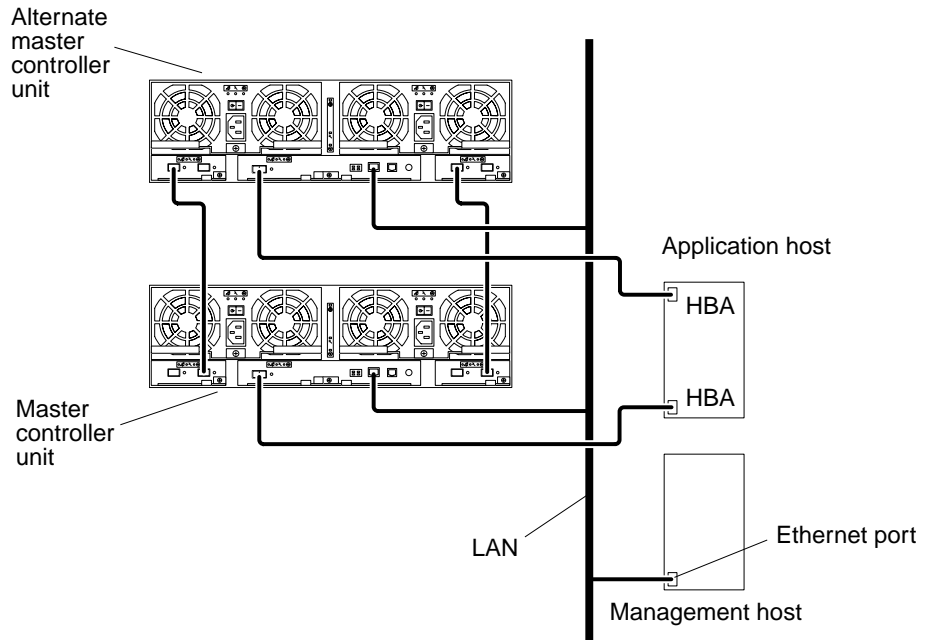


FIGURE 4-1 Array HA Configuration Example

## ▼ To Remove an Existing Slice and Create a New Slice

1. Back up all data on slice 0 onto a safe location.

---

**Note** – With the three slices to be created in this example, you must ensure that the available space on one of the newly created slices is sufficient onto which to restore the backed-up data.

---

2. Use the `volslice remove` command to remove the slice from volume 0.

```
6120/!:<#> volslice remove s0
WARNING - The slice will be deleted.
Continue ? [N]: Y
```

### 3. Use the `volslice create` command to create the desired slices.

For example, to create a slice with a size of 5 Gbytes, a second slice with 15 Gbytes, and a third slice with 10 Gbytes on volume 0, type the following:

---

**Note** – This example shows what happens if you type a slice name that already exists—you are prompted to select another slice name.

---

```
6120:/:<#> volslice create s1 -z 5GB v0
Slice name already exists
6120:/:<#> volslice create s4 -z 5GB v0
4 out of Max. 64 slices created, 60 available.
6120:/:<#> volslice create s5 -z 15GB v0
5 out of Max. 64 slices created, 59 available.
6120:/:<#> volslice create s6 -z 10GB v0
6 out of Max. 64 slices created, 58 available.
```

New slice names can be “Take1,” “slice1,” “Bob1,” or anything you desire. A slice name can be any 12 (maximum) alphanumeric characters except a blank space. The default permission of a newly created slice is set at *none*—the system will not permit any access by any host.

### 4. Use the `volslice list` command to verify the slice sizes.

```
6120:/:<#> volslice list
Slice  Slice Num  Start Blk      Size Blks      Capacity      Volume
s1      0           0             104870400      5.014 GB      v1
-      -           104870400     190125327      68.3 GB       v1
s2      1           0             104870400      5.014 GB      v2
-      -           104870400     190125327      68.3 GB       v2
s3      2           0             104870400      5.014 GB      v3
-      -           104870400     190125327      68.3 GB       v3
s4      4           0             104870400      5.014 GB      v0
s5      5           104870400     120334782      15.020 GB     v0
s6      6           120334782     135335223      10.018 GB     v0
-      -           135335223     190125327      43.8 GB       v0
```

5. Use the `lun perm list` command to verify the permissions are set to none.

```
6120:/:<#> lun perm list
Lun  Slice  WWN          Group Name   Group Perm   WWN Perm    Effective Perm
-----
4    4        default      --          --          none       none
5    5        default      --          --          none       none
6    6        default      --          --          none       none
1    1        default      --          --          none       none
2    2        default      --          --          none       none
3    3        default      --          --          none       none
-----
```

## ▼ To Obtain the Controller Card WWNs for each Array HA Configuration

1. Use the `port list` command to display the WWN of each controller card of the array HA configuration.

```
6120:/:<#> port list

port    targetid  addr_type  status  host  wwn
u1p1   5         hard      online  sun   20020f230000a74d
u2p1   6         hard      online  sun   20020f230000a8bf
```

2. Record the WWN of each array controller card.
3. Use the `lun default` command to assign read/write permission to all LUNs/slices.

This allows the host to detect all slices.

```
6120:/:<#> lun default all_lun rw
```

**4. Use the `lun perm list` command to verify all permissions are set at r/w.**

```
6120:/:<#> lun perm list
```

Lun	Slice	WWN	Group Name	Group Perm	WWN Perm	Effective Perm
4	4	default	--	--	rw	rw
5	5	default	--	--	rw	rw
6	6	default	--	--	rw	rw
1	1	default	--	--	rw	rw
2	2	default	--	--	rw	rw
3	3	default	--	--	rw	rw

**5. On the host, use the `format` command to display the paths to each LUN/slice.**

```
host# format
```

1. c3t5d0 <SUN-T400-0201 cyl 4680 alt 2 hd 7 sec 128>  
/ssm@0,0/pci@1c,600000/pci@1/SUNW,qlc@5/fp@0,0/ssd@w50020f230000a74d,0
2. c3t5d1 <SUN-T400-0201 cyl 11703 alt 2 hd 7 sec 128>  
/ssm@0,0/pci@1c,600000/pci@1/SUNW,qlc@5/fp@0,0/ssd@w50020f230000a74d,1
3. c3t5d2 <SUN-T400-0201 cyl 4680 alt 2 hd 7 sec 128>  
/ssm@0,0/pci@1c,600000/pci@1/SUNW,qlc@5/fp@0,0/ssd@w50020f230000a74d,2
4. c4t6d0 <SUN-T400-0201 cyl 4680 alt L2 hd 7 sec 128>  
/ssm@0,0/pci@1d,700000/pci@1/SUNW,qlc@4/fp@0,0/ssd@w50020f230000a8bf,0
5. c4t6d1 <SUN-T400-0201 cyl 11703 alt 2 hd 7 sec 128>  
/ssm@0,0/pci@1d,700000/pci@1/SUNW,qlc@4/fp@0,0/ssd@w50020f230000a8bf,1
6. c4t6d2 <SUN-T400-0201 cyl 4680 alt 2 hd 7 sec 128>  
/ssm@0,0/pci@1d,700000/pci@1/SUNW,qlc@4/fp@0,0/ssd@w50020f230000a8bf,2

There are six paths—three LUNs/slices and two paths to each LUN/slice (through the two HBAs).

**6. Confirm the two controller card WWNs for the two array units with the WWNs recorded from the output of Step 1 and 2.**

These are listed in line 1 and 4 in the `format` command output:

- 50020f230000a74d
- 50020f230000a8bf



## ▼ To Obtain the WWN for the First Host HBA Port

1. **On the host, use the `luxadm disp` command with the logical path of the first LUN/slice to obtain its physical path.**

Lines “1.” through “3.” of the format command output show the logical device names for the ...a74d controller card. Use the first one with “s2” to indicate the entire LUN/slice (c3t5d0s2) and add it to complete the logical device name path (/dev/rdisk/c3t5d0s2).

```
host# luxadm disp /dev/rdsk/c3t5d0s2
DEVICE PROPERTIES for disk: /dev/rdsk/c3t5d0s2
  Status (Port B):O.K.
  Vendor:SUN
  Product ID:T400
  WWN (Node):50020f230000a74d
  WWN (Port B):50020f230000a8bf
  Revision:0200
  Serial Num:Unsupported
  Unformatted capacity:136588.000 MBytes
  Write Cache: Enabled
  Read Cache: Enabled
    Minimum prefetch:0x0
    Maximum prefetch:0x0
  Device Type:Disk device
  Path(s):
    /dev/rdsk/c3t5d0s2
  /devices/ssm@0,0/pci@1c,600000/pci@1/SUNW,qlc@5/fp@0,0/ssd@w50020f230000a74d,0
```

The physical LUN/slice path in this example is:

```
/devices/ssm@0,0/pci@1c,600000/pci@1/SUNW,qlc@5/fp@0,0
/ssd@w50020f230000a74d,0.
```

2. **Replace the `/ssd@w50020f230000a74d,0` portion of the physical LUN/slice path with `:devctl` to obtain the physical HBA controller path:**

```
/devices/ssm@0,0/pci@1c,600000/pci@1/SUNW,qlc@5/fp@0,0:devctl
```

3. On the host, use the `luxadm` command with the `-e dump_map` option and the physical HBA controller path to display the WWN for the first HBA port.

---

**Note** – The `luxadm -e dump_map` command can only be used with Fibre Channel controller ports.

---

```
host# luxadm -e dump_map
/devices/ssm@0,0/pci@1c,600000/pci@1/SUNW,qlc@5/fp@0,0:devctl
Pos  Port_ID  Hard_Addr  Port WWN          Node WWN          Type
0    1044d5   1000d5     50020f230000091f  50020f200000091f  0x0(Disk device)
1    1046d1   1000d1     50020f230000064a  50020f200000064a  0x0(Disk device)
2    1047cd   1000cd     50020f2300004251  50020f2000004251  0x0(Disk device)
3    104800   0          210100e08b208900  200100e08b247212  0x1f(Unknown
Type,Host Bus Adapter)
```

In this example, the first host HBA port is identified as 210100e08b208900. Record the WWN number for use in [“To Set Up Access for the Desired Host HBA Ports” on page 60.](#)

## ▼ To Obtain the WWN for the Second Host HBA Port

1. On the host, use the `luxadm disp` command with the logical path of the second LUN/slice to obtain its physical path.

Lines “4.” through “6.” of the format command output show the logical device names for the ...a8bf controller card. Use the first one with “s2” to indicate the entire LUN/slice (c4t6d0s2) and add it to complete the logical device name path (/dev/rdisk/c4t6d0s2).

```
host# luxadm disp /dev/rdisk/c4t6d0s2
DEVICE PROPERTIES for disk: /dev/rdisk/c4t6d0s2
  Status(Port B):O.K.
  Vendor:SUN
  Product ID:T400
  WWN(Node):50020f230000a74d
  WWN(Port B):50020f230000a8bf
  Revision:0200
  Serial Num:Unsupported
  Unformatted capacity:136588.000 MBytes
  Write Cache: Enabled
  Read Cache: Enabled
    Minimum prefetch:0x0
    Maximum prefetch:0x0
  Device Type:Disk device
  Path(s):
    /dev/rdisk/c4t6d0s2
  /devices/ssm@0,0/pci@1d,700000/pci@1/SUNW,qlc@4/fp@0,0/ssd@w50020f230000a8bf,0
```

The physical LUN/slice path in this example is:

```
/devices/ssm@0,0/pci@1d,700000/pci@1/SUNW,qlc@4/fp@0,0
/ssd@w50020f230000a8bf,0.
```

- 2. Replace the `/ssd@w50020f230000a8bf,0` portion of the physical LUN/slice path with `:devctl` to obtain the physical HBA controller path:**

```
/devices/ssm@0,0/pci@1d,700000/pci@1/SUNW,qlc@4/fp@0,0:devctl
```

- 3. On the host, use the `luxadm` command with the `-e dump_map` option and the physical HBA controller path to display the WWN for the second HBA port.**

---

**Note** – The `luxadm -e dump_map` command can only be used with Fibre Channel controller ports.

---

```

host# luxadm -e dump_map
/devices/ssm@0,0/pci@1d,700000/pci@1/SUNW,qlc@4/fp@0,0:devctl
Pos  Port_ID  Hard_Addr  Port WWN          Node WWN          Type
0    1044d5   1000d5     50020e230000091b  50020e200000091b  0x0(Disk device)
1    1046d1   1000d1     50020e230000064c  50020e200000064c  0x0(Disk device)
2    1047cd   1000cd     50020e2300004251  50020e2000004251  0x0(Disk device)
3    104800   0          210000e08b04aa9a  200100e08b247212  0x1f(Unknown
Type,Host Bus Adapter)

```

In this example, the second HBA port is identified as 210000e08b04aa9a. Record the WWN number for use in [“To Set Up Access for the Desired Host HBA Ports” on page 60](#).

## ▼ To Set Up Access for the Desired Host HBA Ports

1. On the array, use the `lun default` command to remove the read/write permission from all slices.

This allows setting a specific permission for an HBA port for LUN masking.

```
6120:::<#> lun default all_lun none
```

---

**Note** – If you have existing slices and you want to retain their permissions, do not run this command.

---

2. Use the `lun perm` command to:

- Set the LUN 0 permission as desired (read/write in the example below).
- Set up access to the desired application host HBA port WWN with the named permission.

```
6120:::<#> lun perm lun 0 rw wwn 210100e08b208900 (first HBA port WWN)
```

### 3. Verify the result with the `lun perm list` command.

```
6120:/:<#> lun perm list
Lun  Slice  WWN              Group Name      Group Perm      WWN Perm      Effective Perm
-----
0    4        210100e08b208900  --             --             rw            rw
0    5        default          --             --             none          none
0    6        default          --             --             none          none
1    1        default          --             --             none          none
2    2        default          --             --             none          none
3    3        default          --             --             none          none
-----
```

### 4. Repeat Steps 2 and 3 for each LUN.

When you are finished with all LUNs, restore the data onto the slices.

## ▼ To Create a Volume Slice

### 1. Use the `volslice create` command to create slice 1 with a size of 5 Gbytes on volume 2.

---

**Note** – If you issue the `volslice create` command without any parameters, you will be interactively prompted to specify the parameters.

---

```
6120:/:<#> volslice create s1 -z 5GB v2
1 out of Max. 64 slices created, 63 available.
```

---

**Note** – When you create a slice, the actual size of the slice is rounded to the nearest stripe boundary.

---

### 2. Use the `volslice list` command to list the details of volume 2 to verify the slice.

```
6120:/:<#> volslice list -v v2
Slice  Slice Num  Start blk  Size blks  volume
-      -          0          1023       v2
s1     0          1024       4966680    v2
-      -          4966680    87418240   v2
```

## ▼ To Remove a Volume Slice

- Use the `volslice remove` command to either remove a specified slice or remove all slices of a specified volume.

```
6120:/:<#> volslice remove s4
WARNING - The slice will be deleted.
Continue ? [N]: Y

6120:/:<#> volslice remove -v v1
WARNING - All slices in the given volume will be deleted.
Continue ? [N]: Y
```

## ▼ To Label a Slice

For the Solaris operating system to recognize a slice, it must be labeled with the `format` command. Whenever you create a slice, label it using the following procedure. For more information on the `format` command, see the `format(1M)` man page.

To change the label of a slice:

1. On the array, type `vol stat` to verify that the volume is mounted.

## 2. On the data host, type `format` at the root prompt.

Specify the disk number when prompted. In this example, the array is shown as disk number 2. It can be identified by the `SUN-T400-0200` label.

```
format
Searching for disks...done

AVAILABLE DISK SELECTIONS:
 0. c0t2d0 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk8
    /pci@70,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000b230,0
 1. c0t2d1 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk9
    /pci@70,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000b230,1
 2. c0t4d0 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk10
    /pci@70,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000b37f,0
 3. c0t4d1 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk11
    /pci@70,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000b37f,1
 4. c0t6d0 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk12
    /pci@70,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000b28e,0
 5. c0t6d1 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk13
    /pci@70,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000b28e,1
 6. c0t8d0 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk14
    /pci@70,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000b719,0
 7. c0t8d1 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk15
    /pci@70,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000b719,1
 8. clt1d0 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk8
    /pci@71,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000af55,0
 9. clt1d1 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk9
    /pci@71,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000af55,1
10. clt3d0 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk10
    /pci@71,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000afdf,0
11. clt3d1 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk11
    /pci@71,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000afdf,1
12. clt5d0 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk12
    /pci@71,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000b723,0
13. clt5d1 <SUN-T400-0200 cyl 34901 alt 2 hd 128 sec 256> disk13
    /pci@71,2000/pci@2/SUNW,qlc@4/fp@0,0/ssd@w50020f230000b723,1
14. c3t2d0 <SUN18G cyl 7506 alt 2 hd 19 sec 248>
    /sbus@7d,0/SUNW,fas@1,8800000/sd@2,0
15. c3t3d0 <SUN18G cyl 7506 alt 2 hd 19 sec 248>
    /sbus@7d,0/SUNW,fas@1,8800000/sd@3,0

Specify disk (enter its number): 2
selecting c0t4d0
[disk formatted]
```

- If the volume had been labeled previously using the `format` command, the next display is the `FORMAT MENU`. If the `FORMAT MENU` is displayed, continue to the next step.
- If the volume had not been labeled previously using the `format` command, you will be prompted with the question: `Disk not labeled. Label it now?` If so, answer `y` at the prompt and press `Return`. The `FORMAT MENU` is displayed.

### 3. Type `type` to select a drive type.

```

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
  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 return0
  quit
format> type

```



**4. Type 0 to choose the Auto configure option.**

Select the Auto configure option regardless of which drive types are displayed by the type option. For further information on partitioning, see the Solaris `format(1M)` man page.

```
AVAILABLE DRIVE TYPES:
  0. Auto configure
  1. Quantum ProDrive 80S
  2. Quantum ProDrive 105S
  3. CDC Wren IV 94171-344
  4. SUN0104
  5. SUN0207
  6. SUN0327
  7. SUN0340
  8. SUN0424
  9. SUN0535
 10. SUN0669
 11. SUN1.0G
 12. SUN1.05
 13. SUN1.3G
 14. SUN2.1G
 15. SUN2.9G
 16. SUN-T400-0100
     17. other
Specify disk type (enter its number)[16]: 0
clt1d0: configured with capacity of 33.34GB
<SUN-T400-0200 cyl 34145 alt 2 hd 16 sec 128>
selecting clt1d0
[disk formatted]
```

**5. Type label and answer y when prompted to continue.**

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

---

# Specifying LUN Mapping

This section describes LUN mapping. For more information on the individual commands, see “CLI Commands” on page 181.

This section contains the following topics:

- “To Display the LUN Map” on page 66
- “To Add an Entry to the LUN Map” on page 66
- “To Remove an Entry From the LUN Map” on page 67

## ▼ To Display the LUN Map

1. Use the `lun map list` command to display the LUN map.

```
6120:/:<#> lun map list
Lun No      Slice No
0           0
1           1
2           2
3           3
```

## ▼ To Add an Entry to the LUN Map

1. Use the `lun map add` command to map LUN 4 to slice 3.

```
6120:/:<#> lun map add lun 4 slice 3
```

2. Use the `lun map list` command to verify the result.

```
6120:/:<#> lun map list
Lun No      Slice No
0           0
1           1
2           2
3           4
4           3
```

## ▼ To Remove an Entry From the LUN Map

1. Use the `lun map rm` command to remove LUN mapping from LUN 4 to slice 3.

```
6120:/:<#> lun map rm lun 4 slice 3
```

2. Use the `lun map list` command to verify the result.

```
6120:/:<#> lun map list
Lun No      Slice No
0           0
1           1
2           2
3           4
```

---

## Specifying LUN Masking

LUN masking is a key component of building large storage systems. It eases storage administration while allowing for a more secure environment.

Each host bus adapter (HBA) port is assigned a unique world wide name (WWN) by the HBA manufacturer. A WWN is composed of 16 alphanumeric characters. After the HBA is installed on a host, the host system software (for example, the `luxadm` administration program in the Sun Enterprise Network Array in the Solaris OS) can be used to identify the WWN for each HBA port.

The array controller firmware does not recognize (*register*) a WWN until the WWN is recorded by the `lun perm` or `hwwn add` commands.

WWNs can be assigned to a specific LUN or LUNs. WWNs can also be grouped and assigned to a specific LUN or LUNs. This is referred to as *LUN masking*. LUN masking requires the verification of each host I/O by checking the host WWN against the LUN permissions. This allows for configuration planning for increased security.

For more information on the individual commands, see [“CLI Commands” on page 181](#).

This section contains the following topics:

- [“To Find the Default LUN Permissions and System-Assigned WWNs” on page 68](#)
- [“To Set a Specific LUN Permission” on page 68](#)

- “To View All Registered WWNs” on page 69
- “To Change the Default LUN Permissions” on page 70
- “To Define a Host WWN Group” on page 71
- “To Set the Permissions of a LUN for All Members of a Group” on page 72
- “To Remove the Registered Status of a WWN” on page 73
- “To Remove a WWN From a Specific Group” on page 74
- “To Remove All WWNs From a Specific Group” on page 74

## ▼ To Find the Default LUN Permissions and System-Assigned WWNs

- Use the `lun perm list` command to find the default LUN permissions.

For each LUN, the default access permissions are followed by any exceptions.

```
6120:/:<#> lun perm list
```

Lun	Slice	WWN	Group Name	Group Perm	WWN Perm	Effective Perm
0	0	default	--	--	rw	rw
0	0	20020678ff345678	G1	none	ro	ro
1	1	default	--	--	ro	ro
1	1	20020678ff345678	G1	ro	rw	rw
1	1	20020678ee345678	G1	ro	none	ro
1	1	20020678ee345678	G2	ro	none	ro
1	1	20020678ab345678	G2	ro	none	ro

## ▼ To Set a Specific LUN Permission

1. Use the `lun perm` command to set up LUN 2 with read/write access to WWN `20020da445678901`.

```
6120:/:<#> lun perm lun 2 rw wwn 20020da445678901
```

---

**Note** – The `lun perm` command “registers” the specified WWN, if it is not already registered.

---

## 2. Use the `lun perm list` command to verify the result.

```
6120:/:<#> lun perm list wwn 20020da445678901
```

Lun	Slice	WWN	Group Name	Group Perm	WWN Perm	Effective Perm
0	0	default	--	--	none	none
0	0	20020da445678901	--	--	rw	rw
1	1	default	--	--	none	none
1	1	20020da445678901	--	--	rw	rw
2	2	default	--	--	none	none
2	2	20020da445678901	--	--	rw	rw

## ▼ To View All Registered WWNs

### 1. Use the `lun wwn list` command.

```
6120:/:<#> lun wwn list
List of all registered WWNs
-----
20020da445678901
20020da445678901
```

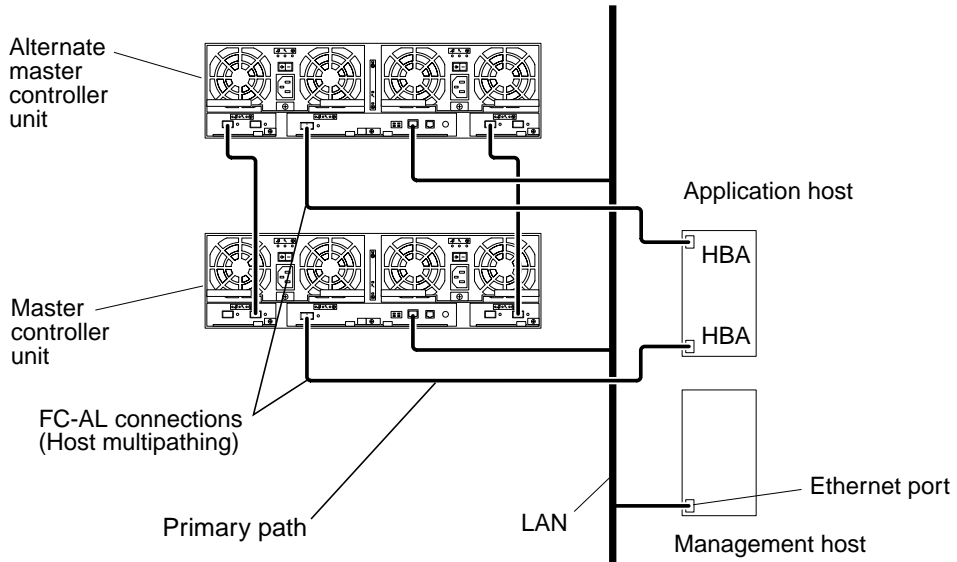
## Setting LUN Permission with Host Multipathing

**Note** – If you are not using Sun StorEdge Traffic Manager, see the documentation for your multipathing solution.

The arrays are redundant devices that automatically reconfigure whenever a failure occurs on an array internal component. To allow for the automatic reconfiguration to take effect, a host-based software solution (for example, Sun StorEdge Traffic Manager Software or VERITAS Dynamic Multipathing (DMP)) and a redundant data path are also required. This redundant path is referred to as *host multipathing*. See FIGURE 4-2.

During normal operation, data I/O takes place on the host channel connected to the controller that owns the LUNs. This path is a *primary path*. During fail-over operation, the multipathing software directs all I/Os to the alternate channel's controller. This path is the *fail-over path*.

When a controller card in the master controller unit fails, the alternate master controller unit becomes the master. When the failed controller is replaced, the new controller immediately boots, goes online, and the original master controller unit becomes the alternate master controller unit. The former alternate master controller unit retains master controller unit status until the next array reboot.



**FIGURE 4-2** Host Multipathing Configuration

When a system is configured to incorporate both LUN masking and host multipathing, you must ensure that all WWNs of all HBAs (or, if applicable, both ports being used on a single HBA) are set with the same permissions to permit the desired fail-over communications. The easiest way to do this is to group the WWNs with a common group name and then set the permission for that group. See [“To Define a Host WWN Group” on page 71](#) and [“To Set the Permissions of a LUN for All Members of a Group” on page 72](#).

## ▼ To Change the Default LUN Permissions

1. Use the `lun default` command to establish the default permission to LUN 3 as read only.

```
6120:/:<#> lun default lun 3 ro
```

---

**Note** – The `lun default` command changes the permissions of only nonregistered WWNs.

---

2. Use the `lun perm list` command to verify the result.

```
6120:/:<#> lun perm list lun 3
Lun  Slice  WWN              Group Name    Group Perm   WWN Perm    Effective Perm
-----
3     3        default          --           --          none       none
3     3        20020678ff345678 --           --          ro         ro
```

## ▼ To Define a Host WWN Group

If all HBAs on a host will share the same access permissions, you can use this procedure to define a host WWN group. The two methods are shown merely as an example.

---

**Note** – If you issue the `hwwn add` command without any parameters, you will be interactively prompted to specify the parameters.

---

1. Use the `hwwn add` command to add the WWN `20020678ef345678` to group `node1`

■ Interactively

```
6120:/:<#> hwwn add
Please enter Group Name: node1
Please enter WWN: 20020678ef345678
Add more WWN? [n]: N
```

■ Manually

```
6120:/:<#> hwwn add node1 wwn 20020321ff345678
```

---

**Note** – The `hwwn add` command registers the specified WWN, if it is not already registered. The permission of the existing group also becomes the permission of the added WWN.

---

## 2. Use the `lun perm list` command to verify the result.

```
6120:/:<#> lun perm list grp node1
Lun  Slice  WWN          Group Name   Group Perm   WWN Perm    Effective Perm
-----
0    0        default      --          --          rw          rw
0    0        20020678ff345678 node1      none        ro          ro
1    1        default      --          --          ro          ro
1    1        20020678ff345678 node1      ro          rw          rw
1    1        20020678ff345678 node1      ro          none        rw
2    2        default      --          --          rw          none
```

## ▼ To Set the Permissions of a LUN for All Members of a Group

With a host WWN defined for a group, this procedure can be used to set permissions using the host WWN group name.

### 1. Use the `lun perm list` command to display the current LUN permissions.

```
6120:/:<#> lun perm list
Lun  Slice  WWN          Group Name   Group Perm   WWN Perm    Effective Perm
-----
0    0        default      --          --          rw          rw
0    0        20020678ff345678 G1          none        ro          ro
1    1        default      --          --          ro          ro
1    1        20020678ff345678 G1          ro          rw          rw
1    1        20020678ee345678 G1          ro          none        ro
1    1        20020678ee345678 node2       rw          none        rw
1    1        20020678ab345678 node2       rw          none        rw
-----
```

### 2. Use the `lun perm` command to set read-only permissions on LUN 1 for group `node2`.

```
6120:/:<#> lun perm lun 1 ro grp node2
```



### 3. Use the `lun perm list` command to verify the result.

```
6120:/:<#> lun perm list
Lun  Slice  WWN          Group Name  Group Perm  WWN Perm  Effective Perm
-----
0    0        default      --          --          rw        rw
0    0        20020678ff345678 G1          none       ro        ro
1    1        default      --          --          ro        ro
1    1        20020678ff345678 G1          ro        rw        rw
1    1        20020678ee345678 G1          ro        none      ro
1    1        20020678ee345678 node2       ro        none      ro
1    1        20020678ab345678 node2       ro        none      ro
-----
```

## ▼ To Remove the Registered Status of a WWN

### 1. Use the `lun wwn list` command to display the registered WWNs.

```
6120:/:<#> lun wwn list
List of all registered WWNs
-----
2002067890123456
2002078901234567
2002089012345678
2002090123456789
```

### 2. Use the `lun wwn rm` command to remove the 2002067890123456 WWN.

```
6120:/:<#> lun wwn rm wwn 2002067890123456
2002067890123456 will get default access right.
Do you want to remove? (Y/N)[n]:Y
```

### 3. Use the `lun wwn list` command to verify the result.

```
6120:/:<#> lun wwn list
List of all registered WWNs
-----
2002078901234567
2002089012345678
2002090123456789
```

## ▼ To Remove a WWN From a Specific Group

1. Use the `hwwn list` command to display all the WWN(s) in a specified group.

```
6120:/:<#> hwwn list node1
WWN in this group node1
-----
20020678ef345678
20020321ff345678
-----
** Total 2 entries **
```

2. Use the `hwwn rm` command to remove both WWNs from the group “node1.”

```
6120:/:<#> hwwn rm node1 wwn 20020678ef345678
6120:/:<#> hwwn rm node1 wwn 20020321ff345678
```

---

**Note** – If you issue the `hwwn rm` command without any parameters, you will be interactively prompted to specify the parameters.

---

## ▼ To Remove All WWNs From a Specific Group

1. Use the `hwwn listgrp` command to display all registered group names.

```
6120:/:<#> hwwn listgrp
Group Name
-----
node1
node2
node3
-----
** Total 3 entries **
```

2. Use the `hwwn list` command to display all WWN(s) in a specified group.

```
6120:/:<#> hwwn list node1
WWN in this group node1
-----
20020678ef345678
20020321ff345678
-----
** Total 2 entries **
```

3. Use the `hwwn rmgrp` command to remove all WWN(s) from a specified group.

```
6120:/:<#> hwwn rmgrp node1
```

4. Use the `hwwn list` command to verify the results.

```
6120:/:<#> hwwn list node1
WWN in this group node1
-----
-----
** Total 0 entries **
```



## Monitoring the Array

---

This chapter describes how to use the CLI to monitor the array. You can check array status by using a variety of CLI commands. This chapter discusses how to monitor the following:

- “To Determine Failover” on page 78
- “To Check the Drive Status” on page 79
- “To Check the Hot-Spare” on page 79
- “To Check Data Parity” on page 80
- “To Check the Battery” on page 81
- “To Display the FRU Information” on page 82
- “to Check the FRU Status” on page 83

## ▼ To Determine Failover

1. To determine which controller unit is the master or alternate master controller unit, type `sys stat`.

The following example shows a 2x2 HA configuration in a normal state:

```
6120:/:<#> sys stat
```

Unit	State	Role	Partner
1	ONLINE	Master	2
2	ONLINE	AlterM	1

In a failover state, unit 2 assumes the role of master unit and unit 1 is disabled, as shown in the following example:

```
6120:/:<#> sys stat
```

Unit	State	Role	Partner
1	DISABLED	Slave	
2	ONLINE	Master	

2. To display how paths are mapped from the host ports to the volume, type `port listmap`.

```
6120:/:<#> port listmap
```

port	targetid	addr_type	lun	volume	owner	access
u1p1	1	hard	0	v0	u1	primary
u1p1	1	hard	1	v1	u2	failover
u2p1	2	hard	0	v0	u1	failover
u2p1	2	hard	1	v1	u2	primary

## ▼ To Check the Drive Status

- Use the `vol stat` command to check drive status codes.

```
6120/!:<#> vol stat

v0: mounted
  u1d01: mounted
  u1d02: mounted
  u1d03: mounted
  u1d04: mounted
  u1d05: mounted
  u1d06: mounted
  Standby: u1d14: mounted
v1: mounted
  u2d01: mounted
  u2d02: mounted
  u2d03: mounted
  u2d04: mounted
  u2d05: mounted
  u2d06: mounted
  Standby: u2d14: mounted
```

## ▼ To Check the Hot-Spare

1. Use the `vol list` command to check the location of the hot spare (standby) drive.

```
6120/!:<#> vol list

volume      capacity  raid  data      standby
v0          125.2 GB   5     u1d01-08  u1d14
v1          125.2 GB   5     u2d01-08  u2d14
```

## 2. Use the `vol stat` command to check the status of the hot spare drive.

```
6120:/:<#> vol stat

v0: mounted
  uld01: mounted
  uld02: mounted
  uld03: mounted
  uld04: mounted
  uld05: mounted
  uld06: mounted
  Standby: uld14: mounted
```

### ▼ To Check Data Parity

---

**Note** – Check data parity before performing tape-backup overwrite cycles, approximately once every 30 days.

---

- Use the `vol verify` command to perform a parity check of the drives.

```
6120:/:<#> vol verify [fix] volume-name
```

where *volume-name* is the name of the volume to verify.

---

**Note** – The volume name is a name internal to the array and to the Sun StorEdge Configuration Service. The name is not seen by the host.

---

The [*fix*] option corrects parity errors on RAID 5 volumes and corrects mirrored data errors on RAID 1 volumes. If *fix* is *not* specified, then `vol verify` will report errors, but not correct them. If the *fix* option is specified and an error is detected, the `vol verify` command will regenerate parity from the existing data on the RAID 5 volume.

---

**Note** – The `vol` command is not reentrant. Therefore, you cannot run other `vol` commands on the array until the `vol verify` operation has completed.

---

See [“To Perform Volume Verification” on page 23](#) for more information on checking parity.



## ▼ To Check the Battery

1. Use the `id read` command to display information about battery life. (Unit number  $n = 1$  or  $2$ ; power cooling unit number  $n = 1$  or  $2$ .)

```
6120:/:<#> id read unbn
Description: ASSY, T4 BATTERY, 14 SLOT
  Short Name: T4-14_Bat
  Serial Number: 001194
  Part Number: 3704861
  Dash Level: 01
  Rev Level: 01
  Vendor Name: 0x076
  Manufacture Loc: TIJUANA,MEXICO
  Timestamp: Thu Nov 07 22:49:45 GMT 2002
```

2. Use the `refresh -s` command to check the status of a battery refresh cycle.

The following example shows a normal battery status (no refresh cycle):

```
6120:/:<#> refresh -s

Current Date and Time:  Wed Feb 12 09:45:20 GMT 2003
Next Scheduled Refresh: Sun Feb 16 02:00:29 GMT 2003

Battery   State           Warranty Expiration
-----
u1b1      Normal          Sat Jan 01 00:00:00 GMT 2005
u1b2      Normal          Sat Jan 01 00:00:00 GMT 2005
u2b1      Normal          Sat Jan 01 00:00:00 GMT 2005
u2b2      Normal          Sat Jan 01 00:00:00 GMT 2005
u3b1      Normal          Sat Feb 05 12:18:44 GMT 2005
u3b2      Normal          Sat Feb 05 12:18:44 GMT 2005
u4b1      Normal          Sat Jan 01 00:00:00 GMT 2005
u4b2      Normal          Sat Jan 01 00:00:00 GMT 2005
```

## ▼ To Display the FRU Information

- Use the `fru list` command to display FRU vendor information, serial number, and firmware levels.

