



RA8000 / ESA12000 HSG80 Solution
Software V8.3b for Sun Solaris 2.x

Installation Reference Guide

AA-RFBQC-TE/387384-003

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Revision Record

This Revision Record provides a concise publication history of this manual. It lists the manual revision levels, release dates, and reasons for the revisions.

The following revision history lists all revisions of this publication and their effective dates. The publication part number is included in the Revision Level column, with the last entry denoting the latest revision. This publication supports the StorageWorks RA8000/ESA12000 Subsystem for the Solaris 2.x Operating Systems.

Revision Level	Date	Summary of Changes
AA-RFBQA-TE / 387384-001	November 1998	Original Release
AA-RFBQB-TE / 387384-002	December 1998	Expanded CC Applet Information
AA-RFBQC-TE / 387384-003	April 1999	Version 8.3b Release - Supports 64-bit CPQfcaw Host Bus Adapter Driver

About This Guide

This section identifies the audience of this guide and describes the contents (chapter by chapter) and structure. In addition, it includes a list of associated documents and the conventions used in this guide, as well as Support and Services Contact Information.

This guide provides the following descriptions:

- How to install StorageWorks software and the Command Console Agent
- How to install the Command Console Client (Optional)
- How to Create Your Storage Configuration with the Command Line Interpreter (CLI)

Intended Audience

This guide is intended for administrators of StorageWorks RAID Array Subsystems. Installing the StorageWorks RAID Array Subsystem requires a general understanding of Solaris system administration and Sun hardware installation procedures.

Document Structure

This guide contains the following chapters:

Chapter 1: Installing the StorageWorks Solution Software

This chapter describes how to install the StorageWorks Solution Software on your Sun server, and how to install and configure the Command Console Agent.

Chapter 2: Installing the Command Console Client

This chapter describes how to install, start, and use the Command Console client.

Chapter 3: Creating Your Storage Configuration with the CLI

This chapter contains instructions for creating an initial configuration for your HSG80 Controller using the Command Line Interpreter (CLI). It briefly describes the CLI and how to access it.

Appendix A: Planning Your Storage Configuration

This appendix describes the RAID configuration options and RAID concepts which you need to know to create your storage configuration.

Appendix B: Valid ALPA Settings

This appendix provides a table of the valid arbitrated loop physical addresses available for hard addressing the fibre channel arbitrated loop.

Appendix C: Command Console LUN

This appendix discusses the Command Console LUN, a virtual disk that can be used for Agent communication.

Appendix D: For Advanced Users

This appendix provides information about Agent data files and formats for advanced level troubleshooting of agent installation problems.

Appendix E: Understanding RAID Manager's Mail Messages

This appendix provides information to help you understand the contents of the automatic mail message(s) RaidManager sends upon the occurrence of an event, if so enabled.

Appendix F: SNMP MIB Information

This appendix provides information about the SNMP traps that may be generated by the Agent.

Associated Documents

In addition to this guide, the following documentation is useful to the reader:

Document Title	Order Number
<i>RA8000 / ESA12000 Storage Subsystem User's Guide</i>	387404-001 / EK-SMCPR-UG
<i>Command Line Interpreter (HSG80) Reference Manual</i>	387402-001 / EK-HSG80-RG. A01
<i>Command Console Version 2.1 (HSG80) User's Guide</i>	387405-002 / AA-RFA2B-TE
<i>Release Notes – HSG80 Solutions Software Version 8.3b for Sun Solaris</i>	387372-003 / AA-RFBPC-TE

Conventions

This guide uses the following documentation conventions:

Style	Meaning
boldface monospace type	To be input by the user.
<i>italic type</i>	For emphasis, manual titles, utilities, menus, screens, and filenames
plain monospace type	Screen text.
#	Represents the Solaris system prompt. Do not type it as part of the information given to be input by the reader.

Nomenclature Convention

RAID Advisory Board Description	RAID Array
RAID 0	STRIPEset
RAID 1	MIRRORset
RAID 0+1	STRIPED MIRRORset
RAID 3/5	RAIDset

Getting Help

If you have a problem and have exhausted the information in this guide, you can get further information and other help in the following locations.

Compaq Web Site

The Compaq Web Site has information on this product as well as the latest drivers and Flash ROM images. To access the Compaq Web Site, log on to the Internet at:

<http://www.compaq.com>

Telephone Numbers

For the name of your nearest Compaq Authorized Reseller:

In the United States, call 1-800-345-1518

In Canada, call 1-800-263-5868

For Compaq technical support:

In the United States and Canada, call 1-800-386-2172

1

Installing the StorageWorks Solution Software On Your Host System

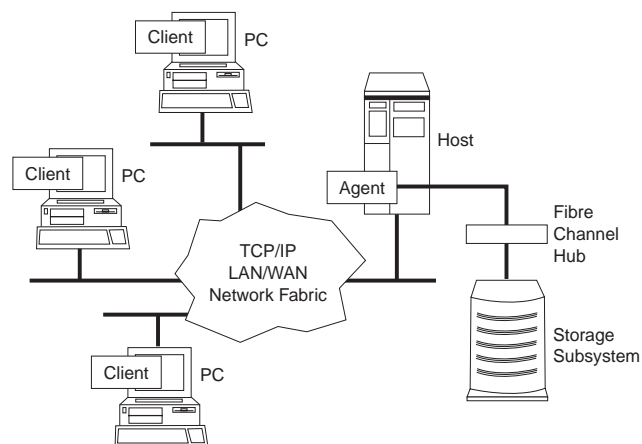
This chapter describes how to install the StorageWorks solution software on your Sun Server, and configure the Command Console Agent.

1.1 Installing and Configuring CC Agent

Command Console (CC) Agent is a companion application to the Command Console (CC) Client graphical user interface (GUI) program. The Agent serves as the Client's assistant in configuring, operating, and monitoring your storage subsystems. The Agent connects to CC Client sessions via the TCP/IP network protocol, as shown in Figure 1-1.

The Agent can also be used as a standalone application without the CC Client. In this mode of operation, the CC Agent monitors the status of the subsystems and provides local and remote notification in the event of a failure. Local notification can be via email and/or the Syslog facility. Remote notification can be made via SNMP messages to an SNMP Monitor application. In the absence of the CC Client, RAID Subsystem configuration must be done through the terminal port using the Command Line Interpreter (CLI).

Figure 1-1 Command Console Client/Agent Connection



shr-1184

1.1.1 Minimum Requirements

The Agent is designed to operate with Command Console Client Version 2.1 for Windows NT and Windows 95.

Before installing the CC Agent, verify that your host system meets the minimum requirements detailed in Table 1-1.

Table 1–1 Minimum System Requirements

Host Feature	Requirement
Platform	SPARC, Ultra SPARC
Architectures	4m, 4d, 4u
Operating System	Solaris 2.5.1, 2.6
Free Disk	500KB, before any log files
Fibre Channel Adapter	Compaq/JNI FC-1063 (SWSA4-SB) or Compaq/JNI FC64-1063 (SWSA4-SC)
SCSI Adapters (optional)	Compaq/PTI SBS450, Sun X1065A, (Sun X6541A - Solaris 2.6 only)
Controller	RAID Array 8000 Controller operating Firmware ACS Version 8.3

NOTE: This release of the RAID Array 8000 has been qualified with the following Sun Solaris patches installed:

Version	Patch Number	Patch Description
2.5.1	103934-06	isp driver
2.6	105600-06	isp driver
2.6	105181-05	kernel (required for 105600)

1.2 Installing the SWCC Agent Software Packages

NOTES

- Prior to installing the CC Agent, ensure that the write-back cache battery is fully charged. This is accomplished by supplying power to the RAID controller for a minimum of 5-6 hours. Otherwise, it may report low batteries and take LUNs offline.
- References in this manual to Solaris 2.x should be assumed to mean Solaris 2.5.1, or 2.6.
- The # symbol represents the system prompt.

The StorageWorks Command Console Solution Software uses Sun Solaris packaging services. See the *Adding and Removing Packages* section in the *Solaris System Configuration and Installation Guide* for more information about *packages*.

Installing the CC Agent on Solaris 2.x requires the following major steps:

- Organizing Your System and Existing CC Agent Files (Section 1.2.1).
- Setting up your CC Agent environment (Section 1.2.2).
- Loading RAID Array 8000 Manager packages onto hard disk (Section 1.2.3).

1.2.1 Organizing Your System and Existing CC Agent Files

Perform the following procedures prior to installing:

1. Back up your system according to your normal procedure.
2. Check for a previously installed CC Agent package by typing:

```
# pkginfo|grep -i dec
```

and:

```
# pkginfo|grep -i cpq
```

3. If you locate any previously installed StorageWorks packages, go to Section 1.2.1.1, otherwise proceed to Section 1.2.2.

1.2.1.1 Removing Old CC Agent Files

Perform the following to remove old CC Agent files:

Remove the existing package(s) using the command:

```
# pkgrm <packagename>
```

where <packagename> is the output from the previous step.

NOTE

Do not delete the DEChsz22 package, if present. This package, the RA3000 RAID Manager, is designed to operate with other steamd_based RAID Manager packages.

Make sure you remove all old packages, both drivers, and Agents. We do not support multiple Agent versions on a single machine. You should use this RAID Array 8000 Manager software to monitor all other StorageWorks RAID subsystems attached to this server. See the Release Notes for more information on supported RAID subsystems.

1.2.2 Setting up Your CC Agent Environment

To set up your CC Agent Environment, follow these steps:

1. Select a system user with superuser privileges (for example: root) as the RAID administrator.
2. Log in as the RAID Administrator.
3. To find a file system with at least 500 KB free space, type:
`# df -k`
4. Choose a directory in which to install the CC Agent software. For example, */opt*. You will need to know this when running the installation script.

NOTE

The “base directory” (referred to when installing the CC Agent Software package) will have a “steam” subdirectory created under it. This is the directory that the Agent files will be installed into.

1.2.3 Installing the CC Agent Packages onto the Hard Disk

You will need approximately 500 KB of permanent space on your hard disk to install and use the CC Agent. If you enable logging, some additional disk space will be used by the logfiles in the */var/adm/steam* directory.

The StorageWorks Solutions Software consists of the following packages:

- CPQhsg80 CC Agent software and system updates required for RAID subsystem operation. This package should always be installed.
- CPQfcaw The HBA driver for the CPQ/JNI FC64-1063 Fibre Channel 64-bit Sbus adapter. This package should be loaded when a CPQ/JNI FC adapter (SWSA4-SC) is installed in the server, which is typically the case.
- CPQfca The HBA driver for the CPQ/JNI FC-1063 Fibre Channel 32-bit Sbus adapter. This package should be loaded when a CPQ/JNI FC adapter (SWSA4-SB) is installed in the server.
- CPQptisp The HBA driver for the CPQ/PTI SBS450 SCSI adapter. This should only be used when the Sun server is interfaced with existing SCSI RAID subsystems (RA410, RA450, RA7000), that are attached to a CPQ/PTI SBS-450 SCSI adapter.

