Sun StorEdge™ T3 and T3+ Array Administrator's Guide

Sun Microsystems, Inc.
901 San Antonio Road
Palo Alto, CA 94303-4900 U.S.A.
650-960-1300

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Preface

The *Sun StorEdge T3 and T3+ Array Administrator's Guide* describes configuring, monitoring, and troubleshooting Sun StorEdge™ T3 and T3+ arrays using the command-line interface (CLI). It provides information on commands that are specific to the array, but it is not intended as a reference for general operating system commands.

This guide is designed for use with the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual* and is written for an experienced system administrator of the Solaris™ operating environment and related disk storage systems.

Before You Read This Book

Read the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual* to install the array.

How This Book Is Organized

Chapter 1 provides an overview of this book.

Chapter 2 describes how to modify array parameters using the CLI.

Chapter 3 provides information for reconfiguring a volume using the CLI.

Chapter 4 describes the commands you can use to check the health and status of the array, and provides procedures for configuring remote monitoring.

Chapter 5 describes how to use the CLI to troubleshoot array problems.

Appendix A lists supported Sun StorEdge T3 and T3+ array CLI commands with descriptions of command options.

Appendix B contains information on error messages that can be viewed using the CLI.

Glossary contains definitions of terms used in this document.

Using UNIX Commands

This document contains some information on basic UNIX® commands and procedures such as booting the devices. For further information, see one or more of the following:

- AnswerBook2™ online documentation for the Solaris™ software environment
- Other software documentation that you received with your system

Typographic Conventions

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

Shell Prompts

Shell	Prompt
C shell	*machine_name*%
C shell superuser	*machine_name*#
Bourne shell and Korn shell	$
Bourne shell and Korn shell superuser	#
Sun StorEdge T3 and T3+ array	:/:

Related Documentation

Application	Title	Part Number
Installation overview	*Sun StorEdge T3 and T3+ Array Start Here*	816-0772
Safety procedures	*Sun StorEdge T3 and T3+ Array Regulatory and Safety Compliance Manual*	816-0774
Site preparation	*Sun StorEdge T3 and T3+ Array Site Preparation Guide*	816-0778
Configuration	*Sun StorEdge T3 and T3+ Array Configuration Guide*	816-0777
Installation and Service	*Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*	816-0773
Cabinet installation	*Sun StorEdge T3 Array Cabinet Installation Guide*	806-7979
Latest array updates	*Sun StorEdge T3 and T3+ Array Release Notes*	816-1983
Disk drive specifications	*18 Gbyte 10K rpm Disk Drive Specifications*	806-1493
	36 Gbyte, 10K rpm Disk Drive Specifications	806-6383
	73 Gbyte, 10K rpm Disk Drive Specifications	806-4800
Sun StorEdge Component Manager installation	*Sun StorEdge Component Manager Installation Guide - Solaris*	806-6645

Application	Title	Part Number
	Sun StorEdge Component Manager Installation Guide - NT	806-6646
Using Sun StorEdge Component Manager	*Sun StorEdge Component Manager User's Guide*	806-6647
Latest Sun StorEdge Component Manager updates	*Sun StorEdge Component Manager Release Notes*	806-6648

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You can find the Sun StorEdge T3 and T3+ array documentation and other select product documentation for Network Storage Solutions at:

`http://www.sun.com/products-n-solutions/hardware/docs/Network_Storage_Solutions`

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CHAPTER 1

Array Administration Overview

This book provides information on using the command-line interface (CLI) of the Sun StorEdge T3 and T3+ array for administrative tasks. Each chapter contains a list of the CLI commands as they pertain to performing various tasks related to configuring, monitoring or troubleshooting an array.

Note – Throughout this book, the terms *logical volume*, *LUNs* (logical units), and *disks* are used interchangeably.

This chapter is organized as follows:

1.1 Displaying Commands

- **To view the available commands on the array, type** `help` **at the prompt.**

```
:/: help
arp      cat      cd       cmp      cp       date     echo     head
help     ls       mkdir    mv       ping     pwd      rm       rmdir
tail     touch
boot     disable  disk     enable   fru      id       logger   lpc
more     passwd   port     proc     reset    set      shutdown
sync     sys      tzset    ver      vol      ep       refresh  route
ofdg
```

Note – Because this book is not a reference manual for the operating system, not all of the commands displayed are discussed in this book, such as common UNIX commands. See Appendix A for detail on commands specific to the array.

1.2 Displaying Command Syntax

You can type *command-name* `help` on the array to display the syntax of a command.

For example:

- **To view the syntax of the** `sys` **command, type** `sys help`**.**

```
:/: sys help
usage:  sys list
        sys stat
        sys blocksize <16k | 32k | 64k>
        sys cache <auto | writebehind | writethrough | off>
        sys mirror <auto | off>
        sys mp_support <none | rw>
        sys rd_ahead <on | off>
        sys recon_rate <high | med | low>
```

1.3 FRU Identifiers

Many commands use a field-replaceable unit (FRU) identifier to refer to a particular FRU in an array. This identifier contains a unit constant (`u`), sometimes referred to as the *enclosure*; 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 1-1 FRU Identifiers

FRU	Identifier	Unit number
Controller card	u*n*ctr	*n* = unit number (1, 2, ...)
Power and cooling unit	u*n*pcu*n*	*n* = unit number (1, 2, ...) *n* = pcu number (1, 2)
Interconnect card	u*n*l*n*	*n* = unit number (1, 2, ...) *n* = interconnect card number (1, 2)
Disk drive	u*n*d*n*	*n* = unit number (1, 2, ...) *n* = disk drive number (1, 2, ... 9)

CHAPTER 2

Changing Global Parameters

This chapter contains information on modifying array settings within an *administrative domain*. An administrative domain can be either a single array controller unit (workgroup configuration) or a partner group (enterprise configuration) that shares common administration through a master controller. Changing these settings will enable you to configure your array to suit your application and recovery needs.

Note – Cache segment size must be set before volumes are created. Thereafter, volumes must be removed before the cache segment block size can be changed.

This chapter contains the following sections:

2.1 Setting Cache Block Size

Caution – Changing the cache segment block size requires that you delete the existing volume; deleting a volume will destroy your 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 there are no volumes defined. The block size can be configured as 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.

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 it is to delete a volume, change the block size, and then create a new volume as follows:

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

```
:/: vol list

volume        capacity   raid   data      standby
v0            143.2 GB    5     u1d1-9     none
:/: vol unmount volume-name

:/: vol remove volume-name
```

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

   Cache segment size is shown as `blocksize`.

```
:/: sys list
blocksize          : 64k
cache              : auto
mirror             : auto
mp_support         : none
naca               : off
rd_ahead           : on
recon_rate         : med
sys memsize        : 128 MBytes
cache memsize      : 1024 MBytes
```

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

   a. **Type** `sys blocksize` *n* **to change the blocksize, where** *n* **= 16k, 32k, or 64k.**

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

   For example:

```
:/: sys blocksize 16k
:/: sys list
blocksize          : 16k
cache              : auto
mirror             : auto
mp_support         : rw
naca               : off
rd_ahead           : on
recon_rate         : med
sys memsize        : 128 MBytes
cache memsize      : 1024 MBytes
```

2.2 Enabling Partner Group Multipathing

This task applies only when two controller units are configured as a partner group. For Alternate Pathing software to function properly, you must enable multipathing support on the array for enterprise configurations.

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

```
:/: sys mp_support rw
```

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

Refer to the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual* for more information on Alternate Pathing.

2.3 Setting the Cache Mode

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

There are four possible cache mode options:

- Auto
- Write-behind
- Write-through
- Off

The default cache setting on the Sun StorEdge T3 and T3+ array is auto, which enables write-behind caching as long as there are no FRU failures. For more information about these settings, refer to Chapter 3 in the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*.

- **To change the cache mode, type** `sys cache` *cache-mode*.

  For example, if you are setting the cache mode to write-behind, type:

```
:/: sys cache writebehind
```

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

Tip – You can view the cache status by typing `vol mode`.

2.4 Enabling Mirrored Cache

Mirrored cache can safeguard cached data when a controller fails in an enterprise 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 – There will be a performance impact when cache mirroring is enabled. This overhead is caused by the data being written to two separate controller caches.

- **To enable mirrored caching, type:**

```
:/: sys mirror auto
```

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

2.5 Setting the LUN Reconstruction Rate

You can configure the LUN reconstruction rate to meet your requirements so as not to impact application performance. 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`**).**

```
:/: sys list
blocksize          : 16k
cache              : auto
mirror             : auto
mp_support         : rw
naca               : off
rd_ahead           : on
recon_rate         : med
sys memsize        : 128 MBytes
cache memsize      : 1024 MBytes
```

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

   a. **Type** `sys recon_rate [high|med|low]` **to change the reconstruction rate.**

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

   For example:

```
:/: sys recon_rate low
:/: sys list
blocksize          : 16k
cache              : auto
mirror             : auto
mp_support         : rw
naca               : off
rd_ahead           : on
recon_rate         : low
sys memsize        : 128 MBytes
cache memsize      : 1024 MBytes
```

2.6 Performing Volume Verification

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

Caution – Ensure that system health is in optimal condition before running the `vol verify` command. For example, ensure that no LUNs are under reconstruction; the status of all disks is zero, which can be checked using the `vol stat` command; and other similar conditions are resolved before performing this procedure.

Caution – It can take up to several hours for the `vol verify` operation to run, depending on system activity and the verification rate selected. Execution of this command will affect system performance depending on these factors.

- **Use the `vol verify` command to set parity check rate.**

```
:/: vol verify volume-name [fix] rate n
```

where:

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

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, 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 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 enterprise configuration, the `vol verify` command can only be run on one volume at a time.

2.7 Setting 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`).**

```
:/: sys list
blocksize          : 16k
cache              : auto
mirror             : auto
mp_support         : rw
naca               : off
rd_ahead           : on
recon_rate         : low
sys memsize        : 128 MBytes
cache memsize      : 1024 MBytes
```

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

   For example:

```
:/: sys rd_ahead off
:/: sys list
blocksize          : 16k
cache              : auto
mirror             : auto
mp_support         : rw
naca               : off
rd_ahead           : off
recon_rate         : low
sys memsize        : 128 MBytes
cache memsize      : 1024 MBytes
```

2.8 Setting the IP Address

There are two ways to set the IP address on an array:

- Editing 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 when the array is first installed and powered on, and 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 T3 and T3+ Array Installation, Operation, and Service Manual*.

- Using the array `set ip` command.

  This option can be used only if the array is online and is already connected to an Ethernet network, which would be possible only if the array IP address had been assigned using the RARP server previously. You can 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:**

```
:/: set ip IP-address
```

Caution – Be aware of the following if you are moving the array to a network with a RARP server and use this command to assign a new IP address: if the array reboots, it can pick up another IP address from the RARP server that overrides 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.

CHAPTER 3

Reconfiguring a Volume

This chapter contains information on configuring volume size, RAID level, and a hot spare.

This chapter is organized as follows:

Note – Cache block size must be configured before volumes are configured. See Chapter 2 for more information.

3.1 Reconfiguration Limitations

Volumes can only be created or deleted. Once a volume has been configured, you cannot reconfigure it to change its size, RAID level, or hot spare configuration. You can only delete a volume and create a new one with the configuration you want.

Caution – Before you begin deleting and creating new volume(s), back up all data on the array. Data that resides in the volume to be deleted will be destroyed.

3.2 Deleting a Logical Volume

Caution – Deleting a volume will destroy your data. Back up all data before beginning this procedure.

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

```
:/: vol list

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

2. **Unmount the volume.**

```
:/: vol unmount volume-name
```

3. **Delete the volume.**

```
:/: vol remove volume-name
```

3.3 Creating a Logical Volume

When configuring a logical volume, you must define the volume, RAID level, and hot spare at the same time.

Note – 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 9 (`d9`) in the array as a hot spare. You can have only one hot spare per array, which can be shared between two volumes.

TABLE 3-1 shows examples of valid volume configurations.

TABLE 3-1 Volume Configuration Examples

Volume 1	Volume 2	Hot spare
9 disk RAID 5	None	
8 disk RAID 5	None	X
9 disk RAID 1	None	
8 disk RAID 1	None	X
2 disk RAID 1	7 disk RAID 5	
2 disk RAID 1	6 disk RAID 5	X
2 disk RAID 1	7 disk RAID 1	
2 disk RAID 1	6 disk RAID 1	X
4 disk RAID 0	5 disk RAID 1	
2 disk RAID 0	6 disk RAID 5	X

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

   a. **Define the volume name (**`vol add` *volume-name*`)`**.**

   b. **Define the drives (**`data u`*n*`d`*n*`-`*n*`)` **on which the volume will reside, where:**

   - `u`*n* is the array unit number
   - `d`*n*`-`*n* are the disk drives, *n* = 1 to 9

   c. **Define the RAID level (**`raid` *n*`)`**, where** *n* **= 0, 1, or 5.**

d. Optional: define the hot spare drive (`standby u`*n*`d9`) where:

- `u`*n* is the array unit number
- `d9` is the number of the hot spare disk drive

```
:/: vol add volume-name data undn-n raid n standby und9
```

For example:

```
:/: vol add v1 data u2d1-8 raid 5 standby u2d9
```

- `v1` is the volume name
- `u2d1-8` indicates the location of the volume: unit 2, disk drives 1 through 8
- `raid 5` is RAID level 5
- `standby u2d9` is the location of the hot spare: unit 2, drive 9

2. Check the status of the volumes.

The `vol stat` command shows the drive status. The status of all drives must be `0`. For example:

```
:/: vol stat

v1             u2d1    u2d2    u2d3    u2d4    u2d5    u2d6    u2d7    u2d8    u2d9
unmounted      0       0       0       0       0       0       0       0       0
```

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

Depending on system activity at the time of initialization, it can take up to an hour to initialize a volume. Only one volume can be initialized at a time.