In the event of a FRU failure, `fru list` output is helpful in verifying correct FRU replacement because it contains the serial numbers. The following example shows `fru list` output for an array.

```
6120:/:<#> fru list
ID          TYPE          VENDOR      MODEL        REVISION     SERIAL
-----
ulctr      controller card  0x301      5405559     01           000192
u3ctr      controller card  0x301      5405559     01           000662
uld01      disk drive      SEAGATE    ST373307FSUN A207       3HZ0A9LG
- - - - - (items omitted in example)
uld14      disk drive      SEAGATE    ST373307FSUN A207       3HZ0AL45
u2d01      disk drive      SEAGATE    ST373405FSUN A538       3EK1VYNN
- - - - - (items omitted in example)
u2d14      disk drive      SEAGATE    ST373405FSUN A538       3EK1VS59
u3d01      disk drive      SEAGATE    ST373307FSUN A207       3HZ0AK2V
- - - - - (items omitted in example)
u3d14      disk drive      SEAGATE    ST373307FSUN A207       3HZ0AGX2
u4d01      disk drive      SEAGATE    ST373405FSUN A538       3EK1VRZE
- - - - - (items omitted in example)
u4d14      disk drive      SEAGATE    ST373405FSUN A538       3EK1VWC7
ull1       loop card       0x301      5405384     02           000981
- - - - - (items omitted in example)
u4l2       loop card       0x301      5405384     02           000708
ulpcu1     power/cooling unit 0x3AD      3001562     16           Q01331
- - - - - (items omitted in example)
u4pcu2     power/cooling unit 0x3AD      3001562     16           Q00900
ulbat1     battery         0x076      3704861     01           001194
- - - - - (items omitted in example)
u4bat2     battery         0xBEEF     3704861     01           000589
ulmpn      mid plane       0x301      5016338     01           400540
- - - - - (items omitted in example)
u4mpn      mid plane       0x301      5016338     01           400480
```

## ▼ to Check the FRU Status

- Use the `fru stat` command to provide a status of each FRU.

Possible FRU states and definitions are listed in TABLE 5-1

```

6120:/:<#> fru stat
CTRLR   STATUS   STATE      ROLE        PARTNER     TEMP
-----
ulctr   ready   enabled    master      u3ctr       28
u2ctr   missing
u3ctr   ready   enabled    alt master  ulctr       28
u4ctr   missing

DISK     STATUS   STATE      ROLE        PORT1       PORT2       TEMP  VOLUME
-----
uld01   ready   enabled    data disk   ready       ready       25    v0
- - - - - (items omitted in example)
uld14   ready   enabled    standby     ready       ready       24    v0
u2d01   ready   enabled    data disk   ready       ready       30    v1
- - - - - (items omitted in example)
u3d14   ready   enabled    standby     ready       ready       24    v2
u4d01   ready   enabled    data disk   ready       ready       29    v3
- - - - - (items omitted in example)
u4d14   ready   enabled    standby     ready       ready       30    v3

LOOP     STATUS   STATE      MODE        CABLE1      CABLE2      TEMP
-----
u1l1    ready   enabled    master      -           installed    31
- - - - - (items omitted in example)
u4l2    ready   enabled    slave       installed    -           33

POWER    STATUS   STATE      SOURCE      OUTPUT      BATTERY     TEMP  FAN1  FAN2
-----
ulpcu1  ready   enabled    line        normal      normal      normal normal normal
- - - - - (items omitted in example)
u4pcu2  ready   enabled    line        normal      normal      normal normal normal

```

**TABLE 5-1** Possible FRU States and Definitions

<b>FRU</b>	<b>Status</b>	<b>State</b>	<b>Definition</b>
<b>Controller Card</b>			<b>Status and State Conditions</b>
	absent	disabled	Controller not in tray
	ready	disabled	Disabled or disabling
	offline	disabled	Reset or resetting
	booting	enabled	Booting
	ready	enabled	Online
<b>Disk Drive</b>			<b>Status and State Conditions</b>
	ready	enabled	Online
	fault	enabled	Problem with the drive; check LED
	missing	enabled	Drive is missing
	<b>Role</b>		<b>Disk Drive Assignment</b>
	data disk		Part of volume
	unassigned		Not in volume
	standby		Standby disk for volume. (Must be drive number 14)
	<b>Port</b>		<b>Drive Port Condition<sup>1</sup></b>
	ready		Corresponding drive port online
	not ready		Drive port not ready. Expect ready soon.
	bypass		This drive port is being bypassed; use another. (It is possible that the interconnect card with corresponding loop to drive is down.)
	unknown		Drive port state is not known. (Occurs only in HA configurations when drive's corresponding interconnect card is down and interconnect card on partnered unit is up.)

**TABLE 5-1** Possible FRU States and Definitions *(Continued)*

FRU	Status	State	Definition
<b>Interconnect (Loop) Card</b>			<b>Status and State Conditions</b>
	ready	enabled	Online
	missing		Interconnect card not installed
	offline		Interconnect card offline
	fault		Interconnect card has fault condition
<b>Power and Cooling Unit</b>			<b>Status and State Conditions</b>
	ready	enabled	Online
	ready	substituted	Battery refresh in progress
	missing		Power and cooling unit not installed
	fault	enabled	Problem in power and cooling unit. For example: fan fault, output fault, overtemperature.
	fault	disabled	Power and cooling unit offline
			<b>Power Source</b>
	line		Powered from power cord
	battery		Powered from battery
	--		Power and cooling unit not installed
			<b>Power and Cooling Unit Condition</b>
	normal		Online
	fault		Fault condition
	--		Power and cooling unit not installed
			<b>Battery Condition</b>
	normal		Battery is healthy, PCU is operating from AC line.
	active		Battery is supplying power to the PCU; AC line has probably failed.
	charge		Battery is charging and not being tested.
	in test		Battery is undergoing health check.
	failed		Battery failed testing and needs to be replaced
missing		Battery is not installed.	

**TABLE 5-1** Possible FRU States and Definitions *(Continued)*

<b>FRU</b>	<b>Status</b>	<b>State</b>	<b>Definition</b>
	off		The PCU is off.
	fault		A PCU fault was detected.
	disabled		The PCU has been disabled.
	margin		None of the defined states applies. PCU has been margined.
	unknown		Should never be seen. Indicates an internal software error.
	--		Power and cooling unit not installed
	<b>Temp</b>		<b>Temperature Condition</b>
	normal		Normal operating temperature
	fault		Power and cooling unit overtemperature condition
	--		Power and cooling unit not installed

1 Each drive has two ports, and each port corresponds to an interconnect card. If one interconnect card fails, then all drives on that loop will bypass that particular port, and the interconnect card that is still online will start controlling all drives using the other port.

## Servicing the Array

---

This chapter explains how to perform basic troubleshooting for the Sun StorEdge 6120 array and how to service the array field-replaceable units (FRUs) in either a Sun StorEdge 6020 or 6120 array. This chapter also includes upgrade procedures for array files and is organized as follows:

- [“Troubleshooting the Array” on page 87](#)
- [“Servicing FRUs” on page 99](#)
- [“Upgrading Array Firmware and System Files” on page 121](#)

---

## Troubleshooting the Array

This section explains how to perform basic troubleshooting procedures on the Sun StorEdge 6120 array. If you are unable to determine the problem using the tools described in this section, contact your Sun Service representative to run detailed diagnostics on the array.

This section is organized as follows:

- [“Analyzing the Problem” on page 87](#)
- [“Determining FRU Failures” on page 98](#)
- [“Determining Channel Connection Failures” on page 98](#)

### Analyzing the Problem

Begin the problem analysis by checking one or more of the following:

- [“Host-Generated Message” on page 88](#)

- [“Telnet Session” on page 88](#)
- [“LEDs” on page 88](#)

## Host-Generated Message

The data host sees the array as 1 to 64 logical volumes. A host-generated message might indicate that the host cannot communicate with the array through the Fibre Channel-Arbitrated Loop (FC-AL) channel or that too many channel errors are occurring. To see details of problems internal to the array, use a diagnostics tool that is installed on your management console, such as the Storage Automated Diagnostic Environment. Refer to the documentation for the Storage Automated Diagnostic Environment that is listed in the “Related Documentation” table in the Preface of this book for more information about this software tool and how to use it.

In an array configuration where multipathing failover has been established, the failure of a channel path or array controller causes the host to redirect I/O from the failed channel to the second FC-AL connection.

## Telnet Session

The Telnet session is a direct network link to the array unit by means of the CLI. You can run individual commands to query and repair the unit from this interface. The Telnet session requires access to the unit’s IP address. You can run the CLI from any host that is part of the same network.

You can quickly determine the status of the array from the CLI. You can also examine the syslog file of the array file system through the CLI. The syslog file contains a record of events that have occurred in the unit.

For information about how to set up the array for message logging, see [“Configuring the Array for Remote System Logging” on page 30](#). For information about interpreting the `syslog` file, see [“Troubleshooting” on page 143](#). For information about how to use the telnet CLI commands to monitor array activity, see [“CLI Commands” on page 181](#).

## LEDs

The array incorporates a number of Service Indicator Standard (SIS) light-emitting diodes (LEDs) that are used to assist in determining the status of the array as well as in repairing it. The array unit and each array FRU have SIS LEDs, which have the following general meanings:

- Green indicates that the unit or FRU is operating properly.
- Yellow or amber indicates that the unit or FRU requires service.

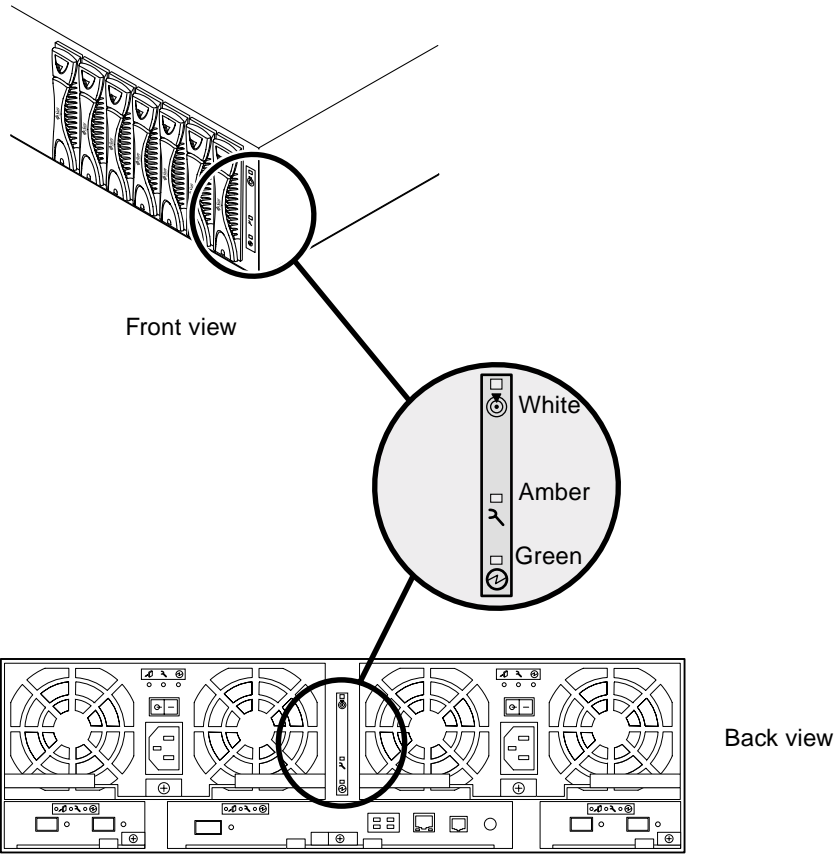


- Blue means that it is safe to remove the unit or FRU and to replace it.
- White indicates the location of the array unit.

A white, or locator, LED is implemented on the front and back of the array. No other FRU within the array has a white LED. The white LED is used to lead the service person to the correct array. LEDs on FRUs within the array indicate to a service person the FRU that requires service and the FRU's current status. This section contains information about the LEDs for the array and each array FRU. This section includes illustrations of the LED locations, and tables of LED descriptions for all types of LED indicators.

### *Array Unit LEDs*

The array contains SIS LEDs that are visible from the front and back of the array unit (FIGURE 6-1).



**FIGURE 6-1** Array Unit SIS LEDs

TABLE 6-1 lists the possible conditions of the LEDs and describes each state.

**TABLE 6-1** Array Unit SIS LEDs

White	Amber	Green	Function
Off	Off	Off	Array is not powered (no AC power).
Off	n/a	On	No locator action is active to this tray.
On	n/a	On	A locator action is underway for this tray.

**TABLE 6-1** Array Unit SIS LEDs

White	Amber	Green	Function
n/a	Off	On	Array is powered on to standby or to full power and no service action is required.
n/a	On	On	A service action is required for an included FRU and the array is powered on to standby or to full power.
Fast blink <sup>1</sup>	Fast blink	On	Array is performing power-on test or tray LED check.

1 Fast blink is measured as four blinks per second.

### Disk Drive LEDs

Each disk drive has three SIS LEDs, viewable from the front of the array only, as shown in the following figure.

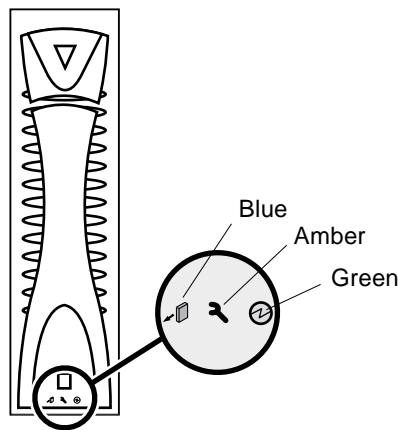
**FIGURE 6-2** Disk Drive LEDs

TABLE 6-2 lists the possible conditions of the LEDs and describes each state.

**TABLE 6-2** Disk Drive LEDs

Blue	Amber	Green	Function
Off	Off	Off	Drive not mated or not powered on.
On	Off	Off	OK to remove; not ready; software deconfigured; drive mated, powered on.

**TABLE 6-2** Disk Drive LEDs (*Continued*)

Blue	Amber	Green	Function
Off	Off	Slow blink <sup>1</sup>	Not ready; drive powered on; either spinning up or down or waiting for the spin-up command.
Off	Off	On	Ready; drive spun-up.
Off	Off	Mainly on, flashing off at a visible frequency	Ready with SCSI activity.
Off	On	On	Drive service action required; drive ready; not OK to remove.
Off	On	Slow blink	Drive service action required; drive not ready; not OK to remove.
On	On	Off	OK to remove; drive service action required; drive not ready; software deconfigured.
On	Off	Slow blink	OK to remove; not ready; software deconfigured; powered on; either spinning up or down or waiting for the spin-up command.
Fast blink	Fast blink	n/a	Array power-on test, drive insertion test, or array LED check.

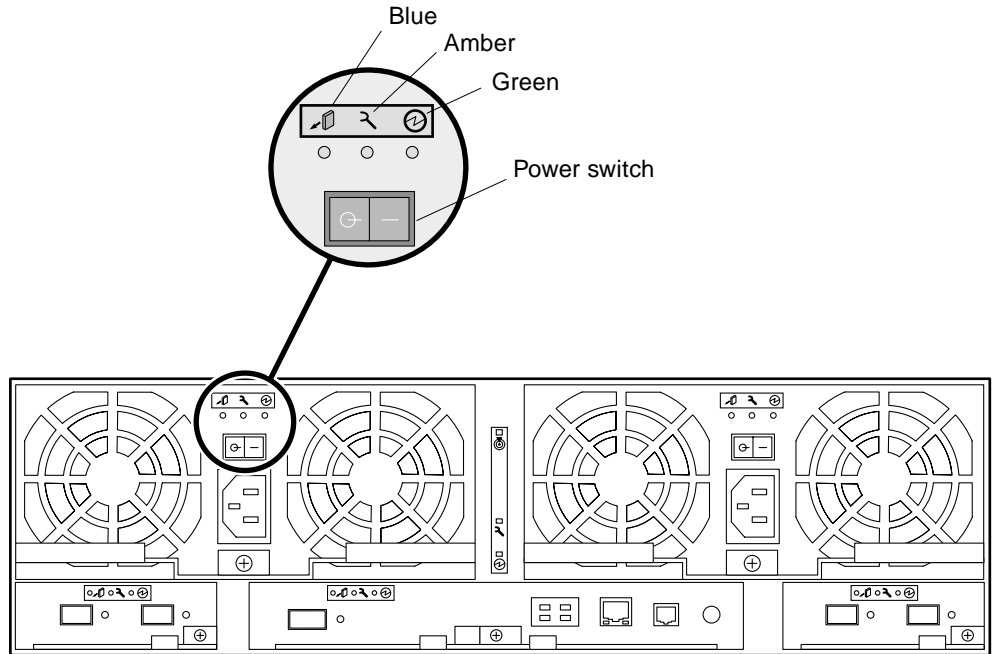
<sup>1</sup> Slow blink is measured as one second on and one second off. Fast blink is measured as four blinks per second.



**Caution** – During a data reconstruction on the disk drive, the blue SIS LED will light indicating a “ready to replace” state for the drive. Do not remove the drive at this time as this is a false LED signal.

## Power and Cooling Unit LEDs

Each power and cooling unit has three SIS LEDs, viewable from the back of the array (FIGURE 6-3).



**FIGURE 6-3** Power and Cooling Unit LEDs

TABLE 6-3 lists the possible conditions of the LEDs and describes each state.

**TABLE 6-3** Power and Cooling Unit LEDs

Blue	Amber	Green	Function
Off	Off	Off	PCU not mated; no AC power, or normal state for PCU in standby.
Off	Off	On	PCU ready; all voltages at rated value.
Off	Off	Fast blink <sup>1</sup>	PCU ready, battery power available, and all DC voltages within tolerance.
Off	On	On	PCU service action is required; PCU ready.
Off	On	Off	PCU service action is required; PCU not ready.

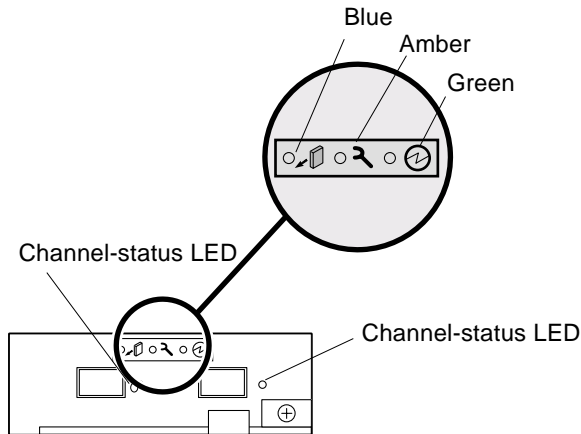
**TABLE 6-3** Power and Cooling Unit LEDs (*Continued*)

Blue	Amber	Green	Function
On	On	Off	OK to remove; PCU service action is required; PCU not ready; PCU is software deconfigured.
On	Off	Off	OK to remove; PCU is software deconfigured; no service action required.
Fast blink	Fast blink	Fast blink	Array power-on test, PCU insertion test, or array LED test.

1 Fast blink is measured as four blinks per second.

### *Interconnect Card LEDs*

Each interconnect card has three SIS LEDs and two channel-status LEDs viewable from the back of the array (FIGURE 6-4).



**FIGURE 6-4** Interconnect Card LEDs

TABLE 6-4 lists the possible conditions of the SIS LEDs and describes each state.

**TABLE 6-4** Interconnect Card SIS LEDs

Blue	Amber	Green	Function
Off	Off	Off	Interconnect card not mated or no standby power.
Off	Off	On	Ready; standby power OK.
Off	On	On	Interconnect card service action required; interconnect card ready.
Off	On	Off	Interconnect card service action required; interconnect card not ready.
On	Off	Off	OK to remove; not ready; software deconfigured.
On	On	Off	OK to remove; interconnect card service action required; interconnect card not ready; interconnect card is software deconfigured.
Fast blink <sup>1</sup>	Fast blink	Fast blink	Array power-on test, interconnect card insertion test, or array LED check.

1 Fast blink is measured as four blinks per second.

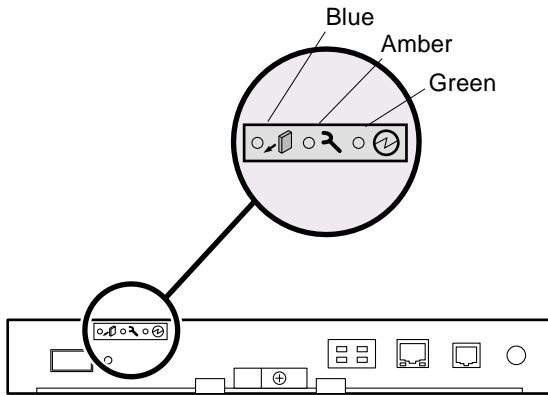
TABLE 6-5 lists the possible conditions and states for the interconnect card channel status LEDs.

**TABLE 6-5** Interconnect Card Channel Status LEDs

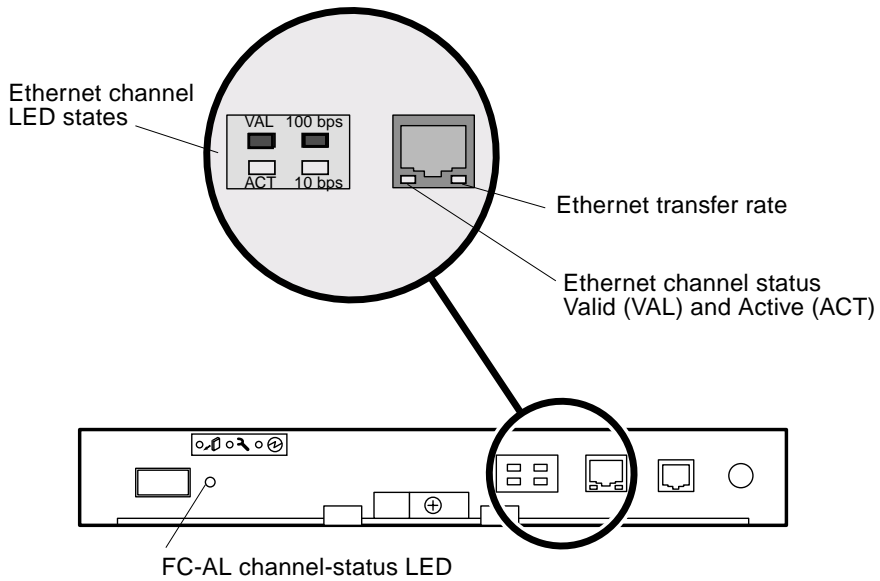
Amber	Green	Function
Off	On	Interconnect cable present; OK.
Off	Off	Interconnect cable missing or port has been shut down.
On	Off	Interconnect cable present; no signal detected.

### *Controller Card LEDs*

Each controller card has three SIS LEDs, an FC-AL channel-status LED, and an Ethernet channel-status LED viewable from the back of the array (FIGURE 6-5 and FIGURE 6-6).



**FIGURE 6-5** Controller Card SIS LEDs



**FIGURE 6-6** Controller Card Communication Channel LEDs



TABLE 6-6 lists the possible conditions of the controller card SIS LEDs and describes each state.

**TABLE 6-6** Controller Card SIS LEDs

Blue	Amber	Green	Function
Off	Off	Off	Controller not mated, not powered, or not booted.
Off	Off	On	Controller ready.
Off	On	On	Controller service action required; controller ready.
Off	On	Off	Controller service action required; controller not ready.
On	On	Off	OK to remove; controller service action required; controller not ready; controller is software deconfigured.
On	Off	Off	OK to remove; controller not ready; software deconfigured.
Fast blink <sup>1</sup>	Fast blink	n/a	Array power-on test, controller insertion test, or array LED check.

<sup>1</sup> Fast blink is measured as four blinks per second.

TABLE 6-7 lists the possible conditions of the FC-AL channel-status LED and describes each state.

**TABLE 6-7** FC-AL Channel-Status LEDs

Green	Amber	Function
Off	Off	Port disabled.
Off	On	Port enabled; no signal detected or Laser Fault
On	Off	Port enabled; signal detected.
Blink	Off	Port enabled; signal detected; transferring information.

TABLE 6-8 lists the possible conditions of the Ethernet channel-status LEDs and describes each state.

**TABLE 6-8** Ethernet Channel Status LEDs

LED	Green	Function
VAL/ACT	Off	Link invalid.
	On	Link valid.
	Blink	Link valid and active.
100 bps or 10 bps	On	100 Mbps communication speed
	Off	10 Mbps communication speed

## Determining FRU Failures

FRU failures are reported by an alarm or message notification from the tool that is used to monitor the array, such as the Storage Automated Diagnostic Environment tool. The failed FRU displays a blinking amber LED. FRU failures can be found also in the syslog output of the array activity.

Before replacing a FRU based on an LED indicator, verify its failure by using one of the diagnostics tools such as the Storage Automated Diagnostic Environment or the array CLI commands.

## Determining Channel Connection Failures

Host-to-array channel failures occur when the connection between the array and the host is either severed or intermittent. Errors in the host data channel are outside the scope of the array. To determine failures in the data path, you must use host-based application diagnostics such as the Storage Automated Diagnostic Environment.

Refer to the documentation of the selected diagnostic tool for information about identifying data channel failures.

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# Servicing FRUs

This section contains information about removing and replacing the FRUs in an array.

This section contains the following information:

- [“Preparing for Service” on page 99](#)
- [“Removing and Replacing Components” on page 99](#)

## Preparing for Service

1. **Read the *Sun StorEdge 6120 Array Regulatory and Safety Compliance Manual* for basic safety information before performing service procedures.**
2. **Follow these guidelines to help prevent damaging FRUs:**
  - Wear a grounding wrist strap.
  - Before handling a FRU, discharge any static electric charge by touching a ground surface.
  - Do not remove a FRU from its antistatic protective bag until it is ready for installation.
  - When removing a FRU from the array, immediately place it in an antistatic bag and packaging.
  - Handle a FRU only by its edges and avoid touching the circuitry.
  - Do not slide a FRU over any surface.
  - Remove all plastic, vinyl, and foam from the work area.
  - Limit body movement (which builds up static electricity) during FRU installation.

## Removing and Replacing Components

This section contains instructions for servicing the following array FRUs:

- [“Disk Drives” on page 100](#)
- [“Power and Cooling Units” on page 102](#)
- [“UPS Battery” on page 106](#)
- [“Interconnect Cards” on page 109](#)
- [“Controller Card” on page 111](#)
- [“Chassis” on page 114](#)

## Disk Drives



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**Caution** – Replace only one disk drive in an array at a time to ensure that no data is lost. Ensure that the disk drive is fully reenabled before replacing another disk drive in the same array.

---

The default configuration for the array is to automatically spin up and reenable a replaced disk drive, and then automatically copy the data. Disk drive spinup takes about 30 seconds, and reconstruction of the data on the disk drive can take one or more hours, depending on system activity.

Replacement disk drives in either a Sun StorEdge 6020 or 6120 array must have either equal or greater storage capacity than the drives used in the volume. Drive capacities available include 36 Gbyte, 73 Gbyte, and 146 Gbyte.

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**Note** – In some cases, if disk drives are removed and replaced on a powered-off or incompletely booted array, the internal system-monitoring facilities might not correctly detect the drive replacement. Therefore, replace disk drives only on powered-on, fully booted arrays.

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**Note** – Even if the LED indicates a drive failure, you should always verify the FRU status using either the Storage Automated Diagnostic Environment or array CLI before replacing the drive.

---

---

**Note** – Use this procedure if you are removing a diskless drive bracket and adding a new drive in its place.

---

### ▼ To Remove and Replace a Disk Drive

1. **Observe static electricity precautions.**
2. **Locate the disk drive that needs to be replaced.**

Disk drives are numbered from 1 to 14, starting on the left side of the array (FIGURE 6-7).

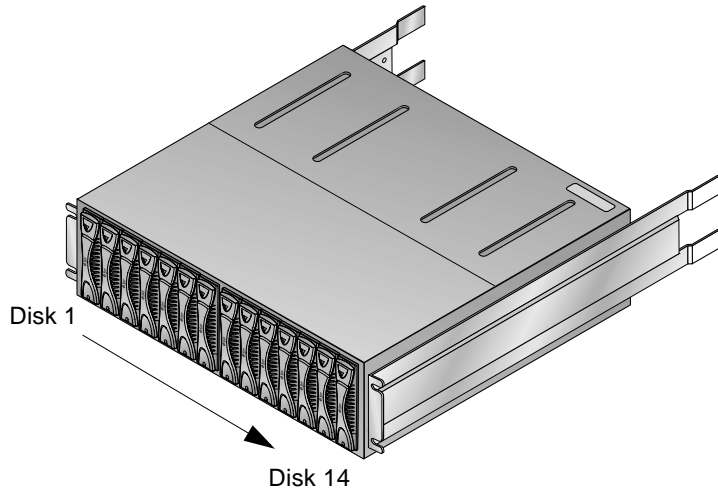


FIGURE 6-7 Disk Drive Numbering

**3. Push down on the latch release to open the drive latch handle (FIGURE 6-8).**

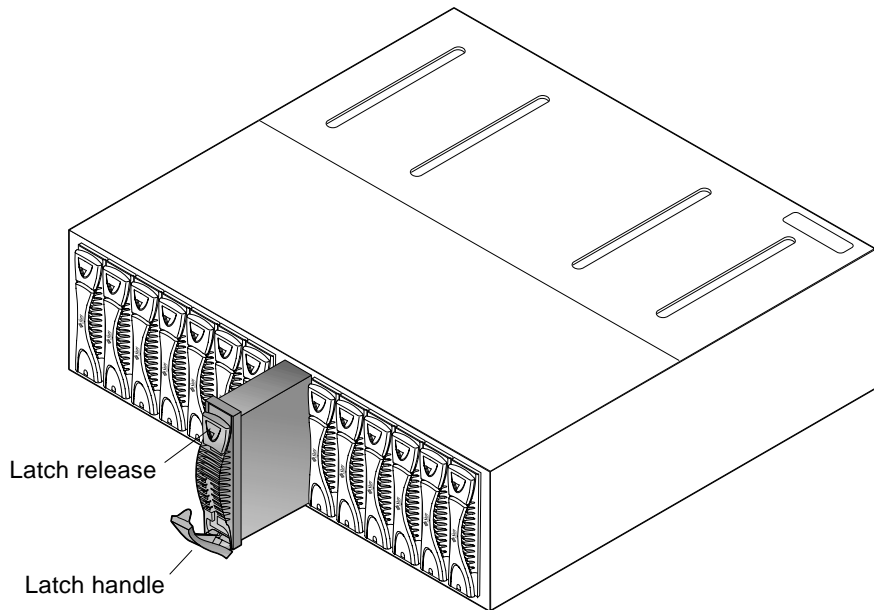


FIGURE 6-8 Removing a Disk Drive

**4. Use the latch handle to slowly pull out the disk drive about one inch.**

Wait 30 seconds before pulling the drive out completely, giving the disk drive time to spin down.

**5. Remove the disk drive from the array.**

After removing the failed drive or a diskless drive bracket, wait for approximately one minute after the drive has been removed before inserting a new replacement drive. This allows the system enough time to correctly determine that the failed drive has been removed and internal drive states get updated correctly.

**6. Push in the latch handle on the removed disk drive to protect it from damage.**

**7. Push the latch release to open the handle on the disk drive to be installed.**

**8. Insert the new disk drive gently on the middle of the rails and push it in until it is seated with the midplane connector.**

**9. Push in on the drive handle to firmly secure the drive.**

The handle will click into place when the drive is fully inserted.

**10. Use the `fru stat` command to view the drive status and to ensure there are no errors.**

See “fru” on page 192 for more information about the `fru stat` command. You can also use the Storage Automated Diagnostic Environment to verify the drive status. Refer to the documentation for the Storage Automated Diagnostic Environment that is listed in the “Related Documentation” table in the Preface of this book for more information about this software tool and how to use it.

## Power and Cooling Units

The power and cooling unit has two active power sources: *standby* and *primary power*. Standby power, which is used to power the microcontroller on the interconnect card, is activated when AC power is present. Primary power, which is used to power all remaining circuits and disk drives, is activated when AC or battery power is present and the power switch is on.

Each power and cooling unit has a power switch in the upper center of the unit. Turning off the power on a power and cooling unit affects only that power and cooling unit. Therefore, to power off all primary power to the unit, both power switches on both power and cooling units must be turned off. After the switches are turned off, system primary power does not actually turn off until the controller has performed an orderly shutdown, including writing any data cache to disk. This process can take up to two minutes.

Separate power cords are used for the connector on each power and cooling unit to provide redundant cabling. The power cords need to be connected to alternate AC power sources on separate power grids for full redundancy.



---

**Caution** – Do not handle the power and cooling unit when the power cord is connected. Line voltages are present within the power and cooling unit when the power cord is connected, even if the power switch is in the Off position.

---



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**Caution** – At the rear of the power and cooling unit is a recessed PC card connector. Do not touch this connector or allow any metal object to touch it. The power and cooling unit contains the UPS battery backup, which can be replaced as a separate FRU.

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**Note** – Even if the LED indicates a power and cooling unit failure, you should always verify the FRU status by using either the Storage Automated Diagnostic Environment or the array CLI.

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**Caution** – To ensure correct airflow for system cooling, both power and cooling units must be in the installed position for normal operation. A failed power and cooling unit should be removed only when a replacement power and cooling unit is available to be inserted.

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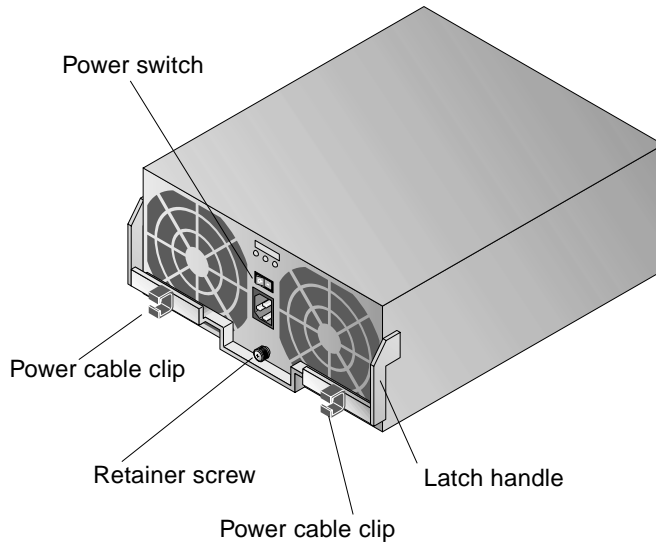
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**Caution** – Replace only one power and cooling unit at a time to prevent system interruption.

---

## ▼ To Replace a Power and Cooling Unit

1. **Power off the power and cooling unit by pressing the power switch** (FIGURE 6-9). Make sure that the blue SIS LED is lit.



**FIGURE 6-9** Power and Cooling Unit

- 2. Disconnect the power cable from the AC outlet and from the power and cooling unit, in that order.**
  - 3. Remove the power cable from the cable clip on the power and cooling unit (FIGURE 6-9).**
  - 4. Loosen the Phillips retainer screw to unlock the power and cooling unit latch handle.**
  - 5. Pull up on the latch handle to release the power and cooling unit from its connector (FIGURE 6-10).**
- Pull the power and cooling unit straight out of the array.



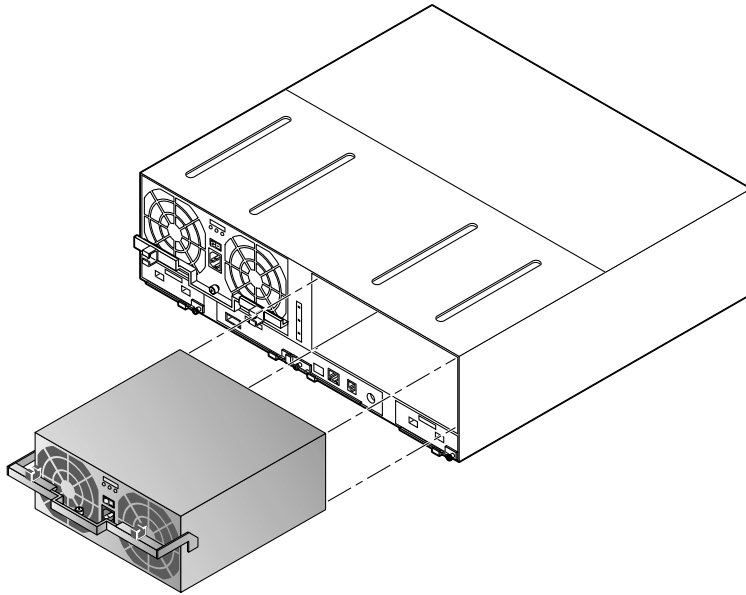


FIGURE 6-10 Removing the Power and Cooling Unit

6. Insert the new power and cooling unit until the latch handle touches the chassis.
7. Push the latch handle down and secure the Phillips retainer screw to lock the latch handle.