Installing the RAID array 8000 Manager packages requires the following major steps:

1. Mounting the CD-ROM.
2. Loading the Fibre Channel adapter driver package. This package can be:
 - CPQfca - To support CPQ/JNI FC-1063 32-bit Sbus adapter
 - CPQfcaw - To support CPQ/JNI FC64-1063 64-bit Sbus adapter
3. Loading the CPQptisp package (optional, only required to support legacy RAID subsystems attached to an SBS-450 SCSI adapter)
4. Loading the CPQhsg80 package.
5. Rebooting your computer.
6. Configuring the CPQhsg80 package.

1.2.3.1 Mounting the CD-ROM

1. Check whether the volume management daemon (vold) is currently running. Type:

```
# ps -ea | grep vold
```
2. Follow the steps below for "vold currently running" or "vold not currently running," as applicable:

If vold is currently running, then:

- a) Insert the CD-ROM into the CD-ROM Drive.
- b) Use the mount command to check that the volume manager has automatically mounted the CD-ROM, by typing:

```
# mount
```

NOTE

The system may take a few seconds to mount the CD-ROM. If the *mount* command does not indicate that the CD-ROM has been mounted, wait a short interval and then repeat the command. You may need to use the *volcheck* command to force *vold* to check for mounted media.

- c). Change to the Solaris directory, type:

```
# cd /cdrom/hsg80_v83b_sun/agents/solaris
```

- d). If you are using the supplied CPQ/PTI FC-1063 or FC64-1063 Sbus adapter, proceed to Section 1.2.3.2, *Loading Fibre Channel HBA Drivers*.

If you are using a SCSI adapter, skip to section 1.2.3.3, *Loading SCSI HBA Drivers*.

If *vold* is not currently running, then:

- a). Insert the CD-ROM into the CD-ROM drive.
- b). Mount the CD-ROM. For example, type:

```
# mount -F hsfs -r /dev/dsk/c0t6d0s2 /cdrom
```
- c). Change to the Solaris directory, type:

```
# cd /cdrom/agents/solaris
```
- d). If you are using the supplied CPQ/PTI FC-1063 or FC64-1063 Sbus adapter, proceed to Section 1.2.3.2, *Loading Fibre Channel HBA Drivers*.
If you are using a SCSI adapter, skip to section 1.2.3.3, *Loading SCSI HBA Drivers*.

1.2.3.2 Loading Fibre Channel HBA Drivers

To install the Fibre Channel host adapter driver files, follow these steps.

To start the Installation Manager, type:

```
# ./install_stgwks
```

The Installation Manager will scan your system for supported adapters, both Fibre Channel and SCSI. After displaying the list of installed adapters, a menu appears listing the available packages. Enter **q** at any prompt if you want to quit the installation process.

1. Using the appropriate menu option, select the host bus adapter driver package, using the following guidelines:

Adapter Type	Driver(s) to Load	Menu Option
CPQ/JNI FC-1063 32-bit Sbus	CPQfca	1
CPQ/JNI FC64-1063 64-bit Sbus	CPQfcaw	2
Both FC-1063 and FC64-1063 (32-bit and 64-bit, Sbus)	Both (CPQfca and CPQfcaw)	First 1, then 2

2. Follow the on-line instructions.
3. After the installation(s), you are returned to the main menu.
4. If you want to add support for a SCSI RAID subsystem, proceed to Section 1.2.3.3 to load the SCSI HBA drivers. Otherwise, go to Section 1.2.3.4 to load the CPQhsg80 package.

1.2.3.3 Loading SCSI HBA drivers

NOTE

Follow the instructions in this section only if you want to add support for an existing SCSI RAID subsystem. The following SCSI RAID subsystems are supported with this release: RA310, RA410, RA450 and RA7000. Refer to the Release Notes for more information on RAID subsystems supported with this package.

To install the SCSI host adapter driver files, follow these steps.

1. If you will be connecting to a Sun X1065A SCSI adapter, you do not have to load any adapter driver files. They are included with the Solaris operating system. Proceed to Section 1.2.3.4 to load the CPQhsg80 package.
2. If you are connecting to a CPQ/PTI SBS-450 SCSI adapter, continue on with the following steps to load CPQptisp:
3. If you have just installed an adapter driver package, and you are at the `install_stgwks` menu, go to step 4. Otherwise, type:

```
# ./install_stgwks
```

The Installation Manager will scan your system for supported adapters, both Fibre Channel and SCSI. After displaying the list of installed adapters, a menu appears listing the available packages. Enter **q** at any prompt if you want to quit the installation process.
4. Select the *CPQptisp* package by choosing menu option **3**.
5. Follow the on-line instructions.
6. After the installation, you are returned to the main menu. Proceed to Section 1.2.3.4 to load the CPQhsg80 package.

1.2.3.4 Loading *CPQhsg80*

To install the RAID Manager software, *CPQhsg80*, follow these steps.

1. If you have just installed an adapter driver package, and you are at the `install_stgwks` menu, go to step 2. Otherwise, type:

```
# ./install_stgwks
```

The Installation Manager will scan your system for supported adapters, both Fibre Channel and SCSI. After displaying the list of installed adapters, a menu appears listing the available packages. Enter **q** at any prompt if you want to quit the installation process.

2. Select the *CPQhsg80* package by choosing menu option 2.
3. The installation manager will give you the option of scanning for supported adapters again. If you added any adapter drivers in earlier steps, you should answer “**y**” to allow it to rescan for any adapter driver changes.
4. The installation manager will display a list of supported SCSI adapters and allow you to choose which adapter(s) you want to enable with your RAID subsystems. Choose “**a**” to automatically add support for all Fibre Channel adapters found (both 32 and 64-bit). Choose “**m**” to manually specify which adapters you want to enable RAID subsystems on. You must specify SCSI adapters manually, only FC adapters are added automatically.
5. The installation manager will ask for the package base directory. This directory will have a “`steam`” directory created under it. The RAID manager and CC Agent files will be copied into this `steam` directory. The default is `/opt`.
6. After installation, press **q** to exit the Installation Manager. You will be prompted to reboot your computer system. Before rebooting, you may want to manually edit your `/kernel/drv/sd.conf` file if you selected “**q**” in step 4 above.
7. To shutdown and reboot, do the following:

```
# cd /  
# /etc/shutdown -y -i0 -g0
```

To reboot Solaris, wait for the “`ok`” *boot* prompt, then type:

```
boot boot_device (Replace boot_device with the name of your boot disk)
```

NOTE: During boot you may see a message similar to the following:

```
WARNING:/io-unit@f,e1200000/sbi@0,0/fca@1,0/sd@41,0(sd41):
corrupt label - wrong magic number.
```

This is because a LUN on the storage subsystem is not yet labeled.

1.3 Post-Installation Tasks

After completing the procedures in the previous section, you need to perform the following procedures:

- Configure the CC Agent.
- Label any new LUN(s).
- Install and configure the CC Client (optional).
- Optimize UNIX filesystem performance (optional).

1.3.1 Configuring the Agent

There are two ways to configure your Agent:

- **install.sh** – This utility is usually used for the first-time configuration. It walks you through each step required for setting up your Agent, providing a simple way to get your Agent configured. Go to Section 1.3.1.1 for instructions on running `install.sh`.
- **config.sh** – A menu-based administration tool that is usually used to modify your Agent configuration after installation. It provides more options than `install.sh`, so it is recommended for advanced users, or users with unique configuration needs. It can also be used for first-time configuration. Go to Section 1.3.1.2 for instructions on running `config.sh`.

1.3.1.1 Configuring the Agent with `install.sh`

To run the install program, run the `install.sh` script from the `$BASEDIR/steam/bin` directory (usually `/opt/steam/bin`).

```
# cd /opt/steam/bin
# ./install.sh
```

Follow the on-screen prompts to setup your Agent files. Once you have configured your Agent, you can use the CC Client software to create storagesets. Go to Chapter 2 instructions on installing and using the CC client.

1.3.1.2 Configuring the Agent with config.sh

To run the *config* program, run the *config.sh* script from the \$BASEDIR/steam/bin directory (usually /opt/steam/bin).

Type:

```
# cd /opt/steam/bin
# ./config.sh
```

This displays the main menu shown in Figure 1–2.

Figure 1–2 Main Menu

```
----- RAID Array v8.3 Configuration Menu -----

Agent Admin Options                               Storage Subsystem Options
-----
 1) Change Agent Password                         12) View Subsystems
 2) Change SNMP Enterprise OID                   13) Add a Subsystem
 3) Start/Stop the Agent                         14) Remove a Subsystem
 4) Toggle Agent Startup on System Boot         15) Modify a Subsystem
 5) Uninstall Agent

Agent Notification Options                       Client Options
-----
 6) Toggle Error Log Notification               16) View Clients
 7) Toggle Mail Notification                   17) Add a Client
 8) View Mail Notification List                 18) Remove a Client
 9) Add User to Mail Notification List          19) Modify a Client
10) Remove User from Mail Notification List
11) Modify Mail Notification List

Exit:                                           Other Options
-----
  q) Quit                                       20) Add/Change Adapters
                                           21) High Avail. Options

Enter Selection:
```


1.3.1.3 Choosing a Password

Select **1** from the *Agent Admin Options* group to set a password to protect your storage subsystems from unauthorized access. Any client with configuration privileges will be asked for this password when attempting to configure the storage subsystem.

1.3.1.4 Adding a Subsystem

Any storageset belonging to the subsystem can be used for this procedure, but be careful not to delete the LUN from the subsystem when reconfiguring, as this breaks the communication link to the Agent for the entire subsystem.

From the Storage Subsystem Options group, select **12**, to View Subsystems. An empty table displays. Before starting the Agent, you must add at least one subsystem you wish to communicate with. Choose option **13**, to add a subsystem.

The subsystem name is arbitrary, but use only lower-case characters to specify it. Associate the name with a storage subsystem by picking a LUN name; for example, *c1t65d0*, which the *format* command output displays as belonging to the RAID subsystem. This is evident from the controller number and SCSI target address used.

Append **s2** to the device name (*cxydz*) when entering the *character special file name*, as a partition must be specified.

Check that this partition exists by entering *format's partition* and *print* commands.

Enter a monitoring interval; for example, 30 seconds, and press the **Enter** key twice to return to the *Main Menu*.