```
:/: vol init volume-name data
```

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

```
:/: vol mount volume-name
```

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

   For example:

```
:/: vol list

volume        capacity   raid   data     standby
v1            125.2 GB    5     u2d1-8   u2d9
```

Note – If you are running on the Solaris 7, 11/99 operating environment or a later release of the Solaris operating environment, skip Step 6. Later versions of the Solaris operating environment automatically recognize added storage devices without additional command operations.

---

6. **On the data host, use the `luxadm(1M)` command to recognize the new volume.**

   In the Solaris environment, the `luxadm(1M)` command probes for new devices. Refer to the `luxadm(1M)` man page for more information on this command.

   a. **Make sure there is a `/dev/es` directory on the host system. If not, type:**

```
# mkdir /dev/es
```

   The `/dev/es` directory is necessary for running the `luxadm` command.

   b. **On the host system, type `luxadm insert`:**

```
# luxadm insert
```

Note – If the `luxadm` utility is not available, you will have to do a reconfiguration reboot (`boot -r`) to ensure that the host recognizes the new volumes. It is preferable, however, to use the `luxadm` command for this procedure instead of the `boot -r` command.

3.4 Volume Labeling

For the Solaris operating environment to recognize a volume, it must be labeled with the `format` command. Whenever you create a volume, 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 volume:

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-T300-0113` label.

```
# format
Searching for disks...done

AVAILABLE DISK SELECTIONS:
       0. c0t2d0 <drive type unknown>
          /sbus@1f,0/SUNW,fas@e,8800000/sd@2,0
       1. c0t3d0 <SUN2.1G cyl 2733 alt 2 hd 19 sec 80>
          /sbus@1f,0/SUNW,fas@e,8800000/sd@3,0
       2. c1t1d0 <SUN-T300-0113 cyl 34145 alt 2 hd 32 sec 128>
         /sbus@1f,0/SUNW,socal@1,0/sf@0,0/ssd@w50020f2300000172,0
Specify disk (enter its number): 2
selecting c1t1d0
[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-T300-0100
       17. other
Specify disk type (enter its number)[16]: 0
c1t1d0: configured with capacity of 33.34GB
<SUN-T300-0100 cyl 34145 alt 2 hd 16 sec 128>
selecting c1t1d0
[disk formatted]
```

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

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

CHAPTER 4

Monitoring the Array

This chapter describes how to use the CLI to monitor the Sun StorEdge T3 and T3+ array, and how to set up the array files for message logging and remote notification.

This chapter contains the following sections:

4.1 Checking Status

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

4.1.1 Determining Failover

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

   The following example shows a partner group in a normal state:

```
:/: 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:

```
:/: 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`**.**

```
:/: 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
```

4.1.2 Checking Drive Status

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

  All drives should show a status of 0 under normal conditions.

```
:/: vol stat

v0            u1d1   u1d2   u1d3   u1d4   u1d5   u1d6   u1d7   u1d8   u1d9
mounted        0      0      0      0      0      0      0      0      0
v1            u2d1   u2d2   u2d3   u2d4   u2d5   u2d6   u2d7   u2d8   u2d9
mounted        0      0      0      0      0      0      0      0      0
```

The numeric drive status codes are listed in the following table.

TABLE 4-1 Drive Status Messages

Value	Description
0	Drive mounted
2	Drive present
3	Drive is spun up
4	Drive is disabled
5	Drive has been replaced
7	Invalid system area on drive
9	Drive not present
D	Drive is disabled and is being reconstructed
S	Drive substituted

4.1.3 Checking the Hot Spare

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

```
:/: vol list

volume        capacity   raid   data      standby
v0            125.2 GB    5     u1d1-8    u1d9
v1            125.2 GB    5     u2d1-8    u2d9
```

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

```
:/: vol stat

v0              u1d1    u1d2    u1d3    u1d4    u1d5    u1d6    u1d7    u1d8    u1d9
mounted          0       0       0       0       0       0       0       0       0
```

All drives should show a status of `0`. See TABLE 4-1 for definitions of drive status codes.

4.1.4 Checking 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.**

```
:/: 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 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 volume.

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

See Section 2.6, "Performing Volume Verification" on page 2-7 for more information on checking parity.

4.1.5 Checking 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.)

```
:/: id read unpcun
                Revision             : 0000
                Manufacture Week     : 00221999
                Battery Install Week: 00221999
                Battery Life Used    :   0 days, 0 hours
                Battery Life Span    : 730 days, 12 hours
                Serial Number        : 01204
                Vendor ID            : TECTROL
                Model ID             : 300-1454-01
```

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):

```
:/: refresh -s

No battery refreshing Task is currently running.

        PCU1                            PCU2
        ------------------------------------------------------------------
        U1                      Normal                          Normal
        U2                      Normal                          Normal

        Current Time            Fri Jun 09 16:54:53 2000
        Last Refresh            Thu Jun 01 12:54:19 2000
        Next Refresh            Fri Jun 29 12:54:19 2000
```

4.1.6 Displaying 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 a Sun StorEdge T3+ array.

```
:/: fru list

ID      TYPE                VENDOR       MODEL          REVISION       SERIAL
------  ------------------  -----------  -----------  -------------  --------
u1ctr   controller card     0034         501-5710-02(  0200           123456
u2ctr   controller card     0034         501-5710-02(  0200           123455
u1d1    disk drive          SEAGATE      ST118202FSUN  9329           LK478728
u1d2    disk drive          SEAGATE      ST118202FSUN  9329           LK493799
u1d3    disk drive          SEAGATE      ST118202FSUN  9329           LK493800
u1d4    disk drive          SEAGATE      ST118202FSUN  9329           LK494457
u1d5    disk drive          SEAGATE      ST118202FSUN  9329           NK040486
u1d6    disk drive          SEAGATE      ST118202FSUN  9329           LK339351
u1d7    disk drive          SEAGATE      ST118202FSUN  9329           LK150715
u1d8    disk drive          SEAGATE      ST118202FSUN  9329           NK040157
u1d9    disk drive          SEAGATE      ST118202FSUN  9329           LKG79907
u2d1    disk drive          SEAGATE      ST118202FSUN  9329           LKG90019
u2d2    disk drive          SEAGATE      ST118202FSUN  9329           LKH18597
u2d3    disk drive          SEAGATE      ST118202FSUN  9329           LKH15606
u2d4    disk drive          SEAGATE      ST118202FSUN  9329           LKH16563
u2d5    disk drive          SEAGATE      ST118202FSUN  9329           LKG88883
u2d6    disk drive          SEAGATE      ST118202FSUN  9329           LKH61907
u2d7    disk drive          SEAGATE      ST118202FSUN  9329           LKG90719
u2d8    disk drive          SEAGATE      ST118202FSUN  9329           LKG95442
u2d9    disk drive          SEAGATE      ST118202FSUN  EA29           LKG61774
u1l1    loop card           SCI-SJ       375-0085-01-   5.03 Flash    007924
u1l2    loop card           SCI-SJ       375-0085-01-   5.02 Flash    007382
u2l1    loop card           SCI-SJ       375-0085-01-   5.02 Flash    003343
u2l2    loop card           SCI-SJ       375-0085-01-   5.02 Flash    003344
u1pcu1  power/cooling unit  TECTROL-CAN  300-1454-01(  0000           001455
u1pcu2  power/cooling unit  TECTROL-CAN  300-1454-01(  0000           001408
u2pcu1  power/cooling unit  TECTROL-CAN  300-1454-01(  0000           001686
u2pcu2  power/cooling unit  TECTROL-CAN  300-1454-01(  0000           001445
u1mpn   mid plane           SCI-SJ       375-0084-01-  0000           000650
u2mpn   mid plane           SCI-SJ       375-0084-01-  0000           000649
```

4.1.7 Checking FRU Status

- **Use the** `fru stat` **command to provide a status of each FRU.**
  Possible FRU states and definitions are listed in TABLE 4-2.

```
:/: fru stat

CTLR    STATUS   STATE       ROLE         PARTNER    TEMP
------  -------  ----------  ----------   -------    ----
u1ctr   ready    enabled     master       u2ctr      32.0
u2ctr   ready    enabled     alt master   u1ctr      29.0

DISK    STATUS   STATE       ROLE         PORT1      PORT2      TEMP  VOLUME
------  -------  ----------  ----------   ---------  ---------  ----  ------
u1d1    ready    enabled     data disk    ready      ready      34    v0
u1d2    ready    enabled     data disk    ready      ready      34    v0
u1d3    ready    enabled     data disk    ready      ready      31    v0
u1d4    ready    enabled     data disk    ready      ready      34    v0
u1d5    ready    enabled     data disk    ready      ready      32    v0
u1d6    ready    enabled     data disk    ready      ready      38    v0
u1d7    ready    enabled     data disk    ready      ready      33    v0
u1d8    ready    enabled     data disk    ready      ready      34    v0
u1d9    ready    enabled     data disk    ready      ready      36    v0
u2d1    ready    enabled     data disk    ready      ready      30    v1
u2d2    ready    enabled     data disk    ready      ready      31    v1
u2d3    ready    enabled     data disk    ready      ready      34    v1
u2d4    ready    enabled     data disk    ready      ready      34    v1
u2d5    ready    enabled     data disk    ready      ready      32    v1
u2d6    ready    enabled     data disk    ready      ready      37    v1
u2d7    ready    enabled     data disk    ready      ready      38    v1
u2d8    ready    enabled     data disk    ready      ready      42    v1
u2d9    ready    enabled     data disk    ready      ready      34    v1

LOOP    STATUS   STATE       MODE         CABLE1     CABLE2     TEMP
------  -------  ----------  -------      ---------  ---------  ----
u2l1    ready    enabled     master       installed  -          30.0
u2l2    ready    enabled     slave        installed  -          30.5
u1l1    ready    enabled     master       -          installed  27.0
u1l2    ready    enabled     slave        -          installed  29.5

POWER   STATUS   STATE       SOURCE  OUTPUT  BATTERY  TEMP    FAN1    FAN2
------  -------  ---------   ------  ------  -------  ------  ------  ------
u1pcu1  ready    enabled     line    normal  normal   normal  normal  normal
u1pcu2  ready    enabled     line    normal  normal   normal  normal  normal
u2pcu1  ready    enabled     line    normal  normal   normal  normal  normal
u2pcu2  ready    enabled     line    normal  normal   normal  normal  normal
```

TABLE 4-2 Possible FRU States and Definitions

FRU	Column	Column	Definition
Controller Card	**Status**	**State**	**Status and State Conditions**
	absent	disabled	Controller not in enclosure
	ready	disabled	Disabled or disabling
	offline	disabled	Reset or resetting
	booting	enabled	Booting
	ready	enabled	Online
Disk Drive	**Status**	**State**	**Status and State Conditions**
	ready	enabled	Online
	fault	enabled	Problem with the drive; check LED
	missing	enabled	Drive is missing
	Role		**Disk Drive Assignment**
	data disk		Part of volume
	unassigned		Not in volume
	standby		Standby disk for volume. (Must be drive number 9)
	Port		**Drive Port Condition**[1]
	ready		Corresponding drive port online
	notReady		Drive port not ready. Expect ready soon.
	bypass		This drive port is being bypassed; use another. (Could be that the interconnect card with corresponding loop to drive is down.)
	unknown		Drive port state is not known. (Occurs only in partner groups when drive's corresponding interconnect card is down and interconnect card on partner unit is up.)

TABLE 4-2 Possible FRU States and Definitions *(Continued)*

FRU	Column	Column	Definition
Interconnect (Loop) Card	**Status**	**State**	**Status and State Conditions**
	ready	enabled	Online
	missing		Interconnect card not installed
	offline		Interconnect card offline
	fault		Interconnect card has fault condition
Power and Cooling Unit	**Status**	**State**	**Status and State Conditions**
	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, over temperature.
	fault	disabled	Power and cooling unit offline
	Source		**Power Source**
	line		Powered from power cord
	battery		Powered from battery
	--		Power and cooling unit not installed
	Output		**Power and Cooling Unit Condition**
	normal		Online
	fault		Fault condition
	--		Power and cooling unit not installed
	Battery		**Battery Condition**
	normal		Online
	fault		Battery refresh in progress
	--		Power and cooling unit not installed
	Temp		**Temperature Condition**
	normal		Normal operating temperature
	fault		Power and cooling unit over temperature
	--		Power and cooling unit not installed

TABLE 4-2 Possible FRU States and Definitions *(Continued)*

FRU	Column	Column	Definition
Power and Cooling Unit	**Fan**		**Fan Condition**
	normal		Online
	fault		Fault condition
	--		Power and cooling unit not installed

1. There are two ports on each drive, 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.

4.2 Configuring the Array for Remote System Logging

This procedure consists of editing the `/etc/syslog.conf` and the `/etc/hosts` file that exist 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 to make the edits and then transfer them back to the array. This procedure consists of the following tasks:

- "Transferring the Array Files to the Management Host" on page 4-11
- "Editing the Array `/etc/syslog.conf` File" on page 4-13
- "Editing the Array `/etc/hosts` File" on page 4-14
- "Transferring the Files Back to the Array" on page 4-15
- "Editing the Management Host `/etc/syslog.conf` File" on page 4-16

Note – For information on interpreting system messages, see Appendix B.