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**Caution** – Make sure the power switch is in the Off position (-) before connecting power cords.

---

8. Insert the power cord into the power and cooling unit connector.
9. Insert the power cable into the cable clip.
10. Connect the power cord to the AC outlet.  
When the power and cooling unit receives AC power, the SIS LEDs will flash.
11. Press the power and cooling unit power switch to the On position.
12. Verify that the power and cooling unit SIS LED is green, indicating that it is receiving power.  
It can take several seconds for the green LED to light.
13. Check the power and cooling unit status by using the `fru stat` command or the Storage Automated Diagnostic Environment.

See “fru” on page 192 for more information about the `fru stat` command. Refer to the documentation for the Storage Automated Diagnostic Environment that is listed in the “Related Documentation” table in the Preface of this book for more information about this software tool and how to use it.

## UPS Battery

The UPS battery is located within the power and cooling unit. The battery provides backup in case of a complete AC power failure, and it sustains power to the array long enough to flush cache data to the drives.

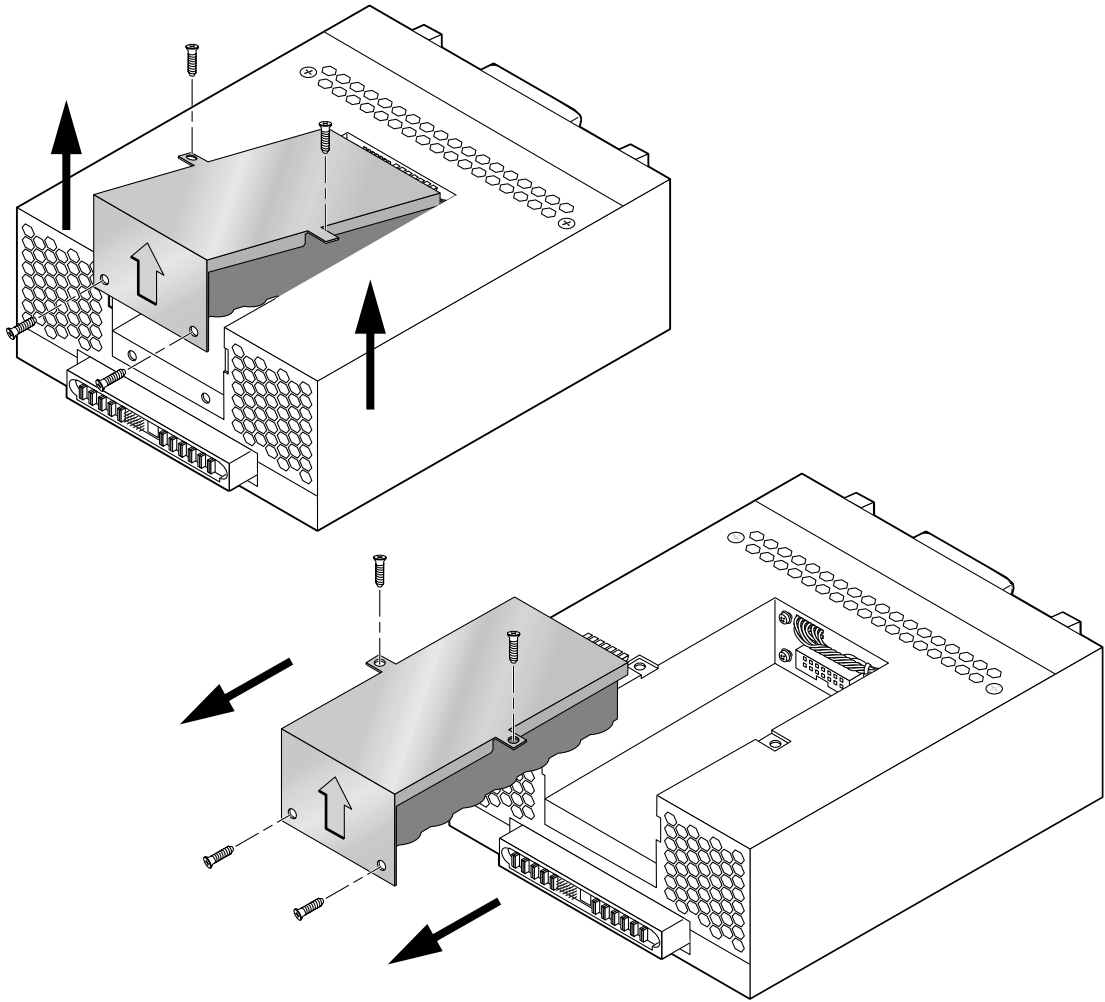
During a power failure, if the battery is flushing cache data to the drives, battery power becomes depleted. After AC power is available, the battery recharges. While the battery is recharging, write-behind cache mode is disabled and write-through cache mode is enabled until the battery is fully recharged. The battery recharge could take up to several hours, depending on the length of the power outage and the amount of cache data that was flushed to the drives.

The battery service life is two years. When the battery approaches the end of its life span, warning messages are sent to the syslog file. The first message is sent 45 days before the end of the life span, followed by a warning message every 5 days thereafter. Replace the power and cooling unit that contains the battery as soon you receive these warning messages.

You can view information about the battery, including the life span, using the CLI. See [“To Check the Battery” on page 81](#) for more information about this feature.

### ▼ To Remove and Replace the UPS Battery

- 1. Remove the power and cooling unit from the array.**  
Follow the instructions in [“To Replace a Power and Cooling Unit” on page 103](#).
- 2. Turn the power and cooling unit over and place it on a flat surface so that the bottom is facing up.**
- 3. Remove the four Phillips screws that secure the UPS battery to the power and cooling unit (FIGURE 6-11).**



**FIGURE 6-11** Removing the UPS Battery

- 4. Lift the battery up and out at an angle to disconnect it.**  
Set the old battery aside for recycling.

5. Slide the new battery in at a slight angle, matching the male connector on the battery with the female connector on the power and cooling unit (FIGURE 6-12).

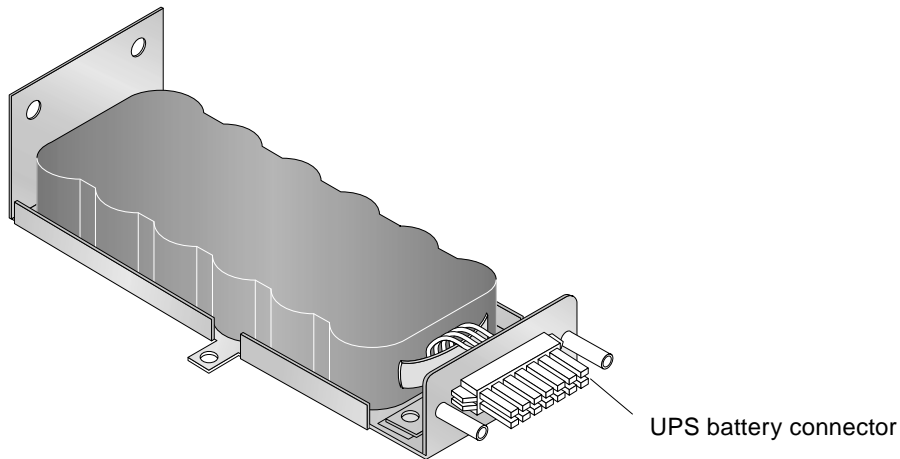


FIGURE 6-12 UPS Battery

6. Secure the four screws that hold the battery in place.
7. Replace the power and cooling unit in the array.  
Tighten the Phillips retainer screw to secure the power and cooling unit latch handle.
8. Press the power switch to the On position.
9. Verify that the power and cooling unit SIS LED is green, indicating that it is receiving power.  
It can take several seconds for the green LED to light.
10. Check the power and cooling unit status using the `fru stat` command or the Storage Automated Diagnostic Environment.  
  
See “fru” on page 192 for more information about the `fru stat` command. Refer to the documentation for the Storage Automated Diagnostic Environment that is listed in the “Related Documentation” table in the Preface of this book for more information about this software tool and how to use it.

## Interconnect Cards

The interconnect cards contain the interface circuitry and two connectors on each card for interconnecting multiple Sun StorEdge 6020 or 6120 arrays. The interconnect card also contains the environmental monitor for the array. If an interconnect card or cable fails, the array continues to function using the remaining interconnect card and cable.

The interconnect cards in an array are assigned a *master* and *slave* status, similar to the controller card. If you unplug or remove the master interconnect card from the unit and then put it back, the new status is reported as “slave.” The corresponding interconnect card that was the slave then becomes the master. You can view the status of the interconnect cards using the `fru stat` command on the array. There is no performance impact to the array if the interconnect cards change status, and it is not necessary to alter the state back to the original master-and-slave configuration.

---

**Note** – If the interconnect card LED indicates an interconnect card failure, you should always verify the FRU status using either the Storage Automated Diagnostic Environment or array CLI

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**Caution** – Use the interconnect cables to cable only Sun StorEdge 6020 or 6120 arrays together using the interconnect card connectors. Do *not* use these cables for any other FC-AL connection.

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**Caution** – The interconnect card FRUs are extremely sensitive to static electricity. Use proper grounding wrist straps and antistatic procedures when handling these FRUs. See [“Preparing for Service” on page 99](#) for a list of static electricity precautions.

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**Caution** – Replace one interconnect card at a time. Follow the procedure as described to ensure that there is no interruption in system operation or loss of data.

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**Caution** – To prevent interruption of system operation during interconnect card replacement, make sure that you remove only the failed interconnect card. Leave the second interconnect card intact in the array. Removing both interconnect cards at the same time in a controller unit causes the array to shut down immediately.

---

## ▼ To Replace an Interconnect Card

1. **Ensure that the interconnect card to be replaced is showing failure status.**

Use either the Storage Automated Diagnostic Environment or the array CLI to check FRU status.

2. **Observe static electricity precautions, as described in “Preparing for Service” on page 99.**

If you have a single controller unit configuration, proceed to [Step 4](#).

3. **Squeeze the connector clip to remove the interconnect cable from the failed interconnect card and from the other array unit to which it connects.**

Mark the connector with either 1 or 2.

4. **Loosen the Phillips retaining screw to unlock the latch handle (FIGURE 6-13).**

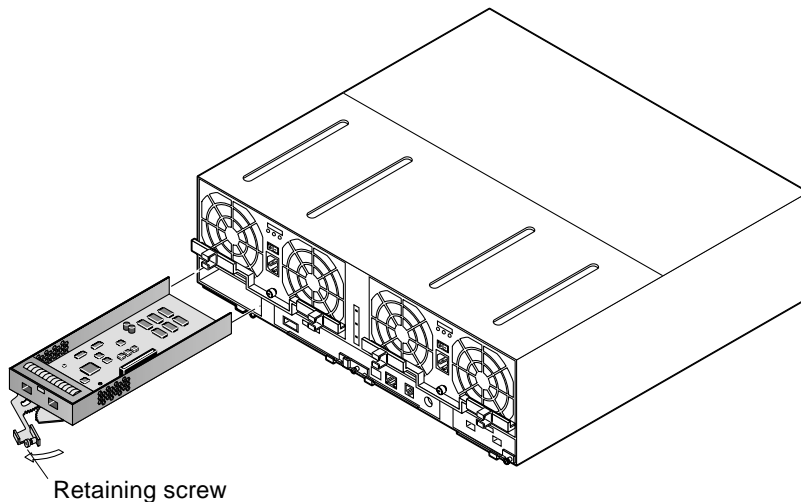


FIGURE 6-13 Removing the Interconnect Card



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**Caution** – The latch handle on the interconnect card is operated by a gear at the base of the card. To avoid injury, keep your fingers away from this gear when removing the card and opening or closing the latch handle.

---

5. **Pull the latch handle out to release the interconnect card from its connector and pull the card out of the chassis.**
6. **Insert the new interconnect card all the way in the chassis, making sure that the card sits on the frame.**

7. Lock the new interconnect card in place by pushing in on the latch handle.
8. Tighten the retaining screw.
9. Reconnect the interconnect cable to the interconnect card and to the other array unit.
10. Verify that the LEDs on the interconnect card show that it has initialized properly.
11. Check the interconnect card status using the `fru stat` command or using the Storage Automated Diagnostic Environment.

See “fru” on page 192 for more information about the `fru stat` command. Refer to the documentation for the Storage Automated Diagnostic Environment that is listed in the “Related Documentation” table in the Preface of this book for more information about this software tool and how to use it.

## Controller Card

The controller card is redundant in a Sun StorEdge 6120 HA array configuration—that is, when the array is connected to another array that contains a controller card.

In an HA array configuration, if there is a controller card failure in a master unit, the controller fails over to the alternate master, which then assumes master controller status. After the failed controller card is replaced in the master unit, that unit assumes the role of alternate master. The new master unit (previously the alternate master) retains all the necessary information, such as the unit IP address, to continue functioning without system interruption. You can return the HA array configuration back to its original, prefailover configuration of master and alternate master by performing a `reset` command.

In a 1x1, 1x2, or 1x3 array configuration, system activity is interrupted until the controller card is replaced and is back online. When a controller card is replaced, the array automatically downloads the previous settings to the new controller card. The array is fully functional after the new controller card is installed and the controller is online.

A controller card can be replaced without system interruption only if the array is part of an HA array configuration.

---

**Note** – If the controller card LED indicates a controller card failure, you should always verify the FRU status by using either the Storage Automated Diagnostic Environment or the array CLI command.

---

## ▼ To Replace the Controller Card:

### 1. Observe static electricity precautions.

See “[Preparing for Service](#)” on page 99 for precautions.

### 2. Ensure that the controller card is showing failure status.

Use either the Storage Automated Diagnostic Environment or the array CLI to check FRU status.

### 3. Remove the Ethernet cable from the Ethernet connector.

### 4. Remove the fiber-optic cable from the FC-AL connector.

### 5. Loosen the Phillips retaining screw to unlock the latch handles (FIGURE 6-14).

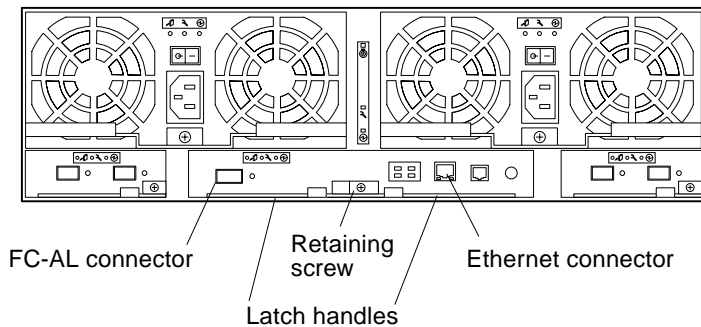


FIGURE 6-14 Controller Card

### 6. Pull the latch handles to release the controller card from the connector and remove it from the array (FIGURE 6-15).



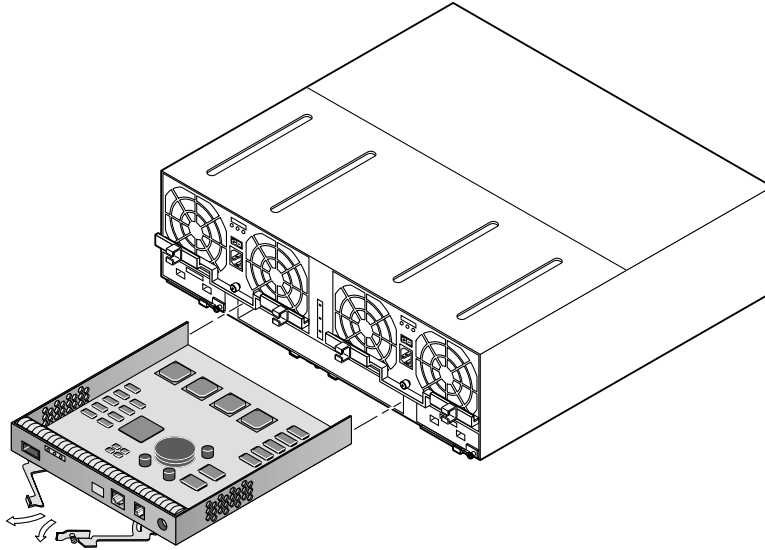


FIGURE 6-15 Removing the Controller Card

7. Insert the new controller card all the way in the chassis.
8. Push in the latch handles to secure the controller card with the connector.
9. Tighten the retaining screw.
10. Insert the fiber-optic cable into the FC-AL connector.
11. Insert the Ethernet cable into the Ethernet connector.
12. Check the controller LEDs to determine when the controller is operational.

When the controller is operational, the SIS LED is green.



---

**Caution** – During a controller boot process, if the Power-On-Self-Test or Built-In-Self-Test firmware detects a fatal problem with the controller, the system prevents the controller from going online. If this happens, the amber LED, which normally indicates a controller failure, will not light. After installing a new controller board, allow enough time for the controller to boot and follow with an inspection by using the Storage Automated Diagnostic Environment to verify controller online status.

---

13. Check the controller card status using the `fru stat` command or using the Storage Automated Diagnostic Environment.

See “fru” on page 192 for more information about the `fru stat` command. Refer to the documentation for the Storage Automated Diagnostic Environment that is listed in the “Related Documentation” table in the Preface of this book for more information about this software tool and how to use it.

## Chassis

The array chassis rarely needs to be replaced. However, the chassis part number is available in case you need to replace the midplane and chassis. (These must be replaced together, because they are factory aligned.)

Any problems with the midplane are usually due to an electrical short or a bent or broken pin connector. These problems first appear as a failure of another FRU component, such as an interconnect failure or drive failure. If replacing the FRU that appears to be failed does not correct the problem, then examine the midplane connector that the FRU connects to for bent or broken pins. If nothing is obvious, install another spare FRU to verify that it is not a failed FRU component causing the problem. If you have eliminated all possibility of a FRU component failure and the problem still remains, it is likely a midplane failure.



---

**Caution** – This procedure should be performed only by a trained, qualified service provider. If you suspect a midplane failure or need to replace a damaged chassis, contact your Sun service representative to perform this procedure.

---



---

**Caution** – Replacing an array chassis interrupts array operation.

---

---

**Note** – If the array is part of an HA array configuration, access to all volumes in the HA array is unavailable during this midplane replacement procedure. Assess the impact of unmounting volumes and stopping applications prior to starting this procedure.

---

## ▼ To Replace a Chassis and Midplane

1. **Perform full backups of data on affected arrays for all accessible volumes.**



---

**Caution** – This procedure involves disassembling the array hardware and reassembling it. Make sure you back up all data on the array before proceeding to avoid data loss.

---

2. From the data host, halt all channel activity going to all volumes in that array and in arrays connected to it.

a. Notify all applications to stop accessing any affected volumes by unmounting the volume(s) or stopping the application if necessary.

b. Verify that all drive activity has stopped.

The drive LEDs become solid green, indicating that the drives are idle.

3. If any volume manager software is running, such as Solaris Volume Manger software or VERITAS Volume Manager, disable transactions to the volumes that reside on the array midplane that you are replacing and to all other volumes in that HA array configuration.

Consult the appropriate volume manager documentation for information about disabling the data host's access to the array volumes.

4. Remove power by typing:

```
:/:<1> shutdown
Shutdown the system, are you sure? [N]: y
```

---

**Note** – After removing power, the fans in the power and cooling unit will continue to operate as long as the AC power cable is connected, even when power switches are in the Off position.

---

5. Press the power switch on the power and cooling units to the Off (-) position (FIGURE 6-16).

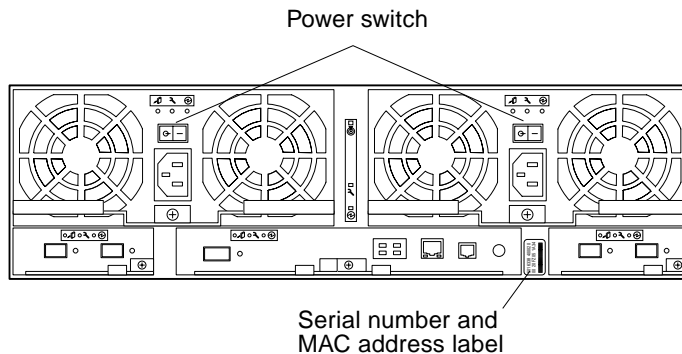


FIGURE 6-16 Array—Back View

All arrays connected to the failed array power off automatically.

**6. Disconnect all external cables from the failed array.**

Disconnect all power, interconnect, FC-AL, and Ethernet cables.

---

**Note** – If the array is part of an HA array configuration, note the placement of the host FC-AL connections and loop cables. You will need this information in [Step 11](#).

---



---

**Caution** – Use two people to lift and move the array. It can weight up to 90 lbs (41 kg).

---

**7. Remove the chassis from the cabinet.**

- a. Remove the four Phillips screws at the back of the chassis and the four at the front that secure the array to the side rails in the cabinet (FIGURE 6-17).

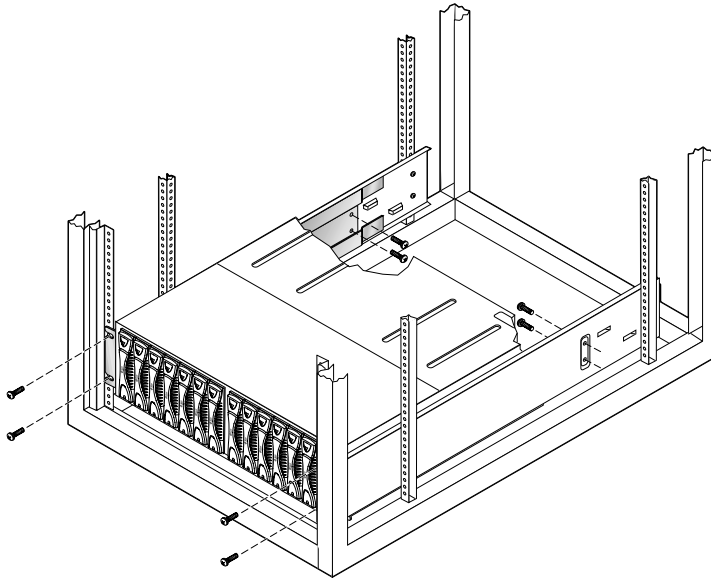


FIGURE 6-17 Removing the Mounting Screws

- b. Slide the chassis out of the cabinet (FIGURE 6-18).

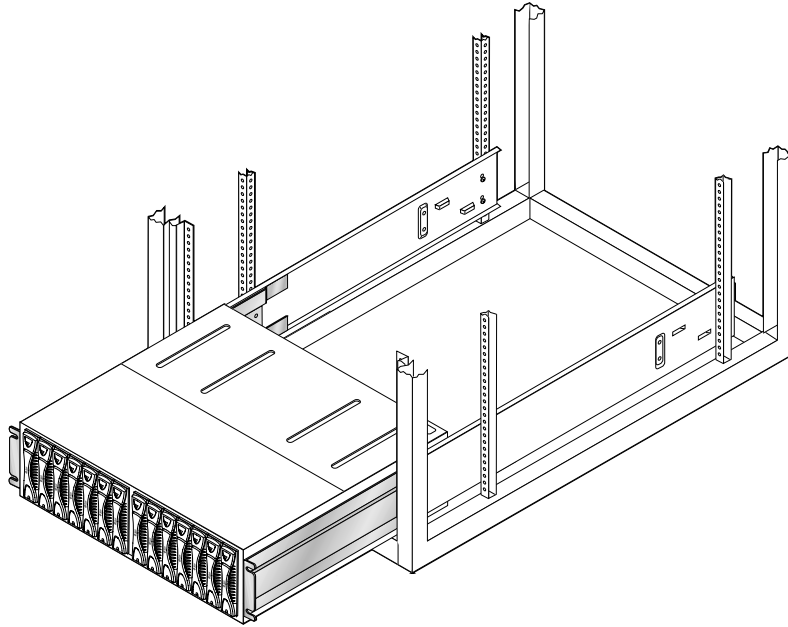


FIGURE 6-18 Removing the Chassis

8. Move the failed array to an area where both the front and back can be easily accessed.



---

**Caution** – FRUs are extremely sensitive to static electricity. Use proper antistatic wrist strap and procedures when handling any FRU. Observe all static electricity precautions as described in [“Preparing for Service” on page 99](#).

---

9. Remove all FRU components from the failed array and put them into the new chassis, making sure they are placed in the same location.

---

**Note** – When removing disk drives, label each one with its slot position in the unit so that you can replace the drives in the correct slots.

---

- a. Unlock each FRU by loosening the Phillips retaining screw that secures the latch handles, and pull out the handles to release the FRU from the midplane connectors.

The disk drives do not have retaining screws.

- b. Pull the FRU straight out.

- c. **Lock the FRU back into place in the new chassis by pushing in and securing the latch handle(s).**

Be sure to tighten the retaining screw for each FRU.



---

**Caution** – Maintain disk positions or data could be lost.

---

10. **Move the replacement chassis back into place.**

If you are installing the chassis in a cabinet, align the new chassis with the side rails and slide the chassis into the cabinet. Replace the four screws at the back of the chassis and the four screws at the front to secure the chassis to the cabinet.

11. **Connect all cables previously removed, but *do not* power on the array(s).**

---

**Note** – If the array is part of an HA array configuration, make sure that the host FC-AL cables are recabled to the same Sun StorEdge 6020 or 6120 array FC-AL connections that they were removed from as you noted in [Step 6](#). Also ensure that loop cables are properly recabled.

---

12. **Contact the appropriate Contract Administrator (CA) of the Contracts Verification Group (CVG) to relay the system serial number and new chassis information.**

13. **On the `rarp` server, update the `/etc/ethers` file.**

Replace the MAC address entry of the failed chassis with the MAC address of the new chassis. For example:

```
8:0:20:6d:93:7e array-name
```

In this example:

- `8:0:20:6d:93:7e` is the new MAC address
- `array-name` is the name of the old array.

---

**Note** – If the failed unit was an alternate master, the unit's MAC address might not be in the `/etc/ethers` file. In this case, no file changes are required.

---

14. **Verify that the `/etc/hosts` file contains the previous IP address and array name.**

For example:

```
nnn.nnn.nnn.nnn array-name
```

In this example, *nnn.nnn.nnn.nnn* is the IP address assigned previously.

**15. Verify that the `/etc/nsswitch.conf` file on the `rarp` server references the local system files.**

To ensure that the Solaris software environment uses the changes made to the `/etc/ethers` and `/etc/hosts` files, edit the `host` and `ethers` entries in the `/etc/nsswitch.conf` file so that the `files` parameter appears before the `[NOTFOUND=return]` statements. For example:

```
hosts:      nis files [NOTFOUND=return]
ethers:     nis files [NOTFOUND=return]
```

**16. Ensure that the `rarp` daemon is running on the `rarp` server:**

```
rarpserver# ps -eaf | grep rarpd
```

**17. If the `rarp` daemon is not already running on the `rarp` server, start it by typing:**

```
rarpserver# /usr/sbin/in.rarpd -a &
```

**18. Verify that AC power is present on each power and cooling unit in the chassis.**

The AC indicator light on each power and cooling unit is amber.

**19. Press the power switch to the On position to restore power.**

FIGURE 6-16 shows the power switch location. The AC indicator lights on the power and cooling units are solid green.

After you power on, the array's previous IP address is reassigned to the new MAC address.

Allow time to complete the boot cycle. When all LEDs are green, proceed to the next step.

**20. Check the LEDs at the front and back of the unit to ensure that all components are receiving power and are functional.**

While the drives are spinning up, the LEDs blink. The array boot time takes up to several minutes, after which all LEDs are solid green, indicating that the unit is receiving power and there is no drive activity.

---

**Note** – The batteries in the power and cooling units recharge after powering on the unit. While the batteries are recharging, write-behind cache is disabled.

---



---

**Caution** – During a controller boot process, if the Power-On-Self-Test or Built-In-Self-Test firmware detects a fatal problem with the controller, the system prevents the controller from going online. If this happens, the amber LED, which normally indicates a controller failure, will not light. After installing a new controller board, allow enough time for the controller to boot and follow with an inspection using the Storage Automated Diagnostic Environment tool to verify controller online status.

---

**21. Use the CLI to verify that all components are functioning properly.**

To verify status using the CLI, open a Telnet session to the disk array and verify volume and FRU status.

```
:/:<1> fru stat
:/:<2> vol stat
```

Note that when the midplane is replaced, the data host volume's worldwide name (WWN) changes. The WWN is derived from the midplane serial number. Because the volume WWN is part of the volume's device path on the data host, the device path definition on the data host changes. Therefore, you must reconfigure the data host to recognize the new WWNs.

**22. Configure the data host to recognize the new WWNs by typing the following command on the data host:**

```
datahost# devfsadm
```

---

**Note** – Any applications specifically dependent on the volume's device path also need to be changed. Refer to each application's documentation for instructions.

---

**23. Execute a `format (1M)` command on the data host to verify that the Sun StorEdge 6120 arrays are seen.**

The Sun StorEdge 6120 array volumes are now usable by the data host and can be mounted or reenabled with the appropriate volume manager software.



---

# Upgrading Array Firmware and System Files

This section explains how to upgrade the array firmware and system files located on the Sun StorEdge 6120 array controller card, interconnect card, and disk drives. There are two types of upgrades:

- A *live upgrade* is performed while the array is operational and is processing I/O data. Live firmware upgrades are used to upgrade the controller card firmware, interconnect card firmware, and system files on Sun StorEdge 6120 HA array configurations where there are two active controller cards in the array.
- *Offline upgrades* are performed when the array is not processing I/O data; all array activity must be halted during the upgrade. Offline upgrades are used for single controller array configurations such as a 1x1, 1x2, or 1x3 array configurations, and for all disk drive firmware upgrades in both single-array controller unit configurations and HA array configurations.

This section is organized as follows:

- [“Live Upgrades” on page 121](#)
- [“Offline Upgrades” on page 129](#)

## Live Upgrades

Use the procedures in this section to upgrade controller card firmware, interconnect card firmware, and system files on Sun StorEdge 6120 HA array configurations only.

---

**Note** – To upgrade disk drive firmware on Sun StorEdge 6120 HA array configurations, you must perform an *offline* upgrade. See [“Offline Upgrades” on page 129](#) for instructions

---

This section is organized as follows:

- [“Preparing for the Live Upgrade” on page 122](#)
- [“Transferring Patches and Files to the Array” on page 124](#)
- [“Upgrading the Controller Card Firmware” on page 124](#)
- [“Upgrading the Interconnect Card Firmware” on page 127](#)
- [“Completing and Verifying the Live Upgrade” on page 128](#)

## Preparing for the Live Upgrade

1. **Make sure there are two active controller cards in the configuration to perform the live firmware upgrade: a master controller unit and an alternate master controller unit.**
2. **Verify that the controller unit ownership is operating in the default mode, where the bottom array is the master controller unit and the top array is the alternate master controller unit.**

```
:/:<36> sys stat
Unit   State   Role    Partner
-----
  1    ONLINE  Master   2
  2    ONLINE  AlterM   1
```

3. **Make sure that the multipathing host software, such as the VERITAS DMP agent in VERITAS Volume Manager or Sun StorEdge Traffic Manager, is configured correctly and is running on the host system.**

Refer to the multipathing software documentation that came with your multipathing software for instructions.

4. **Before you begin the firmware download, verify that the arrays and their associated back-end loops are in an optimal state.**
  - a. **Use the `proc list` command to make sure there are no volume reconstructions underway.**
  - b. **Type `port listmap` to display the current mappings between the host interface ports and the array volumes, and to ensure that no ports are operating in a failover state.**
  - c. **Type `refresh -s` to check the battery status and to ensure that no battery refresh operations are underway.**
  - d. **Type the `fru stat` command to display the status of all array FRUs to ensure that they all are functioning properly.**
5. **Disable any monitoring software, such as the Storage Automated Diagnostic Environment, to avoid triggering false alerts during the upgrade.**
6. **Display current array system settings by using the `sys list` command, and record the array setting information.**

You will be modifying system settings during the upgrade procedure and will need to return them to their previous state after the upgrade.

7. View the `sys list` command from [Step 6](#) and make sure the `mp_support` setting is set to `rw` or `mpxio` to enable multipathing.



---

**Caution** – If multipathing is not enabled, the system is not configured for a failover operation. Before continuing with a live firmware upgrade, make sure the configuration is set up for multipathing support.

---

8. Make backup copies of the following array files if they have been modified for your array configuration:

- `/etc/hosts`
- `/etc/bat.conf`
- `/etc/syslog.conf`

You might need to restore these files to the array after completing the upgrade procedure as these files are over-written during the upgrade, and any previous modifications will be lost.

9. Use the `set` command to verify that the array bootmode is set to `auto`.

For example:

```
:/:<52>set
bootmode auto
bootdelay 3
ip nnn.nnn.nnn.nnn
netmask 255.255.255.0
gateway nnn.nnn.nnn.nnn
tftpghost nnn.nnn.nnn.nnn
tftpfile null
hostname qatest
timezone
logto *
loglevel 3
rarp on
mac 00:03:ba:27:ca:64
```

10. Turn off local system logging on the array to avoid sending false alerts through facilities that monitor the syslog. Type:

```
:/:<53>set logto 1
```

## Transferring Patches and Files to the Array

---

**Note** – You must have a `root` password to log in to the array and set it. If you do not have a `root` password, you must establish one before proceeding for this procedure to work correctly.

---

The latest controller and interconnect card firmware images and the array system files are available on the SunSolve™ web site:

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

1. **Navigate to the Patch Portal and select one of the available patch utilities, such as PatchPro.**
2. **Use the patch program to locate and download the Sun StorEdge 6120 array patch image.**
3. **Refer to the patch README file for specific patch installation instructions.**

The `6120.sh` script is included with the patch image and provides an interactive utility that transfers the necessary files and binaries from the patch directory on the host to the array that is being upgraded.

After downloading the array patch and running the `6120.sh` script, you must install the firmware image on the individual components as described in the following sections.

## Upgrading the Controller Card Firmware

1. **Start a Telnet session from the management host to the array if you are not already in a Telnet session.**
2. **On the array, use the `ep download` command to install the new controller firmware:**

```
:/:<1> ep download xxxx.bin
```

where `xxxx.bin` is the name of the controller firmware file.

3. **Disable cache mirroring and disable the master controller unit by typing:**

```
:/:<2> sys mirror off; disable u1
```

Disabling the master controller unit ends the current Telnet session.

4. Start a new Telnet session with the array.
5. Display the controller status and verify that the master controller unit has been disabled by typing:

```
:/:<3> sys stat
Unit   State      Role      Partner
-----
 1     OFFLINE   Master    2
 2     ONLINE    AlterM    1
```

6. Enable the u1 controller by typing:

```
:/:<4> enable u1
```

It can take a few minutes for the u1 controller to completely boot and become available to the host system.

7. Verify that the master controller unit is enabled by typing:

```
:/:<5> sys stat
Unit   State      Role      Partner
-----
 1     ONLINE    AlterM    2
 2     ONLINE    Master     1
```

8. Using the host-based multipathing software, verify that the u1 controller is back online and that a failback operation to the path associated with the u1 controller has occurred.

You must determine that the path to the u1 controller has been completely restored before continuing this procedure. For example, if you are using Sun StorEdge Traffic Manager software on the Solaris 9 operating environment, you can use the `iostat -X` command to determine the state of physical paths to a storage device. For specific instructions, refer to the documentation that came with your multipathing tool.



---

**Caution** – Failure to confirm a proper failback of I/Os to the master controller unit before continuing this procedure can result in a temporary loss of access to data on the array.

---

9. Once data path failback to the u1 controller has completed, disable the u2 controller by typing:

```
:/:<6> disable u2
```

The Telnet connection to the array terminates, and host path failover of all I/O paths to the u1 controller begins.