1.3.1.5 Adding a Client

From the *Client Options* group, select **19**, *View Clients* to see the authorized client list. *Steamd* will not run on an empty client file, so *localhost* has been added, with Error Notification turned off.

To add a client, select **17**, *Add Client*. First enter the client's network name (for example, **myhost**). Second enter an Access level code. Specify **2** if the manager/client is allowed to configure the subsystem. Third, add an Error Notification Level (**1** for TCP sockets, **2** for SNMP protocol, or **3** for both).

1.3.1.6 Restarting the CC Agent

After you make any changes to the CC Agent configuration, the CC Agent daemon must be stopped and restarted. This ensures that the changes to the configuration files are read by the *steamd* program.

1.3.2 Configuring the Agent with FirstWatch

If you have VERITAS FirstWatch installed, you may configure the StorageWorks Command Console Agent to run under FirstWatch. This allows FirstWatch to start the Agent on the primary host. In the case of a failover, FirstWatch will transition the Agent to the takeover host.

To configure the CC Agent to run with FirstWatch, you must have FirstWatch installed and configured. You must also install the CC Agent on both hosts and configure the agents identically (subsystem name, notification options and client options). This is required so that when the CC Agent is transitioned to the takeover host, all access and notification remains identical.

Once the CC agent is configured on both hosts, determine which host will be the primary and which will be the takeover host. On each host, start the configuration utility (see Section 1.3.1.2) and select **21** from the other options group.

NOTE

Any future configuration changes made on one FirstWatch server must also be made on the other host.

1.3.3 Preparing LUNs for Use by the System

Each LUN created on the RAID Array 8000 appears as a SCSI hard disk to the host. Therefore, it must be labeled before it can be used and, in most instances, a new file system must be created.

1.3.3.1 Labeling LUNs

A LUN is labeled using the */etc/format* utility. The label contains information about the LUN such as controller-type, geometry, and partitions. More details about the use of the format utility may be found in the *Sun 2.x Adding and Maintaining Peripherals* Manual.

1.3.3.2 Labeling a LUN Automatically Using the Format Utility

Sun Solaris releases 2.4 and above have the capability of automatically generating a label for SCSI disks. To access this capability while in the *format* utility, select the desired disk, then from the **type** menu, select **0**.

Example:

```
# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
0. c0t3d0 <SUN0424 cyl 1151 alt 2 hd 9 sec 80>/.../sd@3,0
1. c1t0d0 <DEC-HSG80-AX-V83Z cyl 12841 alt 2 hd 14 sec57>/sd@0,0
Specify disk (enter its number): 1
selecting c1t0d0
[disk formatted]
FORMAT MENU:
    disk-          select a disk
    type-          select (define) a disk type
    partition -    select (define) a partition table
    current  -    describe the current disk
    format  -    format and analyze the disk
    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
    quit

format> type
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. other
```

(continued)

```
Specify disk type (enter its number)[19]: 0
c1t0d0: configured with capacity of 1.89GB
<DEC-HSG80-AX-V83Z cyl 12841 alt 2 hd 14 sec 57>
selecting c1t0d0
[disk formatted]
format> label
Ready to label disk, continue? yes
format> quit
```

Note that the default partition layout when using the automatic mode is of the form,

- partition 0: ~128MB
- partition 1: ~128MB
- partition 2: entire disk
- partition 6: partition 2 - (partition 0 + partition 1)
- partitions 3,4,5,7: empty

NOTE

You may modify the partition table by entering "partition" at the format menu prompt level. Remember to label the disk again after any changes to the partition table are made.

Format places an entry for the RAID Array in the */etc/format.dat* file and the *label* command stores the information on the RAID Array. More details about the creation of *format.dat* entries may be found in the *Sun Solaris 2.x Adding and Maintaining Peripherals Manual*.

NOTE

Although the *format* command will create an HSG80 disk entry in the *format.dat* file, we recommend that you do not try to re-use this definition. Always use type 0 to allow Solaris to retrieve the correct logical geometry for the LUN you are formatting.

1.3.4 Filesystem Creation and Tuning

Before the new LUN can be used by the system, a new filesystem must be created on each partition that will be mounted. The *newfs* command is used to create filesystems, and the *tunefs* command is used to modify existing filesystems. See the man pages for the *newfs* and *tunefs* commands for more information.

To create a new filesystem, use the following command:

```
# newfs -c128 -d0 /dev/dsk/c1t0d0s2
```

To modify an existing filesystem use:

```
# tuneefs -a128 -d0 /dev/dsk/c1t0d0s2
```

These commands set *maxcontig* to 128 and *rotational delay* to 0. These recommendations may not optimize your system performance so you may want to experiment with other values.

1.4 Host Adapter Driver Error Messages

The COMPAQ/JNI FC-1063 host adapter driver (version 2.1) generates three types of error messages: Common, Less Frequent and FCA Driver-Initiated Panics. Refer to Appendix G for a detailed list of possible error messages. These messages may appear on the system console, as well as being logged (see *syslog man* pages).

1.5 Troubleshooting/Avoiding Problem Situations

1.5.1 Agent/Controller Communication

The Command Console Agent communicates with your controller via a virtual disk that you must specify in the *storage.ini* file. There must be at least one virtual disk on your subsystem, so that Agent can communicate with your storage subsystem.

Your subsystem should have been shipped with at least one LUN configured on it to facilitate connection over the host Fibre Channel loop. If your subsystem has no LUNs configured on it, you must temporarily establish a connection via the controller serial maintenance port and use command line interpreter (CLI) commands to create at least one LUN on each of the subsystem's ports. Refer to Chapter 3 to configure your subsystem with the CLI.

Command Console can use either a normal, user-configured virtual disk or a special virtual disk, called "Command Console LUN (CCL)" or the "communications LUN", to make a connection with your controllers. The communications LUN is a simulated virtual disk provided by the controller strictly for connecting Command Console with your storage subsystem. Refer to Appendix C for more information on the CCL.

Use care in making changes to your virtual disk configuration with Command Console. If the virtual disk the Agent is using to communicate with your subsystem fails or is deleted, the Agent loses its connection with the controller, and the Client loses its connection with your subsystem.

1.5.2 RaidManager Mail Messages

Mail messages sent by the RaidManager are useful in troubleshooting subsystem problems. To receive RaidManager messages, you must enable "email notification" via the Agent installation program option. If you receive a mail message from RaidManager, refer to Appendix E for assistance in determining the cause of the problem.

Installing the Command Console Client

This Chapter covers how to install, launch, and use Command Console Client.

2.1 What is Command Console?

The Command Console (CC) Client is a Graphical User Interface (GUI) for StorageWorks Controllers. Command Console consists of two programs:

- **Command Console Client** is the GUI program designed for use on systems running the Microsoft Windows NT or Windows 95 Operating Systems. It provides a user-friendly method of configuring, operating, monitoring, and troubleshooting your storage subsystem.
- **Command Console Agent** is a companion program that enables the CC Client to communicate with your storage subsystems over a network. Agent is available for operation on a variety of popular Host Operating Systems.

The CC Client connects to your storage subsystem via a TCP/IP-compatible network. It sends (via the Agent) CLI commands to your subsystem's Controllers as you perform subsystem configuration, operation, monitoring, and troubleshooting tasks using its graphical interface. It displays subsystem status by interpreting CLI information returned by the subsystem.

Use the procedures within this chapter to:

- Set up Command Console and establish communication with your storage subsystems.
- Configure your storage devices to create host-accessible volumes by:
 - a) Configuring the Client by adding systems to the Navigation Window.
 - b) Adding physical devices
 - c) Creating virtual disks

2.2 Installing Command Console Client

Command Console Client installs from a CD-ROM disk using a standard Windows installation routine on a Windows 95 or Windows NT platform. The program is self-extracting and stores Command Console Client into the directory C:\Program Files\SWCC by default. During setup, you have the option to change the disk or directory location.

To install Command Console:

1. Place the software CD in the CD-ROM Drive.
2. Run File Manager or Windows Explorer.
3. Navigate to the folder: *drive_letter:\swcc\client\intel*
NOTE: SWCC for Alpha processors are located in the folder:
drive_letter:\swcc\client\alpha
4. Double-click on Setup.
5. Follow the instructions in the setup program to complete the installation.

Command Console Client installs the Program Group *Command Console* and places seven icons within the group (Figure 2-1). Client also inserts seven selections on the Start menu (Figure 2-2).



Figure 2-1 Command Console Program Group

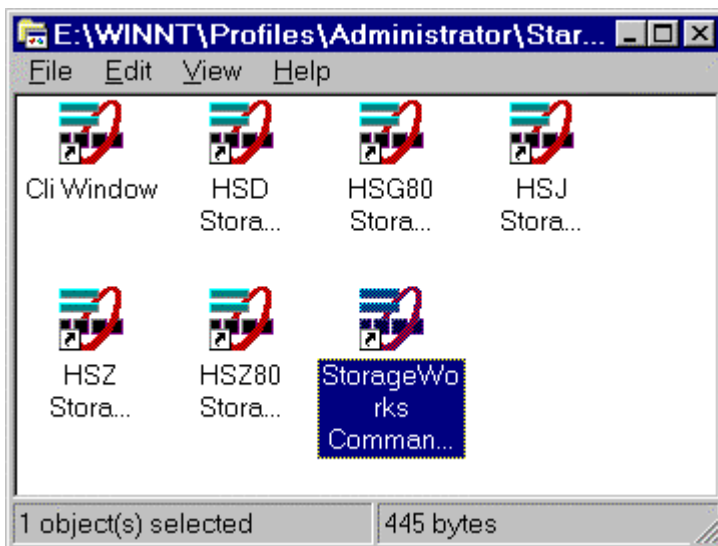
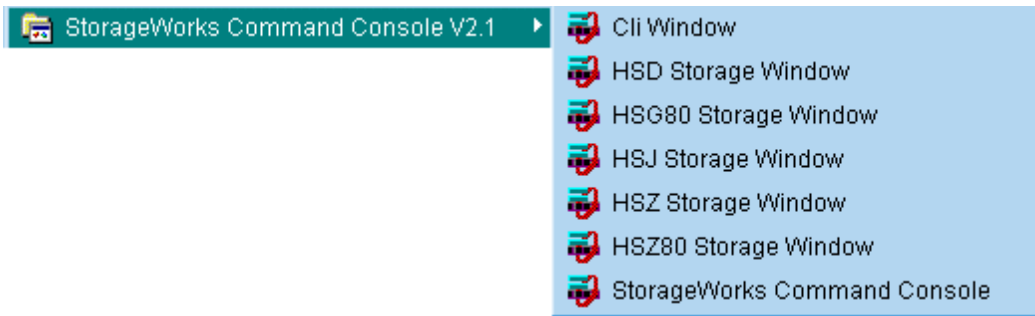


Figure 2–2 Command Console Client's Start Menu



2.3 Uninstalling StorageWorks Command Console Software

Remove the old version of Command Console software as follows:

1. From the **Start Programs** menu select *Settings*, then *Control Panel*.
2. Double-click on the *Add/Remove Programs* icon.
3. Select Command Console applets from the list by clicking on them, then click the Add/Remove button.
4. Selection should no longer appear in display window.