4.2.1 Transferring the Array Files to the Management Host

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

   For example:

```
mngt_host:/:<15>ftp 129.146.81.201
Connected to 129.146.81.201.
220 chon-ji FTP server (SunOS 5.7) ready.
Name (129.146.81.201:root):
```

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

```
Name (129.146.81.201: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. **Type `binary` to set the transfer mode.**

6. **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 (129.150.47.101,1031) (162 bytes).
226 Binary Transfer complete.
162 bytes received in 1 seconds (0 Kbytes/s)
ftp>
```

7. **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 (129.150.47.101,1034) (47 bytes).
226 Binary Transfer complete.
47 bytes received in 1 seconds (0 Kbytes/s)
ftp>
```

8. **Exit the `ftp` session.**

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

4.2.2 Editing 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.**

   Consult with your system administrator if you do not have this information.

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 the following table.

TABLE 4-3 Message Categories

Category	Description
Error	Indicates a critical system event requiring immediate user intervention or attention. For example, inability to flush the write-behind cache.
Warning	Indicates a serious system event requiring 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.

Caution – Use tab spaces to separate field entries when editing the `/etc/syslog.conf` file. If tab spacing is not used, edits will not be recognized by the array.

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 @129.234.56.73

# messages sent as SNMP traps
*.warn | snmp_trap 129.146.81.201
```

Remote system logging

Note – Use the IP address in the `syslog.conf` file. If you want to add a host name, a corresponding entry must be present on 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. Local utilities such as `ping` do not reference the array's `/etc/hosts` file. Therefore, IP addresses must be used with these utilities.

4.2.3 Editing the Array `/etc/hosts` File

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

- **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. Edits are highlighted in the following example:

```
#hosts
#ip-address name
129.146.81.201   host-name
```

IP address

4.2.4 Transferring the 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:

```
mngt_host:/:<15>ftp 129.146.81.201
Connected to 129.146.81.201.
220 chon-ji FTP server (SunOS 5.7) ready.
Name (129.146.81.201:root):
```

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

```
Name (129.146.81.201: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. **Type `binary` to set the transfer mode.**

5. **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 (129.150.47.101,1031) (162 bytes).
226 Binary Transfer complete.
162 bytes received in 1 seconds (0 Kbytes/s)
ftp>
```

6. **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 (129.150.47.101,1034) (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:/:
```

8. **On the array, start message traffic to the host.**

   The `syslogd` must be redirected at the array.

```
:/:<23>set logto *
```

4.2.5 Editing 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 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.noticeifdef(‘LOGHOST’, /var/log/authlog, @loghost)

mail.debugifdef(‘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.t300
```

In this example, all arrays that use this host for logging will have their messages dumped to `/var/adm/messages.t300`. 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 StorTools™ product in the Solaris software environment to monitor the array, verify that you are using the correct `/var/adm/messages` file name. Refer to the StorTools documentation for the name of this message file.

4.3 Configuring the Array for SNMP Notification

Sun StorEdge T3 and T3+ arrays 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 ftp them to a host to make the edits and then ftp them back to the array.

This procedure consists of the following tasks:

- "Transferring the Array Files to the Management Host" on page 4-18
- "Editing the Array `/etc/syslog.conf` File" on page 4-20
- "Editing the Array `/etc/hosts` File" on page 4-22
- "Transferring the Files Back to the Array" on page 4-23

Note – For information on interpreting system messages, see Appendix B.

4.3.1 Transferring the Array Files to the Management Host

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

   For example:

```
mngt_host:/:<15>ftp 129.146.81.201
Connected to 129.146.81.201.
220 chon-ji FTP server (SunOS 5.7) ready.
Name (129.146.81.201:root):
```

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

```
Name (129.146.81.201: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. **Type** `binary` **to set the transfer mode.**

6. **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 (129.150.47.101,1031) (162 bytes).
226 Binary Transfer complete.
162 bytes received in 1 seconds (0 Kbytes/s)
ftp>
```

7. **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 (129.150.47.101,1034) (47 bytes).
226 Binary Transfer complete.
47 bytes received in 1 seconds (0 Kbytes/s)
ftp>
```

8. **Exit the `ftp` session.**

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

4.3.2 Editing 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.**

   Consult with your system administrator if you do not have this information.

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 4-4.

TABLE 4-4 Message Categories

Category	Description
Error	Indicates a critical system event requiring immediate user intervention or attention. For example, inability to flush the write-behind cache.
Warning	Indicates a serious system event requiring 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.

Caution – Use tab spaces to separate field entries when editing the `/etc/syslog.conf` file. If tab spacing is not used, edits will not be recognized by the array.

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 @129.234.56.73

# messages sent as SNMP traps
*.warn | snmp_trap 129.146.81.201
```

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.

4.3.3 Editing the Array `/etc/hosts` File

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

- **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
129.146.81.201  host-name
```

IP address

4.3.4 Transferring the 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:

```
mngt_host:/:<15>ftp 129.146.81.201
Connected to 129.146.81.201.
220 chon-ji FTP server (SunOS 5.7) ready.
Name (129.146.81.201:root):
```

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

```
Name (129.146.81.201: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 (129.150.47.101,1031) (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 (129.150.47.101,1034) (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.
mngt_host:/:
```

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

   The `syslogd` must be redirected at the array.

```
:/:<23>set logto *
```

CHAPTER 5

Troubleshooting the Array

This chapter describes using the CLI to troubleshoot the array and its components.

This chapter contains the following sections:

5.1 Identifying FRU Failures

The first step in remedying a FRU failure is to determine which FRU has failed. You can do this by examining the output of the `fru stat` command and the messages in the `syslog` file. After evaluating the data, you can confirm the failing FRU and replace it.

1. **Display a list of all installed FRUs and check their current status.**

```
:/: fru stat

CTLR    STATUS   STATE       ROLE         PARTNER    TEMP
------  -------  ----------  ----------   -------    ----
u1ctr   ready    enabled     master       u2ctr      32.0
u2ctr   ready    enabled     alt master   u1ctr      29.0

DISK    STATUS   STATE       ROLE         PORT1      PORT2      TEMP  VOLUME
------  -------  ----------  ----------   ---------  ---------  ----  ------
u1d1    ready    enabled     data disk    ready      ready      34    v0
u1d2    ready    enabled     data disk    ready      ready      34    v0
u1d3    ready    enabled     data disk    ready      ready      31    v0
u1d4    ready    enabled     data disk    ready      ready      34    v0
u1d5    ready    enabled     data disk    ready      ready      32    v0
u1d6    ready    enabled     data disk    ready      ready      38    v0
u1d7    ready    enabled     data disk    ready      ready      33    v0
u1d8    ready    enabled     data disk    ready      ready      34    v0
u1d9    ready    enabled     data disk    ready      ready      36    v0
u2d1    ready    enabled     data disk    ready      ready      30    v1
u2d2    ready    enabled     data disk    ready      ready      31    v1
u2d3    ready    enabled     data disk    ready      ready      34    v1
u2d4    ready    enabled     data disk    ready      ready      34    v1
u2d5    ready    enabled     data disk    ready      ready      32    v1
u2d6    ready    enabled     data disk    ready      ready      37    v1
u2d7    ready    enabled     data disk    ready      ready      38    v1
u2d8    ready    enabled     data disk    ready      ready      42    v1
u2d9    ready    enabled     data disk    ready      ready      34    v1

LOOP    STATUS   STATE       MODE         CABLE1     CABLE2     TEMP
------  -------  ----------  -------      ---------  ---------  ----
u2l1    ready    enabled     master       installed  -          30.0
u2l2    ready    enabled     slave        installed  -          30.5
u1l1    ready    enabled     master       -          installed  27.0
u1l2    ready    enabled     slave        -          installed  29.5

POWER   STATUS   STATE       SOURCE  OUTPUT  BATTERY  TEMP    FAN1    FAN2
------  -------  ---------   ------  ------  -------  ------  ------  ------
u1pcu1  ready    enabled     line    normal  normal   normal  normal  normal
u1pcu2  ready    enabled     line    normal  normal   normal  normal  normal
u2pcu1  ready    enabled     line    normal  normal   normal  normal  normal
u2pcu2  ready    enabled     line    normal  normal   normal  normal  normal
```

2. **Review the output of the `fru stat` list for any fault or abnormal status messages.**

   See TABLE 4-2 for a list of possible FRU status messages.

3. **Display the** `syslog` **file.**

   Use the `tail` command to display the last 10 lines of the file, which contain the most recent log entries. (See Appendix B for a description of the `syslog` format.)

```
:/: tail syslog
Oct 26 16:24:15 ROOT[2]: W: u2ctr Hardware Reset (1000) occurred
Oct 26 16:24:16 ROOT[2]: N: u2ctr Waiting for configuration data from master...
Oct 26 16:24:31 MNXT[2]: N: u2ctr Initializing host port u2p1 ISP2100 ...
firmware status = 3
Oct 26 16:24:31 MNXT[2]: N: u2ctr Host port u2p1 TARGET_ID = 0x2 (ALPA = 0xe4)
Oct 26 16:24:58 ROOT[2]: N: u2ctr Starting psh...
Oct 26 16:24:58 ISR1[2]: N: u2ctr ISP2100[2] Received LIP(f7,e4) async event
Oct 26 16:24:58 FCC0[2]: N: u2ctr Port event received on port 3, abort 0
Oct 26 16:25:08 FCC2[2]: N: u2ctr (ITL 0 1 0 TT 20 TID 7910 OP 0) Target in Unit
Attention
```

   For more extensive investigation, display the complete syslog file. You can do this in two ways:

   - Using the `cat` command (that is, `cat syslog`), which could overwrite the terminal window
   - Moving the `syslog` file to the host using an FTP connection. See "Transferring the Array Files to the Management Host" on page 4-11 for instructions.

4. **Use a text editor to examine the** `syslog` **file.**

   Look for Error and Warning messages—these indicate a serious problem with the unit. Error message abbreviations are: E - errors, W - warnings, N - notices, I - informational. The following is a partial output of a `syslog` file:

```
Oct 26 17:01:30 LPCT[1]: W: u2pcu1: Switch off
Oct 26 17:01:31 LPCT[1]: W: u2pcu1: Off
Oct 26 17:01:33 LPCT[1]: W: u2pcu1: DC not OK
Oct 26 17:01:36 LPCT[1]: E: u2pcu1: Battery not present
Oct 26 17:01:39 LPCT[1]: E: u2pcu1: Not present
Oct 26 17:01:39 TMRT[1]: E: u2pcu1: Missing; system shutting down in 30 minutes
Oct 26 17:01:40 TMRT[1]: E: u2ctr: Multiple Fan Faults; system shutting down in
30 minutes
Oct 26 17:01:42 LPCT[2]: E: u2pcu1: Not present
Oct 26 17:01:45 LPCT[1]: E: u2pcu1: Over temperature
Oct 26 17:01:45 LPCT[1]: W: u2pcu1: Switch off
Oct 26 17:01:46 LPCT[1]: W: u2pcu1: Off
Oct 26 17:01:46 LPCT[1]: E: u2pcu1: Battery not present
Oct 26 17:01:48 LPCT[1]: N: u2pcu1: Battery not OK
Oct 26 17:04:16 LPCT[1]: E: u2d4: Not present
Oct 26 17:04:16 TMRT[1]: E: u2d4: Missing; system shutting down in 30 minutes
```

Note – There is limited space on the array for `syslog` files. When the `syslog` file exceeds the file-size threshold (1 Mbyte), this file is moved to a file called `syslog.OLD`, overwriting any previous `syslog.old` image.

If you are monitoring an error condition, transfer the `syslog` file to a host to save the output and prevent any pertinent data from being deleted.

5. **Compare `syslog` entries with the output of the `fru stat` command to see which FRU has failed.**

   In the following example, a warning (`W:`) message is shown in array unit 2 for drive 7 (`u2d7`). The `fru stat` output indicates a problem with `u2d7`. Based on this information, you would determine whether drive 7 in unit 2 needs to be repaired or replaced.