**10. Start a new Telnet session with the array.**

**11. Verify that the u2 controller has been disabled by typing:**

```
:/:<1> sys stat
Unit   State      Role      Partner
-----
 1     ONLINE    Master    2
 2     OFFLINE   AlterM    1
```

**12. Enable the u2 controller by typing:**

```
:/:<2> enable u2
```

**13. Verify that a host-side failback operation has occurred:**

- a. Use the array `port listmap` command to confirm LUN ownership.
- b. Use the host-based multipathing software to verify that I/O has failed back to its primary paths.

**14. Reenable cache mirroring on the array by typing:**

```
:/:<3> sys mirror auto
```

**15. Verify that the new controller firmware is loaded and running by typing:**

```
:/:<4> ver

6120 Release 3.0.2 Fri Feb 21 16:04:37 PST 2003 (nnn.nnn.nnn.nnn)
Copyright (C) 1997-2003 Sun Microsystems, Inc.
All Rights Reserved.
```

The controller firmware is displayed in the `ver` output as `Release 3.0.2`.

## Upgrading the Interconnect Card Firmware

---

**Note** – The firmware for the interconnect card is also referred to as *loop card* firmware. In the screen output, the term *loop* refers to the interconnect card.

---

This procedure explains how to upgrade interconnect (loop) card firmware on an active Sun StorEdge 6120 HA array configuration.

1. **Make sure you have completed the steps in “Preparing for the Live Upgrade” on page 122.**
2. **Determine which interconnect cards in the array configuration require a firmware upgrade by typing:**

```
:/:<11>lpc version
          LOOP A                LOOP B
Enclosure 1  6.19                6.23
Enclosure 2  6.23                6.23
Enclosure 3  6.23                6.19
Enclosure 4  6.23                6.23
```

In this example, only interconnect cards u111 and u312 require a firmware upgrade from version 6.19 to version 6.23.

3. **Use the `lpc` command to download the firmware to all Loop A interconnect cards that require an update.**

Using the example in the previous step, type:

```
:/:<12>lpc download u111 filename.bin
```

where *filename.bin* is the filename of the interconnect card firmware image.

4. **Reboot each interconnect card on Loop A for which you downloaded the new firmware image.**

Using the example in the previous step, type:

```
:/:<13>lpc reboot u111
```

5. Verify that the updated Loop A interconnect cards are running the correct new firmware image.

For example:

```
:/><15>lpc version
          LOOP A          LOOP B
Enclosure 1  6.23          6.23
Enclosure 2  6.23          6.23
Enclosure 3  6.23          6.19
Enclosure 4  6.23          6.23
```

6. Verify that Loop A is up and functional before proceeding.
7. Follow [Step 3](#) through [Step 5](#) to install the firmware image to all Loop B interconnect cards that require an upgrade.

## Completing and Verifying the Live Upgrade

1. Reenable system logging to the previous settings by using the `set logto *` command.

The command restores array logging to settings specified in the array's `/etc/syslog.conf` configuration file.

2. Restore all system settings that you changed during the upgrade procedure back to the previous settings that you recorded in [Step 6](#) of “[Preparing for the Live Upgrade](#)” on [page 122](#).
3. Copy back the system files that you backed up in [Step 8](#) of “[Preparing for the Live Upgrade](#)” on [page 122](#).

Only do this if the system files that you started with had been previously modified and customized for your array configuration. Otherwise, skip this step.

4. Verify that the array configuration is operating correctly by viewing the output of the following array commands:

- `proc list`
- `port listmap`
- `fru stat`
- `fru list`

5. Reenable any remote monitoring tools, such as the Storage Automated Diagnostic Environment, that you disabled before beginning the upgrade.

This completes the live upgrade procedure.



# Offline Upgrades

Use the procedures in this section to upgrade the controller card firmware, interconnect card firmware, and system files on 1x1, 1x2, or 1x3 Sun StorEdge 6120 array configurations. This section also includes an offline firmware upgrade procedure for disk drive firmware on all array configurations.

---

**Note** – Disk drive firmware upgrades can be performed only on Sun StorEdge 6120 arrays or HA array configurations that have been taken offline; that is, all data I/O activity has been halted between the array and the host.

---

This section is organized as follows:

- [“Preparing for the Offline Upgrade” on page 129](#)
- [“Transferring Patches and Files to the Array” on page 130](#)
- [“Upgrading the Controller Card Firmware” on page 131](#)
- [“Upgrading the Interconnect Card Firmware” on page 132](#)
- [“Upgrading the Disk Drive Firmware” on page 133](#)
- [“Completing and Verifying the Upgrade” on page 134](#)

## Preparing for the Offline Upgrade

1. Halt all I/O activity between the data host and the array(s).
2. Verify that the arrays and their associated back-end loops are in an optimal state before beginning the firmware download as follows:
  - a. Use the `proc list` command to make sure no volume reconstructions are underway.
  - b. Use the `refresh -s` command to check battery status and to make sure no battery refresh operations are underway.
  - c. Use the `fru stat` command to display the status of all array FRUs and to ensure they are all functioning properly.
3. Disable any monitoring software, such as the Storage Automated Diagnostic Environment, to avoid triggering false alerts during the upgrade.
4. Display current array system settings by using the `sys list` command, and record the array setting information.

You will be modifying system settings during the upgrade procedure and will need to return them to their previous state after the upgrade.

**5. Make backup copies of the following array files if they have been modified for your array configuration:**

- /etc/hosts
- /etc/bat.conf
- /etc/syslog.conf

You might need to restore these files to the array after completing the upgrade procedure as these files are over-written during the upgrade, and any previous modifications will be lost.

**6. Use the `set` command to verify that the array bootmode is set to `auto`.**

For example:

```
:/:<52>set
bootmode auto
bootdelay 3
ip nnn.nnn.nnn.nnn
netmask 255.255.255.0
gateway nnn.nnn.nnn.nnn
tftpghost nnn.nnn.nnn.nnn
tftpfile null
hostname qatest
timezone
logto *
loglevel 3
rarp on
mac 00:03:ba:27:ca:64
```

**7. Turn off local system logging on the array to avoid sending false alerts through facilities that monitor the syslog by typing:**

```
:/:<53>set logto 1
```

## Transferring Patches and Files to the Array

---

**Note** – You must have a `root` password to log in to the array and set it. If you do not have a `root` password, you must establish one before proceeding for this procedure to work correctly.

---

The latest controller and interconnect card firmware images and the array system files are available on the SunSolve™ web site:

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

1. **Navigate to the Patch Portal and select one of the available patch utilities, such as PatchPro.**
2. **Use the patch program to locate and download the Sun StorEdge 6120 array patch image.**

---

**Note** – The patch image does not include disk drive firmware patches. To download the latest drive firmware patches, use the patch program on the SunSolve web site to search for Sun StorEdge 6120 array disk drive firmware. The patch program provides the latest array drive firmware levels and a README file with drive firmware upgrade information. Download the drive firmware to a host connected to the array, and then ftp the drive firmware files to the array system. See [“Upgrading the Disk Drive Firmware” on page 133](#) to install the drive firmware.

---

3. **Refer to the patch README file for specific patch installation instructions.**

The `6120.sh` script is included with the patch image and provides an interactive utility that transfers the necessary files and binaries from the patch directory on the host to the array that is being upgraded.

After downloading the array patch and running the `6120.sh` script, you must install the firmware image on the individual components as described in the following sections.

## Upgrading the Controller Card Firmware

1. **Start a Telnet session from the management host to the array if you are not already in a Telnet session.**
2. **On the array, use the `ep download` command to install the new controller firmware:**

```
:/:<1> ep download xxxx.bin
```

where `xxxx.bin` is the file name of the controller firmware image.

### 3. Reboot the array by typing:

```
:/:<2> reset -y
```

It can take a few minutes for the u1 controller to completely boot and become available to the host system.

### 4. Verify that the new controller firmware is loaded and running by typing:

```
:/:<1>ver  
  
6120 Release 3.0.2 Fri Feb 21 16:04:37 PST 2003 (nnn.nnn.nnn.nnn)  
Copyright (C) 1997-2003 Sun Microsystems, Inc.  
All Rights Reserved.
```

The controller firmware is displayed in the `ver` output as `Release 3.0.2`.

## Upgrading the Interconnect Card Firmware

---

**Note** – The firmware for the interconnect card is also referred to as *loop card* firmware. In the screen output, the term *loop* refers to the interconnect card.

---

1. Make sure you have completed the steps in [“Preparing for the Offline Upgrade” on page 129](#).
2. Determine which interconnect cards in the array configuration require a firmware upgrade by typing:

```
:/:<15>lpc version  
  
                LOOP A          LOOP B  
Enclosure 1    6.19            6.23  
Enclosure 2    6.23            6.23  
Enclosure 3    6.23            6.19
```

In this example, only interconnect cards u111 and u312 require a firmware upgrade from version 6.19 to version 6.23.

3. Use the `lpc` command to download the firmware to all Loop A interconnect cards that require an update.

Using the example in the previous step, type:

```
:/:<12>lpc download u111 filename.bin
```

where `filename.bin` is the filename of the interconnect card firmware image.

4. Reboot each interconnect card on Loop A for which you downloaded the new firmware image.

Using the example in the previous step, type:

```
:/:<13>lpc reboot u111
```

5. Follow [Step 3](#) and [Step 4](#) to install the firmware image to all Loop B interconnect cards that require an upgrade.
6. Verify that the updated Loop A and Loop B interconnect cards are running the correct new firmware image.

For example:

```
:/:<15>lpc version
          LOOP A          LOOP B
Enclosure 1  6.23          6.23
Enclosure 2  6.23          6.23
Enclosure 3  6.23          6.23
```

## Upgrading the Disk Drive Firmware

1. Make sure you have completed the steps in [“Preparing for the Offline Upgrade” on page 129](#).
2. Copy the disk drive firmware image to the array as explained in [“Transferring Patches and Files to the Array” on page 130](#).

3. In a Telnet session with the array, install the firmware using the `disk` command:

```
:/:<l>disk download u1d1-14 filename
```

where:

- `u1` is the array unit
  - `d1-14` are disk drives 1 through 14
  - `filename` is the file name of the disk drive firmware image
4. Use the `disk version` command to view the firmware level of each disk drive in the array.
  5. Verify that the drives are online and ready using the `fru stat` command.

## Completing and Verifying the Upgrade

1. Restore system logging to the previous settings by using the `set logto *` command.

The command restores array logging to the settings specified in the array's `/etc/syslog.conf` configuration file.

2. Restore all system settings that you changed during the upgrade procedure back to the previous settings that you recorded in [Step 4 of “Preparing for the Offline Upgrade” on page 129](#).
3. Copy back all system files that you backed up in [Step 5 of “Preparing for the Offline Upgrade” on page 129](#).

Only do this if the system files that you started with had been previously modified and customized for your array configuration. Otherwise, skip this step.

4. Verify that the array configuration is operating correctly by viewing the output of the following array commands:
  - `proc list`
  - `port listmap`
  - `fru stat`
  - `fru list`

5. Reenable any remote monitoring tools, such as the Storage Automated Diagnostic Environment, that you disabled before beginning the upgrade.

This completes the offline upgrade procedure.

## Changing the Array Configuration

---

This chapter discusses various configuration changes to an array. The main sections are:

- [“Converting a Single Array” on page 135](#)
- [“Adding Expansion Units” on page 138](#)

---

### Converting a Single Array

These procedures assume the following:

- All reconfigurations are performed while the system is offline from accepting I/O from the host system (I/O has been quiesced).
- System reconfigurations involve power cycling of storage arrays.
- Data stored on the arrays will need to be evacuated before any reconfiguration procedures start. During the reconfiguration process, all existing volumes (storage pools) will be deleted and recreated.

---

**Note** – All telnet CLI connections are made to the CLI that resides in the appropriate Sun StorEdge 6120 array.

---

## ▼ To Convert a Controller Unit into an Expansion Unit



---

**Caution** – This procedure will result in unrecoverable data on the tray being converted from a controller unit to an expansion unit. Before proceeding, be sure to evacuate all data on the tray to some other media (for example, tape or another storage system).

---

1. Connect to the telnet CLI of the array controller that is managing the array.
2. Obtain a list of volumes with the `vol list` command.

```
6120:/: vol list
```

3. Unmount the volumes with the `vol unmount` command.

```
6120:/: vol unmount name
```

4. Remove all volumes from the configuration using the `vol remove` command.

```
6120:/: vol remove name
```

5. Unconfigure the unit to be converted to an expansion tray by running the following command:

```
6120:/: unconfig u<encid>
```

6. Power off the tray (or array system if this unit is part of a larger configuration).
7. Disconnect the host-side Fibre Channel connectors from the array controller.
8. Physically remove the controller card from the unit.
9. Install the controller card slot dummy panel.

The newly created expansion unit is ready to use.



## ▼ To Convert an Expansion Unit into a Controller Unit

---

**Note** – This procedure assumes the expansion unit to be converted has already been removed from its array system and is now a standalone expansion unit that is ready to be converted to a controller unit.

---

1. Verify that the expansion unit is powered off.
2. Verify that the network LAN to which the expansion unit is to be connected has a RARP server with the expansion unit's MAC address already configured.  
Refer to the *Sun StorEdge 6120 Array Installation Guide* for specific instructions on establishing the MAC address on the host.
3. Remove the array controller slot dummy panel.
4. Install a new array controller.
5. Connect the controller card to the host with the FC cable and to the LAN with the Ethernet cable.
6. Power on the array.
7. Connect to the new array controller unit using the telnet CLI.
8. Clear all system labels by executing the following command on the new array controller unit:

```
6120:/: boot -w
```

The new array controller unit reboots.

---

**Note** – Following execution of the `boot -w` command, the array password is reset to the default password, which is blank.

---

---

**Note** – If the `boot -w` command seems to hang, wait for at least five minutes before doing anything else. You can start another telnet CLI session and do a reset of the system. Once the storage array comes back up, then repeat the `boot -w` command to ensure that it executes completely.

---

# Adding Expansion Units

This procedure describes adding expansion units to an array.

The procedure assumes the following:

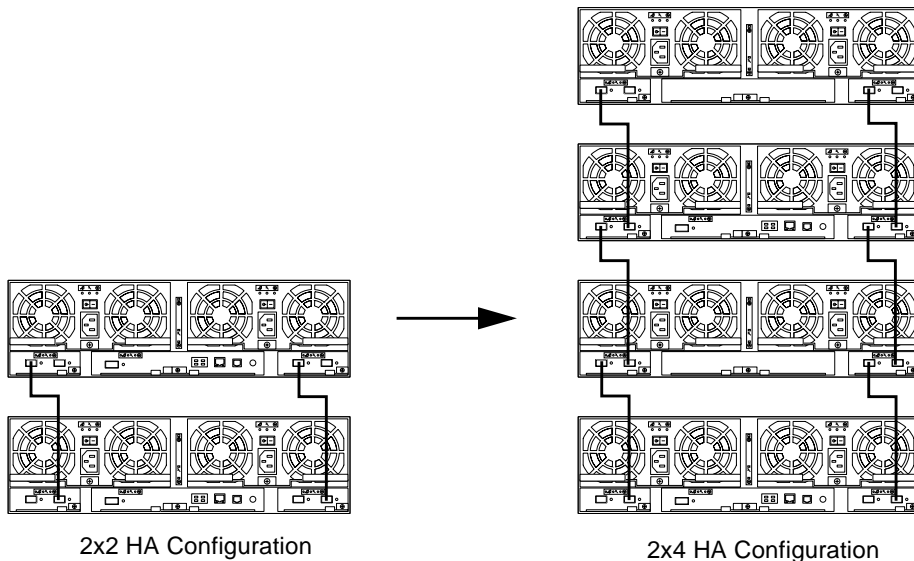
- All reconfigurations are performed while the system is offline from accepting I/O from the host system (I/O has been quiesced).
- System reconfiguration involves power cycling of storage arrays.
- Data stored on the arrays will need to be evacuated before any reconfiguration procedure starts. During the reconfiguration process, all existing volumes (storage pools) will be deleted and recreated.

## ▼ To Add Expansion Units to an Array

---

**Note** – This procedure uses, as a working example, a 2x2 HA configuration and demonstrates the addition of two expansion units, which results in a 2x4 HA configuration.

---



**FIGURE 7-1** Conversion From a 2x2 HA Configuration to a 2x4 HA Configuration

1. Quiesce all I/O from hosts using the storage system.
2. As a precaution, back up all user data to an alternate media location.  
This is not required, but is considered to be good practice.
3. Halt all monitoring applications to prevent erroneous alerts from being generated.

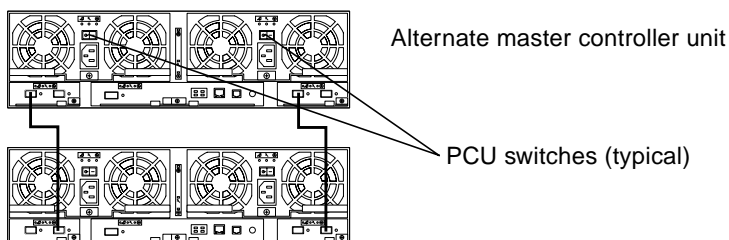
---

**Note** – The next two steps are only required if expanding an array that has two array controllers. If adding trays to a single-controller configuration, proceed directly to [Step 6](#).

---

4. Disable the alternate master controller unit using the `disable u2` command.
5. Run `unconfig u2` specifying the alternate master controller unit that will be relocated to a new tray added to the configuration.
6. Shutdown the 2x2 storage array using the `shutdown` command from the telnet CLI interface.
7. After the 2x2 storage array has shut down, turn off power on all PCUs on the array by pressing the power switches on the PCUs.

Proceed to the next step after the blue LED have been illuminated on the PCUs. ([FIGURE 7-2](#) depicts the base configuration being converted).



**FIGURE 7-2** Base Configuration Before Conversion

8. Remove power cords from all PCUs in the original 2x2 storage array.  
Verify all LEDs on the back of all trays are turned off before proceeding.

9. Add new expansion units to the top of the existing 2x2 storage array. (See FIGURE 7-3.)

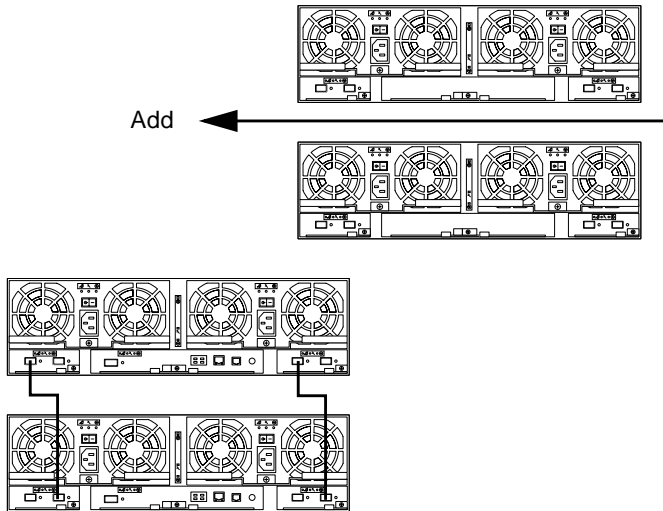


FIGURE 7-3 Expansion Units Added to a Rack Configuration

10. Once the expansion units have been added, move the array controller board from the former alternate master unit to the tray above it. This results in an even number of expansion units above each array controller unit.

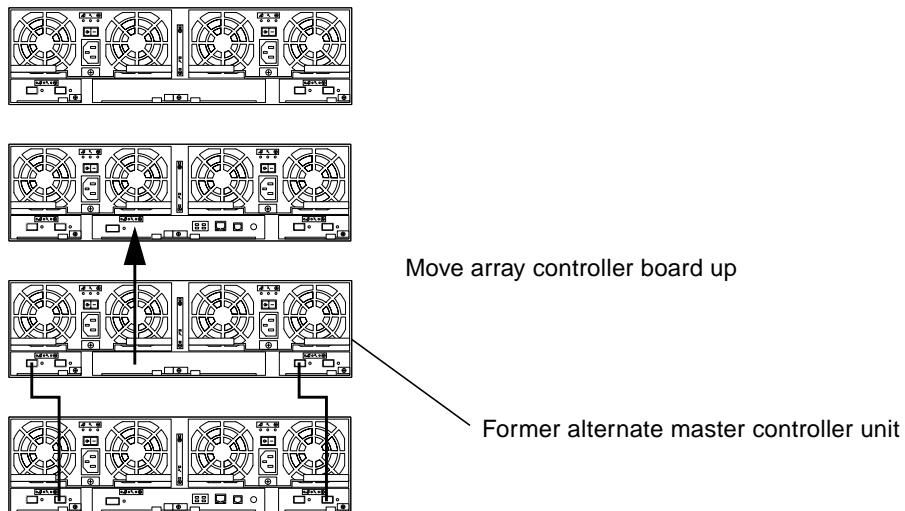
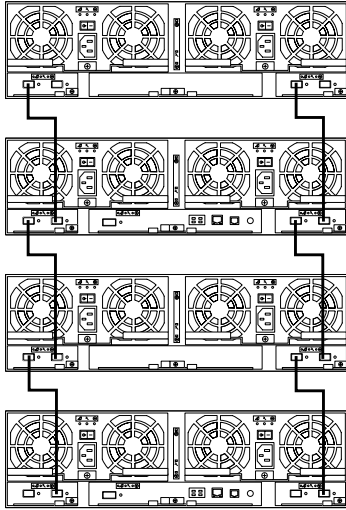


FIGURE 7-4 Move the Array Controller Board

**11. Reconnect interconnect cables to include the new expansion unit trays.**

Interconnect card cable connections to the new trays are connected as shown in [FIGURE 7-5](#).



**FIGURE 7-5** Connect the Interconnect Cables for the New Configuration

**12. Connect power cables to all the trays.**

**13. Connect Ethernet and host Fibre Channel cables to the new tray that received the array controller board.**

**14. Power up the newly configured storage array.**

---

**Note** – Wait while the system boots, which might take several minutes.

---

**15. Verify that the `fru list` command can see the newly installed expansion units.**

**16. Verify overall system health with the `fru stat` command.**

Be sure all drives in all trays are optimal.

**17. Obtain a list of volumes with the `vol list` command.**

```
6120:/: vol list
```

- 18. Perform a `vol verify` command on each existing volume in the configuration to ensure volume integrity.**

```
6120:/: vol verify name
```

# Troubleshooting

---

This chapter contains a list of errors that can be reported by the array in the `syslog` file, along with error definitions.

Topics in this chapter include:

- [“Error Message Syntax” on page 143](#)
- [“Error Message Listing” on page 145](#)
- [“Warning Message Listing” on page 152](#)
- [“Command-Line Error Messages” on page 166](#)
- [“Examples” on page 177](#)

---

## Error Message Syntax

Error message syntax consists of the following three components:

- [“Message Types” on page 144](#)
- [“FRU Identifiers” on page 144](#)
- [“Error Message Listing” on page 145](#)

These components are described in the following subsections, which include a listing of `syslog` error and warning messages.

# Message Types

A `syslog` daemon exists in the hardware controller that records system messages and provides remote monitoring. The four possible levels of messages are listed in TABLE 7-1 in order of their severity.

TABLE 7-1 Message Types

Message Type	Definition
Error	Indicates a critical system event requiring immediate user intervention or attention. For example, an overtemperature condition exists or a detected FRU is being removed.
Warning	Indicates a possible event requiring eventual user intervention. For example, a FRU has been disabled.
Notice	Indicates a system event that may be a side effect of other events or may be a normal condition. For example, the power switch is turned off.
Information	Indicates a system event that has no consequence on the running health of the system. For example, notification of a of a proper functioning FRU.

# FRU Identifiers

The syntax of the error message uses a FRU identifier to refer to a particular FRU in an array. This identifier contains a unit constant (`u`), the unit number (`n`), the FRU constant (`ctr` for controller card, `pcu` for power and cooling unit, `l` for interconnect card, `d` for disk drive), and the FRU number (`n`).

TABLE 7-2 FRU Identifiers

FRU	Identifier	Unit Number
Controller card	<code>uencidctr</code>	<code>encid</code> = unit number (1 to 2)
Power and cooling unit	<code>uencidpcu[1 2]</code>	<code>encid</code> = unit number (1 to 6) <code>n</code> = pcu number (1, 2)
Interconnect card	<code>uencidl[1 2]</code>	<code>encid</code> = unit number (1 to 6) <code>n</code> = interconnect card number (1, 2)
Disk drive	<code>uencidcn</code>	<code>encid</code> = unit number (1 to 6) <code>n</code> = disk drive number (1 to 14)



---

# Error Message Listing

TABLE 7-3 lists possible error messages.

**TABLE 7-3** Error Messages

Error Message	Description	Solution
<b>System</b>		
E: No boot image on disk, writing EPROM to boot image area...	No master boot image on disk. Writing to disk from EPROM the boot image.	
E: EPROM update failed...	Failed to write data to EPROM from disk.	Retry EPROM update, or inspect the controller.
E: Power On Self Test failed...	This is a fatal error that means the firmware probably could not talk to the drives. This could have been caused by the interconnect cables, interconnect cards, the controller, disks/firmware, or a bad centerplane.	Troubleshoot the unit. Check its status.
E: Found then lost property node in chain	Fail to find a property node (contains property information) in the property chain for deletion.	Notify your Sun authorized service provider.
E: Invalid operation for property token	An invalid property token is detected while executing a property token. Two property tokens are supported, the get and set tokens.	Check the property token and only use supported property tokens.
E: Unable to create scheduled task (0x<status>)	The system encounters an error while creating a scheduled internal task. The system is able to continue with the I/O, but some of the housekeeping tasks, for example, periodic battery health check, will not be performed.	Contact your Sun service provider.

**TABLE 7-3** Error Messages (Continued)

Error Message	Description	Solution
E: Unable to start scheduled task (0x<status>)	The system encounters an error while starting a scheduled internal task. The system is able to continue with the i/o, but some of the housekeeping tasks, for example, periodic battery health check, will not be performed.	Contact your Sun service provider.
E: Unable to create scheduler semaphore errno 0x<status>	The system encounters an error while creating an internal scheduler semaphore. The system is able to continue with the i/o, but some of the housekeeping tasks, for example, periodic battery health check, will not be performed.	Contact your Sun service provider.
E: Unable to create scheduler task (0x<status>)	The system encounters an error while creating an internal scheduler task. The system is able to continue with the i/o, but some of the housekeeping tasks, for example, periodic battery health check, will not be performed.	Contact your Sun service provider.
E: Unable to start scheduler task (0x<status>)	The system encounters an error while starting an internal scheduler task. The system is able to continue with the i/o, but some of the housekeeping tasks, for example, periodic battery health check, will not be performed.	Contact your Sun service provider.
E: Out of memory while scheduling a task	The system encounters an error while allocating memory for a scheduled internal task. The system is able to continue with the i/o, but some of the housekeeping tasks, for example, periodic battery health check, will not be performed.	Contact your Sun service provider.
E: Invalid property file entry: <entry>	An invalid property entry is detected while reading entries from the properties file.	Check the properties entry to ensure that it is formatted correctly.

**TABLE 7-3 Error Messages (Continued)**

<b>Error Message</b>	<b>Description</b>	<b>Solution</b>
E: Failed to copy old properties file	Fail to rename the current properties file to a backup properties file.	Check the file system to ensure it is not already full. If this is not the case, notify your Sun authorized service provider.
E: Can't create properties file during flush	Fail to create a new properties file for writing the property entries.	Check the file system to ensure it is not already full. If this is not the case, notify your Sun authorized service provider.
E: Write failed during property flush	Fail to write property entries to the properties file.	Notify your Sun authorized service provider.
<b>Controller Card</b>		
E: u<n>ctr: Missing	A controller card is missing.	Reseat or replace the controller card.
E: u<n>ctr: Missing (last warning)	A controller card was not replaced. This is the last warning message; the system will not print out any more warning messages to indicate this problem after this one.	Replace the controller.
E: u<n>ctr: Not present	The system detects the controller is missing; the controller has been removed.	Reseat or replace the controller card.
E: u<n>ctr BIST: ISP2200 test failed	ISP2200 POST test failed.	Contact your contract service provider for further analysis.
E: u<n>ctr BIST: Data cache memory test failed	Cache Memory POST test failed.	Contact your contract service provider for further analysis.
E: u<n>ctr BIST: XOR functions and datapaths test failed	XOR Memory POST test failed. Controller will be reset.	Controller board replacement may be necessary. Take appropriate action.

**TABLE 7-3** Error Messages (Continued)

Error Message	Description	Solution
E: u<n>ctr XOR: Flags=<flags> Cntr=<error count> Synd=<syndrome> Addr=<addr>	An ECC soft/hard error is detected and the error is a multi-bit uncorrectable error. <flags> - possible values are: <ul style="list-style-type: none"> <li>• A - Accumulator VRAM error</li> <li>• B - Buffer (system cache SDRAM) DIMM error</li> <li>• S - Single-bit error</li> <li>• M - Multi-bit error</li> <li>• V - Accumulator drive out error</li> <li>• D - Buffer drive out error</li> <li>• c - Control signal drive out error</li> <li>• a - Address line drive out error</li> </ul> <error count> - ECC error count after last report <syndrome> - ECC error syndrome <addr> - Offending address	If problem persists, contact your Sun authorized service provider.
E: XOR: Acc mem VRAM address line drive out error!	An ECC uncorrectable error occurred on the address output line of XOR FPGA. This indicates a stuck-a-0/stuck-a-1, or shorted address line.	Contact your Sun service provider.
E: XOR: Acc mem VRAM control line drive out error!	An ECC uncorrectable error occurred on the control output line of XOR FPGA. This indicates a stuck-a-0/stuck-a-1, or shorted control line.	Contact your Sun service provider.
E: XOR: Buf mem SDRAM address line drive out error!	An ECC uncorrectable error occurred on the address output line of XOR FPGA. This indicates a stuck-a-0/stuck-a-1, or shorted address line.	Contact your Sun service provider.
E: XOR: Buf mem SDRAM control line drive out error!	An ECC uncorrectable error occurred on the control output line of XOR FPGA. This indicates a stuck-a-0/stuck-a-1, or shorted control line.	Contact your Sun service provider.

**TABLE 7-3 Error Messages (Continued)**

<b>Error Message</b>	<b>Description</b>	<b>Solution</b>
E: u<n>ctr Diag Fail: Test System Memory failed or E: u<n>ctr Diag Fail: Test ISP2200 failed or E: u<n>ctr Diag Fail: Test data cach memory failed or E: u<n>ctr Diag Fail: XOR Memory Test failed. System Resetting...		Results of diagnostic tests, should be preceded by more detailed error messages.
<b>Interconnect Card and Cable</b>		
E: u<n>l<m>: Missing	An interconnect card is missing.	Replace the interconnect card.
E: u<n>l<m>: Missing (last warning)	A interconnect card was not replaced. This is the last warning message; the system will not print out any more warning messages to indicate this problem after this one.	Replace the interconnect card and power on the system.
E: u<n>l<m>: Not present	System detects the interconnect card is missing.	Reseat or replace the interconnect card.
E: u<n>l<m>: UP cable not present or E: u<n>l<m>: DOWN cable not present	System detects missing interconnect cable for interconnect card.	Check cables.
<b>Disk Drive</b>		
E: u<n>d<m>: Missing	A disk drive is missing.	Replace the missing disk drive.
E: u<n>d<m>: Missing for more than <l> minutes	A disk drive is missing for more than <l> minutes.	Replace the disk drive and power on the system.
E: Multi-disk failure, access disallowed	System detects multiple disk failure in the LUN, and automatically unmounts this volume.	Check the <code>syslog</code> for any other related messages. Replace the failed disks.
E: u<n>d<m>: Not present	System detects a drive was removed.	Reseat or replace the disk drive.

**TABLE 7-3 Error Messages (Continued)**

<b>Error Message</b>	<b>Description</b>	<b>Solution</b>
E: FATAL: No disks were found during boot up... E: FATAL: Check hardware run diags... E: FATAL: Fix problem and try rebooting...	No disks are found on the master unit while system booting.	Check the disks and/or run diagnostics. Fix the problem and try rebooting the system.
<b>Power and Cooling Unit (PCU)</b>		
E: u<n>pcu<m>: Missing	A PCU is missing.	Replace the PCU.
E: u<n>pcu<m>: Missing (last warning)	A PCU was not replaced. This is the last warning message; the system will not print out any more warning messages to indicate this problem after this one.	Replace the PCU; power on the system.
E: u<n>pcu<m> Not present	System detects the PCU is missing.	Reseat or replace the PCU.
E: u<n>pcu<m>: Over temperature	System detects that a PCU has reached an overtemperature state.	Check room temperature and possible airflow obstruction. If the problem persists, replace the PCU.
E: u<n>pcu<m>: Battery not present	System detects that the battery for the PCU is missing.	Inspect and/or install a battery.
E: u<n>ctr: Multiple Fan Faults	The controller has detected a fault on fans in both PCUs.	Determine which fans in which PCU failed; replace the PCU.
E: u<n>ctr: Multiple Fan Faults (last warning)	The controller has detected a fault on fans in both PCUs. This is the last warning message; the system will not print out any more warning messages to indicate this problem after this one.	Determine which fans in which PCU failed; replace the PCU.
E: Disabling u<n>pcu<m>:AC line fault	The system detects the AC line has gone out for over 15 seconds. As a result, the affected PCU is disabled.	Check AC cord and make sure it is plugged in and has electricity.

**TABLE 7-3 Error Messages (Continued)**

Error Message	Description	Solution
E: Battery management functions on enclosure <n> have been disabled due to down rev hardware. Skipping health check for this enclosure.	During the battery health check, a down rev hardware (midplane) has been detected. As a result, the battery management functions are disabled and the battery health check is skipped for this affected tray.	Use correct revision of hardware.
E: Skipping battery health check for enclosure <n> because power would not be safe.	During the battery health check, power has been detected as not safe. As a result, the battery health check is skipped for this affected tray.	Check previous several messages for the cause and take appropriate actions.
E: Battery u<n>b<m> needs to be replaced.	The battery has failed the battery health check or the battery warranty check. Check previous or next messages for the exact problem.	Replace battery.
E: Battery management functions on enclosure <n> have been disabled due to down rev hardware (midplane). Skipping warranty and shelf life checks for this enclosure.	During the battery warranty check, a down rev hardware (midplane) has been detected. As a result, the warranty and shelf-life checks for this tray are skipped.	Use correct revision of hardware
E: BATTERY: u<n>b<m> - battery shelf life exceeded	Battery warranty check detects battery shelf-life has been exceeded.	Replace battery.
E: BATTERY: u<n>b<m> - battery idle life exceeded	Battery warranty check detects battery idle life has been exceeded.	Replace battery.
E: The warranty on battery u<n>b<m> has expired. Sun recommends replacement of the battery for optimal performance of the system.	Battery warranty check detects the warranty on battery has been expired.	Replace battery.

---

# Warning Message Listing

TABLE 7-4 lists possible warning messages, which are divided into FRU categories and System.

TABLE 7-4 Warning Messages

Warning Message	Description	Solution
<b>System</b>		
W: u<n>ctr recon failed in vol (volume name)	Reconstruct operation failed for this volume.	Verify that the volume is still mounted and that there is only one drive disabled. Restart the reconstruct operation manually, or reconstruct the data to another drive. Previous messages in <code>syslog</code> should indicate which disk(s) had a problem.
W: VolGroupAccess{Name Mode} has invalid type	The system detects an invalid group access volume type.	Enter correct group access volume type. Currently, two types of group access volume are supported, name and mode.
W: Failed to set host port fc speed	The system encounters an error in trying to change the speed of the host Fibre Channel interface port.	Verify the port speed by examining the “ <code>fc_speed</code> ” output of the “ <code>sys list</code> ” command, and/or examine the <code>syslog</code> for other indications of problems with the port. If none are found, then there might be a problem in negotiating the requested speed with the attached host. Otherwise, the port may be defective and the controller may need to be replaced.
W: u<n>ctr initialization failed in vol (volume name)	Volume data initialization to zero failed.	Check the disk drive status using the <code>vol stat</code> command. If any disk has a nonzero status, either initialize the volume using the <code>vol init</code> command, or replace the disk.