2.4 Launching the Command Console Client

To start one of the applets, double-click on the applet's icon in the *Command Console* program group or, from the **Start** menu, select the applet's name. Five of the most commonly used applets available are as follows:

- **HSG80 Storage Window:** Displays the Storage Window for HSG80-based storage subsystems. This choice lets you monitor and configure one storage subsystem using Client's graphical user interface. All connection choices are provided: serial line, SCSI bus and network (TCP/IP). Refer to *Command Console V2.1(HSG80) RAID Array 8000/ESA12000 User's Guide, AA-RFA2B-TE/387405-002*, for complete information.
- **HSZ80 Storage Window:** Displays the Storage Window for HSZ80-based storage subsystems. This choice lets you monitor and configure one storage subsystem using Client's graphical user interface. All connection choices are provided: serial line, SCSI bus and network (TCP/IP).
- **HSZ Storage Window:** Displays the Storage Window for HSZ*0-based storage subsystems. This choice lets you monitor and configure HSZ70, HSZ50, HSZ40, SWXRC-04 and HSZ20-based storage subsystems using the Client graphical user interface. All connection

choices are provided: serial line, SCSI bus, and network (TCP/IP). For more details refer to the *Command Console V2.1 RAID Array 7000/ESA10000 User's Guide*.

- **CLI Window:** Displays the CLI Window. The CLI window lets you access a controller's command line interface (CLI) for configuring and monitoring your subsystems using text commands. All connection choices are provided: serial line, SCSI bus and network (TCP/IP).
- **StorageWorks Command Console:** Displays the Navigation Window. The Navigation Window is a network navigation tool used to manage and monitor storage subsystems over a TCP/IP network. This choice lets you monitor and configure one or many storage subsystems over a network using Client's graphical user interface.

2.4.1 Establishing an Initial Host Connection and Verifying Subsystem Setup

NOTE: Prior to making a network connection between the Intel-based System on which you installed the CC Client GUI and your subsystem, you must have completed the steps in this guide to install the CC Agent in your Host System, the CC Client GUI in your Intel-based Client System, and to create a volume on your subsystem. Since the Agent uses a LUN for communication, you cannot make a connection to any subsystem unless the Command Console LUN is enabled or at least one volume has been created on the subsystem.

To establish a network connection proceed as follows:

1. Click on the *Start* button on the taskbar.
2. Click on *Programs*.
3. Click on *Command Console*.
4. Click on *HSG80 Storage Window*.
5. At the Connection Selection dialog box, select the *Network (TCP/IP)* option (Figure 2-3), then click *OK* to display the *Connect Network* dialog box (Figure 2-4).

Figure 2-3 Connection Selection Dialog Box

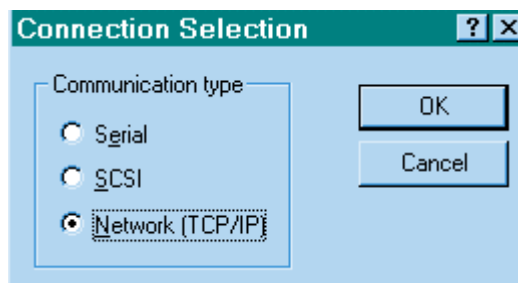
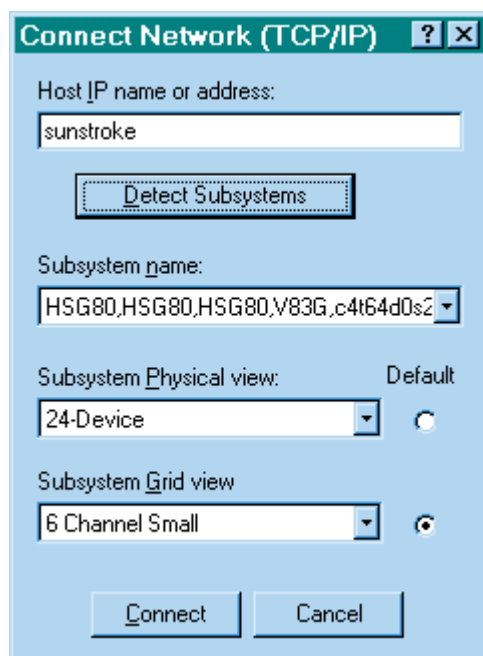


Figure 2-4 Connect Network Dialog Box for Storage Window

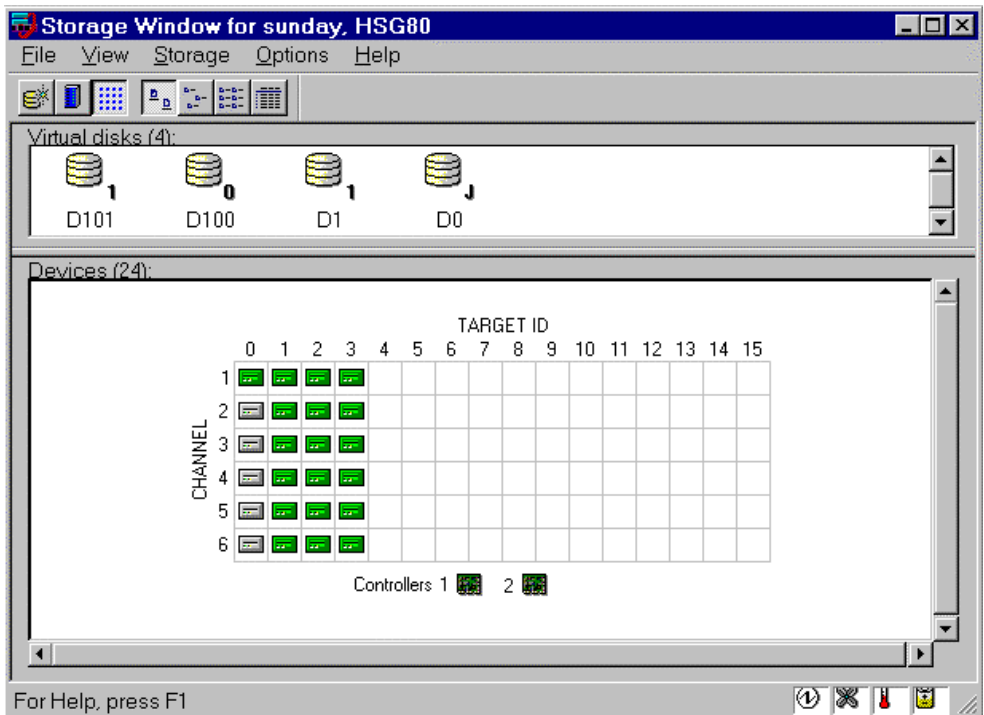


6. On the *Connect Network* dialog box, enter the HOST name or IP address where your HSG80 controller is connected. Then click the *Detect Subsystems* button to display the storage subsystem name. Then click *Connect* to connect to your storage subsystem. The Storage Window appears as shown in Figure 2-5. The next step is to configure the properties of the controller.

NOTE

The top window displays the virtual disks that have been created. The bottom windowpane shows the devices you have installed in the RA8000 Fibre Channel Subsystem. On startup, Command Console finds installed drives and displays them in a grid by channel and SCSI ID number.

Figure 2-5 Storage Window



2.5 Configuring Controller Properties

Your controller’s operating parameters are stored in property sheets. Controller property sheets are accessed by double-clicking on a controller icon in the Storage Window or right clicking on the icon and selecting *Properties*. Property sheets are tabbed. To access a sheet, click on its tab.

For changes in any field to take effect, a controller restart is required. The program prompts you for confirmation before it restarts your controller. A restart of the controller will be detected by the host system. Do not make changes to the controller settings when either file systems are mounted on the RAID Array or applications are using the RAID Array. After you initialize a controller restart, there is approximately a 90 second delay while the controller reinitializes.

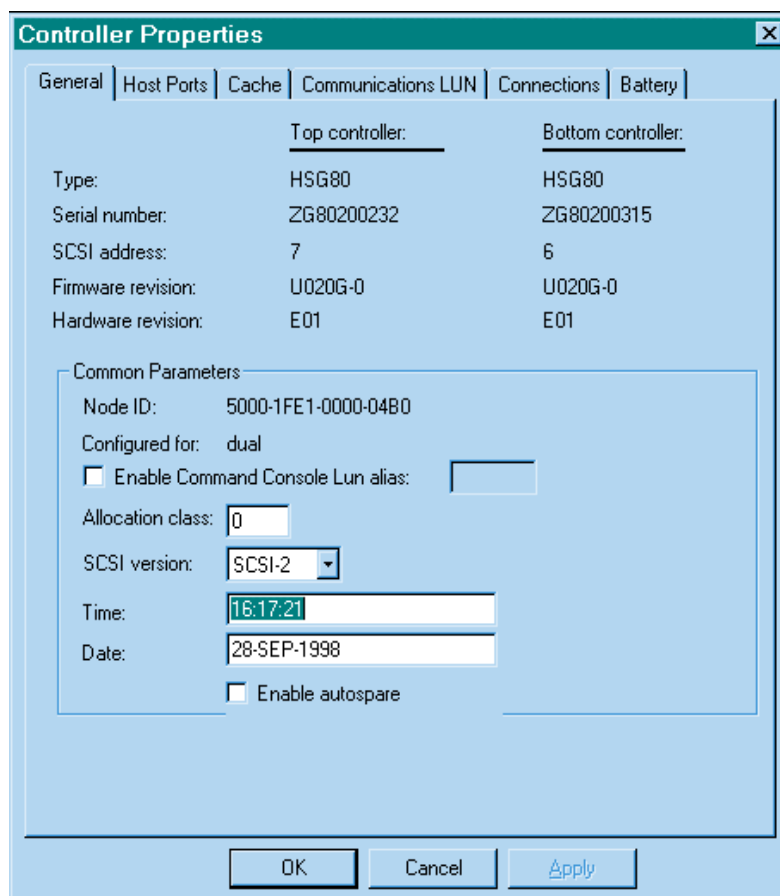
1. Access the controller’s property sheets by double-clicking the controllers icon in the Storage Window. When you double-click on a controller’s icon the *General* controller properties sheet displays (Figure 2-6). The controller has five other property sheets. Each sheet is accessed by clicking on its tab.

Confirm the following:

- Allocation class is 0
- SCSI Version is SCSI-2

(You may also set the time and date.)