```
Oct 26 17:13:38 FCC0[1]: N: u1ctr (ITL 7D 1 0 TT 20 TID 77A8 OP 0) Target in
Unit Attention
Oct 26 17:13:37 FCC0[2]: N: u2ctr (ITL 7D 2 1 TT 20 TID 77A8 OP 0) Target in
Unit Attention
Oct 26 17:14:12 ISR1[2]: W: u2d7 SCSI Disk Error Occurred (path = 0x0)
Oct 26 17:14:12 ISR1[2]: W: Sense Key = 0x2, Asc = 0x4, Ascq = 0x2
Oct 26 17:14:12 ISR1[2]: W: Sense Data Description = Logical Unit Not Ready,
Initializing CMD Required
Oct 26 17:14:13 ISR1[1]: N: u1ctr ISP2100[1] Received LIP(f8,e8) async event
Oct 26 17:14:12 ISR1[2]: N: u2d7 SVD_DONE: Command Error = 0x3
Oct 26 17:14:12 ISR1[2]: N: u2d7 sid 0 stype 815 disk error 3
Oct 26 17:14:12 ISR1[2]: W: u2d7 SCSI Disk Error Occurred (path = 0x0)
Oct 26 17:14:15 SVDT[1]: N: 19 fcal ports were detected on l2
Oct 26 17:14:16 LPCT[1]: N: u2d7: Bypassed on loop 1
Oct 26 17:14:12 ISR1[2]: W: Sense Key = 0x2, Asc = 0x4, Ascq = 0x2
Oct 26 17:14:12 ISR1[2]: W: Sense Data Description = Logical Unit Not Ready,
Initializing CMD Required
Oct 26 17:14:12 ISR1[2]: N: u2d7 SVD_DONE: Command Error = 0x3
Oct 26 17:14:17 LPCT[1]: N: u2d7: Bypassed on loop 2
Oct 26 17:14:12 ISR1[2]: N: u2d7 sid 0 stype 405 disk error 3
Oct 26 17:14:12 ISR1[2]: W: u2d7 SCSI Disk Error Occurred (path = 0x0)
Oct 26 17:14:12 ISR1[2]: W: Sense Key = 0x2, Asc = 0x4, Ascq = 0x2
Oct 26 17:14:12 ISR1[2]: W: Sense Data Description = Logical Unit Not Ready,
Initializing CMD Required
Oct 26 17:14:12 ISR1[2]: N: u2d7 SVD_DONE: Command Error = 0x3
Oct 26 17:14:12 ISR1[2]: N: u2d7 sid 0 stype 405 disk error 3
Oct 26 17:14:12 WXFT[2]: W: u2d7: Failed
Oct 26 17:14:12 WXFT[2]: W: u2d7 hard err in vol (v1) starting auto disable
```

```
:/: fru stat
CTLR    STATUS   STATE       ROLE        PARTNER    TEMP
------  -------  ----------  ----------  -------    ----
u1ctr   ready    enabled     master      u2ctr      34.5
u2ctr   ready    enabled     alt master  u1ctr      33.5

DISK    STATUS   STATE       ROLE        PORT1      PORT2      TEMP  VOLUME
------  -------  ----------  ----------  ---------  ---------  ----  ------
u1d1    ready    enabled     data disk   ready      ready      33    v0
u1d2    ready    enabled     data disk   ready      ready      30    v0
u1d3    ready    enabled     data disk   ready      ready      29    v0
u1d4    ready    enabled     data disk   ready      ready      27    v0
u1d5    ready    enabled     data disk   ready      ready      24    v0
u1d6    ready    enabled     data disk   ready      ready      26    v0
u1d7    ready    enabled     data disk   ready      ready      25    v0
u1d8    ready    enabled     data disk   ready      ready      31    v0
u1d9    ready    enabled     data disk   ready      ready      34    v0
u2d1    ready    enabled     data disk   ready      ready      30    v1
u2d2    ready    enabled     data disk   ready      ready      31    v1
u2d3    ready    enabled     data disk   ready      ready      30    v1
u2d4    ready    enabled     data disk   ready      ready      26    v1
u2d5    ready    enabled     data disk   ready      ready      34    v1
u2d6    ready    enabled     data disk   ready      ready      26    v1
u2d7    fault    disabled    data disk   bypass     bypass     -     v1
u2d8    ready    enabled     data disk   ready      ready      32    v1
u2d9    ready    enabled     data disk   ready      ready      26    v1

LOOP    STATUS   STATE       MODE        CABLE1     CABLE2     TEMP
------  -------  ----------  -------     ---------  ---------  ----
u2l1    ready    enabled     master      installed  -          31.0
u2l2    ready    enabled     slave       installed  -          34.5
u1l1    ready    enabled     master      -          installed  31.0
u1l2    ready    enabled     slave       -          installed  35.0

POWER   STATUS   STATE       SOURCE  OUTPUT  BATTERY  TEMP    FAN1    FAN2
------  -------  ---------   ------  ------  -------  ------  ------  ------
u1pcu1  ready    enabled     line    normal  normal   normal  normal  normal
u1pcu2  ready    enabled     line    normal  normal   normal  normal  normal
u2pcu1  ready    enabled     line    normal  normal   normal  normal  normal
u2pcu2  ready    enabled     line    normal  normal   normal  normal  normal
```

5.2 Replacing FRUs

This section describes how to verify and confirm installation of a replacement FRU. It includes the following sections:

5.2.1 Verifying the FRU Firmware Level

The array contains various types of FRU firmware that are particular to the array model.

The Sun StorEdge T3 array contains four types of firmware:

- Controller firmware
- Controller erasable programmable read-only memory (EPROM) firmware
- Disk drive firmware
- Interconnect card firmware

The Sun StorEdge T3+ array contains the following firmware:

- Controller firmware:
  - Level 1
  - Level 2
  - Level 3
- Disk drive firmware
- Interconnect card firmware

When you install the new FRU, you will check its firmware level to determine if you need to upgrade the existing firmware. Use this procedure to check the firmware versions on your particular array model.

1. **Type `ver` to display the header information:**

   - An example of header information for a Sun StorEdge T3 array:

```
:/:<5>ver

T3 Release 1.17b 2001/08/02 15:21:29 (192.168.209.243)
Copyright (C) 1997-2001 Sun Microsystems, Inc.
All Rights Reserved.
```

     In this example Sun StorEdge T3 array controller firmware is listed as `Release 1.17b`.

   - An example of header information for a Sun StorEdge T3+ array:

```
:/:<5>ver

T3B Release 2.00 2001/08/02 15:21:29 (192.168.209.243)
Copyright (C) 1997-2001 Sun Microsystems, Inc.
All Rights Reserved.
```

     In this example, the Sun StorEdge T3+ array is shown running version `2.00` level 3 controller firmware.

2. **Type `fru list` to display the firmware versions for the disk drives and interconnect card on both array models.**

For example:

```
:/: fru list

ID      TYPE                VENDOR       MODEL          REVISION          SERIAL
------  ------------------  -----------  -----------  -------------  --------
u1ctr   controller card     0034         501-5710-02(  0200           123456
u2ctr   controller card     0034         501-5710-02(  0200           123455
u1d1    disk drive          SEAGATE      ST118202FSUN  9329           LK478728
u1d2    disk drive          SEAGATE      ST118202FSUN  9329           LK493799
u1d3    disk drive          SEAGATE      ST118202FSUN  9329           LK493800
u1d4    disk drive          SEAGATE      ST118202FSUN  9329           LK494457
u1d5    disk drive          SEAGATE      ST118202FSUN  9329           NK040486
u1d6    disk drive          SEAGATE      ST118202FSUN  9329           LK339351
u1d7    disk drive          SEAGATE      ST118202FSUN  9329           LK150715
u1d8    disk drive          SEAGATE      ST118202FSUN  9329           NK040157
u1d9    disk drive          SEAGATE      ST118202FSUN  9329           LKG79907
u2d1    disk drive          SEAGATE      ST118202FSUN  9329           LKG90019
u2d2    disk drive          SEAGATE      ST118202FSUN  9329           LKH18597
u2d3    disk drive          SEAGATE      ST118202FSUN  9329           LKH15606
u2d4    disk drive          SEAGATE      ST118202FSUN  9329           LKH16563
u2d5    disk drive          SEAGATE      ST118202FSUN  9329           LKG88883
u2d6    disk drive          SEAGATE      ST118202FSUN  9329           LKH61907
u2d7    disk drive          SEAGATE      ST118202FSUN  9329           LKG90719
u2d8    disk drive          SEAGATE      ST118202FSUN  9329           LKG95442
u2d9    disk drive          SEAGATE      ST118202FSUN  EA29           LKG61774
u1l1    loop card           SCI-SJ       375-0085-01-   5.03 Flash    007924
u1l2    loop card           SCI-SJ       375-0085-01-   5.02 Flash    007382
u2l1    loop card           SCI-SJ       375-0085-01-   5.02 Flash    003343
u2l2    loop card           SCI-SJ       375-0085-01-   5.02 Flash    003344
u1pcu1  power/cooling unit  TECTROL-CAN  300-1454-01(  0000           001455
u1pcu2  power/cooling unit  TECTROL-CAN  300-1454-01(  0000           001408
u2pcu1  power/cooling unit  TECTROL-CAN  300-1454-01(  0000           001686
u2pcu2  power/cooling unit  TECTROL-CAN  300-1454-01(  0000           001445
u1mpn   mid plane           SCI-SJ       375-0084-01-  0000           000650
u2mpn   mid plane           SCI-SJ       375-0084-01-  0000           000649
```

In this example:

- Disk drive firmware version is listed as `Revision 9329`
- Interconnect card (`loop card`) firmware version is listed as `Revision 5.03 Flash`
- Sun StorEdge T3 array controller EPROM firmware is listed as `Revision 0200`.
- Sun StorEdge T3+ array level 2 controller firmware, the level 2 image is `0200`.

5.2.2 Installing the Replacement FRU

Caution – Make sure you have the replacement FRU available before removing the failed FRU. If you remove a FRU, it must be immediately replaced. There is a timer in the unit that will cause the array and all connected arrays to power off in 30 minutes if a FRU is removed and not replaced.

- **Refer to the** *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual* **for instructions on replacing FRUs.**

5.2.2.1 Rebuilding a Replaced Drive FRU

A replaced drive FRU is automatically reconstructed by the array. If you should need to rebuild the replaced drive FRU manually, do so as follows:

1. **On the array, type:**

```
:/: vol recon undn
```

where `u`*n*`d`*n* is the unit (`u`) number (*n*) and the drive (`d`) number (*n*) of the drive you are rebuilding.

2. **Start a second telnet session with the array to check rebuild progress.**

3. **Check rebuild progress using the** `proc list` **command.**

The information in the `PERCENT` column and the `TIME` column, which shows the elapsed time, enables you to estimate when the volume will complete reconstruction.

```
:/: proc list

VOLUME          CMD_REF PERCENT    TIME COMMAND
v1                20241      23    0:09 vol recon
```

4. **Check the drive status to ensure reconstruction of the replaced drive FRU has completed.**

```
:/: fru stat

CTLR    STATUS   STATE       ROLE        PARTNER    TEMP
------  -------  ----------  ----------  -------    ----
u1ctr   ready    enabled     master      u2ctr      32.0
u2ctr   ready    enabled     alt master  u1ctr      29.0

DISK    STATUS   STATE       ROLE        PORT1      PORT2      TEMP  VOLUME
------  -------  ----------  ----------  ---------  ---------  ----  ------
u1d1    ready    enabled     data disk   ready      ready      34    v0
u1d2    ready    enabled     data disk   ready      ready      34    v0
u1d3    ready    enabled     data disk   ready      ready      31    v0
u1d4    ready    enabled     data disk   ready      ready      34    v0
u1d5    ready    enabled     data disk   ready      ready      32    v0
u1d6    ready    enabled     data disk   ready      ready      38    v0
u1d7    ready    enabled     data disk   ready      ready      33    v0
u1d8    ready    enabled     data disk   ready      ready      34    v0
u1d9    ready    enabled     data disk   ready      ready      36    v0
u2d1    ready    enabled     data disk   ready      ready      30    v1
u2d2    ready    enabled     data disk   ready      ready      31    v1
u2d3    ready    enabled     data disk   ready      ready      34    v1
u2d4    ready    enabled     data disk   ready      ready      34    v1
u2d5    ready    enabled     data disk   ready      ready      32    v1
u2d6    ready    enabled     data disk   ready      ready      37    v1
u2d7    ready    enabled     data disk   ready      ready      38    v1
u2d8    ready    enabled     data disk   ready      ready      42    v1
u2d9    ready    enabled     data disk   ready      ready      34    v1

LOOP    STATUS   STATE       MODE        CABLE1     CABLE2     TEMP
------  -------  ----------  -------     ---------  ---------  ----
u2l1    ready    enabled     master      installed  -          30.0
u2l2    ready    enabled     slave       installed  -          30.5
u1l1    ready    enabled     master      -          installed  27.0
u1l2    ready    enabled     slave       -          installed  29.5

POWER   STATUS   STATE       SOURCE  OUTPUT  BATTERY  TEMP    FAN1    FAN2
------  -------  ---------   ------  ------  -------  ------  ------  ------
u1pcu1  ready    enabled     line    normal  normal   normal  normal  normal
u1pcu2  ready    enabled     line    normal  normal   normal  normal  normal
u2pcu1  ready    enabled     line    normal  normal   normal  normal  normal
u2pcu2  ready    enabled     line    normal  normal   normal  normal  normal
```

Note – There can be a delay between the time when drive reconstruction is started and when the `fru stat` output displays an optimal status. If the drive is under reconstruction when you run the `fru stat` command, the command output will show the drive as missing. Once the drive finishes rebuilding, the `fru stat` output will show the drive as ready.

5.2.2.2 Controller Card

Replacing a controller card does not require any special command line administration, other than verifying its state using the `fru stat` command. For information on the controller card and how to replace it, refer to Section 5.2.5, "Controller Card," in the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual.*

5.2.2.3 Power and Cooling Unit

The replacement of the power cooling unit FRU should be done as quickly as possible to maintain full redundancy. For additional information including replacement instructions, refer to Section 5.2.2, "Power and Cooling Units" in the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual.*

Note – The UPS battery, which is built into the power and cooling unit, will show a fault when the unit is first installed before it recharges.

5.2.2.4 Interconnect Card

Replacing an interconnect card does not require any special command line administration, other than verifying its state using the `fru stat` command. For information on the interconnect card and how to replace it, refer to Section 5.2.4, "Interconnect Cards," in the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual.*

Note – In `fru stat` output, information on the interconnect card is listed under the `LOOP` category.

5.2.2.5 Chassis and Centerplane

It is unlikely that the array chassis and centerplane, which is one FRU, will ever need to be replaced. If it does need to be replaced, contact your Sun service representative. Only trained, qualified service providers should replace an array chassis and centerplane.

5.2.3 Verifying the FRU Replacement

1. **After replacing the FRU, check the firmware level of the new FRU using the `fru list` command to determine if it has the same firmware level as the FRU you replaced.**

   See Section 5.2.1, "Verifying the FRU Firmware Level" on page 5-6. If the firmware level of the new FRU is a later release, you will need to upgrade all firmware. For instructions on how to upgrade firmware, refer to the Service chapter in the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*.

Note – If you replace a controller card FRU, the controller firmware automatically checks the firmware information on the system disk and upgrades or downgrades itself to the previous firmware version recorded. A manual controller firmware upgrade is not required.

---

2. **Check the FRU status to verify that the failure has been corrected using the `fru stat` command.**