**TABLE 7-4 Warning Messages (Continued)**

Warning Message	Description	Solution
W: Existing system banner was corrupted. Use "set banner" to set the system banner if needed.	The existing banner was corrupted.	Use the set banner command to set the system banner to the desire banner. Otherwise, a default system banner will be used.
W: During sysInitiatorWWN or sysInitiatorDescription an invalid type was used.	The system detects invalid initiator name or initiator value used in the management software layer.	Check the initiator name or initiator value to ensure correct name or value is used.
W: Device tree load: substituted u<n> node wwn with type 1 wwn.	The system detects an older format of the WWN on the midplane and was corrected as it was loaded into the device tree.	None. This is down rev hardware.
W: Device tree load: cannot access disk id, u<n>id<m>	Unable to access a drive to load fru id data from Inquiry page.	Hot plugging the drive will cause the system to attempt to re-read the data. Don't hot plug the drive if it is being reconstructed.
W: Device tree to FRUID store: <error>, u<n><fru name><fru no>, <segment name>	An error occurred while trying to write to the FRU ID SEEPROM.	There is not currently any method for re-trying a failed write.
W: Device tree load: <error>, u<n><fru name><fru no>, segment <segment name>	There was an error loading from the FRU ID SEEPROM. It may be an error reading the part, or with the CRC/checksum.	Hot swapping the FRU will cause the system to attempt to re-read the information.

**TABLE 7-4** Warning Messages (Continued)

Warning Message	Description	Solution
	<p><b>Note:</b></p> <p>fru name =</p> <ul style="list-style-type: none"> <li>l - Current interconnect card</li> <li>l_other - Other interconnect card</li> <li>mp - Midplane</li> <li>pcu - Power Control Unit</li> <li>b - Battery</li> </ul> <p>segment name =</p> <ul style="list-style-type: none"> <li>SD - has the manufacturing data</li> <li>ED - has the MAC address and possibly WWN</li> <li>FD - has the battery status and battery warranty records</li> </ul> <p>Error =</p> <ul style="list-style-type: none"> <li>seeprom access error</li> <li>seeprom section header crc error</li> <li>seeprom segment not found</li> <li>parse error</li> <li>record not found</li> <li>bad offset</li> <li>no segments available</li> <li>no space in section</li> <li>seeprom segment checksum error</li> <li>unknown section header tag</li> <li>incompatible section header version</li> <li>unexpected wwn format</li> </ul>	
<p>W: u&lt;n&gt;ctrl :Illegal mp_support mode for explicit lun fail over request (opcode 0xD0 received) on lun &lt;lun_no&gt;</p>	<p>The mp_support option is set to an invalid value.</p>	<p>Use the <code>sys list</code> command (or Component Manager) to set the mp_support flag to mp_xio or std.</p>
<p>W: u&lt;n&gt;d&lt;n&gt;: SVD_PATH_FAILOVER: path_id = &lt;n&gt; or W: SVD_PATH_FAILOVER: path_id = &lt;n&gt;, lid = &lt;m&gt;</p>	<p>A failover has occurred, indicating that one of the system's replaceable units is faulty.</p>	<p>Troubleshoot and replace the failed component. You can find more information in related syslog messages and by using the <code>fru stat</code> command.</p>
<p>W: u&lt;n&gt;l&lt;n&gt; LMON predictive failure threshold exceeded - LIP</p>	<p>The Fibre Channel loop is exhibiting an unexpected number of LIPs. This problem can be generated from any of the FRUs.</p>	<p>In certain cases, running the <code>ofdg</code> diagnostic may find the problem. Notify your Sun authorized service provider.</p>

**TABLE 7-4 Warning Messages (Continued)**

Warning Message	Description	Solution
W: Could not retrieve header information of level N	When the <code>id read</code> or <code>fru stat</code> commands fail to retrieve header information from the flash PROM, Level 2 or Level 3 code may be corrupted.	Try the command again. If problem persists, contact your Sun authorized service provider.
W: <code>u&lt;n&gt;ctr</code> cache memory size is less than 256 M	The cache memory is smaller than 256 Mbytes. The array expects a minimum of 256 Mbytes of cache.	
<b>Controller Card</b>		
W: <code>u&lt;n&gt;ctr: Offline</code>	A controller has stopped communicating with the rest of the system. Possibly the connection between the controller and the rest of the system has been disrupted.	Check that the controller card is connected securely. If its state becomes disabled, replace the controller card.
W: <code>u&lt;n&gt;ctr: Inactive</code>	A controller is not communicating with the rest of the system. The controller will be disabled if it does not start communicating with the rest of the system within a certain time period.	
W: <code>u&lt;n&gt;ctr: Rebooting</code>	A controller has been rebooted because it was removed, disabled, or was offline and is now re-enabled. Alternatively, the system was shut down and restarted.	Check previous messages to determine if the reboot is an unexpected event.
W: <code>u&lt;n&gt;ctr: Failed to boot</code>	The system was not able to reboot a controller successfully, even after repeated attempts.	Replace the controller.
W: <code>u&lt;n&gt;ctr: Disabled</code>	System disabled a controller.	Check the previous message queue to determine why the controller is disabled. Then enable or replace the controller.
W: <code>u&lt;n&gt;ctr</code> starting lun <code>&lt;lun_#&gt;</code> failover	A LUN failover has occurred.	Use the <code>sys stat</code> command to see if the controller is disabled. Then check the <code>syslog</code> for possible interconnect, host adapter, or cable problems.

**TABLE 7-4** Warning Messages *(Continued)*

Warning Message	Description	Solution
W: u<n>ctr BIST: ECC mechanism verification failed		Contact your Sun service provider for further analysis.
W: u<n>ctr: ISP<m>[l] qlcf_i_read_response: Debug Code - Immediate Notify CCBs Exhausted or W: u<n>ctr: ISP<m>[l] DMA Error Detected or W: u<n>ctr: ISP<m>[l] Received LOOP DOWN async event or W: u<n>ctr: ISP<m>[l] Bad request pkt or W: u<n>ctr: ISP<m>[l] Bad request pkt header	Indicates an error in one of the ISP <m> chips in the controller.	Notify your Sun authorized service provider.

**TABLE 7-4 Warning Messages (Continued)**

Warning Message	Description	Solution
<p>W: u&lt;n&gt;ctr XOR T&lt;test_no&gt; ERR: ACC should not be zero or</p>	<p>An XOR Memory POST test failed. The controller will be reset.</p>	<p>The controller board might need to be replaced. Take appropriate action.</p>
<p>W: u&lt;n&gt;ctr XOR T&lt;test_no&gt; ERR: ACC should be zero or</p>		
<p>W: u&lt;n&gt;ctr XOR T&lt;test_no&gt;&gt; ERR: BUF data not equal to previously written or</p>		
<p>W: u&lt;n&gt;ctr XOR T&lt;test_no&gt; ERR: BUF data should be all zeros or</p>		
<p>W: u&lt;n&gt;ctr XOR T&lt;test_no&gt; ERR: ORed data should be all zeros or</p>		
<p>W: u&lt;n&gt;ctr XOR T&lt;test_no&gt; ERR: Compare error of BUS and orig data or</p>		
<p>W: u&lt;n&gt;ctr XOR T&lt;test_no&gt; ERR: buf data should be all zeros or</p>		
<p>W: u&lt;n&gt;ctr XOR T&lt;test_no&gt; ERR: Buf check finds all zeros or</p>		
<p>W: u&lt;n&gt;ctr XOR T&lt;test_no&gt; ERR: Write to data cache mem failed or</p>		
<p>W: u&lt;n&gt;ctr XOR T&lt;test_no&gt; ERR: Read from data cache mem failed or</p>		
<p>W: u&lt;n&gt;ctr XOR T&lt;test_no&gt; ERR: Diag Fail</p>		
<p>W: u&lt;n&gt;ctr ISP&lt;m&gt;[l] LUN 0x&lt;lun_no&gt; - INVALID command count!</p>	<p>The Fibre Channel driver has gone into an unknown state. This message might indicate a bug in the resource management logic.</p>	<p>Contact your Sun authorized service provider.</p>
<p>W: u&lt;n&gt;ctr ISP&lt;m&gt;[l] LUN 0x&lt;lun_no&gt; Out of command resources!</p>	<p>The Fibre Channel driver resource management might need tuning.</p>	<p>Contact your Sun authorized service provider.</p>

**TABLE 7-4** Warning Messages (Continued)

Warning Message	Description	Solution
W: u<n>ctr ISP<m>[l] cmd = 0x<cmd_no> - REQUEST QUEUE FULL !	The Fibre Channel driver is not able to accept/send more commands from ISP. The driver retries automatically.	If this happens frequently, contact your Sun authorized service provider.
W: u<n>ctr XOR: Flags=<flags> Cntr=<error count> Synd=<syndrome> Addr=<addr>	An ECC soft/hard error is detected and the error is a single-bit correctable error. <flags> - possible values are: <ul style="list-style-type: none"> <li>• A - Accumulator VRAM error</li> <li>• B - Buffer (system cache SDRAM) DIMM error</li> <li>• S - Single bit error</li> <li>• M - Multi-bit error</li> <li>• V - Accumulator drive out error</li> <li>• D - Buffer drive out error</li> <li>• c - Control signal drive out error</li> <li>• a - Address line drive out error</li> </ul> <error count> - ECC error count after last report <syndrome> - ECC error syndrome <addr> - Offending address	The ECC error has been corrected.
W: u<n> cannot read from thermal sensor	Cannot read the temperature from the controller thermal sensor.	This could occur if the controller <n> has been disabled by a disable controller command. Enable the controller by using the enable command if necessary. If the problem persists, replace the controller card.
W: u<n>ctr warning temperature threshold exceeded	The controller warning temperature threshold has been exceeded.	Check the room temperature and possible airflow obstruction. If the problem persists, replace the controller card.

**TABLE 7-4** Warning Messages *(Continued)*

<b>Warning Message</b>	<b>Description</b>	<b>Solution</b>
W: u<n>ctr temperature threshold exceeded	The controller shutdown temperature threshold has been exceeded. The controller will be shutdown if the temperature remains at or above the shutdown temperature threshold.	Check the room temperature and possible airflow obstruction. If the problem persists, replace the controller card.

**TABLE 7-4** Warning Messages (Continued)

Warning Message	Description	Solution
<b>Interconnect (loop) card and Cable</b>		
W: u<n>l<n>: Offline	The system is not able to poll the interconnect card for information. If an interconnect card is disabled, it may cause other interconnect cards to go offline.	<ul style="list-style-type: none"> <li>• If no interconnect card is disabled, check cable connections to the interconnect card and make sure it is firmly seated.</li> <li>• If the interconnect card does not come back online, replace the interconnect card.</li> </ul>
W: u<n>l<n>: Disabled	The system detects that the interconnect card is disabled.	Check the previous message queue to determine why the interconnect card is disabled. Replace the interconnect card if necessary.
W: Loop 1 may be bad - Please run ofdg or W: Loop 2 may be bad - Please run ofdg	The system detects the possibility of an internal error in the loop interconnection.	Use the ofdg command to run the system's built-in loop diagnostic.
W: u<n>l<n> LMN2 predictive failure threshold exceeded - IO TIMEOUT	A timeout has occurred during the ondg test.	
W: u<n>ctr Loop 1 may be bad - check interconnect cable or loopcard or W: u<n>ctr Loop 2 may be bad - check interconnect cable or loopcard.	The system detects a potential loop failure.	<ol style="list-style-type: none"> <li>1. Check the syslog for any other related messages.</li> <li>2. Use the fru stat command to determine the problem cause.</li> <li>3. Remove and replace the bad part.</li> </ol>
W: u<n>l<m> :Warning temperature threshold exceeded	The interconnect card warning temperature threshold has been exceeded.	Check the room temperature and possible airflow obstruction. If the problem persists, replace the interconnect card.
W: u<n>l<m> :temperature threshold exceeded	The interconnect card shutdown temperature threshold has been exceeded. The interconnect card will be disabled if the temperature remains at or above the shutdown temperature threshold.	Check the room temperature and possible airflow obstruction. If the problem persists, replace the interconnect card.



**TABLE 7-4** Warning Messages (Continued)

Warning Message	Description	Solution
<b>Disk Drive</b>		
W: u<n>d<n> could not open plugged disk	An attempt to open the newly plugged disk failed.	Unseat the drive and wait a few seconds before reseating it so that the system can retry this operation.
W: u<n>d<n> could not create system area	An attempt to create a system area on this disk failed.	<ol style="list-style-type: none"> <li>1. Unseat the drive and wait a few seconds before reseating it so that the system can retry this operation.</li> <li>2. If step 1 fails, replace this drive with a new drive.</li> </ol>
W: u<n>d<n> system area is bad	The system area of the drive has been corrupted.	<ol style="list-style-type: none"> <li>1. Unseat the drive and wait a few seconds before reseating it so that the system can retry this operation.</li> <li>2. If step 1 fails, replace this drive with a new drive.</li> </ol>
W: u<n>d<n> could not open disk, try unplug then plug	An attempt to bring newly installed drive online failed.	Unseat the drive and wait a few seconds before reseating it.
W: u<n>d<n> could not open disk to be checked	An attempt to open this drive failed.	<ol style="list-style-type: none"> <li>1. Unseat the drive, wait a few seconds, reseat it and retry the volume add procedure.</li> <li>2. If step 1 fails, replace the drive with a new one.</li> </ol>
W: u<n>d<n> system area verify failed	An attempt to verify the data in the system area failed.	<p>Replace the drive.</p> <ul style="list-style-type: none"> <li>• If the volume exists, initialize the system area to fix the problem.</li> <li>• If the volume does not exist, retry the volume add procedure.</li> </ul>
W: u<n>d<n> write disk failed, err=<errno>	An attempt to write this disk failed. The system will automatically disable this disk.	Check the <code>syslog</code> for any other related messages. Replace the failed disk.
W: u<n>d<n> Recon attempt failed	Disk Reconstruct failed for disk u<n>d<n>.	Check the <code>syslog</code> for other related failures. If the disk under reconstruction failed, replace the disk.

**TABLE 7-4** Warning Messages (Continued)

Warning Message	Description	Solution
W: u<n>d<n> Disable attempt failed	Disk Disable failed for disk u<n>d<n>.	Check if the disk is already disabled by using the <code>vol stat</code> command. If not disabled, disable it by typing the <code>vol disable u&lt;n&gt;d&lt;n&gt;</code> command.
W: u<n>d<m> Installing U<n>D<m> failed, Try unplugging and then plugging	Disk drive hot plug installation failed.	Unseat the drive and reseat it.
W: u<n>d<n> Disk Bypassed	A drive is faulty and being bypassed from the data loop.	
W: u<n>ctr read failed during recon stripe scb=<n>	During reconstruction, another drive failed in the volume.	Check <code>syslog</code> for a multiple drive failure. Replace all failed disk drives.
W: u<n>d<m> hard err in vol (volume_name) starting auto disable	A hard error on this disk prompted a disable operation on this disk. The system will auto disable and reconstruct to the hot spare (standby), if there is one configured.	If disabled, replace the failed disk as soon as possible.
W: u<n>ctr disk error during recon, terminating recon	More than one drive in the volume might have failed.	Check the <code>syslog</code> file. Replace all failed disk drives.
W: u<n>d<n> SCSI Disk Error Occurred (path = 0x<n>, port = 0x<n>, lun = 0x<n>)	The SCSI disk drive returned an error status with the appropriate SCSI Sense Data.	Notify your Sun authorized service provider.
W: u<n>d<n> SCSI Disk Error Occurred (path = 0x<n>)	If the <code>port</code> has a value from 0 to 7, the message indicates a transient controller condition, not an error affecting a disk.	
W: Sense Key = 0x<n>, Asc = 0x<m>, Ascq = 0x<l>	The SCSI disk drive returned an error status with the appropriate SCSI Sense Data.	Notify your Sun authorized service provider.
W: Sense Data Description = xxxxx		
W: Valid Information = 0x<n>		
W: u<n>d<n>: Its size is too small.	When the user replaces a drive which is part of a volume with a new drive of smaller size.	Check the size of the drives that constitute the volume, and replace the new drive with the same size as the other drives in the volume.

**TABLE 7-4 Warning Messages (Continued)**

Warning Message	Description	Solution
W: Disk u<n>d<m> may be bad - too slow	If the ondg mode is passive, drive <i>n</i> is bad.	Replace the drive.
W: Can't Disable Disk u<n>d<n> - xxx	When ondg detects a slowly degrading drive, if the ondg mode is active, the array will try to disable that drive. If the array can't disable the drive, it will print out this warning message with the error string.	
W: Disable Disk u<n>d<n>	Disk <i>d</i> is disabled.	
W: u<n>d<n>: Failed	The system detects a disk failure and has automatically disabled the disk drive.	Check the syslog for any other related messages. Replace the failed disk.
W: u<n>d<m> TMON warning temperature threshold exceeded <curr_temp> <warn_threshold> <shutdown_threshold>	The disk drive warning temperature threshold has been exceeded.	Check the room temperature and possible airflow obstruction. If the problem persists, replace the disk drive.
W: u<n>d<m> TMON OVER temperature threshold exceeded <curr_temp> <warn_threshold> <shutdown_threshold>	The disk drive shutdown temperature threshold has been exceeded. The disk drive will be spinning down if the temperature remains at or above the shutdown threshold.	Check the room temperature and possible airflow obstruction. If the problem persists, replace the disk drive.
W: u<n>d<m> TMON OVER temp state exceeded, shutdown disk drive	The disk drive shutdown temperature threshold has been exceeded. The disk drive is spinning down.	Check the room temperature and possible airflow obstruction. If the problem persists, replace the disk drive.
<b>Power and Cooling Unit (PCU)</b>		
W: u<n>pcu<m>: Fan 1 failed	The system detects a fan fault on a PCU.	<ol style="list-style-type: none"> <li>1. Verify that the batteries have had ample time to charge.</li> <li>2. Ensure a refresh operation is not in progress.</li> <li>3. Replace the PCU.</li> </ol>
W: u<n>pcu<m>: Fan 2 failed		
W: u<n>pcu<m>: DC not OK	System detects that the DC power source in the PCU is not functioning properly.	Replace the PCU.
W: u<n>pcu<m>: Disabled	A PCU has been disabled.	Check previous messages to see why the PCU has been disabled, and replace the PCU, if necessary.

**TABLE 7-4** Warning Messages (Continued)

Warning Message	Description	Solution
W: u<n>pcu<m>: Off	A PCU is off.	Check <code>syslog</code> for a fan fault or PCU overtemp. Replace the PCU if necessary.
W: u<n>pcu<m>: On battery	The system detects that a PCU has switched to battery.	1. Make sure that the AC power cord is attached. 2. If the unit is receiving AC power, then replace the PCU.
W: u<n>pcu<n>: Switch off	The system detects a PCU has been powered off.	Power on the unit by pressing the power switch.
W: Syntax error in <code>/etc/bat.conf</code> . The value for "DAY" is not valid.	The value for "DAY" entered in file <code>/etc/bat.conf</code> is not within allowed range.	Enter the correct value for "DAY".
W: Syntax error in <code>/etc/bat.conf</code> file. The value for "HOUR" is not valid.	The value for "HOUR" entered in file <code>/etc/bat.conf</code> is not within allowed range.	Enter the correct value for "HOUR".
W: Syntax error in <code>/etc/bat.conf</code> . The value for "MINUTE" is not valid.	The value for "MINUTE" entered in file <code>/etc/bat.conf</code> is not within allowed range.	Enter the correct value for "MINUTE".
W: While parsing the <code>/etc/bat.conf</code> file. An unknown key was detected.	The system parses the <code>/etc/bat.conf</code> file for a key (DAY, HOUR, MINUTE) and detects an invalid key.	Check the <code>/etc/bat.conf</code> file and ensure the keys are correct.
W: There was an error parsing the <code>/etc/bat.conf</code> file. The default scheduled will be used instead.	The system parses the <code>/etc/bat.conf</code> file for a key (DAY, HOUR, MINUTE) and detects an invalid key.	None. Day, hour, and minute will be set to default values.
W: Unable to determine manufacture date for u<n>b<m>	The system checks the shelf-life of a newly installed battery and is unable to determine the manufacturing date of this battery. The battery was not manufactured correctly.	Replace battery.
W: u<n>pcu<m> is margined high	The PCU margin is too high. This could occur if the interconnect card, PCU, or midplane has failed.	Determine which of the hardware is bad and replace appropriate hardware.
W: u<n>pcu<m> is margined low	The PCU margin is too low. This could occur if the interconnect card, PCU, or midplane has failed.	Determine which of the hardware is bad and replace appropriate hardware.

**TABLE 7-4** Warning Messages (Continued)

Warning Message	Description	Solution
W: u<n>pcu<m> sensor s<l> :Warning temperature threshold exceeded	The PCU warning temperature threshold has been exceeded.	Check the room temperature and possible airflow obstruction. If the problem persists, replace the PCU.
W: u<n>pcu<m> sensor <l> :Shutdown temperature threshold exceeded	The PCU shutdown temperature threshold has been exceeded. The PCU will be shutdown if the temperature remains at or above the shutdown temperature threshold.	Check the room temperature and possible airflow obstruction. If the problem persists, replace the PCU.
W: Battery test (recharge) did not start for u<n>b<m>. Stopping further tests for enclosure <l>	The recharge check portion of the battery health check did not start. No further battery health check is performed.	Notify your Sun authorized service provider.
W: Skipping battery health checks on enclosure <n> due to high PCU temperature.	The battery temperature has exceeded the maximum battery health check temperature. The battery health check is skipped.	Check the room temperature and possible airflow obstruction. If the problem persists, replace the PCU.

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# Command-Line Error Messages

The array issues a variety of error messages to the command line, indicating an incorrectly entered command or invalid operation. When you enter a command by itself, or the error is syntactic (for example, missing an argument or using the wrong format), the array displays the command synopsis. Otherwise, the array displays an error message consisting of a name in capital letters, a numerical code in hexadecimal digits, and a text message.

The following tables list the errors that the array displays. TABLE 7-5 lists the types of errors and the numerical range associated with each.

**TABLE 7-5** CLI Error Message Types

Type of Error	Numerical Range	Description
Logical volume manager (LVM) driver error codes	0x10001–0x1000A	Disk drive-related errors
Virtual Node ("VN") error codes	0x200000–0x200025	Errors related to <code>vol</code> and other command-line operations
Port error codes	0x300000–0x300006	Errors related to the <code>port</code> command
Sys error codes	0x400000	Only one error, indicating an incorrect value
FRU error codes	0x500001–0x500076	Errors related to field replaceable units (FRUs)
pSOS operating system errors	00000001–C000FFFF	pSOS errors (embedded operating system)

## RAID Errors and Other Common Errors

Volume-related errors (VN\_ERRORS) are the most common error messages displayed. TABLE 7-6 lists the names and values of these errors.

**TABLE 7-6** Volume-Related (VN) Errors

Error Name	Numerical Value	Message
VN_BADUNIT	0x200000	Bad unit number
VN_BADDRIVE	0x200001	Bad drive number
VN_BADPART	0x200002	Bad partition ID

**TABLE 7-6** Volume-Related (VN) Errors *(Continued)*

<b>Error Name</b>	<b>Numerical Value</b>	<b>Message</b>
VN_VOLEXISTS	0x200003	Volume already in use
VN_VOLNOTFOUND	0x200004	Volume name not found
VN_PARTHASFS	0x200005	Partition already has file system
VN_FACLOCKED	0x200006	Facility locked by other command
VN_BADATTR	0x200007	Unable to read attributes
VN_MOUNTED	0x200008	Volume already mounted
VN_UNMOUNTED	0x200009	Volume not mounted
VN_MNTINUSE	0x20000A	Mount point in use
VN_NOMEMORY	0x20000B	Could not allocate memory for operation
VN_ALREADYDSBL	0x20000C	Is already a disabled drive
VN_NODSBL	0x20000D	No drives are disabled
VN_ABORTED	0x20000E	Operation aborted
VN_NOTSUP	0x20000F	Operation not supported
VN_UNKVOL	0x200010	Unknown volume
VN_RAIDERR	0x200015	RAID error
VN_NOPART	0x200016	Partition has size 0
VN_PARTSMALL	0x200017	Partition too small
VN_UNKVIF	0x200019	Unknown interface
VN_UNKVIFTYP	0x20001A	Unknown interface type
VN_BADVOLNAME	0x20001B	Bad volume name
VN_BADVOLNAMELEN	0x20001C	Bad volume name too long
VN_CFGNOTSUPPORTED	0x20001D	Unsupported volume configuration
VN_BADSTANDBYUNIT	0x20001E	Standby unit number is wrong
VN_DEVINVALID	0x20001F	Invalid drive specified
VN_LOCVOLBAD	0x200020	Local volume bad
VN_PORTMAPRM	0x200021	Volume still mapped to a port
VN_UNINITIALIZED	0x200022	Volume is uninitialized
VN_PENDING	0x200023	Operation is pending

**TABLE 7-6** Volume-Related (VN) Errors (Continued)

Error Name	Numerical Value	Message
VN_BADMODE	0x200024	Cache mode must be set to auto for mirroring
VN_MIRRORON	0x200025	Cannot change cache mode when mirroring is on
VN_CANTMOUNT	0x200026	Cannot mount volume because multiple disabled drives
VN_STARTPARAM	0x200027	Slice start parameter invalid or in use
VN_VSLBADNAME	0x200028	Bad slice name
VN_MAXSLICEERR	0x200029	No more slices can be created
VN_VSLNOTFOUND	0x20002A	Slice not found
VN_SIZEPARAM	0x20002B	Incorrect slice size parameter encountered
VN_VSLBADNAMELEN	0x20002C	Slice name exceeded 12 characters allowed
VN_VSLEXISTS	0x20002D	Slice name already exists
VN_NOSLICEINVOL	0x20002E	Volume does not have slice(s) to be removed
VN_VSLRAIDERR	0x20002F	RAID error in volume slicing

Some of these errors are generated more often than others, such as VN\_MOUNTED, VN\_UNMOUNTED, VN\_MNTINUSE, VN\_CFGNOTSUPPORTED, VN\_DEVINVALID, VN\_LOCVOLBAD, VN\_UNINITIALIZED, VN\_BADMODE, and VN\_MIRRORON. In particular, VN\_RAIDERR, code 0x200015, can result from a variety of scenarios and this warrants attention. The array uses a specific protocol for carrying out commands, and this protocol uses the RAID error as a general error message to be sent to the user. As such, the RAIDERR may result from any of a number of software or hardware conditions. Some cases involve problems related to the user configuration, which can be remedied easily. Other cases are more subtle and are related to the function of the array's internal software. Detailed information for specific instances of the RAID error can be found in the `syslog`; an overview of the scenarios are provided here.

## Categories of RAID Errors

The following is a list of the categories that the array's embedded protocol uses for RAID errors and a few of the cases within each category. Each category code, which can be useful in reference to the `syslog`, is included. Though not exhaustive, this list provides a general breakdown of common RAID error generators:



1. **Command Incomplete (0x1A):** The command was not executed correctly internally. The software responded to the command with too much or too little information. In certain cases, the command might simply be paused and will resume.
2. **Partial (conditional) Success (0x19):** This category includes the following cases:
  - a. **Aborting a nonexistent command:** A user has issued a command, then tried to abort it after the command is executed.
  - b. **Retry error:** The command was retried one or more times.
  - c. **Target error:** A volume is offline or disabled.
3. **Invalid Response (part of the category above; 0x19):** The software did not provide a valid response to the user command. These cases are more specific than the Command Incomplete category.
  - a. **Invalid information type (parameter):** The software responded with the wrong type of information.
  - b. **Error in information returned:** The information returned in response to the command is erroneous. This case implies an embedded software error.
  - c. **Function failed:** The command failed to retrieve the appropriate information.
  - d. **Zero size:** The command accessed a volume with zero size.
4. **Command Aborted(0x18):** The command is aborted, often because of a time-out. A command aborts when a component in the system freezes or if a connection is defective.
5. **Command Exception (0x17):** This category includes cases where the command cannot be executed. This error type is generated when a disabled, unavailable, or invalid drive or volume is specified. For example, after using a hot spare (standby) to reconstruct the data on a drive, you cannot refer to it again as a hot spare.
  - a. **Invalid name/address:** Either the user or the internal software used a volume or disk drive name that is invalid or does not match the current configuration.
  - b. **Invalid command fields:** The command is no longer supported or the internal software used a command opcode that is unsupported.
  - c. **Missing fields:** The user or the internal software issued a command with missing information.
  - d. **Drive (module) errors:** The disk drive referenced may be unattached, disabled, substituted, or in the process of being reconstructed.

6. Machine Exception (0x16): This category includes cases where there is a hardware error, or where other commands are being executed, thereby giving a busy response.
  - a. Drive fatal error: There is an error internal to a referenced drive.
  - b. Auto reconstruct or disable attempted: A drive that is being reconstructed or disabled is specified.
  - c. Queue full or busy response: The command cannot be executed because the system is busy processing other commands.
  - d. Unknown host: The specified host address is invalid or unreachable.
  - e. Single drive errors: A drive referenced by the command was not detected, the connection could not be opened, or the sysarea on the drive could not be created. This case implies that the drive or the connection to it is faulty. Alternatively, a retry of a command accessing a disk could fail to execute.
  - f. Multiple disk failure: An error occurred involving more than one drive.
  - g. Standby already in use: (This error resembles the one in the Command Exception category). In this case, the drive is busy processing a previous command. This case applies when the command is complete and if the drive configuration has changed as a result.
  - h. Volume (LUN) errors: A volume may be inaccessible, or its configuration may be corrupted and represented as nonvalid.
7. Intervention Required (0x14): Here, an error results when a volume is mounted or unmounted, in contrast to what is expected. Alternatively, a physical connection might be broken and should be reinstated (by replacing the appropriate FRUs).

RAID errors can result from invalid command arguments or from a system problem. The error might refer to the configuration of a volume or an individual drive. For example, you can encounter the error while reconfiguring the array with volumes that have been added but not mounted, or the problem might be related to the hardware or an embedded component.

In general, RAID errors can be diagnosed by checking the status of the volumes mounted on the array. Often, an existing but unmounted volume can trigger the error. Other times, a conflict occurs when a new version of the binary is downloaded while previous volumes are still being used.

## Investigating RAID Errors

Some guidelines for investigating RAID errors include:

1. **Check the state of the current volumes with the `vol stat` command.**

- If the volumes are unmounted, try remounting them and then resetting the system using the `reset` command.
- If you are unable to remount the volumes, try removing all the volumes, resetting the system, then adding them back before remounting them.

## 2. Check the host connection to the array.

On hosts running the Solaris OS, the `format` command should match the number of volumes present on the array. If the number of volumes listed do not match, see the troubleshooting instructions. Specifically, the T400 entries listed by the `format` command should be recognized and labeled, and the number of these entries should equal the number of volumes mounted on the array.

## 3. If you suspect that a hardware problem is causing the RAID error, use the `fru list` and `fru stat` commands to check the status of the components.

It might also be worthwhile to check the cables and connections between partner-group units and between the host and the array units.

More detail regarding the error might be available in the `syslog`, in which case note the date and time of the error for lookup. However, most common cases can be handled as described above.

# Port Errors

TABLE 7-7 lists the port error messages that can be displayed.

TABLE 7-7 Port Errors

Error Name	Numerical Value	Message
PRT_UNKNOWNPORT	0x300000	bad port number
PRT_ALREADYMAPPED	0x300001	port is already mapped unmap first
PRT_INVALIDNAME	0x300002	volume name is not correct
PRT_VOLNOTFOUND	0x300003	volume name not found
PRT_INVALID	0x300004	port number is incorrect
PRT_LUNNOTMAPPED	0x300005	this lun is not mapped
PRT_ACCESSINVALID	0x300006	need to specify the access mode

## Interconnect Card and Other FRU Errors

TABLE 7-8 lists the various FRU-related errors that you can encounter. These include various power and cooling unit fault conditions, missing disks, and interconnect card errors.

**TABLE 7-8** Unit-Related Errors (Interconnect Card and Other FRUs)

<b>Error Name</b>	<b>Numerical Value</b>	<b>Message</b>
PS1_NOTEXIST	0x500001	Power Supply 1 Not Present
PS2_NOTEXIST	0x500002	Power Supply 2 Not Present
PS1_NOBATT	0x500003	Power Supply 1 Battery Not Present
PS2_NOBATT	0x500004	Power Supply 2 Battery Not Present
PS1_DISABLED	0x500005	Power Supply 1 Disabled
PS2_DISABLED	0x500006	Power Supply 2 Disabled
PS1_DISABLE	0x500007	Power Supply 1 Shutting off...
PS2_DISABLE	0x500008	Power Supply 2 Shutting off...
PS1_FAN1FAIL	0x500011	Power Supply 1 Fan 1 Failed
PS2_FAN1FAIL	0x500012	Power Supply 2 Fan 1 Failed
PS1_FAN2FAIL	0x500013	Power Supply 1 Fan 2 Failed
PS2_FAN2FAIL	0x500014	Power Supply 2 Fan 2 Failed
PS1_OVERTEMP	0x500015	Power Supply 1 Over Temperature
PS2_OVERTEMP	0x500016	Power Supply 2 Over Temperature
PS1_SWOFF	0x500017	Power Supply 1 Switch Off
PS2_SWOFF	0x500018	Power Supply 2 Switch Off
PS1_DCNOK	0x500019	Power Supply 1 DC Not OK
PS2_DCNOK	0x50001A	Power Supply 2 DC Not OK
PS1_ONBATT	0x500021	Power Supply 1 On Battery
PS2_ONBATT	0x500022	Power Supply 2 On Battery
PS1_FANHIGH	0x500023	Power Supply 1 Fan High
PS2_FANHIGH	0x500024	Power Supply 2 Fan High
PS1_REFBATT	0x500025	Power Supply 1 Refresh Battery
PS2_REFBATT	0x500026	Power Supply 2 Refresh Battery
DK1_NOTEXIST	0x500031	Disk 1 Not Present

**TABLE 7-8** Unit-Related Errors (Interconnect Card and Other FRUs) *(Continued)*

<b>Error Name</b>	<b>Numerical Value</b>	<b>Message</b>
DK2_NOTEXIST	0x500032	Disk 2 Not Present
DK3_NOTEXIST	0x500033	Disk 3 Not Present
DK4_NOTEXIST	0x500034	Disk 4 Not Present
DK5_NOTEXIST	0x500035	Disk 5 Not Present
DK6_NOTEXIST	0x500036	Disk 6 Not Present
DK7_NOTEXIST	0x500037	Disk 7 Not Present
DK8_NOTEXIST	0x500038	Disk 8 Not Present
DK9_NOTEXIST	0x500039	Disk 9 Not Present
DK10_NOTEXIST	0x50003a	Disk 10 Not Present
DK11_NOTEXIST	0x50003b	Disk 11 Not Present
DK12_NOTEXIST	0x50003c	Disk 12 Not Present
DK13_NOTEXIST	0x50003d	Disk 13 Not Present
DK14_NOTEXIST	0x50003e	Disk 14 Not Present
DK_NONE	0x50003f	No Disk Present
DK1_BYPASSED	0x500041	Disk 1 Bypassed
DK2_BYPASSED	0x500042	Disk 2 Bypassed
DK3_BYPASSED	0x500043	Disk 3 Bypassed
DK4_BYPASSED	0x500044	Disk 4 Bypassed
DK5_BYPASSED	0x500045	Disk 5 Bypassed
DK6_BYPASSED	0x500046	Disk 6 Bypassed
DK7_BYPASSED	0x500047	Disk 7 Bypassed
DK8_BYPASSED	0x500048	Disk 8 Bypassed
DK9_BYPASSED	0x500049	Disk 9 Bypassed
DK10_BYPASSED	0x50004a	Disk 10 Bypassed
DK11_BYPASSED	0x50004b	Disk 11 Bypassed
DK12_BYPASSED	0x50004c	Disk 12 Bypassed
DK13_BYPASSED	0x50004d	Disk 13 Bypassed
DK14_BYPASSED	0x50004e	Disk 14 Bypassed
DK1_NOTREADY	0x500051	Disk 1 Not Ready
DK2_NOTREADY	0x500052	Disk 2 Not Ready

**TABLE 7-8** Unit-Related Errors (Interconnect Card and Other FRUs) *(Continued)*

<b>Error Name</b>	<b>Numerical Value</b>	<b>Message</b>
DK3_NOTREADY	0x500053	Disk 3 Not Ready
DK4_NOTREADY	0x500054	Disk 4 Not Ready
DK5_NOTREADY	0x500055	Disk 5 Not Ready
DK6_NOTREADY	0x500056	Disk 6 Not Ready
DK7_NOTREADY	0x500057	Disk 7 Not Ready
DK8_NOTREADY	0x500058	Disk 8 Not Ready
DK9_NOTREADY	0x500059	Disk 9 Not Ready
DK10_NOTREADY	0x50005a	Disk 10 Not Ready
DK11_NOTREADY	0x50005b	Disk 11 Not Ready
DK12_NOTREADY	0x50005c	Disk 12 Not Ready
DK13_NOTREADY	0x50005d	Disk 13 Not Ready
DK14_NOTREADY	0x50005e	Disk 14 Not Ready
CT_NOTEXIST	0x500061	Controller Not Present
CT_QLOGNRDY	0x500062	Qlogic Chip Not Ready
CT_SEL_ID	0x500063	Select ID Changed
LP_VSC_ERR	0x500064	VSC7120 Loop Failed
LC1_OFFLINE	0x500065	Interconnect card 1 Offline
LC2_OFFLINE	0x500066	Interconnect card 2 Offline
LP_CABLE1	0x500067	Cable 1 Not Present
LP_CABLE2	0x500068	Cable 2 Not Present
LC1_NSTART	0x500069	Interconnect card 1 Failed to Start
LC2_NSTART	0x50006A	Interconnect card 2 Failed to Start
CT_NOALTLP	0x50006B	No Alternate Loop
LP_SWITCH1	0x500071	Switch to Loop 1
LP_SWITCH2	0x500072	Switch to Loop 2
LP_MUX_ISO	0x500073	Loop Mux Changed to Isolated
LP_MUX_TOP	0x500074	Loop Mux Changed to Top
LP_MUX_MID	0x500075	Loop Mux Changed to Middle
LP_MUX_BOT	0x500076	Loop Mux Changed to Bottom

## Other Errors

You will rarely see other types of errors, such as logical volume manager (LVM) errors (range 0x10001-0x1000A) and operating system errors (range 00000001-C000FFFF). The `tftp error` (numerical values 10060001-10060005) is an exception that you can see when you try to download a new binary. The `tftp errors` are usually generated due to one of the following reasons:

- The permissions for the file to be downloaded are too restrictive. In general, binaries should be world readable and executable.
- The checksum for the binary file to be downloaded is erroneous.
- The array units have not been recognized by the network. In this case, a system administrator should make sure that the IP addresses of the arrays are entered in the network database.