Figure 2-6 General Controller Properties Tab



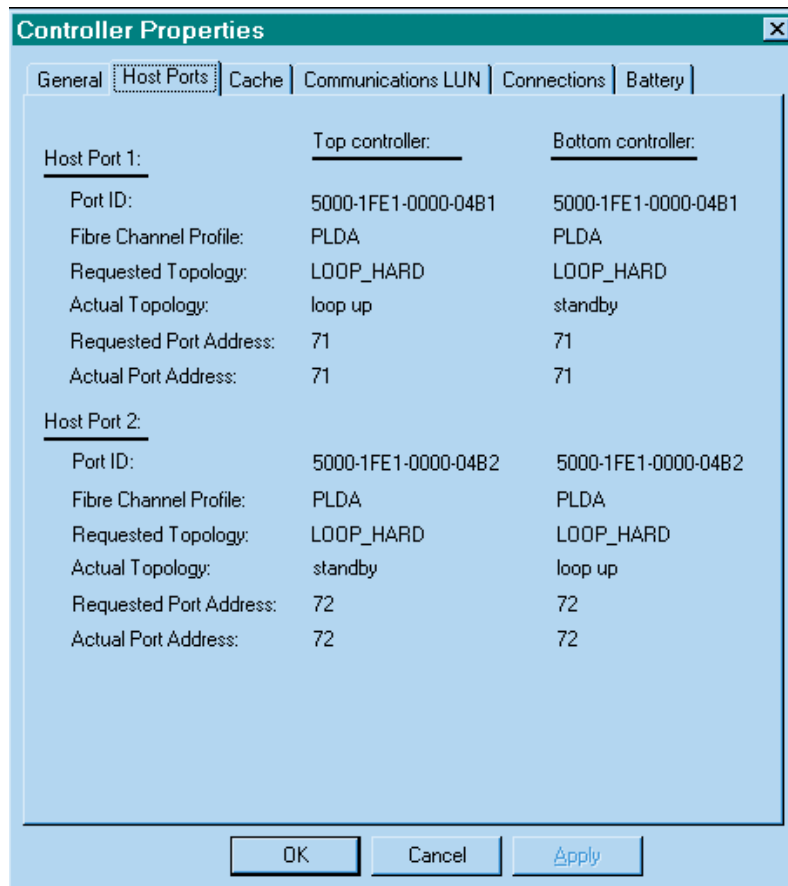
- Click the *Host Ports* tab to display the host port operating parameters and verify the host port operating parameters shown in Figure 2-7.

The settings displayed for:

- Port ID
- Actual Topology
- Requested Port Address
- Actual Port Address

will vary depending upon your cabling, loop configuration, ALPA settings and number of host ports in use.

Figure 2-7 Host Ports Controller Properties Tab

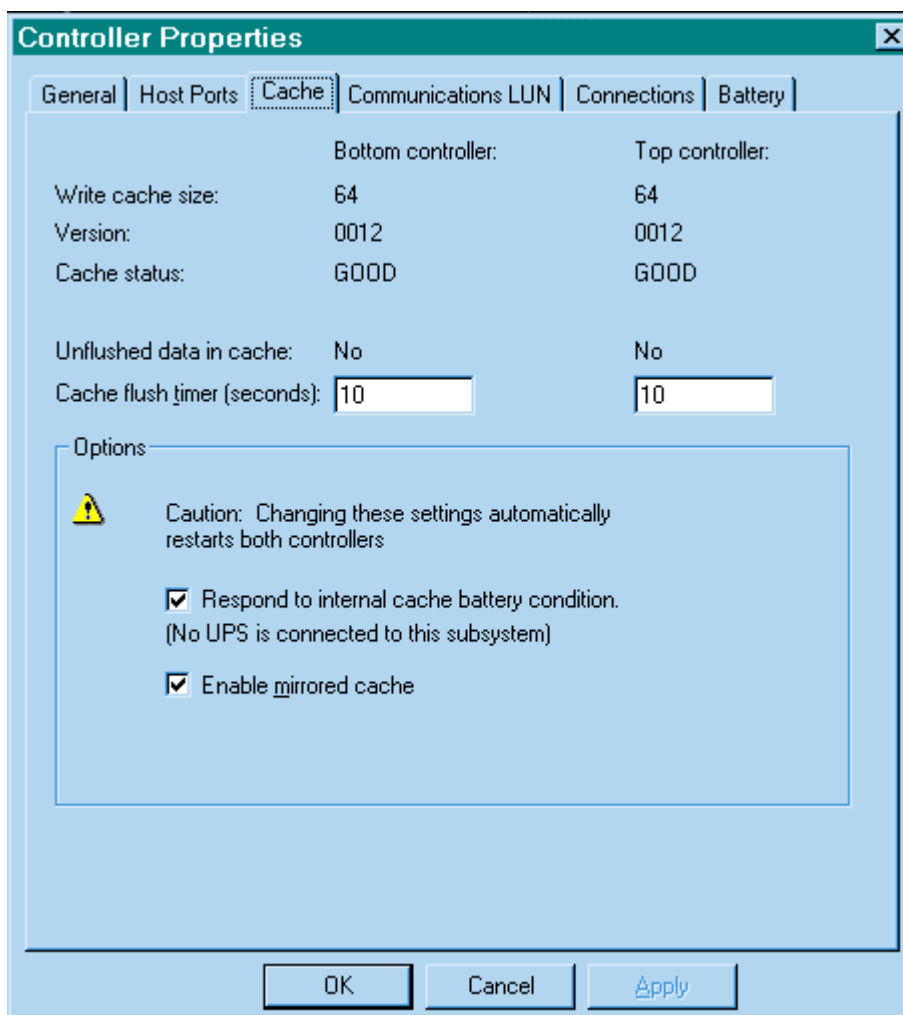


3. Click the *Cache* tab to check cache size. (Figure 2-8)

Confirm the following:

- Cache flush timer is 10 (seconds)
- Respond to internal cache battery condition is selected

Figure 2-8 Cache Controller Properties Tab

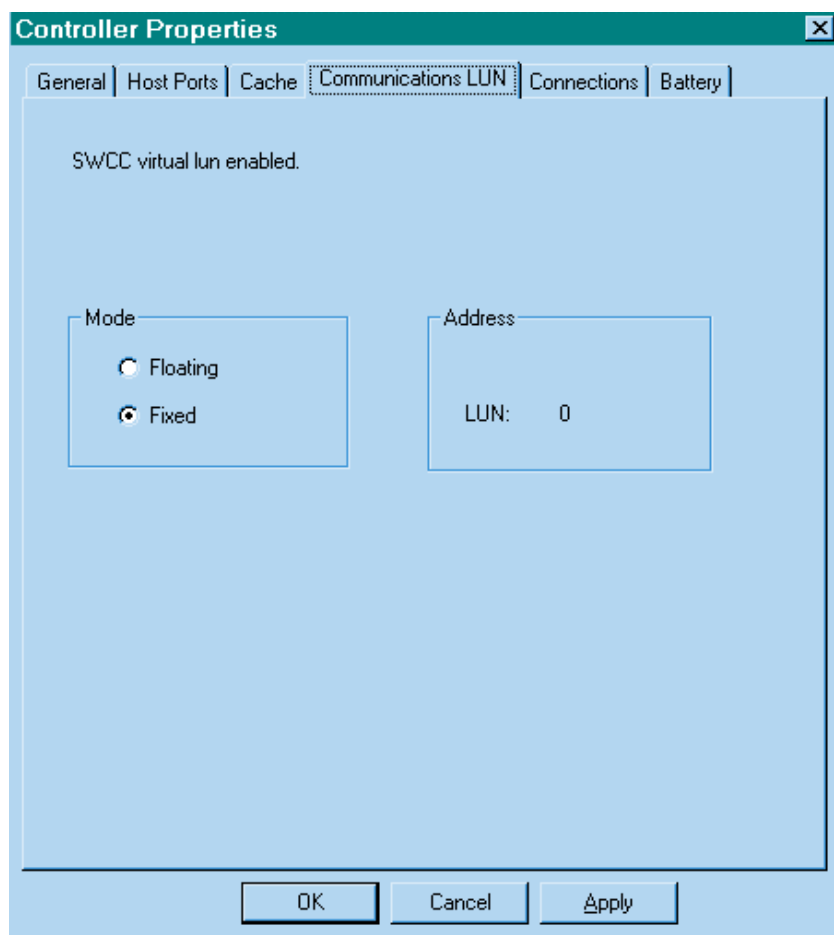


4. Click the *Communications LUN* tab. (Figure 2-9).

NOTE

Ensure that *Fixed* is set if you are using the virtual LUN (CCL). Refer to Appendix C for more information on the CCL.

Figure 2-9 Communications LUN Controller Properties Tab

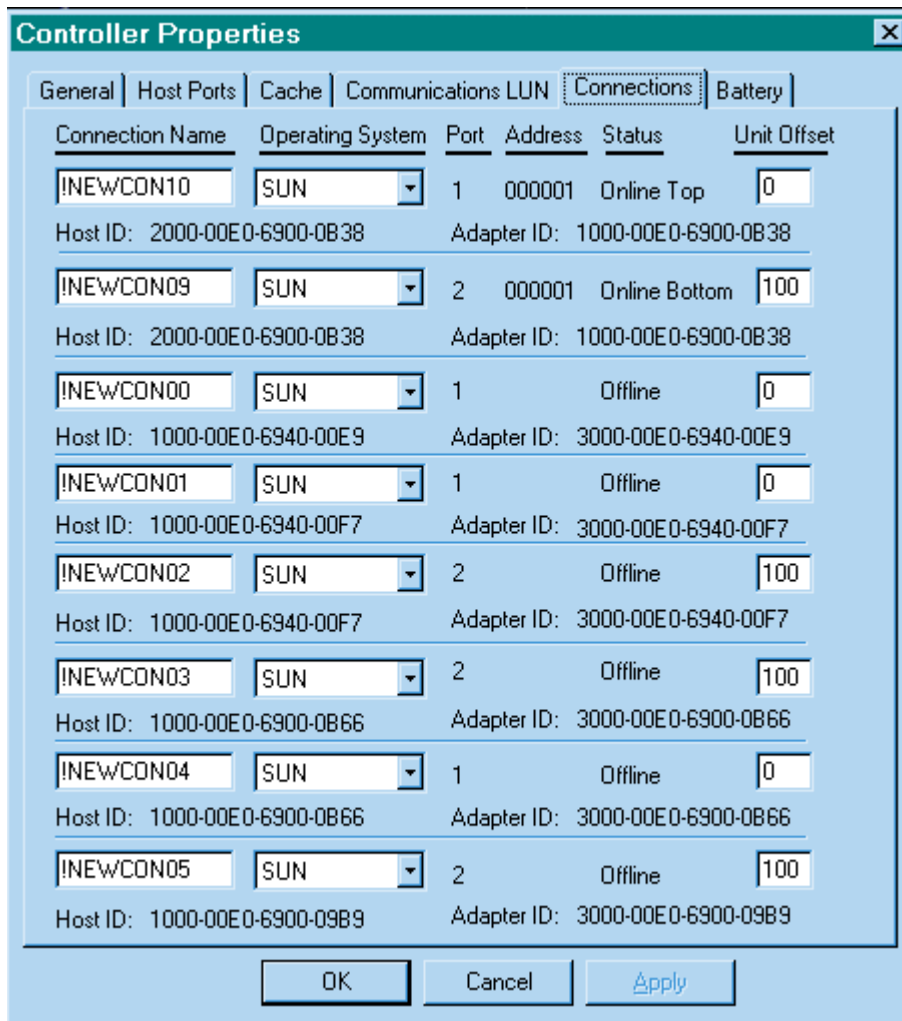


5. Click the *Connections* tab. (Figure 2-10)

Confirm the following:

- Use the pull-down menu to change the operating system to Sun.
- Unit Offset should be 0 for Port 1
- Unit Offset should be 100 for Port 2

Figure 2-10 Connections Controller Properties Tab

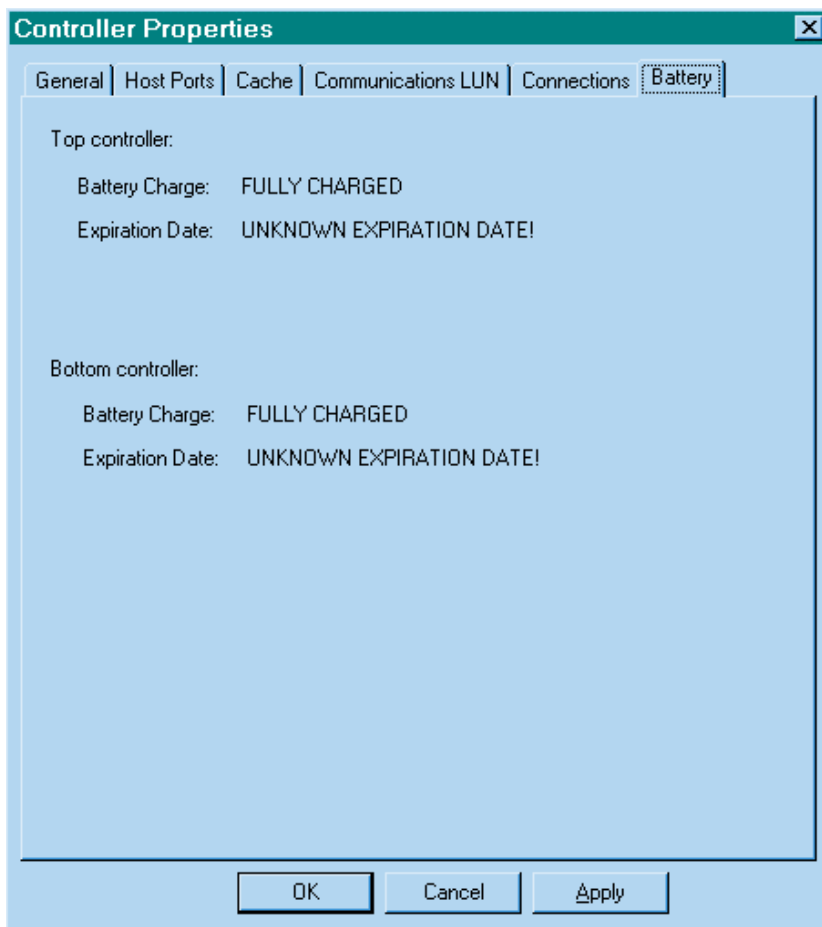


6. Click the *Battery* tab. (Figure 2–11)

NOTE

Confirm the that the battery is fully charged. If not, wait until it is fully charged before using the system.

Figure 2–11 Battery Controller Properties Tab



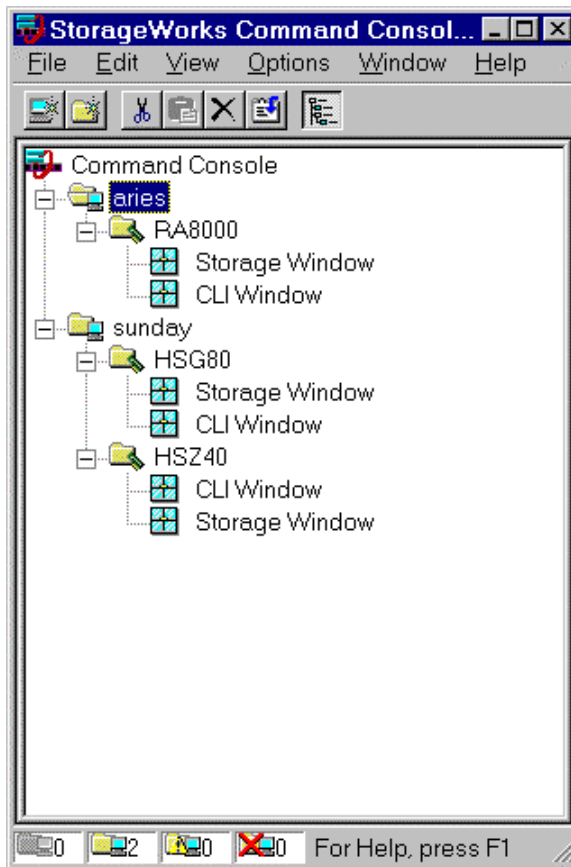
Click on the *Apply* button. Once all of the changes have been made, click the OK button to complete controller configuration. The storage window is now displayed. To begin using SWCC to create Virtual Disks, refer to the StorageWorks Command Console User's Guide, to the section entitled *Creating Your First Virtual Disk*.

2.6 Using the Navigation Window

The Navigation Window is a network management tool that you can use to create, monitor and configure a network of storage subsystems. The Navigation Window has its own Menu Bar. It can be moved and minimized. It can be sized by dragging on its corners and borders. You start building a network of RAID Array 8000 storage subsystems by adding Host Systems to the Navigation Window.

Figure 2-12 illustrates a navigation window that shows a two-host network with systems *sunday* and *aries*. Subsystem *RA8000* is connected to host *aries*. Subsystems *HSG80* and *HSZ40* are connected to host *sunday*. Folders are shown expanded.

Figure 2-12 Navigation Window Shows Two-Host Network

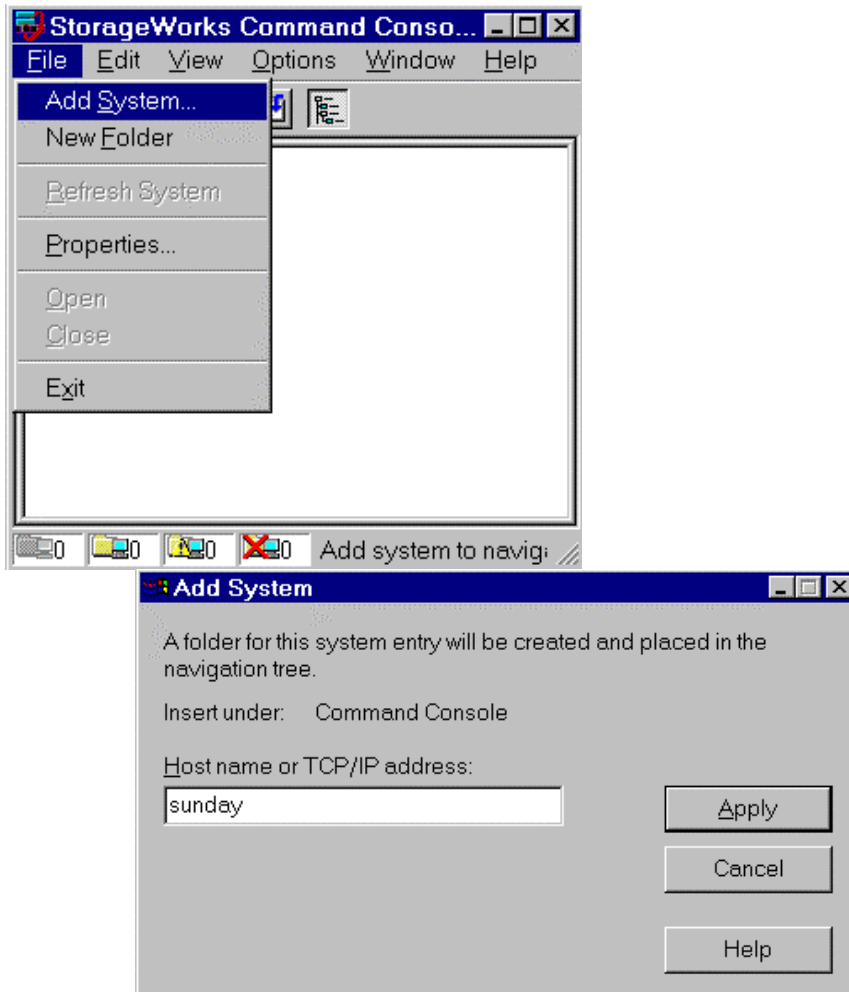


2.6.1 Adding a Host System to the Navigation Window

To add a system (reference Figure 2-13):

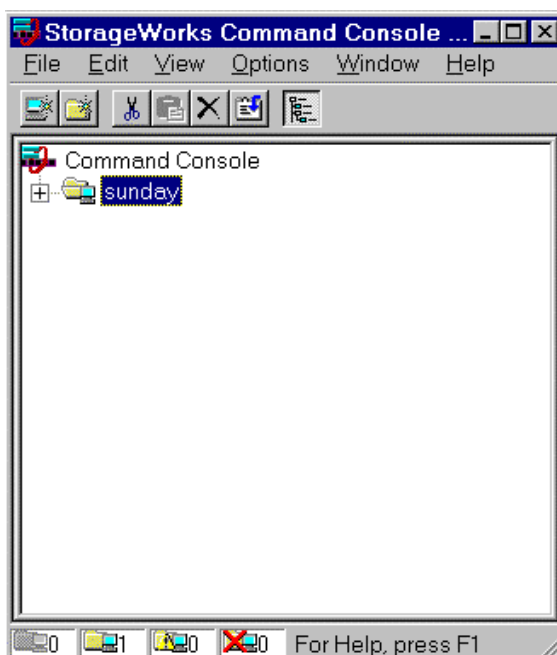
1. From the **File** menu select *Add System*.
2. Use the *Add System* dialog box to add host systems to the Command Console Client. A system is any machine running a Command Console Agent. Enter the Domain Name Service (DNS) name or the Internet Protocol (IP) address in the “Host name or TCP/IP address text box” and click *Apply*. Refer to the on-line **Help** menu *Adding a System* if you need more information about entering a system name.