```
:/: fru stat

CTLR    STATUS   STATE       ROLE         PARTNER    TEMP
------  -------  ----------  ----------   -------    ----
u1ctr   ready    enabled     master       u2ctr      32.0
u2ctr   ready    enabled     alt master   u1ctr      29.0

DISK    STATUS   STATE       ROLE         PORT1      PORT2      TEMP  VOLUME
------  -------  ----------  ----------   ---------  ---------  ----  ------
u1d1    ready    enabled     data disk    ready      ready      34    v0
u1d2    ready    enabled     data disk    ready      ready      34    v0
u1d3    ready    enabled     data disk    ready      ready      31    v0
u1d4    ready    enabled     data disk    ready      ready      34    v0
u1d5    ready    enabled     data disk    ready      ready      32    v0
u1d6    ready    enabled     data disk    ready      ready      38    v0
u1d7    ready    enabled     data disk    ready      ready      33    v0
u1d8    ready    enabled     data disk    ready      ready      34    v0
u1d9    ready    enabled     data disk    ready      ready      36    v0
u2d1    ready    enabled     data disk    ready      ready      30    v1
u2d2    ready    enabled     data disk    ready      ready      31    v1
u2d3    ready    enabled     data disk    ready      ready      34    v1
u2d4    ready    enabled     data disk    ready      ready      34    v1
u2d5    ready    enabled     data disk    ready      ready      32    v1
u2d6    ready    enabled     data disk    ready      ready      37    v1
u2d7    ready    enabled     data disk    ready      ready      38    v1
u2d8    ready    enabled     data disk    ready      ready      42    v1
u2d9    ready    enabled     data disk    ready      ready      34    v1

LOOP    STATUS   STATE       MODE         CABLE1     CABLE2     TEMP
------  -------  ----------  -------      ---------  ---------  ----
u2l1    ready    enabled     master       installed  -          30.0
u2l2    ready    enabled     slave        installed  -          30.5
u1l1    ready    enabled     master       -          installed  27.0
u1l2    ready    enabled     slave        -          installed  29.5

POWER   STATUS   STATE       SOURCE  OUTPUT  BATTERY  TEMP    FAN1    FAN2
------  -------  ---------   ------  ------  -------  ------  ------  ------
u1pcu1  ready    enabled     line    normal  normal   normal  normal  normal
u1pcu2  ready    enabled     line    normal  normal   normal  normal  normal
u2pcu1  ready    enabled     line    normal  normal   normal  normal  normal
u2pcu2  ready    enabled     line    normal  normal   normal  normal  normal
```

Note – When checking disk drive status, there can be a delay between the time when drive reconstruction is started and when the `fru stat` output displays an optimal status. If the drive is under reconstruction when you run the `fru stat` command, the command output will show the drive as missing. Once the drive finishes rebuilding, the `fru stat` output will show the drive as ready.

5.3 Identifying Miscabled Partner Groups

If you configure a partner group that has booted successfully, but you are unable to establish a telnet connection, a possible cause is that the partner group has been cabled together incorrectly.

The interconnect cable connections between dual controller units are critical for determining which unit is the master controller unit and which is the alternate master controller unit. If the interconnect cables are not properly installed on the interconnect cards, it is possible for the top unit to boot as the master controller, and the bottom unit would assume alternate master status. This becomes a problem because the host has been configured to use the MAC address of the bottom unit.

If the bottom unit is incorrectly cabled making the bottom unit the alternate master, the bottom unit's Ethernet port will be inactive unless a failover situation occurs. In that event, the IP and MAC address of the bottom unit will take over the values of the master (top) unit.

If you suspect the partner group has been cabled together incorrectly, the following procedure can help you determine if the top unit is acting as the master controller.

1. **Determine the MAC address of the top unit.**

   The MAC address is located on a pull-out tab at the front of the unit, to the left of the first disk drive. (FIGURE 5-1).

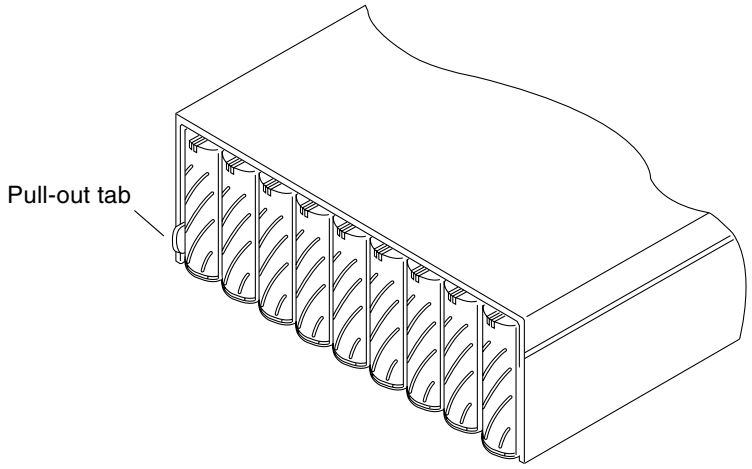

FIGURE 5-1 MAC Address on Pull-out Tab

2. **Edit the files on the RARP server to include the MAC address of the top unit.**

   a. **Edit the** `/etc/ethers` **file by adding the MAC address and array name.**

   For example:

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

   In this example:

   - `8:0:20:7d:93:7e` is the MAC address
   - *array-name* is the name of the master controller unit.

   b. **Edit the** `/etc/hosts` **file with the IP address and array name.**

   For example:

```
192.129.122.111 array-name
```

   In this example, `192.129.122.111` is the assigned IP address.

c. Edit the `/etc/nsswitch.conf` file to reference the local system files.

To ensure the Solaris software environment uses the changes made to `/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 as shown:

```
hosts:      nis files [NOTFOUND=return]
ethers:     nis files [NOTFOUND=return]
```

d. Determine if the RARP daemon is running by typing:

```
# ps -eaf | grep rarpd
```

- If the RARP daemon is running, you must kill the process and restart it for the host to recognize the changes you just made. To kill the process, type:

```
# kill process ID
```

The process ID was provided in the `ps -eaf | grep rarpd` command output.

- If the RARP daemon is not running, continue to the next step.

e. Start the RARP daemon in the Solaris environment by typing:

```
# /usr/sbin/in.rarpd -a &
```

3. **Make sure you have an Ethernet connection to the Ethernet port of the top unit.**

   See the cabling section in the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual* for more information. If you do not have an Ethernet connection to the top unit but do have one to the bottom unit, remove the cable from the bottom unit and connect it to the top unit.

4. **Press the power switch on the power and cooling units on both arrays to remove AC power (**FIGURE 5-2**).**

   After pressing the switches, it may take some time for the units to power off while shutdown procedures are performed. Wait until the units have powered off completely.

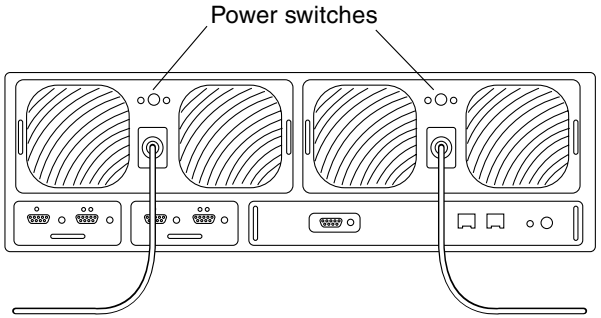

FIGURE 5-2 Power Switch Locations

5. **After both units have powered off, press the power switch on the power and cooling units again to restore power to and reset the arrays.**

   It may take up to several minutes for the arrays to power on and come back online. All LEDs will be green when the unit is fully powered on.

6. **After the units are fully powered on, start a telnet session.**

   The telnet session will connect to the top unit.

   If you still cannot start a telnet session, investigate the following other possible causes:

   - **RARP server not responding.** To determine if this is the problem:
     - Verify that the RARP daemon is running on the host system.
     - Verify that the `/etc/nsswitch.conf` file is properly configured on the RARP server.
     - In the Solaris environment, use the `snoop(1M)` command to verify that the array is attempting to establish RARP communication with the Solaris server.
   - **MAC address is incorrect.** In the Solaris environment, use the `snoop(1M)` command to specify the MAC address of the array and see if any RARP packets are transmitted. If nothing is observed during a reboot of the array, verify that the MAC address on the array label matches the MAC address configured on the RARP server.
   - **Netmask is incorrect.** The default netmask address used on the array is 255.255.255.0. If your local subnet uses a different netmask, the RARP operation may not work.
   - **Inoperable network connections.** If you are using hubs to connect to the network, try eliminating or replacing the hub.

5.4 Identifying Data Channel Failures

The data channel encompasses the host data path that extends from the host bus adapter to the array. Errors in the host data channel are outside of the scope of the Sun StorEdge T3 and T3+ array. To determine failures in the data path, you must use host-based application diagnostics, such as the StorTools product for the Solaris operating environment.

Refer to the documentation of the selected diagnostics tool for information on identifying data channel failures.

APPENDIX **A**

Command Descriptions

This appendix contains descriptions of the commands supported by the Sun StorEdge T3 and T3+ array and is divided into the following sections:

A.1 Commands List

TABLE A-1 contains an alphabetical listing of the commands supported by the array. To generate the command descriptions, use the *command-name* `help` command.

For example, for information on the `reset` command, type:

```
:/: reset help
usage:  reset [ -y ]
```

TABLE A-1 Commands Listed in Alphabetical Order

Command	Description	Re-entrant[1]	Page
`boot`	Boot system	No	A-4
`disable`	Disable certain FRUs	No	A-5
`disk`	Disk administration	No	A-5
`enable`	Enable certain FRUs	No	A-6
`ep`	Program the flash EPROM	No	A-6
`fru`	Display the FRU information	No	A-7
`help`	Display reference manual pages	Yes	A-8
`id`	Display FRU identification summary	No	A-8
`lpc`	Get interconnect card property	No	A-10
`ofdg`	Perform back-end offline loop diagnostics	No	A-11
`port`	Configure the interface port	No	A-12
`proc`	Display status of outstanding `vol` processes	No	A-13
`refresh`	Start/stop battery refreshing or display its status	No	A-13
`reset`	Reset system	Yes	A-15
`set`	Display or modify the set information	No	A-15
`shutdown`	Shutdown array or partner group	No	A-17
`sys`	Display or modify the system information	No	A-18
`ver`	Display software version	No	A-19
`vol`	Display or modify the volume information	No	A-19

1. A re-entrant command is one that can be run in multiple telnet sessions to the same array.

A.2 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 (e*ncid*), 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 A-2 lists the possible FRU variables as they appear in this appendix.

TABLE A-2 FRU Identifiers

FRU	Identifier	Unit number
Controller card	u*encid*`ctr`	*encid* = unit number (1, 2, ...)
Power and cooling unit	u*encid*`pcu[1|2]`	*encid* = unit number (1, 2, ...) *n* = pcu number (1, 2)
Interconnect card	u*encid*`l[1|2]`	*encid* = unit number (1, 2, ...) *n* = interconnect card number (1, 2)
Disk drive	u*encid*`d`*n*	*encid* = unit number (1, 2, ...) *n* = disk drive number (1 to 9)

A.3 Command Summaries

The following sections provide summaries of Sun StorEdge T3 and T3+ array commands. Command summaries are listed in alphabetical order of the command.

A.3.1 boot

TABLE A-3 boot Command Summary

Name	boot
Synopsis	boot -f *disk_no* boot -i *filename*.bin boot -s boot -w
Description	Boots the RAID software according to the boot mode, configured with the set command.
Options	
-f	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 "Failed to set new boot disk position" on the console.
-i	• Sun StorEdge T3 arrays: Installs new autoboot firmware onto the drives from *filename*.bin. *filename* can be a maximum of 11 characters. This new firmware will be executed after the next system restart (if boot mode is set to auto). The new firmware must be downloaded using the ftp command. Firmware is copied to disk and boots from disk. • Sun StorEdge T3+ arrays: Copies the level 3 controller firmware image to the controller card flash, which is different from the location used for a Sun StorEdge T3 array.
-s	Used when disks in an array are detected as being in the wrong disk position. If this occurs, a special prompt ADMIN> is displayed. At this point, use the boot -s command to correct this state and reboot the array.
-w	Sets the default values to system area and configuration setting only. The boot image and local file system will be retained. Use to quickly clear all the system and configuration settings.

A.3.2 disable

TABLE A-4 `disable` Command Summary

Name	`disable`
Synopsis	`disable u`*`encid`* `disable u`*`encid`*`l [1|2]`
Description	Disables specified FRUs.
Arguments	See Section A.2, "FRU Identifiers" on page A-3 for definitions.

A.3.3 disk

TABLE A-5 `disk` Command Summary

Name	`disk`
Synopsis	`disk version` *drives* `disk download` *drives filename*
Description	Controls, displays and configures disks.
Options	
`version`	Displays the firmware version of the selected drive(s).
`download`	Updates the selected drive(s) with new firmware specified by the *filename*.
Arguments	
drives	The disk drive numbers.
filename	The file to use for drive firmware updates.

A.3.4 enable

TABLE A-6 enable Command Summary

Name	enable
Synopsis	enable u*encid* enable u*encid*l [1|2]
Description	Enables specific FRUs.
Arguments	See Section A.2, "FRU Identifiers" on page A-3 for definitions.

A.3.5 ep

TABLE A-7 ep Command Summary

Name	ep
Synopsis	ep download *filename*
Description	Updates the FLASH with new firmware specified by *filename*.
Arguments	
filename	The new firmware to be loaded into the controller EPROM. The file must reside in the local file system.

A.3.6 fru

TABLE A-8 fru Command Summary

Name	fru
Synopsis	fru l[ist] fru list sys fru list [u<1-8>] fru list [u<1-8>]c[1] fru list [u<1-8>]d[<1-9>] fru list [u<1-8>]l[<1-2>] fru list [u<1-8>]pcu[<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[<1-9>] 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[<1-9>] fru statistic [u<1-8>]p[1] [clear] fru statistic [u<1-8>]v[<1-2>] [clear] fru myuid
Description	Displays the field-replaceable unit (FRU) information.
Options	
list list sys	Displays all FRU IDs types, vendor, model, version, and serial number.
stat sys	Displays the status and role of each tray.
statistic sys	Displays I/O statistics.
myuid	Displays the current controller.
Arguments	See Section A.2, “FRU Identifiers” on page A-3 for definitions.

A.3.7 help

TABLE A-9 help Command Summary

Name	help
Synopsis	help
Description	Displays commands.

A.3.8 id

TABLE A-10 id Command Summary

Name	id
Synopsis	id read u*encid* id read u*encid*pcu[1|2] id read u*encid*l[1|2] id read u*encid*c1
Description	Displays FRU identification summary.
Option	
id read u*encid*	Displays FRU information for the array midplane.
id read u*encid*pcu [1|2]	Displays FRU information for the array power and cooling unit.
id read u*encid*l[1|2]	Displays FRU information for the array interconnect (loop) cards.
id read u*encid*c1	Displays FRU information for the array controller.
id read u*ncid*c1 [fruid]	Displays information from center FRUID for the array only.
Arguments	See Section A.2, "FRU Identifiers" on page A-3 for definitions.

A.3.9 logger

TABLE A-11 logger Command Summary

Name	logger
Synopsis	logger [-dmprstlog] [-f <*file* | ->] [-p *facility.priority*] [*message*]
Description	Generates messages to the syslog in the unit.
Options	
-dmprstlog	Dumps the reset log, and displays the system crash information. This log information can be useful in troubleshooting controller crashes.
-f	Specifies a particular file or content to be logged. -f <*file*> specifies a particular file; if used, only the first 20 lines will be 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 will be logged.
-p	Specifies the message's facility and priority level. The default facility is user and the default priority is notice.
Arguments	
message	Text of message to be logged.
Example	This example shows text being written to the syslog facility as a warning: :/: logger -p syslog.warning this is a test will write the following into the syslog: Oct 26 14:44:56 sh01[1]: W: this is a test

A.3.10 lpc

TABLE A-12 lpc Command Summary

Name	lpc
Synopsis	lpc version lpc download u*encid*1{1|2} *filename* lpc reboot u*encid*1{1|2} lpc rsn u*encid*1{1|2} lpc rid u*encid*1{1|2} lpc ledtest u*encid*1{1|2} *delay*
Description	A utility to display and upgrade interconnect cards.
Options	
version	Displays each interconnect card firmware version.
download	Downloads new interconnect card firmware.
reboot	Executes soft reset to selected interconnect card.
rsn	Displays serial number.
rid	Displays interconnect card vendor id and product id.
ledtest	Tests LEDs controlled through the interconnect card. This option does not test the AC LED on the PCU or the drive activity LED on disk drives; these LEDs are not controlled through the interconnect card.
Arguments	
u*encid*	Unit ID. See Section A.2, "FRU Identifiers" on page A-3 for definitions.
filename	File name of new firmware to download.

A.3.11 ofdg

TABLE A-13 ofdg (Offline Diagnostics) Command Summary

Name	ofdg
Synopsis	ofdg [-y] health_check ofdg [-y] fast_test u*encid*l[1|2] ofdg [-y] fast_find u*encid*l[1|2] ofdg [-y] find u*encid*l[1|2]
Description	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.
Options	
health_ check	Performs a fast test on all detected loops in a partner group.
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 partner groups, providing limited detection of bad FRUs. Use the fast_find option before using the find 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 a partner group and provides loop fault diagnostics, which has the capability to isolate a FRU problem to a single disk port. Use the find option only after using the fast_find option. This test reconfigures loops and by-passes disk ports.
Arguments	
-y	Provides an affirmative answer to the command prompt: WARNING - Volume data will be offline while OFDG is running. Continue? [N]:
u*encid*	Unit ID. See Section A.2, “FRU Identifiers” on page A-3 for definitions.

A.3.12 port

TABLE A-14 port Command Summary

Name	port
Synopsis	port list port set *port* targetid *target-id-value* | s[oft] port host *port* sun | other port listmap [*port*]
Description	A utility used to manage ports.
Options	
list	Displays the configuration of the ports.
set	Modify port parameters and change the port target ID value. Any changes to the target ID require a reset for the changes to take effect.
host	Whenever attaching to a Solaris 2.6 host, add the option 'sun' to the end of the port host command. For example: port host u1p1.
listmap	Shows the current mappings between host interface ports and LUNS and volumes.
Arguments	
port	Specifies the port. The format is: u*arrayp portindex*. Examples: u1p1, u2p1
target-id-value	Specifies the target ID (FC-AL ALPA). Valid values are from 0 to 125; the optional argument s means soft-addressing.
Examples	:/: port list port targetid addr_type status host wwn u1p1 1 hard online other 50020f230000036a :/: port listmap port targetid addr_type lun volume owner access u1p1 1 hard 1 u1vol1 u1 primary :/: port set u1p1 targetid 6

A.3.13 proc

TABLE A-15 proc Command Summary

Name	proc
Synopsis	proc list [*cmd-ref* | *vol-name*] proc kill *cmd-ref* | *vol-name*
Description	Displays status of outstanding vol processes.
Options	
list	Displays the command reference number of an active vol init, vol verify or vol recon command currently in progress.
kill	Terminates the active vol init, vol verify or vol recon command by specifying its command reference number.
Arguments	
cmd-ref | *vol-name*	Specifies the command reference number or volume name.

A.3.14 refresh

TABLE A-16 refresh Command Summary

Name	refresh
Synopsis	refresh -c refresh -s refresh -i refresh -k
Description	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 up to 10 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/sched.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.
Options	
-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.

A.3.15 reset

TABLE A-17 reset Command Summary

Name	reset
Synopsis	reset [-y]
Description	Resets the controller. Use the sync command before a reset command.
Argument	
-y	Answers "yes" when prompted to perform reset.

A.3.16 set

TABLE A-18 set Command Summary

Name	set
Synopsis	set bootmode auto | tftp | none set bootdelay *seconds* <use value from 1 to 20 seconds> set ip *value* set netmask *value* set gateway *value* set tftphost *value* set tftpfile *value* set hostname *value* set logto 1 | * | */filename* set loglevel 0 | 1 | 2 | 3 | 4 set rarp on |off
Description	Sets and displays the boot parameters. Without any parameters, the set command shows the values of the parameters.

TABLE A-18 `set` Command Summary *(Continued)*

Options	
`bootmode`	Defines how the array is booted: • Use `auto` boot for loading the RAID software from the local drives. This is the default mode. • If `bootmode` is using `tftp`, use `tftphost` and `tftpfile`. (Field service procedure only.) • If `bootmode` is set to none, use system EPROM command line. (Field service procedure only.)
`bootdelay`	The delay time, in seconds, to cancel a system boot.
`ip`	The network IP address. The *value* is expressed in dotted decimal notation (for example, 192.9.200.100).
`netmask`	The subnet mask for the network. The *value* is expressed in dotted decimal notation (for example, 255.255.255.0).
`gateway`	The default gateway on the network. The *value* is expressed in dotted decimal notation (for example, 192.9.200.1).
`tftphost`	The IP address of the server from which a `tftp` boot should be performed. (Field service procedure only.)
`tftpfile`	The file name on the tftpboot server that contains the RAID software. The *value* is a string of up to 39 characters. (Field service procedure only.)
`hostname`	The user assigned name of the array.

TABLE A-18 `set` Command Summary *(Continued)*

`logto`	The file where messages are to be logged: • If `logto` is set to `1`, logging occurs only through the serial port; log messages are not sent to the `/syslog` file. • If `logto` is set to `*`, and an `/etc/syslog.conf` entry specifies an output file name that already exists, the arrayappends new log information to the end of that output file. If the output file specified in `/etc/syslog.conf` doesn't exist, the arraycreates a new file with that name. If the output file does not exist and cannot be created, the entry will be ignored. Note: If there are changes to the `/etc/syslog.conf` file, you must type `set logto *` for those changes to take effect. • If `logto` is set to */filename*, and the specified file name does not exist, the arraycreates 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 `/syslog`. If both `/filename` and `/syslog` cannot be opened, logging occurs through the serial port only.
`loglevel`	The level of messages to be logged (0=none, 1=errors, 2= warnings/errors, 3=notices/warnings/errors, 4= informational/notices/warnings/errors).
`rarp`	If enabled and connected to a rarp server, sets the IP address.

A.3.17 `shutdown`

TABLE A-19 `shutdown` Command Summary

Name	`shutdown`
Synopsis	`shutdown [-y]`
Description	The `shutdown` command performs a controlled shutdown of the array and any array connected to it.
Argument	
`-y`	Answers "yes" when prompted to perform a shutdown.

A.3.18 sys

TABLE A-20 sys Command Summary

Name	sys
Synopsis	sys list sys stat sys blocksize 16k|32k|64k sys cache auto|writebehind|writethrough|off sys mirror auto|off sys mp_support none|rw|mpxio|std sys rd_ahead on|off sys recon_rate high|med|low sys naca
Description	A utility used to manage system information.
Options	
list	Displays the current controller configuration.
stat	Displays the current controller status.
blocksize	Sets the system block size, which equals the stripe unit size: 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.
cache	Sets the system caching policy.
mirror	Turns the cache mirror feature on or off when using dual controllers.
mp_support	• If mp_support is set to none, multipathing support is disabled. Use this mode for workgroup configurations only. • If mp_support is set to rw, multipathing support is enabled. Use this mode for enterprise configurations to ensure redundancy. • If mp_support is set to mpxio, this setting supports Sun StorEdge Traffic Manager software's multipathing utility. This setting is required for all enterprise configurations in Sun Cluster environments. • The std option is reserved. Before using this option, contact your SunService provider.
rd_ahead	Sets the number of sequential read commands before automatically switching to datablock read ahead. Set to off to always perform datablock read ahead.

TABLE A-20 sys Command Summary *(Continued)*

recon_rate	The disk drive reconstruction rate options: high, medium, or low.
naca	Enables IBM/AIX support.

A.3.19 ver

TABLE A-21 ver Command Summary

Name	ver
Synopsis	ver
Description	Displays the current version of controller firmware on a Sun StorEdge T3 array or the current version of level 3 controller firmware on a Sun StorEdge T3+ array.

A.3.20 vol

TABLE A-22 vol Command Summary

Name	vol
Synopsis	vol add *name* data *drive* raid 0|1|5> [standby *drive*] vol disable *drive* [to-standby] vol init *name* data|sysarea|fast [rate <1-16>] vol list *name* vol mode *name* vol mount *name* vol recon *drive* to-standby|from-standby vol remove *name* vol stat *name* vol unmount *name* vol verify *name* [fix] [rate <1-8>] vol -y remove *name*
Description	Used to manage volumes.
Options	
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.

TABLE A-22 vol Command Summary *(Continued)*

`disable`	Marks the specified drive unusable. If the `to_standby` 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`	Initializes the volume parity or system area label. This argument specifies the initialize option to be performed on the selected volume: • `data` - Initialize the entire data area with correct parity data. This operation will destroy all user data on volume. It will take several minutes to complete. • `sysarea` - Initialize the system area with correct private label information. This option is only for qualified service providers. • `fast` - Initialize and bypass data area. The initialization rate can be set to any value from 1 (slowest) to 16 (fastest). The default rate for the array is 16. This option is to be used for RAID 0 volumes only.
`list`	Displays the configuration of the currently assigned volumes.
`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 `to_standby` argument is included, data is written to the hot spare (standby) drive. If the `from_standby` 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 de-assigning 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 `vol verify` command before performing tape-backup overwrite cycles, approximately once every 30 days. If the fix option is specified and an error is detected, the vol verify command will regenerate parity from the existing data on the volume.
`-y remove`	Deletes a volume without prompting for verification to remove.

TABLE A-22 vol Command Summary *(Continued)*

Arguments	
name	Specifies the volume name.
drives	Specifies the set of drives to be assigned to the volume.

Example	`:/: vol list`
	
	`volume capacity raid data standby`
	`v0 125.2 GB 5 u2d1-8 u2d9`
	`v1 125.2 GB 5 u2d1-8 u2d9`
	
	`:/: vol add vol-name data u5d1-8 raid 5 standby u5d9`

APPENDIX **B**

`syslog` Error Messages

This appendix contains a list of errors that can be reported by the array, along with error definitions.

This appendix is divided into the following sections:

B.1 Error Message Syntax

Error message syntax consists of the following three components:

These components are described in the following subsections, including a listing of `syslog` error and warning messages.

B.1.1 Message Types

A `syslog` daemon exists in the hardware RAID controller that records system messages and provides for remote monitoring. There are four possible levels of messages, listed in TABLE B-1 in order of severity.

TABLE B-1 Message Types

Message Type	Definition
`Error`	Indicates a critical system event requiring immediate user intervention or attention. For example, an over temperature condition or a detected FRU being removed.
`Warning`	Indicates a possible event requiring eventual user intervention. For example, a FRU being disabled and recovery procedure executed.
`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, a good state of a FRU.

B.1.2 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 B-2 FRU Identifiers

FRU	Identifier	Unit number
Controller card	u*n*ctr	*n* = unit number (1, 2, ...)
Power and cooling unit	u*n*pcu*n*	*n* = unit number (1, 2, ...) *n* = pcu number (1, 2)
Interconnect card	u*n*l*n*	*n* = unit number (1, 2, ...) *n* = interconnect number (1, 2)
Disk drive	u*n*d*n*	*n* = unit number (1, 2, ...) *n* = disk drive number (1 to 9)

B.1.3 Error Message Listing

TABLE B-3 lists possible error messages.

TABLE B-3 Error Messages

Error Message	Description	Solution
System		
`E: No boot image on disk, writing EPROM to boot image area...`	No master copy of image on disk. Writing to disk from flash.	
`E: EPROM update failed...`	Failed to write image from disk to flash.	
`E: Power On Self Test failed...`	This is a fatal error which means that the firmware may be unable to communicate with the drives. Problem may be caused by interconnect cables, loop cards, controller, disks/ firmware, centerplane.	Troubleshoot the unit. Check status.
Controller Card		
`E: u<n>ctr: Not present`	The array detects that the controller is missing; controller has been removed.	Reseat or replace the controller card.
`E: u<n>ctr: Missing; system shutting down in <n> minutes`	A controller is missing and a countdown has started. If the controller is not replaced in <n> minutes, the system will shut down.	Replace the controller.
`E: u<n>ctr: Missing; system shutting down now`	A controller card was not replaced within the stated time; system shutting down now.	Replace the controller card and power on the system.