TABLE 7-9 lists pSOS errors.

**TABLE 7-9** Embedded Operating System and Driver Errors

Error Type	Numerical Value
pSOS+	0000'0001 0000'0FFF
(reserved)	0000'1000 0000'1FFF
embedded file system	0000'2000 0000'2FFF
pREPC+	0000'3000 0000'3FFF
(reserved)	0000'4000 0000'4FFF
pNA+, pRPC+, pX11+	0000'5000 0000'5FFF
(reserved)	0000'6000 0000'FFFF
Networking libraries	0110'0000 01FF'FFFF
MMUlib	0120'0000 0120'00FF
(reserved)	0120'0100 1000'FFFF
serial driver	1001'0000 1001'FFFF
tick timer driver	1002'0000 1002'FFFF
(reserved)	1003'0000 1003'FFFF
RAM disk driver	1004'0000 1004'FFFF
(reserved)	1005'0000 1005'FFFF
TFTP driver	1006'0000 1006'FFFF
SLIP driver	1007'0000 1007'FFFF

**TABLE 7-9** Embedded Operating System and Driver Errors *(Continued)*

<b>Error Type</b>	<b>Numerical Value</b>
(reserved)	1008'0000 1004'FFFF
SCSI driver	1050'0000 105F'FFFF
(reserved)	1060'0000 FFFF'FFFF



---

# Examples

This section contains examples for different types of messages.

- [Error Messages](#)
- [Warning Messages](#)
- [Notice](#)

## Error Messages

This section provides examples of the types of errors that may be encountered and the corresponding error message.

### FRU Level Errors

- Example 1

A power and cooling unit (PCU) has an overtemperature condition.

```
E: u<n>pcu<n>: Over temperature
```

- Example 2

The power and cooling unit (PCU) is flagged as not being present.

```
E: u<n>pcu<n>: Not present
```

## Warning Messages

This section provides examples of the types of errors that may occur and the corresponding warning messages.

## Unrecoverable Drive Error

Data drive u1d4 error occurred while using interconnect path 0.

```
Jan 25 00:09:20 ISR1[1]: W: u1d4 SCSI Disk Error Occurred (path = 0x0)
Jan 25 00:09:20 ISR1[1]: W: Sense Key = 0x4, Asc = 0x15, Ascq = 0x1
Jan 25 00:09:20 ISR1[1]: W: Sense Data Description = Mechanical Positioning Error
```

This example shows the decode of the prior SCSI sense key information (from the data drive) regarding the drive error. In this case, the drive error was a “Mechanical Position Error.”

```
Jan 25 00:09:21 WXFT[1]: W: u1d4 hard err in vol (n1) starting auto disable
```

This message indicates that drive u1d4 was disabled as a result of the previous error. The unit will continue to operate with a disabled drive, with possible performance degradation. A repair action must be planned. However, since the drive automatically disabled, the repair can be deferred.

## Recoverable Drive Error

```
Feb 04 22:39:11 ISR1[1] : W: u1d1 SCSI Disk Error Occurred (path = 0x1)
```

- W: u1d1 indicates the failing drive.
- path = 0x1 indicates that the error was detected while using the interconnect served by interconnect card 2 (path 0x0 is interconnect served by interconnect card 1).

```
Feb 04 22:39:11 ISR1[1] : W: Sense key = 0x1, Asc 0x47, Ascq = 0x1
Feb 04 22:39:11 ISR1[1] : W: Sense Data Description = Recovered Data With Retries
```

- Sense key (N (hex)) = RECOVERED ERROR. Indicates that the last command completed successfully after some recovery action was performed.
- The meaning of Asc and Ascq is decoded in the second line.
- Recovered Data With Retries is the decode of the most important information contained in the Sense key message of the previous line.

# Notice

```
Feb 25 21:47:03 LPCT[1]: N: ulpcu2: Refreshing battery
```

- N: is the Notice level message.
- ulpcu2 is unit 1, power and cooling unit 2.
- Refreshing battery indicates that the battery refresh is in progress.



## CLI Commands

---

This chapter contains descriptions of the commands supported by the array.

Topics in this chapter include:

- [“Displaying Commands” on page 181](#)
- [“FRU Identifiers” on page 182](#)
- [“Complete List of CLI Commands” on page 184](#)
- [“CLI Commands” on page 187](#)

---

## Displaying Commands

Follow these directions to display commands and their syntax.

### ▼ To Display Commands

- **To view the available commands on the array, type `help` at the prompt.**

```
6120:::<#> help
arp      cat      cd      cmp      cp      date    du      echo
head     help     ls      mkdir   mv      netstat ping   pwd
rm       rmdir   tail    touch
abort    boot     df      disable disk  enable  fru     id
led      linkstat  logger lpc     more    ntp     passwd
port     proc     reset   savecore set     shutdown
sim_diag sun      sync    sys     tzset   ver     vol
volslice ep       refresh route   ofdg    lun     hwnn
```

## ▼ To Display Command Syntax

- Type `command-name help` on the array, to display the syntax of a command.

```
6120:/:<#> id help
usage:  id read u<encid>
        id read u<encid>c1
        id read u<encid>l<1|2>
        id read u<encid>pcu<1|2>
        id read u<encid>b<1|2>
```

## ▼ To Display Command Summary

- Type `help command-name` on the array to display a summary of the command.

```
6120:/:<#> help id
id  - read fru id (not reentrant, not locked)
```

---

## FRU Identifiers

Many commands use a FRU identifier to refer to a particular FRU in an array. This identifier contains a unit constant (*u*), the unit number (*encid*), the FRU constant (*ctr* for controller card, *pcu* for power and cooling unit, *bat* for battery, *l* for interconnect card, and *d* for disk drive) and the FRU number (*n*).

TABLE 7-10 FRU Identifiers

FRU	Identifier	Unit Number
Controller card	<i>uencidc</i>	<i>encid</i> = unit number (1-8)
Power and cooling unit	<i>uencidpcu</i> [1 2]	<i>encid</i> = unit number (1-8) <i>n</i> = pcu number (1, 2)

**TABLE 7-10** FRU Identifiers

<b>FRU</b>	<b>Identifier</b>	<b>Unit Number</b>
Battery	<i>uencid</i> bat[1 2]	<i>encid</i> = unit number (1-8) <i>n</i> = battery number (1, 2)
Interconnect card	<i>uencid</i> 1[1 2]	<i>encid</i> = unit number (1-8) <i>n</i> = interconnect card number (1, 2)
Disk drive	<i>uencid</i> n	<i>encid</i> = unit number (1-8) <i>n</i> = disk drive number (1 to 14)

---

**Note** – Commands support 8 units, while 6 are currently being supplied.

---

---

# Complete List of CLI Commands

TABLE 7-11 lists all the commands described in this chapter. Note that not all command options are listed separately in this table.

**TABLE 7-11** CLI Commands Listed in Alphabetical Order for the Array

Command	Command Option	Page Number
abort		"abort" on page 187
arp		"arp" on page 252
boot		"boot" on page 188
cat		"cat" on page 252
cd		"cd" on page 253
cmp		" <a href="#">cmp</a> " on page 253
cp		"cp" on page 253
date		"date" on page 254
disable		"disable" on page 189
disk		"disk" on page 190
du		"du" on page 254
df		"df" on page 254
echo		"echo" on page 254
enable		"enable" on page 191
ep		"ep" on page 191
fru		"fru" on page 192
head		"head" on page 255
help		"help" on page 198
hwwn		"hwwn" on page 198
	hwwn list	"hwwn list" on page 199
	hwwn listgrp	"hwwn listgrp" on page 199
	hwwn add	"hwwn add" on page 200
	hwwn rm	"hwwn rm" on page 201
	hwwn rmgrp	"hwwn rmgrp" on page 202



**TABLE 7-11** CLI Commands Listed in Alphabetical Order for the Array *(Continued)*

<b>Command</b>	<b>Command Option</b>	<b>Page Number</b>
id		"id" on page 202
led		"led" on page 205
linkstat		"linkstat" on page 205
logger		"logger" on page 206
lpc		"lpc" on page 206
ls		"ls" on page 255
lun		"lun" on page 208
	lun map list	"lun map list" on page 208
	lun map add	"lun map add" on page 210
	lun map rm	"lun map rm" on page 210
	lun map rm all	"lun map rm all" on page 211
	lun perm list	"lun perm list" on page 212
	lun perm	"lun perm" on page 213
	lun default	"lun default" on page 215
	lun wwn list	"lun wwn list" on page 216
	lun wwn rm	"lun wwn rm" on page 216
	lun wwn rm all	"lun wwn rm all" on page 217
mkdir		"mkdir" on page 255
more		"more" on page 256
mv		"mv" on page 256
ofdg		"ofdg" on page 221
netstat		"netstat" on page 256
ntp		"ntp" on page 218
	ntp stats	"ntp stats" on page 219
	ntp poll	"ntp poll" on page 220
	ntp interval	"ntp interval" on page 220
	ntp server	"ntp server" on page 221
passwd		"passwd" on page 257
ping		"ping" on page 257
port		"port" on page 222

**TABLE 7-11** CLI Commands Listed in Alphabetical Order for the Array *(Continued)*

<b>Command</b>	<b>Command Option</b>	<b>Page Number</b>
proc		"proc" on page 224
pwd		"pwd" on page 257
refresh		"refresh" on page 225
reset		"reset" on page 226
rm		"rm" on page 257
rmdir		"rmdir" on page 258
route		"route" on page 258
savecore		"savecore" on page 227
set		"set" on page 228
	set timezone	"set timezone" on page 230
shutdown		"shutdown" on page 236
sim_diag		"sim_diag" on page 237
sun		"sun" on page 237
sync		"sync" on page 259
sys		"sys" on page 237
	sys fc_topology	"sys fc_topology" on page 240
tail		"tail" on page 259
tzset		"tzset" on page 241
touch		"touch" on page 260
ver		"ver" on page 242
vol		"vol" on page 242
volslice		"volslice" on page 246
	volslice create	"volslice create" on page 247
	volslice list	"volslice list" on page 248
	volslice remove	"volslice remove" on page 250

---

# CLI Commands

This section describes the commands supported by the Sun StorEdge 6020 and 6120 arrays. For additional command information, see [“Displaying Commands” on page 181](#).

Whenever possible, a command is introduced with its summary statement as provided by entering:

```
6120:: help command-name
```

Commands whose usage is not unique to the array, such as a Solaris OS or a UNIX command, are documented in [“Other Commands” on page 252](#).

Array-specific commands are accompanied by more detailed usage statements.

---

**Note** – Commands are listed as either reentrant commands or as not reentrant. A reentrant command can be run in multiple telnet sessions, or CLI windows, to the same array.

---

abort

## Description

Summary: Abort the tray (not reentrant, not locked).

The abort command allows the operator to force a crash dump to be taken on the current controller, or the controller given by unit number. After the crash dump is taken, the controller is immediately reset.

---

**Note** – This command is to be used by authorized service personnel only!

---

## Usage

```
abort [-y] [u<1-8>]
```

## Parameters

**TABLE 7-12** `abort` Command Options and Parameters

Parameter	Function
<code>-y</code>	The <code>-y</code> option is used to inhibit the abort confirmation prompt.

This command may be issued from either controller of a high-availability (HA) configuration.

## boot

### Description

Summary: Boot system (not reentrant, not locked).

Boots the RAID software according to the boot mode configured with the `set` command.

### Usage

```
boot -f disk-no.
```

```
boot -i filename.bin
```

```
boot -s
```

```
boot -w
```

## Parameters

TABLE 7-13 boot Command Options and Parameters

Parameter	Function
-f <i>disk-no.</i>	Verifies the disk boot image in the specified disk; updates the disk with its current disk position if the boot partition is OK; if the boot partition is not OK, the command exits, displaying <code>Failed to set new boot disk position</code> on the console.
-i <i>filename.bin</i>	Copies the level 3 controller firmware image to a reserved area on disk, which is loaded into flash upon reboot. The <i>filename</i> string can be a maximum of 11 characters.  <i>Note that the use of the ep_download command is the preferred procedure for updating the controller FLASH. See “ep” on page 191.</i>
-s	Used when disks in an array are detected as being in the wrong disk position. If this occurs, a special prompt <code>ADMIN&gt;</code> is displayed. At this point, use the <code>boot -s</code> command to correct this state and reboot the array.
-w	Sets the system area and configuration settings to an unspecified set of values. The boot image and local file system will be retained. Use to quickly clear all the system and configuration settings. You might run this command when adding trays to the array to clear all settings. You must reconfigure the array after running this command.  <i>CAUTION: Note that LUN and volume information are also lost.</i>  See also <code>ep_download</code> in “ep” on page 191.

## disable

### Description

Summary: Disable certain FRUs (not reentrant, not locked).

Takes the specified FRU offline. If you disable a disk drive that has a hot spare configured to it, the hot spare will replace the disabled drive until you replace the disabled drive. A disabled FRU responds only to an `enable` command.

### Usage

```
disable uencid
```

```
disable uencid[1|2]
```

```
disable uencid[1-14]
```

## Parameters

TABLE 7-14 `disable` Command Options and Parameters

Parameter	Function
<code>uencid</code>	Tray. See “FRU Identifiers” on page 182.
<code>l</code>	Interconnect card. See “FRU Identifiers” on page 182.
<code>d</code>	Disk drive. See “FRU Identifiers” on page 182.

## disk

### Description

Summary: Disk administration (not reentrant, not locked).

Controls, displays, and configures disks.

### Usage

```
disk version drives[1-14]
```

```
disk download drives filename
```

### Parameters

TABLE 7-15 `disk` Command Options and Parameters

Parameter	Function
<code>version</code>	Displays the firmware version of the selected drives.
<code>download</code>	Updates the selected drives with new firmware specified by the <i>filename</i> .
<i>drives</i>	Specifies the disk drive numbers.
<i>filename</i>	Specifies the file to use for drive firmware updates.

## Example

```
6120:/:<#> disk version uld3
```

```
DISK    VENDOR  PRODUCT                REVISION  SERIAL_NO  FW_REV    ROM_REV
-----
uld03   SEAGATE  ST373307FSUN72G A207      3HZ0AMYN  073004A2  00000000
pass
```

enable

### Description

Summary: Enable certain FRUs (not reentrant, not locked).

Enables specific FRUs. See [“disable” on page 189](#).

### Usage

```
enable uencid
```

```
enable uencidl[1|2]
```

```
enable uencidd[1-14]
```

### Parameters

TABLE 7-16 enable Command Options and Parameters

Parameter	Function
<i>uencid</i>	Tray. See <a href="#">“FRU Identifiers” on page 182</a> .
<i>l</i>	Interconnect card. See <a href="#">“FRU Identifiers” on page 182</a> .
<i>d</i>	Disk drive. See <a href="#">“FRU Identifiers” on page 182</a> .

ep

### Description

Summary: Program the flash eeprom (not reentrant, not locked).

Updates the controller FLASH with new firmware specified by *filename*. Using this command is the preferred method for updating controller FLASH.

## Usage

ep download *filename*

## Parameters

TABLE 7-17 ep Command Options and Parameters

Parameter	Function
<i>filename</i>	Specifies the new firmware to be loaded into the controller EPROM. The file must reside in the local file system.

## Example

```
6120:/:<#> ep download t413_303.bin

Erasing Flash...done
Programming Flash.....done
Done with writing EPROM code of controller 1
Start writing EPROM code of controller 2
Done with writing EPROM code of controller 2
6120:/:<5>
```

fru

## Description

Summary: Display the field-replaceable unit (FRU) information (not reentrant, not locked).

## Usage

```
fru l[ist]
fru list sys
fru list [u<1-8>]
fru list [u<1-8>]c[1]
fru list [u<1-8>]d[<1-14>]
fru list [u<1-8>]l[<1-2>]
fru list [u<1-8>]pcu[<1-2>]
fru list [u<1-8>]bat[<1-2>]
```



```

fru list [u<1-8>]mpn[1]
fru s[tat]
fru stat sys
fru stat [u<1-8>]
fru stat [u<1-8>]c[1]
fru stat [u<1-8>]d[<1-14>]
fru stat [u<1-8>]l[<1-2>]
fru stat [u<1-8>]pcu[<1-2>]
fru st[atistic]
fru statistic sys
fru statistic [u<1-8>]
fru statistic [u<1-8>]d[<1-14>]
fru statistic [u<1-8>]p[1] [clear]
fru statistic [u<1-8>]v[<1-2>] [clear]
fru myuid

```

## Parameters

**TABLE 7-18** fru Command Options and Parameters

Parameter	Function
fru list	Displays <i>fruid</i> type, vendor, model, version, and serial # for all FRUs, or for a specific <i>fruid</i> .
fru list <i>fruid</i>	
fru stat	Displays hardware status for all FRUs or for a specific <i>fruid</i> .
fru stat <i>fruid</i>	
fru [stat list] sys	Displays operational status of each unit (u<1-8>).
fru statistic	Displays I/O statistics for all FRUs or for a specific <i>fruid</i> .
fru statistic <i>fruid</i>	
fru statistic sys	Displays overall I/O statistics for the array.
fru myuid	Displays the current controller.
u<1-8>, d, l, pcu, bat	See “FRU Identifiers” on page 182.
c[1]	Controller card.
mpn[1]	Midplane card.

**TABLE 7-18** fru Command Options and Parameters

Parameter	Function
p[1]	Controller card port.
v[<1-2>]	Volume.
clear	Resets the counter to restart calculating the statistics.

### Examples

```
6120:/:<#> fru myuid  
ul
```

```
6120:/:<#> fru list
```

ID	TYPE	VENDOR	MODEL	REVISION	SERIAL
ulctr	controller card	0x301	5405559	01	000192
u3ctr	controller card	0x301	5405559	01	000662
uld01	disk drive	SEAGATE	ST373307FSUN A207		3HZ0A9LG
- - - - -	(items omitted in example)				
uld14	disk drive	SEAGATE	ST373307FSUN A207		3HZ0AL45
u2d01	disk drive	SEAGATE	ST373405FSUN A538		3EK1VYNN
- - - - -	(items omitted in example)				
u2d14	disk drive	SEAGATE	ST373405FSUN A538		3EK1VS59
u3d01	disk drive	SEAGATE	ST373307FSUN A207		3HZ0AK2V
- - - - -	(items omitted in example)				
u3d14	disk drive	SEAGATE	ST373307FSUN A207		3HZ0AGX2
u4d01	disk drive	SEAGATE	ST373405FSUN A538		3EK1VRZE
- - - - -	(items omitted in example)				
u4d14	disk drive	SEAGATE	ST373405FSUN A538		3EK1VWC7
ul11	loop card	0x301	5405384	02	000981
- - - - -	(items omitted in example)				
u4l2	loop card	0x301	5405384	02	000708
ulpcu1	power/cooling unit	0x3AD	3001562	16	Q01331
- - - - -	(items omitted in example)				
u4pcu2	power/cooling unit	0x3AD	3001562	16	Q00900
ulbat1	battery	0x076	3704861	01	001194
- - - - -	(items omitted in example)				
u4bat2	battery	0xBEEF	3704861	01	000589
ulmpn	mid plane	0x301	5016338	01	400540
- - - - -	(items omitted in example)				
u4mpn	mid plane	0x301	5016338	01	400480

```
6120:/:<#> fru list ulmpn1
```

ID	TYPE	VENDOR	MODEL	REVISION	SERIAL
ulmpn	mid plane	0x301	5016338	01	400540

```
6120:/:<#> fru list sys
```

UNIT	STATE	ROLE
u1	* ONLINE	master
u2	EXPN UNIT	
u3	ONLINE	alt master
u4	EXPN UNIT	

```
6120:/:<#> fru stat
```

CTLR	STATUS	STATE	ROLE	PARTNER	TEMP		
-----	-----	-----	-----	-----	-----		
u1ctr	ready	enabled	master	u3ctr	28		
u2ctr	missing						
u3ctr	ready	enabled	alt master	u1ctr	28		
u4ctr	missing						

DISK	STATUS	STATE	ROLE	PORT1	PORT2	TEMP	VOLUME
-----	-----	-----	-----	-----	-----	-----	-----
uld01	ready	enabled	data disk	ready	ready	25	v0
- - - -	- - - -	(items omitted in example)					
uld14	ready	enabled	standby	ready	ready	24	v0
u2d01	ready	enabled	data disk	ready	ready	30	v1
- - - -	- - - -	(items omitted in example)					
u3d14	ready	enabled	standby	ready	ready	24	v2
u4d01	ready	enabled	data disk	ready	ready	29	v3
- - - -	- - - -	(items omitted in example)					
u4d14	ready	enabled	standby	ready	ready	30	v3

LOOP	STATUS	STATE	MODE	CABLE1	CABLE2	TEMP		
-----	-----	-----	-----	-----	-----	-----		
u1l1	ready	enabled	master	-	installed	31		
- - - -	- - - -	(items omitted in example)						
u4l2	ready	enabled	slave	installed	-	33		

POWER	STATUS	STATE	SOURCE	OUTPUT	BATTERY	TEMP	FAN1	FAN2
-----	-----	-----	-----	-----	-----	-----	-----	-----
ulpcu1	ready	enabled	line	normal	normal	normal	normal	normal
- - - -	- - - -	(items omitted in example)						
u4pcu2	ready	enabled	line	normal	normal	normal	normal	normal

```
6120:/:<#> fru stat u1l1
```

LOOP	STATUS	STATE	MODE	CABLE1	CABLE2	TEMP
-----	-----	-----	-----	-----	-----	-----
u1l1	ready	enabled	master	-	installed	31

```
6120:/:<#> fru stat sys
```

UNIT	STATE	ROLE
-----	-----	-----
u1	* ONLINE	master
u2	EXPN UNIT	
u3	ONLINE	alt master
u4	EXPN UNIT	

```
6120:/:<#> fru statistic
```

```
SYSTEM CMD RCVD CMD COMP WR REQ RD REQ WR BLKS RD BLKS
-----
t400 11a70389 230523e9 0a018bb4 07801b10 9631a1f8 59aac592

PORT CMD RCVD CMD COMP WR REQ RD REQ WR BLKS RD BLKS
-----
ulp1 11838daf 11838daf 0a018bb0 07801b10 962fa1f0 59aac592
u3p1 0000c2fb 0000c2fb 00000000 00000fdc 00000000 000010b1

VOLUME WR REQ RD REQ WR BLKS RD BLKS SOFT ERR FIRM ERR HARD ERR NAME
-----
ulvol1 03040837 025d3d2c 2c8ca95b 1e0e4a1e 00000000 00000000 00000000 v0
u2vol1 052bb5d4 03d64c59 41adfa3a 27100d27 00000000 00000000 00000000 v1
u3vol1 01590c51 0133b65e 15bef312 0fea719d 00000000 00000000 00000000 v2
u4vol1 0078c158 0018db2d 12380b51 04a1fcb0 00000000 00000000 00000000 v3

DISK WR REQ RD REQ ERROR RETRY LOOP UP LOOP DN
-----
uld01 0098a241 0029174e 00000000 00000001 00000003 00000000
- - - - - (items omitted in example)
uld14 0000c7ae 000799ed 00000000 00000003 00000003 00000000
u2d01 0058135d 007b3fe2 00000000 00000001 00000003 00000000
- - - - - (items omitted in example)
u2d14 00000002 0000000e 00000000 00000001 00000003 00000000
u3d01 004de640 000dffff 00000000 00000003 00000003 00000000
- - - - - (items omitted in example)
u3d14 00000002 0000000e 00000000 00000003 00000003 00000000
u4d01 000cf21e 00067cb0 00000000 00000003 00000003 00000000
- - - - - (items omitted in example)
u4d14 00000002 00000008 00000000 00000003 00000003 00000000
```

```
6120:/:<#> fru statistic ulv1
```

```
VOLUME WR REQ RD REQ WR BLKS RD BLKS SOFT ERR FIRM ERR HARD ERR NAME
-----
ulvol1 03040837 025d3d2c 2c8ca95b 1e0e4a1e 00000000 00000000 00000000 v0
```

```
6120:/:<#> fru statistic sys
```

```
SYSTEM CMD RCVD CMD COMP WR REQ RD REQ WR BLKS RD BLKS
-----
t400 11a7074d 230523e9 0a018bb4 07801b10 9631a1f8 59aac592
```

## help

### Description

Displays commands with help text explanations.

The `help` command is a *reentrant command*. A reentrant command is one that can be run in multiple telnet sessions (CLI windows) to the same array.

### Usage

*command* help

### Parameters

TABLE 7-19 help Command Options and Parameters

Parameter	Function
<i>command</i>	Any valid array CLI command.

## hwwn

---

**Note** – Each of the commands listed in the usage section of this section is described in its own section.

---

### Description

Summary: Add or remove grouping of host port WWN (World Wide Name) (not reentrant, not locked).

### Usage

`hwwn add grp-name wwn wwn-no. {Add WWN to group named grp-name}`

`hwwn rm grp-name wwn wwn-no. {Remove WWN from group named grp-name}`

`hwwn list {list all the WWNs in all the groups}`

`hwwn list grp-name {list all the WWNs in this group}`

`hwwn rmgrp grp-name {remove all the WWNs in this group}`

`hwwn listgrp {list all the registered group names}`

hwwn list

### Description

Lists all the WWNs in a specified group.

### Usage

```
hwwn list grp-name
```

### Parameters

**TABLE 7-20** hwwn list Command Options and Parameters

Parameter	Function
<i>group-name</i>	Specifies a specific group name such as node1 or node2. The group name has a maximum of 16 alphanumeric characters consisting of a-z, A-Z, 0-9, and -.

### Example

```
6120/::<#> hwwn list node1
WWN in this group node1
-----
20020678ef345678
20020321ff345678
-----
** Total 2 entries **
```

hwwn listgrp

### Description

Lists all the registered group names.

### Usage

```
hwwn listgrp
```

---

**Note** – If all WWNs have been removed from a group, that group is not displayed in the output of any LUN masking command except this one. An empty group is always displayed in the output of the `hwwn listgrp` command.

---

## Example

```
6120:/:<#> hwwn listgrp
Group Name
-----
node1
node2
node3
-----
** Total 3 entries **
```

hwwn add

### Description

Adds a WWN to an existing group. If a specified group name does not exist, the firmware creates a new group with that name and adds the WWN to it.

The maximum number of groups that can exist is 128.

### Usage

```
hwwn add
```

```
hwwn add group-name wwn wwn-no.
```

---

**Note** – If you issue the `hwwn add` command without any parameters, you will be interactively prompted to specify the parameters.

---

### Parameters

**TABLE 7-21** hwwn add Command Options and Parameters

Parameter	Function
<i>group-name</i>	Specifies a specific group name such as <code>node1</code> or <code>node2</code> . The group name has a maximum of 16 alphanumeric characters consisting of a-z, A-Z, 0-9, and -.
<i>wwn-no.</i>	Specifies a world wide name. This is a unique 8-byte port WWN of an HBA Fibre Channel port. The WWN must be exactly 16 alphanumeric characters consisting of a-f, A-F, and 0-9.



## Example

This example shows the interactive and manual methods to add the WWN 20020678ef345678 to group `node1`.

```
6120:/:<#> hwwn add
Please enter Group Name: node1
Please enter WWN: 20020678ef345678
Add more WWN? [n]: N

6120:/:<#> hwwn add node1 wwn 20020678ef345678
```

`hwwn rm`

## Description

Removes one or more WWN(s) from a specific group.

## Usage

```
hwwn rm
```

```
hwwn rm group-name wwn wwn-no.
```

---

**Note** – If you issue the `hwwn rm` command without any parameters, you will be interactively prompted to specify the parameters.

---

## Parameters

**TABLE 7-22** `hwwn rm` Command Options and Parameters

Parameter	Function
<i>group-name</i>	Specifies a specific group name such as <code>node1</code> or <code>node2</code> . The group name has a maximum of 16 alphanumeric characters consisting of a-z, A-Z, 0-9, and -.
<i>wwn-no.</i>	Specifies a world wide name. This is a unique 8-byte port WWN of an HBA Fibre Channel port. The WWN must be exactly 16 alphanumeric characters consisting of a-f, A-F, and 0-9.

## Example

This example shows the interactive and manual methods to remove the 20020678ef345678 and 20020321ff345678 WWNs from group node1.

```
6120:/:<#> hwwn rm
Please enter Group Name: node1
Please enter WWN: 20020678ef345678
More WWN [n]: Y
Please enter WWN: 20020321ff345678
More WWN [n]: N

6120:/:<#> hwwn rm node1 wwn 20020678ef345678
6120:/:<#> hwwn rm node1 wwn 20020321ff345678
```

hwwn rmgrp

## Description

Removes a specific group name and all its associated WWNs.

## Usage

hwwn rmgrp *group-name*

## Parameters

TABLE 7-23 hwwn rmgrp Command Options and Parameters

Parameter	Function
<i>group-name</i>	Specifies a specific group name such as node1 or node2. The group name has a maximum of 16 alphanumeric characters consisting of a-z, A-Z, 0-9, and -.

## Example

```
6120:/:<#> hwwn rmgrp node2
```

id

## Description

Summary: Read FRU id (not reentrant, not locked).

Displays the FRU identification summary.

## Usage

```
id read uencid
id read uencidc1
id read uencidl[1|2]
id read uencidpcu[1|2]
id read uencidb[1|2]
```

## Parameters

**TABLE 7-24** id Command Options and Parameters

Parameter	Function
<i>uencid</i> , <i>pcu</i> , <i>l</i> , <i>c</i>	See “FRU Identifiers” on page 182.
<i>b</i>	Battery
<i>c1</i>	Controller card.

## Examples

```
6120:/:<#> id read u1
  Description: ASSY, T4 MIDPLANE, 14 SLOT
  Short Name: T4-14_MdPn
  Serial Number: 400540
  Part Number: 5016338
  Dash Level: 01
  Rev Level: 01
  Vendor Name: 0x301
  Manufacture Loc: Milpitas,CA,USA
  Timestamp: Wed Nov 20 00:48:45 GMT 2002
  MAC: 00:03:ba:27:d7:99
  WWN: 50:00:3b:a3:00:27:d7:99
```

```
6120:/:<#> id read ulb1
  Description: ASSY, T4 BATTERY, 14 SLOT
  Short Name: T4-14_Bat
  Serial Number: 001194
  Part Number: 3704861
  Dash Level: 01
  Rev Level: 01
  Vendor Name: 0x076
  Manufacture Loc: TIJUANA,MEXICO
  Timestamp: Thu Nov 07 22:49:45 GMT 2002
```

```
6120:/:<#> id read ulc1
  Description: ASSY, T4 CONTROLLER, 14 SLOT
  Short Name: T4-14_Ctlr
  Serial Number: 000192
  Part Number: 5405559
  Dash Level: 01
  Rev Level: 01
  Vendor Name: 0x301
  Manufacture Loc: Milpitas,CA,USA
  Timestamp: Thu Dec 26 17:33:57 GMT 2002
  MAC: 00:03:ba:27:c8:85
```

## led

### Description

Summary: Set light-emitting diodes (LED) on FRUs (not reentrant, not locked).

### Usage

```
led [-e encid] [-f fru_str -l led_str [-i index] | -t]
```

### Parameter

TABLE 7-25 led Command Options and Parameters

Parameter	Function
<i>encid</i>	Tray id
<i>fru_str</i>	One of the following: pcu controller drive box
<i>led_str</i>	One of the following: ok busy disabled failed service locate nlocate
-t	Run in test mode

## linkstat

### Description

Summary: Report link statistics (not reentrant, not locked).

### Usage

```
linkstat u{1|2}ctr {0|1|2}
```

### Example

```
6120:/:<#> linkstat ulctr 0

LINKFAIL LOSSSYNC LOSSSIG PROTOERR INVTXWORD INVCRC
-----
0          1          1          0          0          0
```

## logger

### Description

Summary: Log a message to `syslog` (not reentrant, not locked).

Generates messages to the `syslog` in the unit.

### Usage

```
logger [-f <file | ->] [-p facility.priority] [message]
```

### Parameters

TABLE 7-26 logger Command Options and Parameters

Parameter	Function
-f	Specifies a particular file or content to be logged. -f <file> specifies a particular file; if used, only the first 20 lines are logged. -f - specifies a request to log standard input; if used, the next line up to Control-c or Control-d followed by a Return is logged.
-p	Specifies the message's facility and priority level. The default facility is user and the default priority is notice.
message	Text of message to be logged.

### Example

This example shows text being written to the `syslog` facility as a warning and writes the following entry into the `syslog`:

```
Oct 26 14:44:56 sh01[1]: W: this is a test
```

```
6120:/:<#> logger -p syslog.warning this is a test
```

## lpc

### Description

Summary: Get interconnect card property (not reentrant, not locked).

Used to display and upgrade interconnect cards.

### Usage

```
lpc version
```

```
lpc download uencid1[1|2] filename
```

```
lpc reboot uencid1[1|2]
```

## Parameters

**TABLE 7-27** lpc Command Options and Parameters

Parameter	Function
version	Displays each interconnect card's firmware version.
download	Downloads new interconnect card firmware. You must reboot the card after a download with the <code>lpc reboot</code> command.
reboot	Executes soft reset to the selected interconnect card.
<i>uencid, 1</i>	See <a href="#">“FRU Identifiers” on page 182</a> .
<i>filename</i>	File name of new firmware to download.

## Example

```
6120:/:<#> lpc version
          LOOP A           LOOP B
Enclosure 1  6.27          6.27
Enclosure 2  6.27          6.27
Enclosure 3  6.27          6.27
Enclosure 4  6.27          6.27
```

```
6120:/:<#> lpc download u111 lpc14_6.27.bin
Start Downloading Image .....
Done
6120:/:<#> lpc download u211 lpc14_6.27.bin
Start Downloading Image .....
Done
```

```
6120:/:<#>lpc reboot u111
6120:/:<#>lpc reboot u211
```

## lun

---

**Note** – Each of the commands listed in the usage statement of this section is described in its own section.

---

### Description

Summary: Display or modify the lun mapping or access right information (not reentrant, not locked).