`E: ISP2200 test failed`	ISP2200 POST test failed.	Please contact your contract service provider for further analysis.
`E: Data cache memory test failed`	Cache Memory POST test failed.	Contact your contract service provider for further analysis.
`E: XOR functions and datapaths test failed`	XOR Memory POST test failed. Controller will be reset.	Controller board replacement may be necessary. Please take appropriate action.

TABLE B-3 Error Messages *(Continued)*

Error Message	Description	Solution
Interconnect (loop) Card and Cable		
`E: u<n>l<n>: Missing; system shutting down in <n> minutes`	A loopcard is missing, and a countdown has started. If the loop card is not replaced in the time frame, then the system will shut down.	Replace the loop card.
`E: u<n>l<n>: Missing; system shutting down now`	A loopcard was not replaced within stated time; system shutting down now.	Replace the loop card and power on the system.
`E: u<n>l<n>: Not present`	System detects that the interconnect card is missing.	Reseat or replace the interconnect card.

`E: u<n>l<n>: UP cable not present`
or:
`E: u<n>l<n>: DOWN cable not present`
	System detects missing interconnect cable for interconnect card.	Check cables.

Drive		
`E: u<n>d<n>: Missing; system shutting down in <n> minutes`	A disk drive is missing and a countdown has started. If the drive is not replaced in the stated time, the system will shut down.	Replace the missing disk drive.
`E: u<n>d<n>: Missing; system shutting down now`	A disk drive was not replaced within the stated time; system shutting down now.	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 syslog for any other related messages. Replace the failed disks.
`E: u<n>d<n>: Not present`	System detects a drive was removed.	Reseat or replace the disk drive.
Power and Cooling Unit		
`E: u<n>pcu<n>: Missing; system shutting down in <n> minutes`	A power and cooling unit is missing and a countdown has started. If the unit is not replaced in the stated time, the system will shut down.	Replace the power and cooling unit.
`E: u<n>pcu<n>: Missing; system shutting down now`	A power and cooling unit was not replaced within in the stated time; system shutting down now.	Replace the power and cooling unit; power on the system.

TABLE B-3 Error Messages *(Continued)*

Error Message	Description	Solution
`E: u<n>pcu<n> Not present`	System detects the power and cooling unit is missing.	Reseat or replace the power and cooling unit.
`E: u<n>pcu<n>: Over temperature, serial no = x`	System detects that a power and cooling unit has reached an over temperature state.	Replace the power and cooling unit.
`E: u<n>pcu<n>: Battery not present`	System detects that the battery is missing.	Replace the power and cooling unit.
`E: u<n>ctr1: Multiple Fan Faults; system shutting down in N minutes`	The controller has detected a fault on fans in both power and cooling units.	Determine which fans in which power and cooling unit failed; replace the power and cooling unit.
`E: u<n>ctr1: Multiple Fan Faults; system shutting down now`	The controller has detected a fault on fans in both power and cooling units.	Determine which fans in which power and cooling unit failed; replace the power and cooling unit.

B.1.4 Warning Message Listing

TABLE B-4 lists possible warning messages, which are divided into FRU categories and System.

TABLE B-4 Warning Messages

Warning Message	Description	Solution
System		
`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 `syslog` should indicate which disk(s) had a problem.
`W: u<n>ctr initialization failed in vol volume_name`	Volume data initialization to zero failed.	Check the disk drive status using the `vol stat` command. If any disk has a non-zero status, either initialize the volume using the `vol init` command, or replace the disk.

TABLE B-4 Warning Messages *(Continued)*

Warning Message	Description	Solution

`W: u<n>ctr Reset (xxxx) occurred`
or
`W: u<n>ctr Hardware Reset (xxxx) occurred`
or
`W: u<n>ctr Exception Reset (xxxx) occurred`
or
`W: u<n>ctr Assertion Reset (xxxx) occurred`
or
`W: u<n>ctr RaidFail Reset (xxxx) occurred`
or
`W: u<n>ctr Takeover Reset (xxxx) occurred`
or
`W: u<n>ctr PsosFail Reset (xxxx) occurred`
or
`W: u<n>ctr SysFail Reset (xxxx) occurred`
or
`W: u<n>ctr MmuFail Reset (xxxx) occurred`
	A hard reset occurred. Message indicates a controller has been reset manually.	Check adjacent messages to see if this event indicates an error.

TABLE B-4 Warning Messages *(Continued)*

Warning Message	Description	Solution
W: u<n>ctr Reset (xxxx) was initiated at <date> <time> <message> or W: u<n>ctr Hardware Reset (xxxx) was initiated at <date> <time> <message> or W: u<n>ctr Exception Reset (xxxx) was initiated at <date> <time> <message> or W: u<n>ctr Assertion Reset (xxxx) was initiated at <date> <time> <message> or W: u<n>ctr RaidFail Reset (xxxx) was initiated at <date> <time> <message> or W: u<n>ctr Takeover Reset (xxxx) was initiated at <date> <time> <message> or W: u<n>ctr PsosFail Reset (xxxx) was initiated at <date> <time> <message> or W: u<n>ctr SysFail Reset (xxxx) was initiated at <date> <time> <message> or W: u<n>ctr MmuFail Reset (xxxx) was initiated at <date> <time> <message>	A soft reset occurred, for one of several reasons. The specific error is indicated by the Type.	Check Table B-5 for information about the type of reset that occurred. The field here should match one of those listed in Table B-5.
W: u<n>ctr Illegal mp_support mode for explicit LUN fail over request (opcode 0xD0 received) on LUN	The `mp_support` option is set to an invalid value.	Use the `sys list` command (or Component Manager) to set the `mp_support` flag to `mpxio` or `std`.
W: u<n>d<n>: SVD_PATH_FAILOVER: path_id = x or W: u<n>d<n>: SVD_PATH_FAILOVER: path_id = x, lid = x	A failover has occurred, indicating that one of the system's replaceable units is faulty.	Troubleshoot and replace the failed component. You can find more information in related syslog messages and by using the `fru stat` command.

TABLE B-4 Warning Messages *(Continued)*

Warning Message	Description	Solution
`W: u<n>l<n> LMON predictive failure threshold exceeded - LIP`	The Fibre Channel loop is exhibiting an unexpected number of LIPs. This problem can be generated from any of the FRUs.	In certain cases, running the `ofdg` diagnostic may find the problem. In general, notify your Sun authorized service provider.
Controller		
`W: u<n>ctr: Offline`	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: u<n>ctr: Inactive`	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: u<n>ctr: Rebooting`	A controller has been rebooted because it was removed, disabled, or 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: u<n>ctr: Failed to boot`	The system was not able to reboot a controller successfully, even after repeated attempts.	Replace the controller.
`W:  u<n>ctr: Disabled`	System disabled a controller.	Check previous message queue to determine why the controller is disabled. Then enable or replace the controller.
`W: u<n>ctr starting lun <lun_#> failover`	A LUN failover has occurred.	Use the `sys stat` command to see if the controller is disabled. Then check the syslog for possible interconnect, host adapter, or cable problems.
`W: ECC mechanism verification failed`		Contact your contract service provider for further analysis.

TABLE B-4 Warning Messages *(Continued)*

Warning Message	Description	Solution

`W: u<n>ctr: ISP2x00[N] qlcf_i_read_response: Debug Code - Immediate Notify CCBs Exhausted`
or
`W: u<n>ctr: ISP2x00[N] DMA Error Detected`
or
`W: u<n>ctr: ISP2x00[N] Received LOOP DOWN async event`
or
`W: u<n>ctr: ISP2x00[N] Bad request pkt`
or
`W: u<n>ctr: ISP2x00[N] Bad request pkt header`
	Indicates an error in one of the ISP 2x00 chips in the controller.	Notify your Sun authorized service provider.

TABLE B-4 Warning Messages *(Continued)*

Warning Message	Description	Solution
W: XOR T<n> ERROR: ACC should not be zero or W: XOR T<n> ERROR: ACC should be zero or W: XOR T<n> ERROR: BUF data not equal to previously written or W: XOR T<n> ERROR: BUF data should be all zeros or W: XOR T<n> ERROR: ORed data should be all zeros or W: XOR T<n> ERROR: Compare error of BUS and orig data or W: XOR T<n> ERROR: buf data should be all zeros or W: XOR T<n> ERROR: Buf check finds all zeros or W: XOR T<n> ERROR: Write to data cache mem failed or W: XOR T<n> ERROR: Read from data cache mem failed or W: XOR T<n> ERROR: Diag Fail	A XOR Memory POST test failed. Controller will be reset.	Replace the controller board.

TABLE B-4 Warning Messages *(Continued)*

Warning Message	Description	Solution
Interconnect (loop) card and Cable		
`W: u<n>l<n>: Offline`	System is not able to poll the interconnect card for information. It is possible that an interconnect card is disabled, which may cause other interconnect cards to go offline.	• If no interconnect card is disabled, check cable connections to the interconnect card and make sure it is firmly seated. • If the interconnect card does not come back online, replace the interconnect card.
`W: u<n>l<n>: Disabled`	System detects the interconnect card is disabled.	Check 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`
	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>l<n> Loop 1 may be bad - check interconnect cable or loopcard`
or
`W: u<n>l<n> Loop 2 may be bad - check interconnect cable or loopcard.`
	System detects a potential loop failure.	Check the `syslog` for any other related messages and use the `fru stat` command to determine the problem cause. Remove and replace the bad part.

TABLE B-4 Warning Messages *(Continued)*

Warning Message	Description	Solution
Drive		
`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 system area on this disk failed.	1. Unseat the drive and wait a few seconds before reseating it so that the system can retry this operation. 2. If step 1 fails, replace this drive with a new drive.
`W: u<n>d<n> system area is bad`	The system area of the drive has been corrupted.	1. Unseat the drive and wait a few seconds before reseating it so that the system can retry this operation. 2. If step 1 fails, replace this drive with a new drive.
`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.	1. Unseat the drive, wait a few seconds, reseat it and retry the volume add procedure. 2. If step 1 fails, replace the drive with a new one.
`W: u<n>d<n> system area verify failed`	An attempt to verify the data in the system area failed.	Replace the drive. • If the volume exists, initialize the system area to fix the problem. • If the volume does not exist, retry the volume add procedure.
`W: u<n>d<n> write disk failed, err=<errno>`	An attempt to write this disk failed. System will automatically disable this disk.	Check the `syslog` 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 `syslog` for other related failures. If the disk under reconstruction failed, replace the disk.

TABLE B-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 `vol stat` command. If not disabled, disable it by typing the `vol disable u<n>d<n>` command.
`W: u<n>d<n> Installing u<n>d<n> 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 `syslog` for a multiple drive failure. Replace all failed disk drives.
`W: u<n>d<n> hard err in vol starting auto disable`	There was a hard error on this disk that prompted a disable operation on this disk. 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`	Possible multiple drive failure in the volume.	Check the `syslog` file. Replace all failed disk drives.

`W: u<n>d<n> SCSI Disk Error Occurred (path = 0x<n>, port = 0x<n>, lun = 0x<n>)`
 	
`W: u<n>d<n> SCSI Disk Error Occurred (path = 0x<n>)`
	SCSI disk drive returned an error status with the appropriate SCSI Sense Data.
	
	If `port` has a value from `0` to `7`, then the message indicates a transient controller condition, not an error affecting a disk.
		Notify your Sun authorized service provider.

`W: Sense Key = 0x%x, Asc = 0x%x, Ascq = 0xN`
 	
`W: Sense Data Description = xxxxx`
 	
`W: Valid Information = 0xN`
	SCSI disk drive returned an error status with the appropriate SCSI Sense Data.	Notify your Sun authorized service provider.

`W: u<n>d<n> is in wrong disk position`
 	
`W: u<n>d<n> is in wrong disk position, previously in u<n>d<n>`
	This indicates a drive is in the wrong position in the unit.	Try to determine correct position for disk from the `syslog`. Power off the system. Reorder the affected disks and reboot the system.

TABLE B-4 Warning Messages *(Continued)*

Warning Message	Description	Solution
`W: Disk <n> may be bad - too slow`	If the `ondg` mode is passive, drive n 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 *d* is disabled.	
`W: u<n>d<n> TMON over temperature threshold exceeded`	A disk drive temperature has been exceeded. The drive is spinning down.	Check drives and possible airflow obstruction.
`W: u<n>d<n> TMON warning temperature threshold exceeded`	A disk drive temperature threshold has been exceeded; the drive is still online.	Check disk drive and possible airflow obstruction.
`W: u<n>d<n>: Failed`	System detects disk failure and automatically disables the disk drive.	Check the `syslog` for any other related messages. Replace the failed disk.
Power and Cooling Unit		

`W: u<n>pcu<n>: Fan 1 failed, serial no=x`
 	
`W: u<n>pcu<n>: Fan 2 failed, serial no=x`
	System detects fan fault on a power and cooling unit.	1. Verify that the batteries have had ample time to charge.
		2. Ensure a refresh operation is not in progress.
		3. Replace the power and cooling unit.

`W: u<n>pcu<n>: DC not OK, serial no=x`	System detects that the DC power source in the power and cooling unit is not OK.	Replace the power and cooling unit.
`W: u<n>pcu<n>: Disabled, serial no=x`	A power and cooling unit has been disabled.	Check previous messages to see why the power and cooling unit has been disabled, and replace the power and cooling unit if necessary.
`W: u<n>pcu<n>: Off, serial no=x`	A power and cooling unit is off.	Check `syslog` for a fan fault or power and cooling unit overtemp. Replace the power and cooling unit if necessary.

TABLE B-4 Warning Messages *(Continued)*

Warning Message	Description	Solution
`W: u<n>pcu<n>: On battery, serial no=x`	System detects that a power and cooling unit 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 power and cooling unit.
`W: u<n>pcu<n>: Switch off`	System detects a power and cooling unit has been powered off.	Power on the unit by pressing the power switch.
`W: u<n>pcu<n>: Replace battery, hold time low, serial no=x`	System detects that a battery is nearing its end of life.	Replace the power and cooling unit.
`W: u<n>pcu<n>: Battery life expired, replace battery`	System detects an expired battery.	Replace the power and cooling unit.
`W: u<n>pcu<n>: Replace battery, battery has been on the shelf for more than two years`	The battery's shelf life has exceeded its warranty period.	Replace the power and cooling unit.
`W: u<n>pcu<n>:` *n* `days battery life left, replace battery`	System detects that battery is approaching expiration date.	Replace the power and cooling unit.

B.2 Reset Log Types

If the error level is set to Notice (2) or higher (Warning or Error), you can trace the reason for the reset through the `syslog` file.

TABLE B-5 Reset Log Types

Index	Type	Type Value	Description
0	Hardware	0x1000	User reset
1	Exception	0x2000	Exception
2	Assertion	0x3000	Software assertion
3	RaidFail	0x4000	RAID fatal error

TABLE B-5 Reset Log Types *(Continued)*

Index	Type	Type Value	Description
4	Takeover	0x5000	Takeover
5	PsosFail	0x6000	pSOS fatal error
6	SysFail	0x7000	System error

B.3 Command-Line Error Messages

Sun StorEdge T3 and T3+ arrays issue 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 hexidecimal digits, and a text message.

The following tables list the errors that the array displays. TABLE B-6 lists the types of errors and the numerical range associated with each.

TABLE B-6 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 `vol` and other command-line operations
Port error codes	0x300000–0x300006	Errors related to the `port` command
Sys error codes	0x400000	Only one error, indicating a bad value
FRU error codes	0x500001–0x500076	Errors related to field replaceable units (FRUs)
pSOS operating system errors	00000001–C000FFFF	pSOS errors (embedded operating system)

B.3.1 RAID Errors and Other Common Errors

Volume related errors (VN_ERRORs) are the most common error messages displayed. TABLE B-7 lists the names and values of these errors.

TABLE B-7 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
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

TABLE B-7 Volume-Related (VN) Errors *(Continued)*

Error Name	Numerical Value	Message
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
VN_BADMODE	0x200024	Cache mode must be set to auto for mirroring
VN_MIRRORON	0x200025	Cannot change cache mode when mirroring is on

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_UNITIALIZED, VN_BADMODE, and VN_MIRRORON. In particular, VN_RAIDERR, code 0x200015, can result from a variety of scenarios and these warrant 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.

B.3.1.1 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 may simply be paused and will resume.

2. Partial (conditional) Success (0x19): This category includes the following cases:

a. Aborting a non-existent 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. Autoreconstruct 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 may 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 may 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 may 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.

B.3.1.2 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 re-mounting them and then resetting the system using the T3 `reset` command.
   - If you are unable to re-mount the volumes, try removing all the volumes, resetting the system, then adding them back before re-mounting them.

2. **Check the host connection to the array.**

   On hosts running the Solaris software environment, the `format` command should match the number of volumes present on the array. If the number of volumes listed do not match, see Chapter 5 for troubleshooting instructions. Specifically, the `T300` 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 may be causing the RAID error, use the `fru list` and `fru stat` commands to check the status of the components.**

   It may 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 may 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.

B.3.2 Port Errors

TABLE B-8 lists the port error messages that can be displayed.

TABLE B-8 Port Errors

Error Name	Numerical Value	Message
PRT_UNKNOWPORT	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

B.3.3 Interconnect Card and Other FRU Errors

TABLE B-9 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 B-9 Unit-Related Errors (Interconnect Card and Other FRUs)

Error Name	Numerical Value	Message
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
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
DK_NONE	0x50003A	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

TABLE B-9 Unit-Related Errors (Interconnect Card and Other FRUs) *(Continued)*

Error Name	Numerical Value	Message
DK1_NOTREADY	0x500051	Disk 1 Not Ready
DK2_NOTREADY	0x500052	Disk 2 Not Ready
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
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	Loop Card 1 Offline
LC2_OFFLINE	0x500066	Loop Card 2 Offline
LP_CABLE1	0x500067	Cable 1 Not Present
LP_CABLE2	0x500068	Cable 2 Not Present
LC1_NSTART	0x500069	Loop Card 1 Failed to Start
LC2_NSTART	0x50006A	Loop 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

B.3.4 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 B-10 lists pSOS errors:

TABLE B-10 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
device driver errors	0001'0000 0FFF'FFFF
(reserved)	1000'0000 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
MMUlib	1008'0000 1008'FFFF
(reserved)	1009'0000 104F'FFFF

TABLE B-10 Embedded Operating System and Driver Errors *(Continued)*

Error Type	Numerical Value
SCSI driver	1050'0000 105F'FFFF
(reserved)	1060'0000 BFFF'FFFF
Shared memory	C000'0000 C000'FFFF
(reserved)	C001'0000 FFFF'FFFF

B.4 Examples

This section contains examples for different types of messages.

- Error
- Warning
- Notice

B.4.1 Error

This section provides examples of the types of errors that may be encountered and the corresponding error message.

B.4.1.1 FRU Level Errors

- Example 1

When a FRU is removed, it must be replaced in less than 30 minutes or the unit will automatically shut down. In this example, the PCU in unit 1 is missing.