---

**Note** – A volume can be made into 64 slices, numbered 0 to 63. LUN numbers allowed are 0 to 255. Any single LUN number can be mapped to any single slice number.

---

### Usage

```
lun map add lun lun-no. slice slice-no.
lun map rm lun lun-no. [slice slice-no.]
lun map rm all
lun map list [lun lun-no. | slice slice-no.]
lun perm <all_lun|lun lun-no.> <rw|ro|none> <all_wwn|wwn wwn|grp grp_name>
lun perm list [lun lun-no. | wwn wwn | grp grp_name]
lun default <all_lun|lun lun-no.> <rw|ro|none>
lun wwn list
lun wwn rm all
lun wwn rm wwn wwn-no.
```

## lun map list

### Description

Without any options, this command lists all current LUN and slice mapping entries. With an option, it displays the corresponding LUN/slice pair complement for a specific slice number or for a LUN number.

### Usage



```

lun map list
lun map list slice slice-no.
lun map list lun lun-no.

```

## Parameters

**TABLE 7-28** lun map list Command Options and Parameters

Parameter	Function
<i>slice-no.</i>	Specifies the slice number such as 0, 1, 2, 3, ... 63.
<i>lun-no.</i>	Specifies a LUN number such as 0, 1, 2, 3, ... 255.

## Example

- The first example lists all current LUN and slice mapping entries.

```

6120:/:<#> lun map list
Lun No          Slice No
-----
0                0
1                1
2                2
- - - - - (items omitted in example)
63              63
-----
** Total 64 entries **

```

- The second example gives the LUN mapping to slice 4.

```

6120:/:<#> lun map list slice 04
Lun No          Slice No
-----
4                4

```

- The third example gives the slice mapping to LUN 3.

```

6120:/:<#> lun map list lun 03
Lun No          Slice No
-----
3                3

```

## lun map add

### Description

Maps a LUN to a slice number. A slice must be mapped to a corresponding LUN before it can be accessed by any HBA.

### Usage

```
lun map add lun lun-no. slice slice-no.
```

### Parameters

**TABLE 7-29** lun map add Command Options and Parameters

Parameter	Function
<i>lun-no.</i>	Specifies a LUN number such as 0, 1, 2, 3, ... 63.
<i>slice-no.</i>	Specifies the slice number such as 0, 1, 2, 3, ... 63.

### Example

The following example maps LUN 8 to slice 3. This assumes LUN 8 has not been previously assigned.

```
6120:/:<#> lun map add lun 8 slice 3
```

## lun map rm

### Description

Removes the mapping between a specified LUN and its corresponding slice. You are asked to confirm the removal before the command is executed.

---

**Note** – Removing the mapping between LUNs and slices terminates host system access to the slices.

---

### Usage

```
lun map rm lun lun-no  
lun map rm lun lun-no. slice slice-no.
```

## Parameters

TABLE 7-30 lun map rm Command Options and Parameters

Parameter	Function
<i>lun-no.</i>	Specifies a LUN number such as 0, 1, 2, 3, ... 255.
<i>slice-no.</i>	Specifies the slice number such as 0, 1, 2, 3, ... 63.

## Example

- In the first example, lun 8 is mapped to slice 3. This command removes the existing LUN mapping to lun 8. You don't have to specify the slice.

```
6120:/:<#> lun map rm lun 8
Remove the mapping, are you sure? [N]:
```

- Also in the second example, lun 8 is mapped to slice 3. The command removes LUN mapping from lun 8 to slice 3. If lun 8 is not mapped to slice 3, an error message is displayed, for example: Error : Current lun 8 maps to slice 8

```
6120:/:<#> lun map rm lun 8 slice 3
Remove the mapping, are you sure? [N]:
```

lun map rm all

## Description

Removes all current LUN mappings.

---

**Note** – Removing the mapping between LUNs and slices terminates host system access to the slices.

---

## Usage

```
lun map rm all
```

## Example

```
6120:/:<#> lun map rm all
```

## lun perm list

### Description

Lists the accessibility of LUNs based on specified criteria.

### Usage

```
lun perm list
lun perm list lun lun-no.
lun perm list wwn wwn-no.
lun perm list grp group-name
```

### Parameters

**TABLE 7-31** lun perm list Command Options and Parameters

Parameter	Function
<i>lun-no</i> .	Specifies a LUN number such as 0, 1, 2, 3, ... 255.
<i>wwn-no</i> .	Specifies a world wide name. This is a unique 8-byte port WWN of an HBA Fibre Channel port. The WWN must be exactly 16 alphanumeric characters consisting of a-f, A-F, and 0-9.
<i>group-name</i>	Specifies a specific group name such as node1, node2, etc. The group name has a maximum of 16 alphanumeric characters consisting of a-z, A-Z, 0-9, and -.

### Example

- The first example lists all permissions for all LUNs. For each LUN, the default access permissions are followed by any exceptions.

```
6120:/:<#> lun perm list
lun  slice  WWN      Group Name  Group Perm  WWN Perm  Effective Perm
-----
0     0       default  --         --         rw       rw
1     1       default  --         --         rw       rw
- - - - - (items omitted in example)
62    62     default  --         --         rw       rw
63    63     default  --         --         rw       rw
-----
```

- The second example lists all WWNs that can access LUN 0.

```
6120:/:<#> lun perm list lun 0
List of WWNs and their access right to lun 0
lun  slice  WWN          Group Name  Group Perm  WWN Perm  Effective Perm
-----
0     0       default      --         --         rw        rw
```

- The third example lists all LUN's accessibility for WWN 20020678ff345678.

```
6120:/:<#> lun perm list wwn 20020678ff345678
lun  slice  WWN          Group Name  Group Perm  WWN Perm  Effective Perm
-----
0     0       20020678ff345678 --         --         rw        rw
1     1       20020678ff345678 --         --         rw        rw
2     2       20020678ff345678 --         --         rw        rw
```

This WWN is not defined in any group.

- The fourth example lists all the permissions for members of group G1.

```
6120:/:<#> lun perm list grp G1
lun  slice  WWN          Group Name  Group Perm  WWN Perm  Effective Perm
-----
0     0       default      --         --         rw        rw
0     0       20020678ff345678 G1         none       ro        ro
1     1       default      --         --         ro        ro
1     1       20020678ff345678 G1         ro        rw        rw
1     1       20020678ff345678 G1         ro        none     rw
2     2       default      --         --         rw        none
```

## lun perm

### Description

By default, no LUN access is given to any HBA. This command is used to grant LUN access to:

- A single HBA (specified by its WWN)
- A group of HBAs
- All HBAs

### Usage

```

lun perm lun lun-no. rw | ro | none wwn wwn-no.
lun perm lun lun-no. rw | ro | none all_wwn
lun perm lun lun-no. rw | ro | none grp group-name
lun perm all_lun rw | ro | none wwn wwn-no.
lun perm all_lun rw | ro | none all_wwn
lun perm all_lun rw | ro | none grp group-name

```

## Parameters

**TABLE 7-32** lun perm Command Options and Parameters

Parameter	Function
<i>lun-no.</i>	Specifies a LUN number such as 0, 1, 2, 3, ... 255.
all_lun	Specifies all LUNs.
rw	Specifies read and write permission.
ro	Specifies read-only permission.
none	Specifies no access permission. The host cannot see the LUN.
<i>wwn-no.</i>	Specifies a world wide name. This is a unique 8-byte port WWN of an HBA Fibre Channel port. The WWN must be exactly 16 alphanumeric characters consisting of a-f, A-F, and 0-9.
all_wwn	Specifies all world wide names.
<i>group-name</i>	Specifies a specific group name such as node1, node2, etc. The group name has a maximum of 16 alphanumeric characters consisting of a-z, A-Z, 0-9, and -.

## Example

- The first example sets up LUN 3 with read/write access to WWN 20020da445678901.

```
6120:/:<#> lun perm lun 3 rw wwn 20020da445678901
```

- The second example sets up LUN 2 with no access to all WWNs.

```
6120:/:<#> lun perm lun 2 none all_wwn
```

- The third example sets up all LUNs with read-only access to group node1.

```
6120:/:<#> lun perm all_lun ro grp node1
```

## lun default

### Description

Sets up the LUN default permission. The default permission for an unregistered LUN is none.

### Usage

```
lun default lun lun-no. rw
lun default lun lun-no. ro
lun default lun lun-no. none
lun default all_lun rw
lun default all_lun ro
lun default all_lun none
```

### Parameters

**TABLE 7-33** lun default Command Options and Parameters

Parameter	Function
<i>lun-no.</i>	Specifies a LUN number such as 0, 1, 2, 3, ... 63.

### Example

- The first example sets up the read and write default permission for LUN 3.

```
6120:/:<#> lun default lun 3 rw
```

- The second example sets up the read-only default permission for all LUNs.

```
6120:/:<#> lun default all_lun ro
```

lun wwn list

### Description

Lists all registered WWNs.

### Usage

```
lun wwn list
```

### Example

```
6120:/:<#> lun wwn list
List of all registered WWNs
-----
2002067890123456
2002078901234567
2002089012345678
2002090123456789
```

lun wwn rm

### Description

Removes the specified WWN from the system database.

### Usage

```
lun wwn rm wwn wwn-no.
```

### Parameters

**TABLE 7-34** lun wwn rm Command Options and Parameters

Parameter	Function
<i>wwn-no.</i>	Specifies a world wide name. This is a unique 8-byte port WWN of an HBA Fibre Channel port. The WWN must be exactly 16 alphanumeric characters consisting of a-f, A-F, and 0-9.



## Example

In this example, running the `lun wwn list` command shows the registered WWNs. The first WWN is then removed with the `lun wwn rm` command. The result is then verified.

```
6120/!<#> lun wwn list
List of all registered WWNs
-----
2002067890123456
2002078901234567
2002089012345678
2002090123456789

6120/!<#> lun wwn rm wwn 2002067890123456
2002067890123456 will get default access right.
Do you want to remove? (Y/N)[n]:Y

6120/!<#> lun wwn list
List of all registered WWNs
-----
2002078901234567
2002089012345678
2002090123456789
```

```
lun wwn rm all
```

### Description

Removes all registered WWNs from the system database. The default LUN access permission applies to all unregistered WWNs.

### Usage

```
lun wwn rm all
```

## Example

In this example, running the `lun wwn list` command shows the registered WWNs. The WWNs are then removed with the `lun wwn rm all` command. The result is then verified.

```
6120:/:<#> lun wwn list
List of all registered WWNs
-----
2002067890123456
2002078901234567
2002089012345678
2002090123456789

6120:/:<#> lun wwn rm all
Are you sure? (Y/N)[n]:Y

6120:/:<#> lun wwn list
List of all registered WWNs
-----
```

ntp

---

**Note** – Each of the commands listed in the usage statement of this section is described in its own section.

---

## Description

Summary: Display or modify NTP settings (not reentrant, not locked).

Displays:

- The NTP server IP address
- The polling on/off status
- The polling interval in minutes

## Usage

```
ntp -v
ntp stats
ntp server [dotted decimal]
ntp poll [off | unicast]
ntp interval [1..60]
```

## Parameters

Parameter	Function
-v	Prints the ntpdate version that was ported from the Solaris OS.

## Example

```
6120:/:<#> ntp
server      nnn.nnn.nnn.nnn
poll        off
interval    5
```

ntp stats

## Description

Displays:

- The time of the last poll
- The NTP server IP address
- The adjustment made to the array internal clock
- The clock set success statement

## Usage

```
ntp stats
```

## Example

```
6120:/:<#> ntp stats
lastpoll    Tue Feb 19 21:07:32 GMT 2002
server      nnn.nnn.nnn.nnn
offset      + 0.00413176
status      Successfully adjusted the time.
```

## ntp poll

### Description

Turns NTP polling on and off.

### Usage

```
ntp poll unicast
```

```
ntp poll off
```

### Parameters

**TABLE 7-35** ntp poll Command Options and Parameters

Parameter	Function
unicast	Turns polling on.
off	Turns polling off.

### Example

```
6120:/:<#> ntp poll unicast
```

## ntp interval

### Description

Sets the polling interval from 1 to 60 minutes. The default is 10 minutes.

### Usage

```
ntp interval time
```

### Parameters

**TABLE 7-36** ntp interval Command Options and Parameters

Parameter	Function
<i>time</i>	Sets polling interval time in minutes from 1 to 60.

## Example

```
6120:/:<#> ntp interval 5
```

ntp server

### Description

Establishes the server that is running the Network Time Protocol daemon in the array firmware.

### Usage

```
ntp server IP_address
```

### Parameters

TABLE 7-37 ntp server Command Options and Parameters

Parameter	Function
<i>IP_address</i>	Specifies the IP address of the server running the NTP daemon.

### Example

```
6120:/:<#> ntp server nnn.nnn.nnn.nnn
```

ofdg

### Description

Summary: Offline loop diagnostics (not reentrant, not locked).

A utility to perform back-end loop diagnostics. All non-u1 disks must be assigned to a volume to perform this diagnostic. Test output is displayed in the `syslog` file. This test does not detect missing interconnect cables.

---

**Note** – This command is to be used by authorized service personnel only!

---

Do not run this command while online. Be sure that the system is offline before running the `ofdg` command.

## Usage

```
ofdg [-y] health_check
ofdg [-y] fast_test uencid1[1 | 2]
ofdg [-y] fast_find uencid1[1 | 2]
ofdg [-y] find uencid1[1 | 2]
```

## Parameters

**TABLE 7-38** ofdg Command Options and Parameters

Parameter	Function
health_check	Performs a fast test on all detected loops in an HA configuration.
fast_test	Performs a nondisruptive, fast loop test on the specified loop. Disk path failovers are not performed with this test.
fast_find	Performs a loop test on HA configurations, providing limited detection of bad FRUs. Use the <code>fast_find</code> option before using the <code>find</code> option to eliminate interconnect cards, interconnect cables, and controller cards as possible bad FRUs. This test reconfigures loops and performs disk path failovers.
find	Performs a loop test on all loops in an HA configuration and provides loop fault diagnostics, which have the capability to isolate a FRU problem to a single disk port. Use the <code>find</code> option only after using the <code>fast_find</code> option. This test reconfigures loops and bypasses disk ports.
-y	Provides an affirmative answer to the command prompt: WARNING - Volume data will be offline while OFDG is running. Continue? [N]:
uencid, 1	See <a href="#">“FRU Identifiers” on page 182</a> .

port

## Description

Summary: Configure the interface port (not reentrant, not locked).

This is a port management utility.

## Usage

```
port list
port set port targetid target-id-value | s[oft]
```

```
port host port sun | other
```

```
port listmap [port]
```

## Parameters

**TABLE 7-39** port Command Options and Parameters

Parameter	Function
<code>list</code>	Displays the configuration of the ports.
<code>set</code>	Modifies port parameters and changes the port target ID value. Any changes to the target ID require a reset for the changes to take effect.
<code>host</code>	Whenever attaching to a Solaris OS 2.6 host, add the option <code>sun</code> to the end of the <code>port host</code> command. For example: <code>port host u1p1</code>
<code>listmap</code>	Shows the current mappings between host interface ports and LUNS and volumes.
<i>port</i>	Specifies the port. The format is: <code>uarraypportindex</code> . Examples: <code>u1p1</code> , <code>u2p1</code>
<i>target-id-value</i>	Specifies the target ID (FC-AL ALPA). Valid values are from 0 to 125; the optional argument <code>s</code> means soft-addressing.

## Example

```
6120:/:<#> port list
```

port	targetid	addr_type	status	host	wwn
ulp1	1	hard	online	sun	20030003ba27d799
u3p1	3	hard	online	sun	2003000000000003

```
6120:/:<#> port listmap
```

port	targetid	addr_type	lun	volume	owner	access
ulp1	1	hard	0	v0	u1	primary
ulp1	1	hard	1	v0	u1	primary
ulp1	1	hard	2	v0	u1	primary
- - - - - (items omitted in example)						
u3p1	3	hard	60	v3	u1	primary
u3p1	3	hard	61	v3	u1	primary
u3p1	3	hard	62	v3	u1	primary
u3p1	3	hard	63	v3	u1	primary

```
6120:/:<#> port set ulp1 targetid 6
```

proc

## Description

Summary: Display or kill pending vol command (not reentrant, not locked).

Displays the status of outstanding vol processes.

## Usage

```
proc list [cmd-ref | vol-name]
```

```
proc kill cmd-ref | vol-name
```



## Parameters

TABLE 7-40 `proc` Command Options and Parameters

Parameter	Function
<code>list</code>	Displays the command reference number of an active <code>vol init</code> , <code>vol verify</code> or <code>vol recon</code> command currently in progress.
<code>kill</code>	Terminates the active <code>vol init</code> , <code>vol verify</code> or <code>vol recon</code> command by specifying its command reference number.
<code>cmd-ref</code>	Specifies the command reference number.
<code>vol-name</code>	Specifies the volume name.

## refresh

### Description

**Summary:** Start/stop battery refreshing or display its status (not reentrant, not locked).

Starts the battery refresh operation on all power and cooling unit 1 batteries, followed by all power and cooling unit 2 batteries. This operation consists of discharging and recharging each power and cooling unit battery. Battery refresh takes several hours for each power and cooling unit.

An automatic battery refresh cycle is performed once every 28 days; the cycle frequency is specified in the `/etc/bat.conf` file on the array. A manual battery refresh cycle is not required. During this cycle, one battery is always fully charged. A battery refresh cycle will not begin unless both batteries are in optimal condition.

### Usage

```
refresh -c
```

```
refresh -s
```

```
refresh -i
```

```
refresh -k
```

## Parameters

**TABLE 7-41** refresh Command Options and Parameters

Parameter	Function
-c	Starts the refresh cycle.
-s	Reports the refresh cycle status.
-i	Directs the scheduler to reload the battery configuration file. For field service use only.
-k	Kills the current refreshing task.

## Example

```
6120:/:<#> refresh -s

Current Date and Time: Sun Feb 23 11:50:25 GMT 2003
Next Scheduled Refresh: Sun Mar 02 02:00:44 GMT 2003

Battery      State                Warranty Expiration
-----      -
u1b1        Normal                Sat Jan 01 00:00:00 GMT 2005
u1b2        Normal                Sat Jan 01 00:00:00 GMT 2005
u2b1        Normal                Sat Jan 01 00:00:00 GMT 2005
u2b2        Normal                Sat Jan 01 00:00:00 GMT 2005
u3b1        Normal                Sat Feb 05 12:18:44 GMT 2005
u3b2        Normal                Sat Feb 05 12:18:44 GMT 2005
u4b1        Normal                Sat Jan 01 00:00:00 GMT 2005
u4b2        Normal                Sat Jan 01 00:00:00 GMT 2005
```

reset

## Description

Summary: Reset system (reentrant, not locked).

Use the `sync` command before a `reset` command. See [“sync” on page 259](#). This command can take several minutes to run.

## Usage

```
reset [-y]
```

## Parameters

**TABLE 7-42** `reset` Command Options and Parameters

Parameter	Function
<code>-y</code>	Answers “yes” when prompted to perform reset.

## `savecore`

### Description

Summary: Manage crash dump images (not reentrant, not locked).

The `savecore` command manages dump images, and allows these images to be uploaded to the external host given by the array’s `tftp host` variable using the Trivial File Transfer Protocol (TFTP). In a high-availability configuration, the `savecore` command may only be executed from the master controller.

---

**Note** – Stage-2 dumps residing on disks in the alternate master are accessible from the master controller.

---

---

**Note** – This command is to be used by authorized service personnel only!

---

### Usage

```
savecore list [u<1-8>]
savecore list [u<1-8>]d[<1-9>]
savecore remove u<1-8>
savecore remove u<1-8>d<1-9>
savecore restore u<1-8>
savecore restore u<1-8>d<1-9>
savecore upload u<1-8> [hostname]
savecore upload u<1-8>d<1-9> [hostname]
```

## set

### Description

Summary: Display or modify the set information (not reentrant, not locked).

Sets and displays the boot parameters. Without any parameters, the set command shows the values of the parameters.

```
6120:/:<#> set
bootmode auto
bootdelay 3
ip nnn.nnn.nnn.nnn
netmask 255.255.255.0
gateway nnn.nnn.nnn.nnn
tftpghost nnn.nnn.nnn.nnn
tftpfile t413_300b19.bin
hostname array00
timezone GMT00
logto /syslog (* in nvram)
loglevel 3
rarp on
mac 00:03:ba:27:d7:99
```

### Usage

```
set bootmode auto | tftp | none
```

```
set bootdelay seconds
```

```
set ip dotted-decimal
```

```
set netmask dotted-decimal
```

```
set gateway dotted-decimal
```

```
set tftpghost dotted-decimal
```

```
set tftpfile string39
```

```
set hostname string39
```

```
set timezone string80
```

```
set logto 1 | * | /filename
```

```
set loglevel 0 | 1 | 2 | 3 | 4
```

```
set rarp on | off
```

```
set banner string81 | default
```

## Parameters

---

**Note** – If you change the array’s network settings, make sure that your network’s physical connectivity and settings match these new array settings.

---

**TABLE 7-43** set Command Options and Parameters

Parameter	Function
bootmode	Defines how the array is booted: <ul style="list-style-type: none"><li>• Use <code>auto</code> boot for loading the RAID software from the local drives. This is the default mode.</li><li>• If <code>bootmode</code> is using <code>tftp</code>, use <code>tftphost</code> and <code>tftpfile</code>. (Field service procedure only.)</li><li>• If <code>bootmode</code> is set to <code>none</code>, use system EPROM command line. (Field service procedure only.)</li></ul>
bootdelay	Specifies the delay time, in seconds, to start a system boot. This command is used for troubleshooting. <i>The default <code>bootdelay</code> parameter for the array is set to a value of 3. To avoid problems with booting the array, do not reset the <code>bootdelay</code> parameter to a higher value than the default setting.</i>
ip	Specifies the network IP address. The <i>value</i> is expressed in dotted decimal notation (for example, <i>nnn.nnn.nnn.nnn</i> ).
netmask	The subnet mask for the network. The <i>value</i> is expressed in dotted decimal notation (for example, 255.255.255.0).
gateway	The default gateway on the network. The <i>value</i> is expressed in dotted decimal notation (for example, <i>nnn.nnn.nnn.nnn</i> ).
tftphost	The IP address of the server from which a <code>tftp</code> boot should be performed. (Field service procedure only.)
tftpfile	The file name on the <code>tftpboot</code> server that contains the RAID software. The <i>value</i> is a string of up to 39 characters. (Field service procedure only.)
hostname	The user-assigned name of the array.

**TABLE 7-43** set Command Options and Parameters (Continued)

Parameter	Function
logto	<p>The file where messages are to be logged:</p> <ul style="list-style-type: none"><li>• If <code>logto</code> is set to 1, logging occurs only through the serial port; log messages are not sent to the <code>/syslog</code> file.</li><li>• If <code>logto</code> is set to *, and an <code>/etc/syslog.conf</code> entry specifies an output file name that already exists, the array appends new log information to the end of that output file. If the output file specified in <code>/etc/syslog.conf</code> doesn't exist, the array creates a new file with that name. If the output file does not exist and cannot be created, the entry will be ignored.</li></ul> <p>Note: If there are changes to the <code>/etc/syslog.conf</code> file, you must type <code>set logto *</code> for those changes to take effect.</p> <ul style="list-style-type: none"><li>• If <code>logto</code> is set to <code>/filename</code>, and the specified file name does not exist, the array creates a new file with that name. If the file name already exists, the array appends new log information to the end of the existing file. If the file name does not exist and cannot be created, the array will attempt to open or create the default syslog file <code>/syslog</code>. If both <code>/filename</code> and <code>/syslog</code> cannot be opened, logging occurs through the serial port only.</li></ul>
loglevel	The level of messages to be logged (0=none, 1=errors, 2=warnings/errors, 3=notices/warnings/errors, 4=informational/notices/warnings/errors).
timezone	See TABLE 7-45 for a list of timezone entries.
rarp	If enabled and connected to a rarp server, sets the IP address.

## set timezone

### Description

Sets the time zone of the Server that is running the NTP daemon. The time zone region codes are provided in TABLE 7-45.

### Usage

```
set timezone :region
```

## Parameters

**TABLE 7-44** `set timezone` Command Options and Parameters

Parameter	Function
<i>region</i>	Establishes the timezone for the system. See TABLE 7-45.

### Example

```
6120:/:<#> set timezone :America/Los_Angeles
```

**TABLE 7-45** Olson Time Zone Regions

Africa/Abidjan	Africa/Accra	Africa/Addis_Ababa	Africa/Algiers
Africa/Asmera	Africa/Bamako	Africa/Bangui	Africa/Banjul
Africa/Bissau	Africa/Blantyre	Africa/Brazzaville	Africa/Bujumbura
Africa/Cairo	Africa/Casablanca	Africa/Ceuta	Africa/Conakry
Africa/Dakar	Africa/Dar_es_Salaam	Africa/Djibouti	Africa/Douala
Africa/El_Aaiun	Africa/Freetown	Africa/Gaborone	Africa/Harare
Africa/Johannesburg	Africa/Kampala	Africa/Khartoum	Africa/Kigali
Africa/Kinshasa	Africa/Lagos	Africa/Libreville	Africa/Lome
Africa/Luanda	Africa/Lubumbashi	Africa/Lusaka	Africa/Malabo
Africa/Maputo	Africa/Maseru	Africa/Mbabane	Africa/Mogadishu
Africa/Monrovia	Africa/Nairobi	Africa/Ndjamena	Africa/Niamey
Africa/Nouakchott	Africa/Ouagadougou	Africa/Porto-Novo	Africa/Sao_Tome
Africa/Timbuktu	Africa/Tripoli	Africa/Tunis	Africa/Windhoek
America/Adak	America/Anchorage	America/Anguilla	America/Antigua
America/Araguaina	America/Aruba	America/Asuncion	America/Atka
America/Barbados	America/Belem	America/Belize	America/Boa_Vista

**TABLE 7-45 Olson Time Zone Regions (Continued)**

America/Bogota	America/Boise	America/ Buenos_Aires	America/ Cambridge_Bay
America/Cancun	America/Caracas	America/ Catamarca	America/Cayenne
America/Cayman	America/Chicago	America/ Chihuahua	America/Cordoba
America/ Costa_Rica	America/Cuiaba	America/Curacao	America/ Denmarkshavn
America/Dawson	America/ Dawson_Creek	America/Denver	America/Detroit
America/Dominica	America/Edmonton	America/Eirunepe	America/El_Salvador
America/Ensenada	America/ Fort_Wayne	America/Fortaleza	America/Glace_Bay
America/Godthab	America/ Goose_Bay	America/ Grand_Turk	America/Grenada
America/ Guadeloupe	America/ Guatemala	America/Guayaquil	America/Guyana
America/Halifax	America/Havana	America/ Hermosillo	America/Indiana
America/Indiana/ Indianapolis	America/Indiana/ Knox	America/Indiana/ Marengo	America/Indiana/ Vevay
America/ Indianapolis	America/Inuvik	America/Iqaluit	America/Jamaica
America/Jujuy	America/Juneau	America/Kentucky	America/Kentucky/ Louisville
America/Kentucky /Monticello	America/Knox_IN	America/La_Paz	America/Lima
America/ Los_Angeles	America/Louisville	America/Maceio	America/Managua
America/Manaus	America/ Martinique	America/Mazatlan	America/Mendoza
America/ Menominee	America/Merida	America/ Mexico_City	America/Miquelon
America/ Monterrey	America/ Montevideo	America/Montreal	America/Montserrat
America/Nassau	America/ New_York	America/Nipigon	America/Nome



**TABLE 7-45 Olson Time Zone Regions (Continued)**

America/Noronha	America/ North_Dakota	America/ North_Dakota/ Center	America/Panama
America/ Pangnirtung	America/Paramaribo	America/Phoenix	America/Port-au-Prince
America/Port_of_Spain	America/ Porto_Acre	America/ Porto_Velho	America/Puerto_Rico
America/ Rainy_River	America/ Rankin_Inlet	America/Recife	America/Regina
America/ Rio_Branco	America/Rosario	America/Santiago	America/ Santo_Domingo
America/Sao_Paulo	America/ Scoresbysund	America/Shiprock	America/St_Johns
America/St_Kitts	America/St_Lucia	America/ St_Thomas	America/St_Vincent
America/ Swift_Current	America/ Tegucigalpa	America/Thule	America/Thunder_Bay
America/Tijuana	America/Tortola	America/ Vancouver	America/Virgin
America/ Whitehorse	America/Winnipeg	America/Yakutat	America/Yellowknife
Antarctica	Antarctica/Casey	Antarctica/Davis	Antarctica/ DumontDURville
Antarctica/Mawson	Antarctica/ McMurdo	Antarctica/Palmer	Antarctica/South_Pole
Antarctica/Syowa	Antarctica/Vostok	Arctic/ Longyearbyen	Asia/Aden
Asia/Almaty	Asia/Amman	Asia/Anadyr	Asia/Aqtau
Asia/Aqtobe	Asia/Ashgabat	Asia/Ashkhabad	Asia/Baghdad
Asia/Bahrain	Asia/Baku	Asia/Bangkok	Asia/Beirut
Asia/Bishkek	Asia/Brunei	Asia/Calcutta	Asia/Choibalsan
Asia/Chongqing	Asia/Chungking	Asia/Colombo	Asia/Dacca
Asia/Damascus	Asia/Dhaka	Asia/Dili	Asia/Dubai
Asia/Dushanbe	Asia/Gaza	Asia/Harbin	Asia/Hong_Kong
Asia/Hovd	Asia/Irkutsk	Asia/Istanbul	Asia/Jakarta
Asia/Jayapura	Asia/Jerusalem	Asia/Kabul	Asia/Kamchatka

**TABLE 7-45 Olson Time Zone Regions (Continued)**

Asia/Karachi	Asia/Kashgar	Asia/Katmandu	Asia/Krasnoyarsk
Asia/ Kuala_Lumpur	Asia/Kuching	Asia/Kuwait	Asia/Macao
Asia/Magadan	Asia/Manila	Asia/Muscat	Asia/Nicosia
Asia/Novosibirsk	Asia/Omsk	Asia/Phnom_Penh	Asia/Pontianak
Asia/Pyongyang	Asia/Qatar	Asia/Rangoon	Asia/Riyadh
Asia/Riyadh87	Asia/Riyadh88	Asia/Riyadh89	Asia/Saigon
Asia/Sakhalin	Asia/Samarkand	Asia/Seoul	Asia/Shanghai
Asia/Singapore	Asia/Taipei	Asia/Tashkent	Asia/Tbilisi
Asia/Tehran	Asia/Tel_Aviv	Asia/Thimbu	Asia/Thimphu
Asia/Tokyo	Asia/ Ujung_Pandang	Asia/Ulaanbaatar	Asia/Ulan_Bator
Asia/Urumqi	Asia/Vientiane	Asia/Vladivostok	Asia/Yakutsk
Asia/Yekaterinburg	Asia/Yerevan	Atlantic/Azores	Atlantic/Bermuda
Atlantic/Canary	Atlantic/ Cape_Verde	Atlantic/Faeroe	Atlantic/Jan_Mayen
Atlantic/Madeira	Atlantic/Reykjavik	Atlantic/ South_Georgia	Atlantic/St_Helena
Atlantic/Stanley	Australia	Australia/ACT	Australia/Adelaide
Australia/Brisbane	Australia/ Broken_Hill	Australia/Canberra	Australia/Darwin
Australia/Hobart	Australia/LHI	Australia/ Lindeman	Australia/Lord_Howe
Australia/ Melbourne	Australia/NSW	Australia/North	Australia/Perth
Australia/ Queensland	Australia/South	Australia/Sydney	Australia/Tasmania
Australia/Victoria	Australia/West	Australia/ Yancowinna	Brazil/Acre
Brazil/DeNoronha	Brazil/East	Brazil/West	CET
CST6CDT	Canada/Atlantic	Canada/Central	Canada/East- Saskatchewan
Canada/Eastern	Canada/Mountain	Canada/ Newfoundland	Canada/Pacific
Canada/ Saskatchewan	Canada/Yukon	Chile/Continental	Chile/EasterIsland

**TABLE 7-45 Olson Time Zone Regions (Continued)**

Cuba	EET	EST	EST5EDT
Egypt	Eire	Etc/GMT	Etc/GMT+0
Etc/GMT+1	Etc/GMT+10	Etc/GMT+11	Etc/GMT+12
Etc/GMT+2	Etc/GMT+3	Etc/GMT+4	Etc/GMT+5
Etc/GMT+6	Etc/GMT+7	Etc/GMT+8	Etc/GMT+9
Etc/GMT-0	Etc/GMT-1	Etc/GMT-10	Etc/GMT-11
Etc/GMT-12	Etc/GMT-13	Etc/GMT-14	Etc/GMT-2
Etc/GMT-3	Etc/GMT-4	Etc/GMT-5	Etc/GMT-6
Etc/GMT-7	Etc/GMT-8	Etc/GMT-9	Etc/GMT0
Etc/Greenwich	Etc/UCT	Etc/UTC	Etc/Universal
Etc/Zulu	Europe/ Amsterdam	Europe/Andorra	Europe/Athens
Europe/Belfast	Europe/Belgrade	Europe/Berlin	Europe/Bratislava
Europe/Brussels	Europe/Bucharest	Europe/Budapest	Europe/Chisinau
Europe/ Copenhagen	Europe/Dublin	Europe/Gibraltar	Europe/Helsinki
Europe/Istanbul	Europe/ Kaliningrad	Europe/Kiev	Europe/Lisbon
Europe/Ljubljana	Europe/London	Europe/ Luxembourg	Europe/Madrid
Europe/Malta	Europe/Minsk	Europe/Monaco	Europe/Moscow
Europe/Nicosia	Europe/Oslo	Europe/Paris	Europe/Prague
Europe/Riga	Europe/Rome	Europe/Samara	Europe/San_Marino
Europe/Sarajevo	Europe/Simferopol	Europe/Skopje	Europe/Sofia
Europe/Stockholm	Europe/Tallinn	Europe/Tirane	Europe/Tiraspol
Europe/Uzhgorod	Europe/Vaduz	Europe/Vatican	Europe/Vienna
Europe/Vilnius	Europe/Warsaw	Europe/Zagreb	Europe/Zaporozhye
Europe/Zurich	GB	GB-Eire	GMT
GMT+0	GMT-0	GMT0	Greenwich
HST	Hongkong	Iceland	Indian/Antananarivo
Indian/Chagos	Indian/Christmas	Indian/Cocos	Indian/Comoro
Indian/Kerguelen	Indian/Mahe	Indian/Maldives	Indian/Mauritius
Indian/Mayotte	Indian/Reunion	Iran	Israel

**TABLE 7-45 Olson Time Zone Regions (Continued)**

Jamaica	Japan	Kwajalein	Libya
MET	MST	MST7MDT	Mexico/BajaNorte
Mexico/BajaSur	Mexico/General	Mideast/Riyadh87	Mideast/Riyadh88
Mideast/Riyadh89	NZ	NZ-CHAT	Navajo
PRC	PST8PDT	Pacific/Apia	Pacific/Auckland
Pacific/Chatham	Pacific/Easter	Pacific/Efate	Pacific/Enderbury
Pacific/Fakaofu	Pacific/Fiji	Pacific/Funafuti	Pacific/Galapagos
Pacific/Gambier	Pacific/Guadalcanal	Pacific/Guam	Pacific/Honolulu
Pacific/Johnston	Pacific/Kiritimati	Pacific/Kosrae	Pacific/Kwajalein
Pacific/Majuro	Pacific/Marquesas	Pacific/Midway	Pacific/Nauru
Pacific/Niue	Pacific/Norfolk	Pacific/Noumea	Pacific/Pago_Pago
Pacific/Palau	Pacific/Pitcairn	Pacific/Ponape	Pacific/Port_Moresby
Pacific/Rarotonga	Pacific/Saipan	Pacific/Samoa	Pacific/Tahiti
Pacific/Tarawa	Pacific/Tongatapu	Pacific/Truk	Pacific/Wake
Pacific/Wallis	Pacific/Yap	Poland	Portugal
ROC	ROK	Singapore	SystemV/AST4
SystemV/AST4ADT	SystemV/CST6	SystemV/CST6CDT	SystemV/EST5
SystemV/EST5EDT	SystemV/HST10	SystemV/MST7	SystemV/MST7MDT
SystemV/PST8	SystemV/PST8PDT	SystemV/YST9	SystemV/YST9YDT
Turkey	UCT	US/Alaska	US/Aleutian
US/Arizona	US/Central	US/East-Indiana	US/Eastern
US/Hawaii	US/Indiana-Starke	US/Michigan	US/Mountain
US/Pacific	US/Pacific-New	US/Samoa	UTC
Universal	W-SU	WET	Zulu

## shutdown

### Description

Summary: Shutdown system (not reentrant, not locked).

The shutdown command performs a controlled shutdown of the array and any array connected to it.

## Usage

shutdown [-y]

## Parameters

**TABLE 7-46** shutdown Command Options and Parameters

Parameter	Function
-y	Answers “yes” when prompted to perform a shutdown.

## sim\_diag

### Description

Summary: Display sim\_diag Echo/Loopback command information (not reentrant, not locked).

This is a diagnostic command for use by Sun-authorized personnel.

### Usage

sim\_diag echo <Primary|Alternate> <fabric\_controller> <payload pattern1> <payload pattern2> <payload size>

sim\_diag loopback <Primary|Alternate> <0|1|2> <Loopback path> <payload pattern1> <payload pattern2> <payload size> <iterations>

## sun

### Description

Summary: Enable access to Sun-only commands (not reentrant, not locked).

This command provides access to Sun-only commands and requires a password. This command is used only by Sun-authorized personnel.

## sys

### Description

Summary: Display or modify the system information (not reentrant, not locked).

This utility manages system information. See [“Setting Global Parameters” on page 17](#) for more information.

## Usage

```
sys list
sys stat
sys blocksize <4K | 8K | 16k | 32k | 64k>
sys cache <auto | writebehind | writethrough | off>
sys mirror <auto | off>
sys mp_support <none | rw | mpxio | std>
sys naca <off | on>
sys rd_ahead <on | off>
sys recon_rate <high | med | low>
sys fc_topology [<auto | loop | fabric_p2p>]
sys fc_speed [<auto | 1 | 2> <cable | force>]
    cable = change speed on cable pullor next link reset
    force = change speed now
```

## Parameters

**TABLE 7-47** `sys` Command Options and Parameters

Parameter	Function
<code>list</code>	Displays the current controller configuration.
<code>stat</code>	Displays the current controller status.
<code>blocksize</code>	Sets the system block size, which equals the stripe unit size. This is the amount of data written to each drive when striping data across drives. The block size can be changed only when there are no volumes defined.
<code>cache</code>	Sets the system caching policy.
<code>mirror</code>	Turns the cache mirror feature on or off when using dual controllers.

**TABLE 7-47** `sys` Command Options and Parameters (Continued)

Parameter	Function
<code>mp_support</code>	<ul style="list-style-type: none"><li>• If <code>mp_support</code> is set to <code>none</code>, multipathing support is disabled.</li><li>• If <code>mp_support</code> is set to <code>rw</code>, multipathing support is enabled. Use this mode for single-host configurations when using VERITAS Volume Manager with dynamic multipathing (DMP).</li><li>• If <code>mp_support</code> is set to <code>mpxio</code>, this setting supports Sun StorEdge Traffic Manager software's multipathing utility in single- or multi-host configurations. This setting is required for all high-availability configurations in Sun Cluster environments. This setting can be used with VERITAS.</li><li>• The <code>std</code> option is reserved.</li></ul>
<code>rd_ahead</code>	Sets the number of sequential read commands before automatically switching to datablock read ahead. Set to <code>off</code> to always perform datablock read ahead.
<code>recon_rate</code>	The disk drive reconstruction rate options: <code>high</code> , <code>medium</code> , or <code>low</code> . Higher <code>recon_rate</code> settings have a greater impact on system performance, but reconstruction is faster.
<code>naca</code>	Enables IBM/AIX support.
<code>fc_topology</code>	Fibre Channel topology selection, see TABLE 7-48 for options.
<code>fc_speed</code>	If set to <code>auto</code> , the array determines the speed of the Fibre Channel automatically. If set to <code>1</code> or <code>2</code> , the speed of the array is set to 1Gbit/sec or to 2Gbit/sec. The <code>cable</code> option causes any change in the <code>fc_speed</code> setting to take effect upon the next cable pull or the next link reset. The <code>force</code> option forces the speed setting to change immediately. Note that if you enter <code>sys list</code> , the actual speed is displayed, not the setting.

## Example

This example shows the result of typing `sys list`.

```
6120:/:<#> sys list
controller      : 2.5
blocksize       : 16k
cache           : auto
mirror          : auto
mp_support      : mpxio
naca            : off
rd_ahead        : on
recon_rate      : med
sys memsize     : 128 MBytes
cache memsize   : 1024 MBytes
fc_topology     : auto
fc_speed        : 2Gb
```

`sys fc_topology`

### Description

Without any parameter, this command displays the current negotiated topology.

With a parameter selected, this command sets the array topology firmware mode.

### Usage

```
sys fc_topology
sys fc_topology auto
sys fc_topology loop
sys fc_topology fabric_p2p
```

### Parameters

**TABLE 7-48** Fibre Channel Topology Options

Parameter	Function
auto	Enables the controller firmware to automatically determine and set the topology firmware mode.
loop	Sets the loop topology firmware mode.
fabric_p2p	Sets the point-to-point topology firmware mode.



---

**Note** – When using `loop` or `fabric_p2p` modes, make sure that the switches are set in the same way.

---

---

**Note** – Normally the automatic mode is set. The other modes can be used for special situations or for troubleshooting.

---

### Example

- This example displays the current negotiated network topology.

```
6120:/:<#> sys fc_topology
Host port ulp1 Current Negotiated Topology=Auto
Point to Point, Port ID=100300
```

- This example sets up the array topology firmware mode to automatic sense and set.

```
6120:/:<#> sys fc_topology auto
```

tzset

### Description

Summary: Display or modify the timezone information (not reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the array.

### Usage

```
tzset [[+|-]hh00]
```

ver

### Description

Summary: Display software version (not reentrant, not locked).

Displays the current version of controller firmware on an array.

### Usage

ver

### Example

```
6120 Release 3.0.3 Mon Mar 10 15:47:42 PST 2003 (nnn.nnn.nnn.nnn)
Copyright (C) 1997-2003 Sun Microsystems, Inc.
All Rights Reserved.
```

vol

### Description

Summary: Display or modify the volume information (not reentrant, not locked).

This command manages volumes.

### Usage

```
vol list [name]
```

```
vol stat [name]
```

```
vol mode [name]
```

```
vol add name data drives raid 0 | 1 | 5 [standby drive]
```

```
vol init name data | sysarea
```

```
vol mount name
```

```
vol unmount name
```

```
vol [-y] remove name
```

```
vol verify name [fix] [rate <1-8>]
```

```
vol recon drive [to-standby | from-standby]
```

```
vol disable drive [to-standby]
```

## Parameters

TABLE 7-49 vol Command Options and Parameters

Parameter	Function
add	Configures a new volume by assigning it data and hot spare (standby) drives. The data drives cannot already be assigned to any other volume. The hot spare (standby) drive can be shared by multiple volumes.
disable	Marks the specified drive unusable. If the <code>to-standby</code> argument is included, data is first reconstructed onto the hot spare (standby) drive (if available), and then it is disabled. The volume must be mounted for this command.
init	<p>Initializes the volume or system area label.</p> <p>Initialization takes about 9.6 seconds per gigabyte of physical disk being configured regardless of RAID level.</p> <p>Example times required to initialize a volume:</p> <ul style="list-style-type: none"><li>• RAID 5 using five 36Gbyte disks: Time to Initialize: <math>(36\text{Gbyte} * 5 \text{ disks}) * 9.6\text{sec}/\text{Gbyte} * 1\text{min}/60\text{sec} = 29 \text{ minutes}</math> Approximate Volume Capacity: <math>(36\text{Gbyte} * 4 \text{ disks w/1 drive used for parity}) = 144\text{Gbyte}</math></li><li>• RAID 1 using 5 36Gbyte disks: Time to Initialize: <math>(36\text{Gbyte} * 5 \text{ disks}) * 9.6\text{sec}/\text{Gbyte} * 1\text{min}/60\text{sec} = 29 \text{ minutes}</math> Approximate Volume Capacity: <math>(36\text{Gbyte} * 5 \text{ disks}) / 2 \text{ (for mirroring)} = 90\text{Gbyte}</math></li><li>• RAID 0 using 5 36Gbyte disks: Time to Initialize: <math>(36\text{Gbyte} * 5 \text{ disks}) * 9.6\text{sec}/\text{Gbyte} * 1\text{min}/60\text{sec} = 29 \text{ minutes}</math> Approximate Volume Capacity: <math>(36\text{Gbyte} * 5 \text{ disks}) = 180\text{Gbyte}</math></li></ul> <p>This argument specifies the initialize option to be performed on the selected volume:</p> <ul style="list-style-type: none"><li>• <code>data</code> - Initializes the entire data area. This operation will destroy all user data on the volume. It will take several minutes to complete.</li><li>• <code>sysarea</code> - Initializes the system area with correct private label information. This option is only for qualified service providers.</li></ul>
list	Displays the configuration of the currently assigned volumes.

**TABLE 7-49** vol Command Options and Parameters (Continued)

Parameter	Function
mode	Displays cache and mirror settings, and whether the volume is mounted.
mount	Mounts the volume so the host can access it.
recon	Rebuilds (reconstruct) the data of the specified drive. If the <code>to-standby</code> argument is included, data is written to the hot spare (standby) drive. If the <code>from-standby</code> argument is included, data is written back from the hot spare (standby). The volume must be mounted for this command. If necessary, the drive is spun up before reconstruction occurs. Following successful reconstruction, the disabled drive is re-enabled.
remove	Deletes a volume by unassigning the data and hot spare (standby) drives assigned to it. The drives can then be assigned to a different volume. The volume must be unmounted before it can be removed.
stat	Displays the operational status of a volume.
unmount	Unmounts the volume to disable access from the host.
verify	Enables an array administrator to execute manual parity checks on existing volumes. The default verification rate is 1 (minimum impact on data host). The verification rate can be set to a value from 1 to 8. Run the <code>vol verify</code> command before performing tape-backup overwrite cycles, approximately once every 30 days. If the <code>fix</code> option is specified and an error is detected, the <code>vol verify</code> command will regenerate parity from the existing data on the volume.
<code>-y remove</code>	Deletes a volume without prompting for verification to remove.
<i>name</i>	Specifies the volume name.
<i>drives</i>	Specifies the set of drives to be assigned to the volume.

## Examples

```
6120:/:<#> vol list
volume          capacity raid data      standby
v0              204.510 GB   1 u1d01-06   u1d14
v1              340.851 GB   5 u2d01-06   u2d14
v2              204.510 GB   1 u3d01-06   u3d14
v3              340.851 GB   5 u4d01-06   u4d14
```

```
6120:/:<#> vol list v0
volume          capacity raid data      standby
v0              204.510 GB   1 u1d01-06   u1d14
```

```
6120:/:<#> vol stat

v0: mounted
  u1d01: mounted
  - - - - - (items omitted in example)
  u1d06: mounted
  Standby: u1d14: mounted
v1: mounted
  u2d01: mounted
  - - - - - (items omitted in example)
  u2d06: mounted
  Standby: u2d14: mounted
v2: mounted
  u3d01: mounted
  - - - - - (items omitted in example)
  u3d06: mounted
  Standby: u3d14: mounted
v3: mounted
  u4d01: mounted
  - - - - - (items omitted in example)
  u4d06: mounted
  Standby: u4d14: mounted
```

```
6120:/:<#> vol stat v0

v0: mounted
  uld01: mounted
  uld02: mounted
  uld03: mounted
  uld04: mounted
  uld05: mounted
  uld06: mounted
  Standby: uld14: mounted
```

```
6120:/:<#> vol mode
volume      mounted cache      mirror
v0          yes      writebehind on
v1          yes      writebehind on
v2          yes      writebehind on
v3          yes      writebehind on
```

```
6120:/:<#> vol mode v0
volume      mounted cache      mirror
v0          yes      writebehind on
```

```
6120:/:<#> vol add vol-name data u5d1-8 raid 5 standby u5d14
```

## volslice

---

**Note** – Each of the commands listed in the usage statement of this section is described in its own section.

---

### Description

Summary: Display or modify the volume slice info (not reentrant, not locked).

### Usage

```
volslice create [slice-name [-s start] -z size vol-name]
```

```
volslice list [slice-name | -v volume-name]
```

```
volslice remove slice-name | -v volume-name
```

volslice create

### Description

Creates a volume slice. A maximum of 64 slices is allowed for an array or an array HA configuration.

---

**Note** – If you issue the `volslice create` command without any parameters, you will be interactively prompted to specify the parameters.

---

---

**Note** – The default permission of a newly created slice is `none`. You must set the permissions before a host can use it.

---

---

**Note** – When you create a slice, the actual size of the slice is rounded to the nearest stripe boundary.

---

### Usage

```
volslice create
```

```
volslice create slice-name -z size volume-name
```

```
volslice create slice-name -s start -z size volume-name
```

## Parameters

**TABLE 7-50** `volslice create` Command Options and Parameters

Parameter	Function
<i>slice-name</i>	Specifies the slice name such as s0, s1, s2, and s3. Can be any 12 (maximum) alphanumeric characters except a blank space.
<code>-z size</code>	Specifies the size of the block in Mbytes or Gbytes.
<i>volume-name</i>	Specifies the volume name such as v0, v1, v2, and v3.
<code>-s start</code>	In addition to the above options, this parameter can be used to specify the starting block. If it is not specified, the application will find the best fit for the specified slice size on the specified volume and create the slice accordingly. Use the <code>volslice list</code> command to find the starting block of unused space on a slice.

## Example

This example shows the interactive and manual methods to create a slice.

```
6120:/:<#> volslice create
volume    capacity    raid    data    standby
v1        50.020 GB    5       uld1-4  uld14
v2        50.020 GB    5       uld5-8  uld9
Select the volume to be sliced: v1
Slice     Slice Num    Start Blk    Size Blks    Capacity    Volume
-        -            0            143709696    50.020 GB  v1
Enter the name of slice to be created : s0
Do you want to specify the start block for slice ? [N]: n
Enter size of slice [ < size >gb ] : 5gb
1 out of Max. 64 slices created, 63 available.

6120:/:<#> volslice create s0 -s 1024 -z 5GB v1
1 out of Max. 64 slices created, 63 available.
```

## `volslice list`

### Description

Lists the details of all or specified volumes. If a slice name is provided, the details of that slice are displayed. If a volume name is provided, the details of the slices and unused portion on that volume are shown. With no options specified, the details of all volumes (slices and unused portion) are shown.



## Usage

```
volslice list
```

```
volslice list slice-name
```

```
volslice list -v volume-name
```

## Parameters

**TABLE 7-51** volslice list Command Options and Parameters

Parameter	Function
<i>slice-name</i>	Specifies the slice name such as s0, s1, s2, and s3.
-v <i>volume-name</i>	Specifies the volume name such as v0, v1, v2, and v3.

## Examples

- The first example lists the details of all slices (slices and unused portion) on all volumes.

```
6120:/:<#> volslice list
Slice      Slice Num   Start Blk   Size Blks   Capacity    Volume
s1         0           0           26768832    12.763 GB   v0
s2         1           26768832    26768832    12.763 GB   v0
----- (items omitted in example)
s18        17          44666880    44666880    21.298 GB   v1
s19        18          89333760    44666880    21.298 GB   v1
----- (items omitted in example)
s33        32          0           26748288    12.753 GB   v2
s34        33          26748288    26748288    12.753 GB   v2
----- (items omitted in example)
s49        48          0           44666880    21.298 GB   v3
s50        49          44666880    44666880    21.298 GB   v3
----- (items omitted in example)
s64        63          670003200   44810240    21.367 GB   v3
-          -           714813440   5120        2.500 MB    v3
```

- The second example lists the details of slice s62.

```
6120:/:<#> volslice list s62
Slice      Slice Num   Start Blk   Size Blks   Capacity    Volume
s62        61          580669440   44666880    21.298 GB   v3
```

- The third example lists the details of the slices and unused portion on volume v1.

```
6120:/:<#> volslice list -v v0
Slice          Slice Num      Start Blk      Size Blks      Capacity      Volume
s1             0              0              26768832       12.763 GB     v0
s2             1              26768832       26768832       12.763 GB     v0
- - - - - (items omitted in example)
s16            15             401532480      26768832       12.763 GB     v0
-             -              428301312      589824         288.000 MB     v0
```

volslice remove

### Description

Removes a volume slice. If a slice name is provided, the named slice is removed. If a volume name is provided, all slices of that volume are removed, with the underlying volume remaining intact.

This command also causes the slice information to be deleted from the disk and the dynamic data structure. All the Persistent Group Reservations (PGR) and LUN mapping and masking permissions are also deleted for the slice or for all slices in a volume if `-v volume-name` is used.

### Usage

```
volslice remove slice-name
```

```
volslice remove -v volume-name
```

### Parameters

**TABLE 7-52** volslice remove Command Options and Parameters

Parameter	Function
<i>slice-name</i>	Specifies the slice name such as s0, s1, s2, and s3..
-v <i>volume-name</i>	Specifies the volume name such as v0, v1, v2, and v3 for which all slices are to be removed.

## Example

- The first example removes slice name s4.

```
6120:/:<#> volslice remove s4  
WARNING - The slice will be deleted.  
Continue ? [N]: Y
```

- The second example removes all slices from volume v1.

```
6120:/:<#> volslice remove -v v1  
WARNING - All slices in the given volume will be deleted.  
Continue? [N]: Y
```

---

## Other Commands

The array's telnet CLI includes a number of commands that are very similar to or identical with the same command in UNIX or Solaris. This section documents these commands.

If you need additional information about the command, see the UNIX or Solaris man page.

---

**Note** – Commands are listed as either reentrant commands or as not reentrant. A reentrant command can be run in multiple telnet sessions, or CLI windows, to the same array.

---

arp

### Description

Summary: Display, set, and delete arp table entries (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

### Usage

```
arp host
```

```
arp -a
```

```
arp -d host
```

```
arp -s host ether_addr [temp]
```

```
arp -f filename
```

cat

### Description

Summary: Concatenate and display (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

## Usage

```
cat [-benstv] filename...
```

---

**Note** – Do not use the `cat` command on a long file because the command cannot be aborted.

---

cd

## Description

Summary: Change working directory (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command.

cmp

## Description

Summary: Perform a byte-by-byte comparison of two files (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

## Usage

```
cmp [-ls] file1 file2 [skip1] [skip2]
```

cp

## Description

Summary: Copy files (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

## Usage

```
cp [-i] src target; or: cp [-irR] src1 ... srcN directory
```

date

### **Description**

Summary: Display or set the date (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

### **Usage**

```
date [-u] [yyyymmddhhmm[.ss]]
```

du

### **Description**

Summary: Display disk blocks usage (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

### **Usage**

```
du [-as] [filename...]
```

df

### **Description**

Summary: Display sysarea file system usage (not reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

### **Usage**

```
df [-k] [directory]
```

echo

### **Description**

Summary: Echo arguments to the standard output (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command.

### Example

```
6120:/:<#> echo my typing
my typing
gatest:/:<5>
```

head

### Description

Summary: Display the first few lines of the specified files (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

### Usage

```
head [-n] filename...
```

ls

### Description

Summary: List the contents of a directory (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

### Usage

```
ls [-lACFLRadfgilqrs] [filename...]
```

mkdir

### Description

Summary: Make a directory (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

## Usage

```
mkdir [-p] dirname ...
```

more

## Description

Summary: View file on console (not reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

## Usage

```
more filename
```

mv

## Description

Summary: Move or rename files (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

## Usage

```
mv [-if] src target; or: mv [-if] src1 ... srcN directory
```

netstat

## Description

Summary: Show network status (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

## Usage

```
netstat [-airs]
```



passwd

### Description

Summary: Change password file information (not reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command.

ping

### Description

Summary: Send ICMP ECHO\_REQUEST packets to network hosts (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

### Usage

```
ping host [timeout]
```

```
ping -s host [count/timeout]
```

pwd

### Description

Summary: Display the pathname of the current working directory (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command.

rm

### Description

Summary: Remove (unlink) files (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

## Usage

```
rm [-rif] filename...
```

rmdir

## Description

Summary: Remove (unlink) directories (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

## Usage

```
rmdir directory ...
```

route

## Description

Summary: Manipulate the route table (not reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

## Usage

```
route [-cr]
```

```
route [-af] path-name
```

```
route add [host|net] destination gateway
```

```
route delete [host|net] destination gateway
```

## Parameters

Parameter	Function
-c	Clear existing route table
-r	Display existing route table
-a <i>path-name</i>	Read and overwrite existing route table from <i>path-name</i> .
-f <i>path-name</i>	Read commands and modify existing route table.

sync

### Description

Summary: Write the memory-cached data to disk (not reentrant, not locked).

The `sync` command executes the sync system primitive. If the system is to be reset, `sync` must be called to insure file system integrity. See “reset” on page 226. The `sync` command will flush all previously unwritten system buffers out to disk, thus assuring that all file modifications up to that point will be saved.

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the array.

### Usage

```
sync
```

tail

### Description

Summary: Display the last part of a file (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

### Usage

```
tail [+|-number[1c]] filename
```

touch

### **Description**

Summary: Update the modification time of a file (reentrant, not locked).

This is a standard UNIX or Solaris OS command, but it might not support all the functionality of the full command. The usage statement shows supported command options for the Sun StorEdge 6020 and 6120 arrays.

### **Usage**

```
touch [-cf] filename...
```

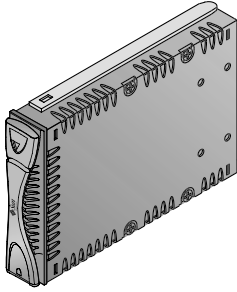
## Illustrated Parts

---

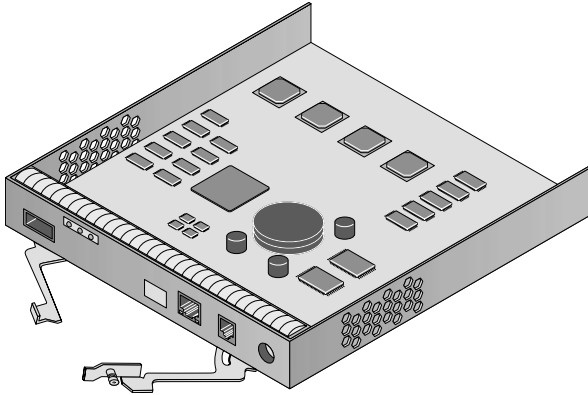
This appendix contains part numbers and illustrations of field-replaceable units (FRUs) for the Sun StorEdge 6020 and 6120 arrays.

**TABLE C-1** Illustrated Parts

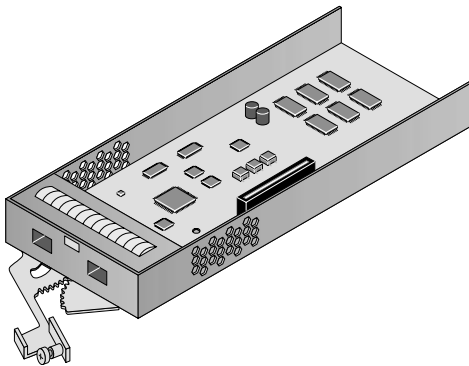
FRU	Part Number	Figure
Disk drive in canister:		
• 36 Gbyte, 15K rpm, 1-inch FC-AL	F540-5322	FIGURE C-1
• 73 Gbyte, 10K rpm, 1-inch FC-AL	F540-5330	
• 146 Gbyte, 1-inch FCAL	F540-5471	
Array controller card (version 2.5)	F540-5559	FIGURE C-2
Array interconnect card (loop card)	F540-5384	FIGURE C-3
Power and cooling unit	F300-1562	FIGURE C-4
UPS battery pack	F370-4861	FIGURE C-5
Array chassis and midplane	F540-5318	FIGURE C-6
Array interconnect cable	F530-3211	FIGURE C-7
Array power cable (Y-cord)	F180-2039	n/a
Shielded Ethernet cable (category 5)		
• 1 meter	F530-3205	FIGURE C-7
• .3 meter	F530-3206	
Array fiber-optic cable .8 meter	F537-1057	FIGURE C-7



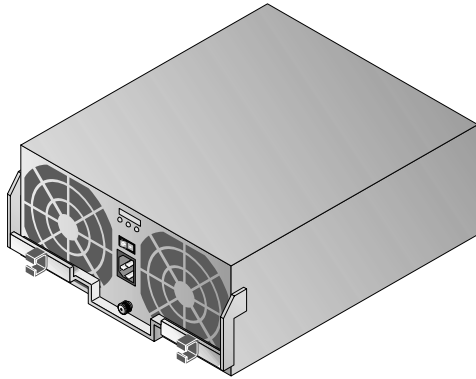
**FIGURE C-1** Disk Drive in Canister



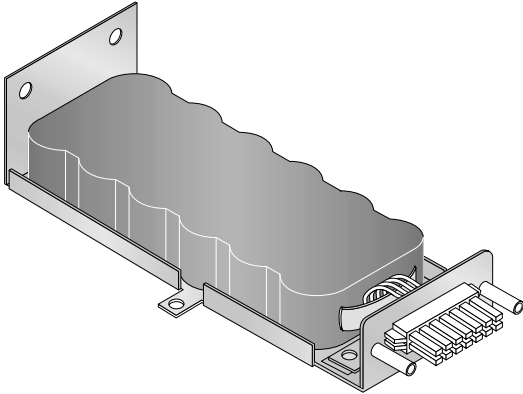
**FIGURE C-2** Array Controller Card, Version 2.5



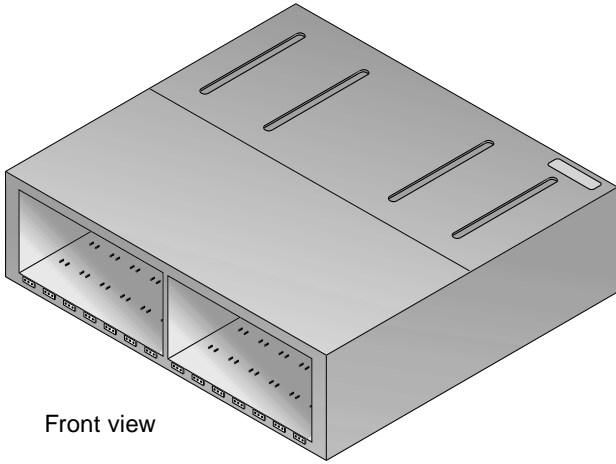
**FIGURE C-3** Array Interconnect Card (Loop Card)



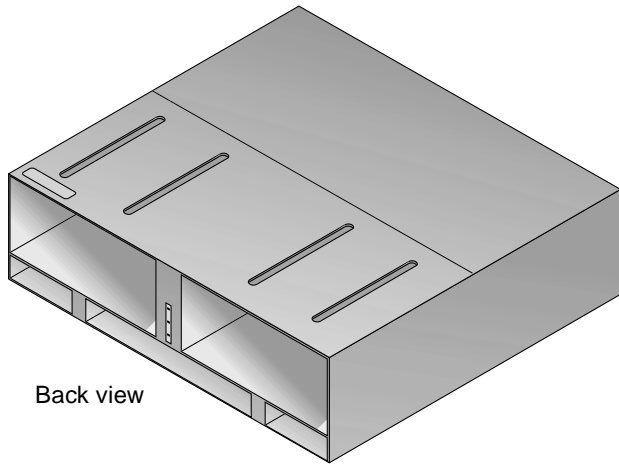
**FIGURE C-4** Power and Cooling Unit



**FIGURE C-5** UPS Battery Pack



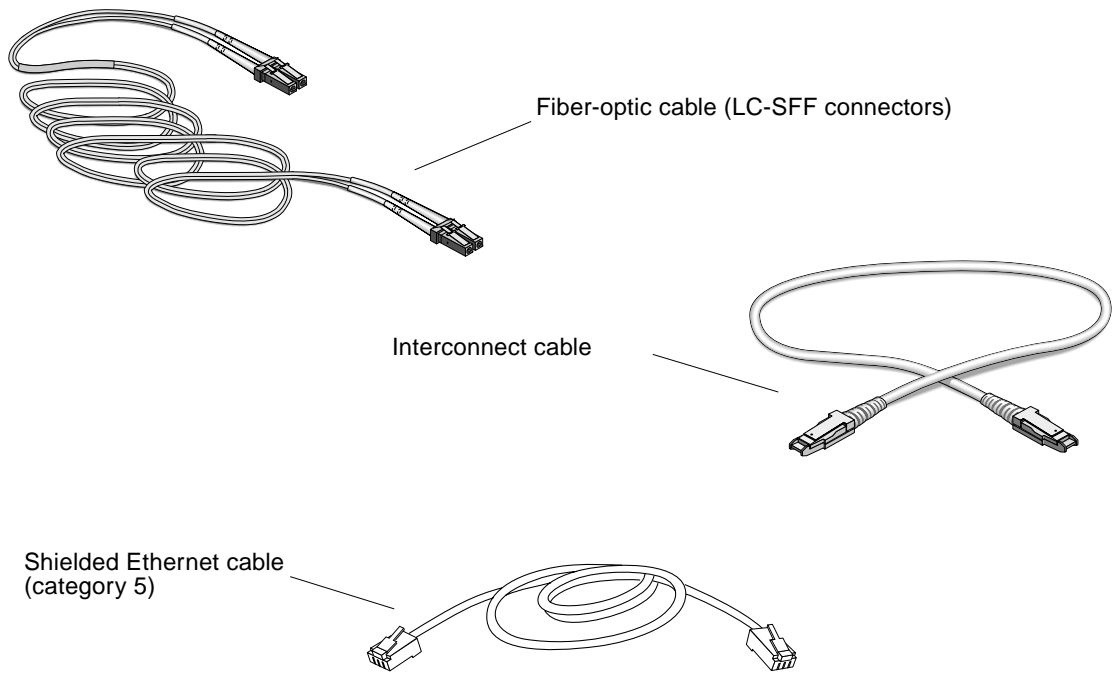
Front view



Back view

**FIGURE C-6** Array Chassis and Midplane





**FIGURE C-7** Array Cables

---

**Note** – The Y-cord power cable is not shown in FIGURE C-7.

---



# Glossary

---

---

## A

- administrative domain** HA configurations (interconnected controller units) that share common administration through a master controller.
- alternate master controller unit** Also called “alternate master unit,” the secondary array unit in an HA configuration that provides failover capability from the master controller unit.
- auto cache mode** The default cache mode for the Sun StorEdge 6120 array. In a fully redundant configuration, cache is set to write-behind mode. In a nonredundant configuration, cache is set to write-through mode. Read caching is always performed.
- auto disable** The Sun StorEdge 6120 array default that automatically disables a disk drive that has failed.

---

## B

- buffering** Data that is being transferred between the host and the drives.

---

## C

**command-line interface  
(CLI)**

The interface between the Sun StorEdge 6120 array's pSOS operating system and the user in which the user types commands to administer the array.

**controller unit**

A Sun StorEdge 6120 array that includes a controller card. It can be used as a standalone unit or configured with other Sun StorEdge 6120 arrays.

---

## D

**Dynamic Multi-Pathing  
(DMP)**

A VERITAS Volume Manager feature that provides an Alternate Pathing mechanism for rerouting data in the event of a controller failover.

---

## E

**erasable programmable  
read-only memory  
(EPROM)**

Memory stored on the controller card; useful for stable storage for long periods without electricity while still allowing reprogramming.

**expansion unit**

A Sun StorEdge 6120 array without a controller card. It must be connected to a controller unit to be operational.

---

## F

**Fibre Channel  
Arbitrated Loop  
(FC-AL)**

A 100-Mbyte/s serial channel that enables connection of multiple devices (disk drives and controllers).

**field-replaceable unit  
(FRU)**

A component that is easily removed and replaced by a field service engineer or a system administrator.

**FLASH memory device (FMD)** A device on the controller card that stores EPROM firmware.

---

## G

**Gigabit Interface Converter (GBIC)** An adapter used on an SBus card to convert fiber-optic signal to copper.

**gigabyte (GB or Gbyte)** One gigabyte is equal to one billion bytes (1X10<sup>9</sup>).

**graphical user interface (GUI)** A software interface that enables configuration and administration of the Sun StorEdge 6120 array using a graphic application.

---

## H

**host bus adapter (HBA)** An adapter that resides on the host.

**hot spare** A drive in a RAID 1 or RAID 5 configuration that contains no data and acts as a standby in case another drive fails.

**hot-swappable** The ability of a field-replaceable unit (FRU) to be removed and replaced while the system remains powered on and operational.

---

## I

**input/output operations per second (IOPS)** A performance measurement of the transaction rate.

**interconnect cable** An FC-AL cable with a unique switched-loop architecture that is used to interconnect multiple Sun StorEdge 6120 arrays.

**interconnect card** An array component that contains the interface circuitry and two connectors for interconnecting multiple Sun StorEdge 6120 arrays.

---

## L

- LC** An industry-standard name used to describe a connector standard. The Sun StorEdge 6120 array uses an LC-SFF connector for the host FC-AL connection.
- light-emitting diode (LED)** A device that converts electrical energy into light that is used to display activity.
- logical unit number (LUN)** One or more drives that can be grouped into a unit; also called a volume.

---

## M

- master controller unit** Also called a “master unit,” the main controller unit in a partner-group configuration.
- media access control (MAC) address** A unique address that identifies a storage location or a device.
- megabyte (MB or Mbyte)** One megabyte is equal to one million bytes (1X10<sup>6</sup>).
- megabytes per second (MB/s)** A performance measurement of the sustained data transfer rate.
- multi-initiator configuration** A supported array configuration that connects two hosts to one or more array administrative domains through hub or switch connections.

---

## P

- parity** Additional information stored with data on a disk that enables the controller to rebuild data after a drive failure.
- power and cooling unit (PCU)** A FRU component in the Sun StorEdge 6120 array. It contains a power supply, cooling fans, and an integrated UPS battery. There are two power and cooling units in a Sun StorEdge 6120 array.

**pSOS** An operating system built into the Sun StorEdge 6120 array controller card firmware, which provides interfaces between the mounted RAID volumes and the database environment.

---

## Q

**quiesce** To halt all drive activity.

---

## R

**read caching** Data stored for future retrieval, to reduce disk I/O as much as possible.

**redundant array of independent disks (RAID)**

A configuration in which multiple drives are combined into a single virtual drive to improve performance and reliability.

**reliability, availability, serviceability (RAS)**

A term to describe product features that include high availability, easily serviced components, and dependability.

**reverse address resolution protocol (RARP)**

A utility in the Solaris operating environment that enables automatic assignment of the array IP address from the host.

---

## S

**SC** An industry standard name used to describe a connector standard.

**Simple Network Management Protocol (SNMP)**

A network management protocol designed to give a user the capability to remotely manage a computer network.

**small form factor (SFF)**

An industry standard describing a type of connector. An LC-SFF connector is used for the host FC-AL connection to the Sun StorEdge 6120 array.

**synchronous dynamic  
random access memory  
(SDRAM)**

A form of dynamic random access memory (DRAM) that can run at higher clock speeds than conventional DRAM.

**system area**

Located on the disk drive label, the space that contains configuration data, boot firmware, and file-system information.

---

## U

**uninterruptable power  
source (UPS)**

A component within the power and cooling unit. It supplies power from a battery in the case of an AC power failure.

---

## V

**volume**

Also called a logical unit or LUN, a volume is one or more drives that can be grouped into a unit for data storage.

---

## W

**world wide name  
(WWN)**

A number used to identify array volumes in both the array system and Solaris operating environment.

**write caching**

Data used to build up stripes of data, eliminating the read-modify-write overhead. Write caching improves performance for applications that are writing to disk.



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---

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