```
Jan 28 22:16:16 TMRT[1]: E: u1pcu1: Missing; system shutting down in 25 minutes
Jan 28 22:21:16 TMRT[1]: E: u1pcu1: Missing; system shutting down in 20 minutes
Jan 28 22:26:16 TMRT[1]: E: u1pcu1: Missing; system shutting down in 15 minutes
Jan 28 22:31:16 TMRT[1]: E: u1pcu1: Missing; system shutting down in 10 minutes
Jan 28 22:36:16 TMRT[1]: E: u1pcu1: Missing; system shutting down in 5 minutes
Jan 28 22:41:16 TMRT[1]: E: u1pcu1: Missing; system shutting down now
```

- Example 2

A power and cooling unit (PCU) over temperature condition.

```
E: u<n>pcu<n>: Over temperature
```

- Example 3

The power and cooling unit (PCU) is flagged as not being present.

```
E: u<n>pcu<n>: Not present
```

B.4.2 Warning

This section provides examples of the types of errors that may occur and the corresponding warning message.

B.4.2.1 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.

B.4.2.2 Cache Parity Error

The Fibre Channel chip, model ISP2200 interconnect 1, on the controller card detected a parity error.

```
Dec 22 14:09:50 ROOT[1]: W: (ctr) SysFail Reset (7010) was initiated at 19981222
130800 ISP2100[1] detected parity error
```

In this example:

- `W: (ctr)` indicates that the controller card needs to be replaced.
- `SysFail Reset (7010)` indicates a reset log type.

This message points to a parity error occurring on the local bus of the controller. The error is examined to determine if it is a single-bit error. If it is a single-bit error, an attempt is made to rewrite the location. If the rewrite is successful, the error is viewed as temporary and a notice, containing the address, is written to the `syslog` with a unique identifier. If the rewrite is not successful, the error is considered permanent and a warning, containing the address, is sent upstream to the monitoring applications.

If another error occurs while operating with a permanent single-bit error, the controller will fail over to the other controller.

B.4.2.3 Software Assertion or Panic

Reset type.

```
Jan 30 03:01:48 ROOT[1]: W: u1ctr Assertion Reset (3000) was initiated at
20000130 030050 g78/src/noblep/sdl/scsi/svd.c line 829, Assert(lid >=
SVD_START_LID) => 0 BOOT

Jan 30 03:01:48 ROOT[1]: N: CPU state...
Jan 30 03:01:48 ROOT[1]: N: R0 = 00000000 01554588 00250ea4 015545cc 00000000
ffffffff 01554634 00efe334
Jan 30 03:01:48 ROOT[1]: N: R8 = ffffffff 00002051 000d7438 00440000 00438f74
00252418 2fff0000 00000001
Jan 30 03:01:48 ROOT[1]: N: R16= 00000000 00000000 0023b828 00e40308 00e40308
00000008 00000009 00000000
Jan 30 03:01:48 ROOT[1]: N: R24= 00000000 2ffe0000 0023abe8 00060894 00000000
00efe324 00efe318 0023b940
```

This message points to a software assertion or panic on the controller. This error causes a controller panic. The controller is reset and a warning message is logged.

B.4.2.4 Unrecoverable Drive Error

```
Dec 22 16:57:55 ISR1[1] : W: (dr) SCSI Disk Error Occurred (path = 0x0,u1d8)
```

- `W: (dr)` indicates that the disk drive requires repair.
- `path = 0x0` indicates that the error was detected while using the interconnect served by interconnect card 1 (`path 0x1` is interconnect served by interconnect card 2).
- `u1d8` is the address of the failing drive.

```
Dec 22 16:57:55 ISR1[1] : W: (dr) Sense key  = 0xb, Asc 0x47, Ascq = 0x0
Dec 22 16:57:55 ISR1[1] : W: (dr) Sense Data Description = SCSI Parity Error
```

- `Sense key` 0xb = ABORTED COMMAND. Indicates that the TARGET aborted the command. The INITIATOR may be able to recover by re-trying the command.
- The meaning of `Asc` and `Ascq` is decoded in the second line.
- `SCSI Parity Error` is the decode of the most important information contained in the `Sense key` message of the previous line.

These messages point to a parity error being detected and reported by the associated disk drive.

B.4.2.5 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.

B.4.3 Notice

```
Feb 25 21:47:03 LPCT[1]: N: u1pcu2: Switch off
```

- `N:` is the Notice level message.
- `u1pcu2` is unit 1, power and cooling unit 2.
- `Switch off` indicates that the power switch is off.

Glossary

A

administrative domain Partner groups (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 a partner group that provides failover capability from the master controller unit.

Alternate Pathing (AP) A mechanism that reroutes data to the other array controller in a partner group upon failure in the host data path. Alternate Pathing requires special software to perform this function.

auto cache mode The default cache mode for the Sun StorEdge T3 and T3+ 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 T3 and T3+ 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 T3 and T3+ array's pSOS operating system and the user in which the user types commands to administer the array.

controller unit A Sun StorEdge T3 and T3+ array that includes a controller card. It can be use as a standalone unit or configured with other Sun StorEdge T3 and T3+ arrays.

G

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

enterprise configuration One or more partner groups (pair of interconnected controller units) in a system configuration.

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 T3 and T3+ 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 (1X109).

graphical user interface (GUI) A software interface that enables configuration and administration of the Sun StorEdge T3 and T3+ 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 characteristic 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 T3 and T3+ arrays.

interconnect card An array component that contains the interface circuitry and two connectors for interconnecting multiple Sun StorEdge T3 and T3+ arrays.

L

LC An industry standard name used to describe a connector standard. The Sun StorEdge T3+ 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.

media interface adapter (MIA) An adapter that converts fiber-optic light signals to copper.

megabyte (MB or Mbyte) One megabyte is equal to one million bytes (1X106).

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.

partner group A pair of interconnected controller units. Expansion units interconnected to the pair of controller units can also be part of the partner group.

power and cooling unit (PCU) A FRU component in the Sun StorEdge T3 and T3+ array. It contains a power supply, cooling fans, and an integrated UPS battery. There are two power and cooling units in a Sun StorEdge T3 and T3+ array.

pSOS An operating system built into the Sun StorEdge T3 and T3+ array RAID Controller firmware, which provides interfaces between the mounted RAID volumes and the database environment.

Q

quiesce To halt all drive activity.

R

read caching Data 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 very dependable.

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 T3+ 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

workgroup configuration A standalone array connected to a host system.

world wide name (WWN) A number used to identify array volumes in both the array system and Solaris 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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