Figure 2–13 Adding a Host System



3. After you click the *Apply* button, once the system address is resolved, click *Close* on the Add System dialog box. Client adds an icon for *sunday* in the Navigation Window, as shown in Figure 2-14.

Figure 2–14 “Sunday” Added to the Navigation Window



2.6.2 Deleting a Host System from the Navigation Window

To delete a system:

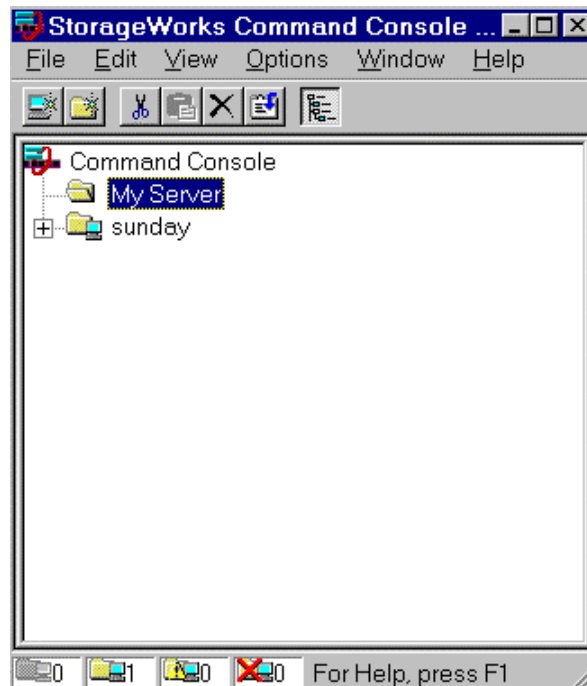
1. In the Navigation Window, click on and highlight the system that you want to delete.
2. From the **Edit** menu, select *Delete*.
3. System icon should disappear from Navigation Window.

2.6.3 Creating and Using New General Folders

Use folders to help organize your storage. The Client will automatically create folders when you add a subsystem. You may also create your own folders to help organize your subsystem. Folders can be dragged and dropped within the Navigation Window. In the following example, we have created the folder *My Server* and then dragged and dropped the host *sunday*, in the folder (Figure 2–15). To create a new folder:

1. From the File menu, choose *New Folder*.
2. Name the new folder in the Navigation Window by double-clicking its label and entering a new name.

Figure 2–15 Adding a Folder



2.6.4 Renaming a Folder

1. Double-click on the folder name in the Navigation Window.
2. Enter the new name. Only general folders that you create can be renamed.

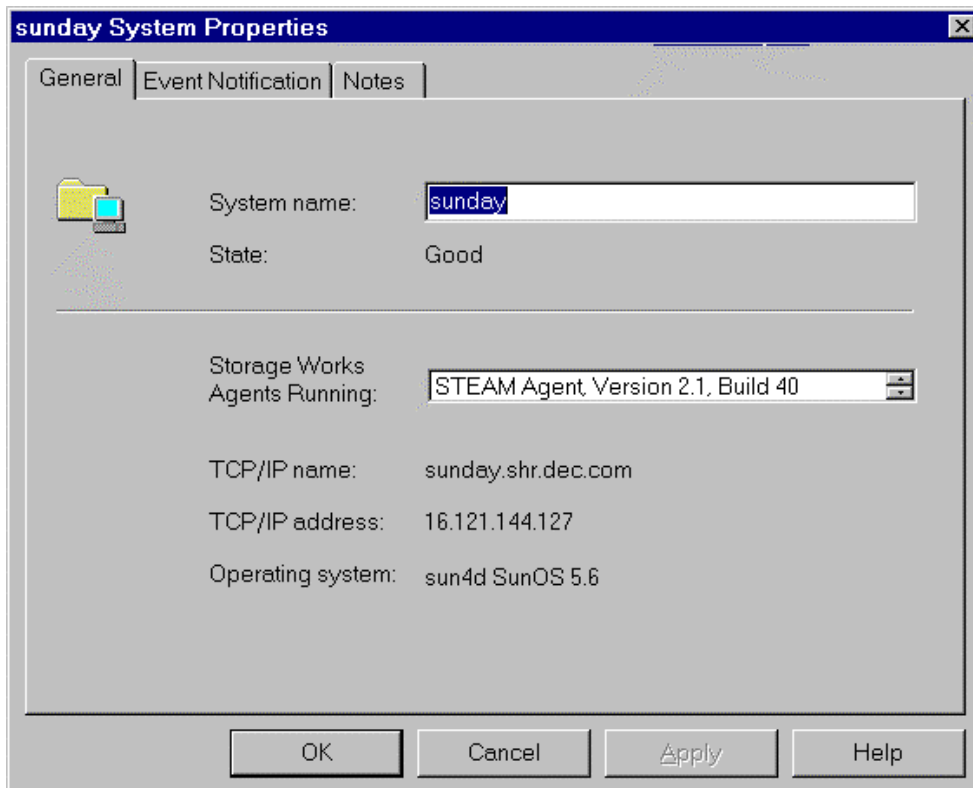
2.6.5 Viewing the Hierarchy in the Navigation Window

1. Click on a folder on the Navigation Window to display its contents.
2. Click the plus signs (+) to display more folders, systems, and controllers. To open a folder, double-click on it.

2.6.6 Viewing and Modifying System Folder Properties

1. Right-click on a system icon in the Navigation Window.
2. Click Properties from the shortcut menu to view the system folder properties.

Figure 2–16 System Properties



2.6.7 Opening a Storage Window



1. Connect to a storage subsystem.
2. In the Navigation Window, double-click on a system folder.
3. Double-click the Storage Window icon to open a Storage Window.

2.6.8 Opening a CLI Window

Not all controllers support the Command Line Interpreter (CLI) window. If you are familiar with CLI syntax, you can enter commands into the command line area directly underneath the CLI Window Menu Bar. Error messages and system responses are displayed in the message area directly beneath the command line area.



1. Connect to a storage subsystem.
2. In the Navigation Window, double-click on a system folder.
3. Double-click the CLI Window icon to open a CLI Window.

2.7 Choosing a Connection Method

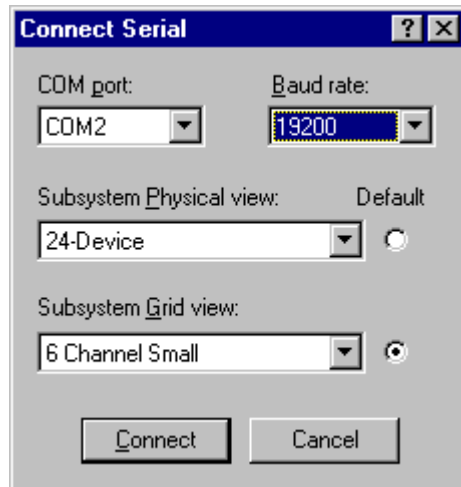
The Client offers three ways to connect to your storage subsystem: over the controller's serial port, the SCSI bus (Windows NT Only) or over a TCP/IP network. The serial port and SCSI bus connections are local connections and allow you to connect to only one storage subsystem at a time.

2.7.1 Establishing a Serial Connection

The simplest connection to a storage subsystem is a direct, cable connection from the Client's host system to one of the storage subsystem's serial ports. To establish a serial connection, connect a serial cable from one of the PC's COM ports to the storage subsystem's serial configuration port and proceed as follows:

1. From the Start menu, select Programs, Command Console 2.1, and then the *HSG80 Storage Window* applet.
2. When the Connection Selection dialog box displays, select the *Serial* option, then click OK to display the Connect Serial dialog box (Figure 2-17).
3. On the Serial Connection dialog box, from the drop-down menu, select the PC COM port your controller is connected to, a subsystem physical and grid view, and a baud rate. Next click the Connect button to display the Storage Window. When the Storage Window appears, you are connected to your storage subsystem.

Figure 2-17 Connect Serial Dialog Box



2.8 Creating a Virtual Disk

Before you can create a virtual disk, you must select a host system, open a Storage Window, set the Controller parameters, and make your physical devices known to your Controller.

2.8.1 Add Physical Devices to Your Configuration

You must make the physical devices known to the Controller before you can create virtual disks from them. To add physical devices to the configuration:

1. In the **Storage** menu, select *Device*, then *Add*.
2. Enter your password if required.
3. When Client prompts you to insert the physical devices (Figure 2–18), insert them in the storage subsystem; then click the **OK** button. Client adds your devices to your configuration and refreshes the Storage Window.

Figure 2–18 Insert Devices Prompt



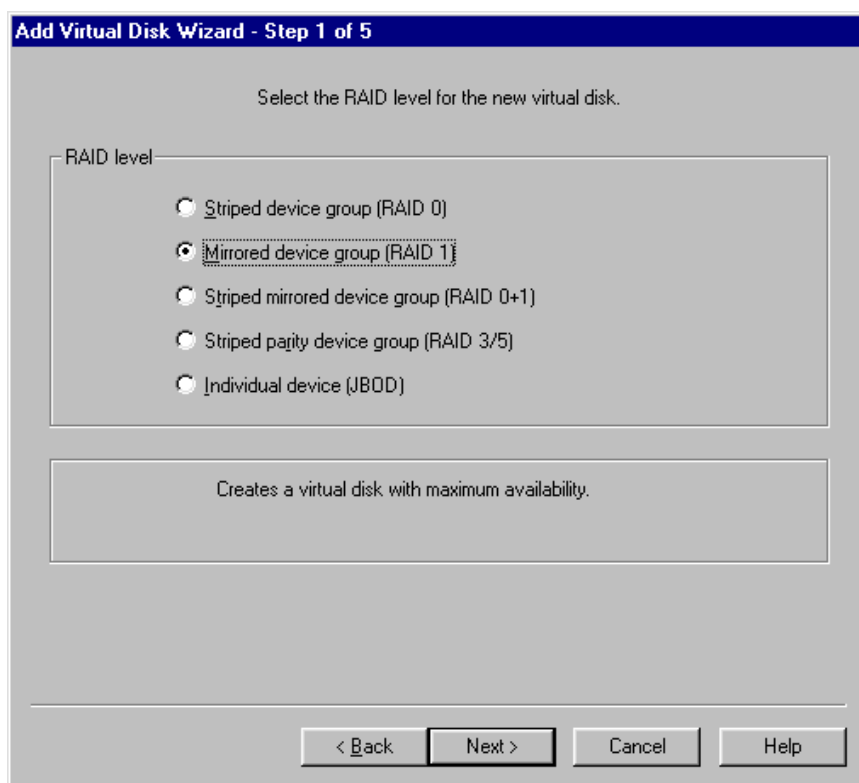
Once you have added the physical devices to the storage configuration you can use them to create a number of different types of logical storage units called virtual disks. You can create:

- Single-device virtual disks JBODs (Just a Bunch of Disks)
- Striped virtual disks (RAID 0)
- Mirrored virtual disks (RAID 1)
- Striped mirrored virtual disks (RAID 0+ 1)
- Striped virtual disks with parity (RAID 3/5)

2.8.2 Create a Virtual Disk

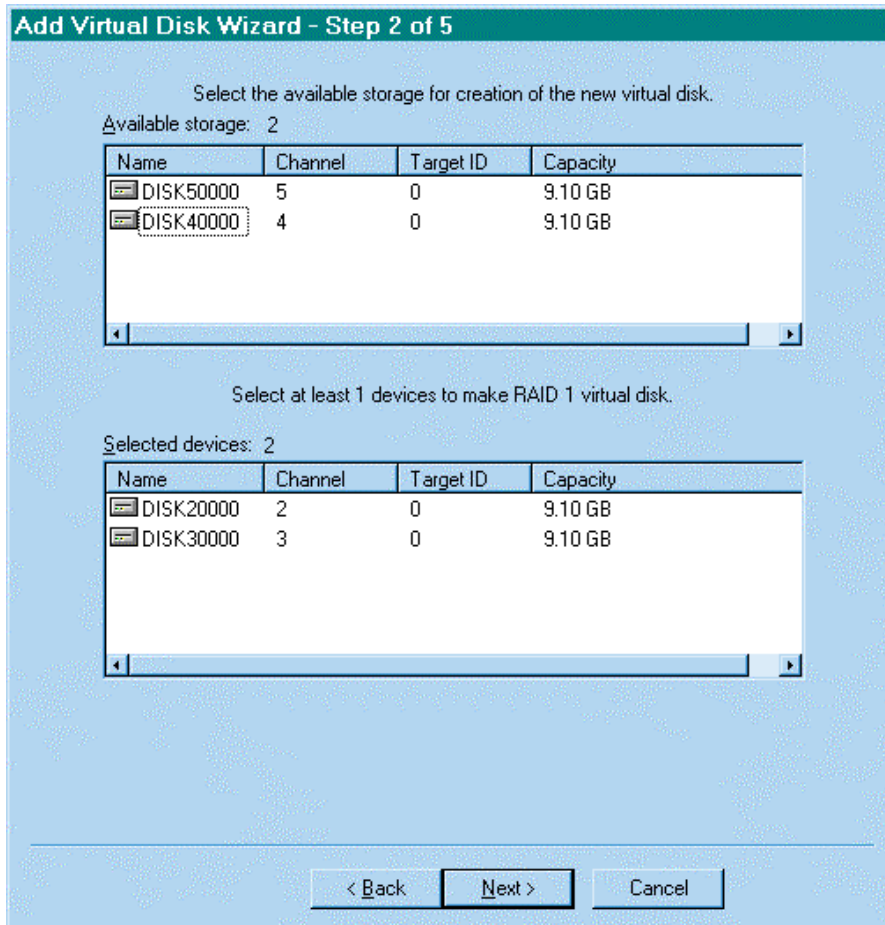
1. In the **Storage** menu, select *Add Virtual Disk*. Virtual Disk Wizard's Step 1 (Figure 2-19) appears. There are five steps in total.
2. Select the RAID level you want to create, then click *Next*.

Figure 2-19 Add Virtual Disk Wizard Step 1



3. Select the devices you want to include in the virtual disk from a list of available storage devices. You select devices by double-clicking them in the *Available Storage* window in the dialog box. As you click them, they move to the *Selected Devices* window in the dialog box. They are also shown as selected in the Device Window pane of the Storage Window.

Figure 2–20 Add Virtual Disk Wizard Step 2



4. Select the capacity of the virtual disk, then click *Next*. The wizard offers you the option of using only a portion of the capacity of the devices you have selected for your new virtual disk. It displays the total, available capacity of the devices you have selected in the capacity box. Enter the size of the virtual disk you want to create in the box.

Figure 2–21 Add Virtual Disk Wizard Step 3

Add Virtual Disk Wizard - Step 3 of 5

Set the capacity for the new virtual disk.

Based on the RAID level and devices you have selected, the capacity available for the new virtual disk is displayed below.

Selected RAID level: 1 (mirrored device)

Set virtual disk capacity

Specify a capacity within this range:

Minimum capacity:	1 MB
Maximum capacity:	9097.82 MB
Capacity for virtual disk:	<input type="text" value="9097.82"/> MB

< Back Next > Cancel

5. Specify the target ID and Logical Unit Number (LUN), operating parameters, and options of your new virtual disk, then click *Next*.

Figure 2–22 Add Virtual Disk Wizard Step 4

Set the options to be used when creating this new virtual disk.

Virtual Disk Name
Name (i.e..D0 - D199):

Enable writeback cache Enable read cache
 Enable readahead cache Enable writeprotect

Maximum cached transfer: blocks

Host access:

Save controller configuration to virtual disk

Read source:

Copy speed:

Replacement policy:

Strip size (in blocks):

Reconstruction rate:

< Back Next > Cancel

6. The final Virtual Disk Wizard window, Step 5, recaps the choices you have made in steps 1 through 4. If you are satisfied with your choices, click *Finish*. Otherwise, use the *Back* button to go return to the previous step and make the necessary changes.

Figure 2–23 Add Virtual Disk Wizard Step 5

Add Virtual Disk Wizard – Step 5 of 5

A virtual disk with the following characteristics will be created on the subsystem:

Characteristics

RAID level:	1 (mirrored)	Virtual Disk Name:	D104
Capacity:	9.10 GB	Write-back cache:	ON
Lun ID Alias:	NONE	Readahead cache:	ON
Save configuration:	OFF	Read cache:	ON
Member devices:	2	Write protect:	OFF
Max cached transfer:	2048		

Name	Channel	Target ...	Capacity
DISK20000	2	0	9.10 GB
DISK30000	3	0	9.10 GB

Replacement policy: BEST_PERFORMANCE Read source: LEAST_BUSY
Strip size: Copy speed: NORMAL

Host access:

!NEWCON10
!NEWCON09
!NEWCON00
!NEWCON01
!NEWCON02

If you are satisfied with these characteristics, select Finish to create the virtual disk.

< Back Finish Cancel

2.8.3 Delete a Virtual Disk

To delete a virtual disk:

1. Select its *icon* by clicking on it in the Virtual Disk Window.
2. Choose *Storage* from the Menu Bar; then *Virtual Disk*, then *Delete*.

2.8.4 Saving the Configuration

1. From the **Storage** menu, click *Controller Configuration*, then *Save*.
2. The Save dialog box appears, enter the desired location and file name. Your configuration is saved.

3

Creating Your Storage Configuration with the CLI

This chapter contains instructions for creating an initial storage configuration using the Command Line Interpreter (CLI). It briefly describes the CLI and how to access it. The configuration steps include: adding devices; creating and initializing RAIDsets, stripesets, mirrorsets, and striped mirrorsets; identifying a storageset as a unit to the host; and verifying and recording the final configuration.

NOTE

To create your storage configuration using the StorageWorks Command Console, refer to The Command Console User's Guide.

Once you complete the physical setup of the RAID Array, configure the devices in your subsystem into storagesets.

To configure the devices in your subsystem into storagesets, you need to:

- Plan your configuration (Refer to Appendix A)
- Add disks to the controller
- Create storagesets
- Save the configuration
- Record the configuration

3.1 Configuration Guidelines

Use the following guidelines to configure the HSG80 controller and your host system to optimize system performance.

3.1.1 Controller Device Configuration Guidelines

- The enclosure has six device ports (SCSI buses). Evenly distribute disk devices across the six separate device ports. This permits parallel activities on the controller's available device ports to the attached drives.
- Avoid configuring multiple mirrorsets with the first member being on the same device port. Configure multiple mirrorsets similar to the following example:

```
ADD MIRRORSET MIRR_1 DISK12000 DISK20000
ADD MIRRORSET MIRR_2 DISK20100 DISK10100
```

3.1.2 Host System Configuration Guidelines

You need to assign a host logical unit number to each storageset or single disk unit that you want your host to know about in your subsystem. The host uses these numbers to indicate the source or destination for every I/O request it sends to the controller.

Each logical unit number contains the following:

- A letter that indicates the kind of devices in the storage unit. For example, D for disk drives
- A number from 0-99 or 100-199

Each HSG80 controller has two host ports, Port 1 and Port 2, as shown in the following figures. Unit numbers D0-D99 are assigned to Host Port 1, unit numbers D100-D199 are assigned to Host Port 2. You can specify a maximum of 64 host logical units per host port, for a total of 128 host units when access is from two Fibre Channel host adapter ports. The last two digits of your unit number specify the Logical Unit Number (LUN), at which Solaris will see the unit. **Ensure that the LUN is specified in your `\kernel\drv\sd.conf` file; failure to do so may prevent Solaris from accessing the unit.** The `CPQhsg80` package enables lun0 through 15 on each port by default.

NOTE

Always assign all partitions of a storageset to the same host port (do not split partitioned storagesets across host ports).

Figure 3–1 Single Controller/Single Host

Controller A	Port 1 Active	Port 2 Unused	
EMPTY			
Cache A		EMPTY	

- For single HSG80 controller configurations connected to a single host you can configure up to 64 host logical units on Controller A - Host Port 1. Valid unit numbers are D0-D99. Controller A - Host Port 2 is unused.

Figure 3–2 Single Controller/Two Hosts

Controller A	Port 1 Active	Port 2 Active	
EMPTY			
Cache A		EMPTY	

- For single HSG80 controller configurations connected to two host systems, for one host you can configure up to 64 host logical units on Controller A - Host Port 1. Valid unit numbers are D0-D99. For the other host, you can configure up to 64 host logical units on Controller A - Host Port 2. Valid unit numbers are D100-D199.

Figure 3–3 Dual Controller/Single Host

Controller A	Port 1 Active	Port 2 Unused	
Controller B	Port 1 Standby	Port 2 Unused	
Cache A		Cache B	

- For dual-redundant HSG80 controller configurations connected to a single host you can configure up to 64 host logical units on Controller A - Host Port 1. Valid unit numbers are D0-D99. Controller B - Host Port 1 is automatically configured as a standby port for these same 64 units. Controller A - Host Port 2 and Controller B - Host Port 2 are unused.

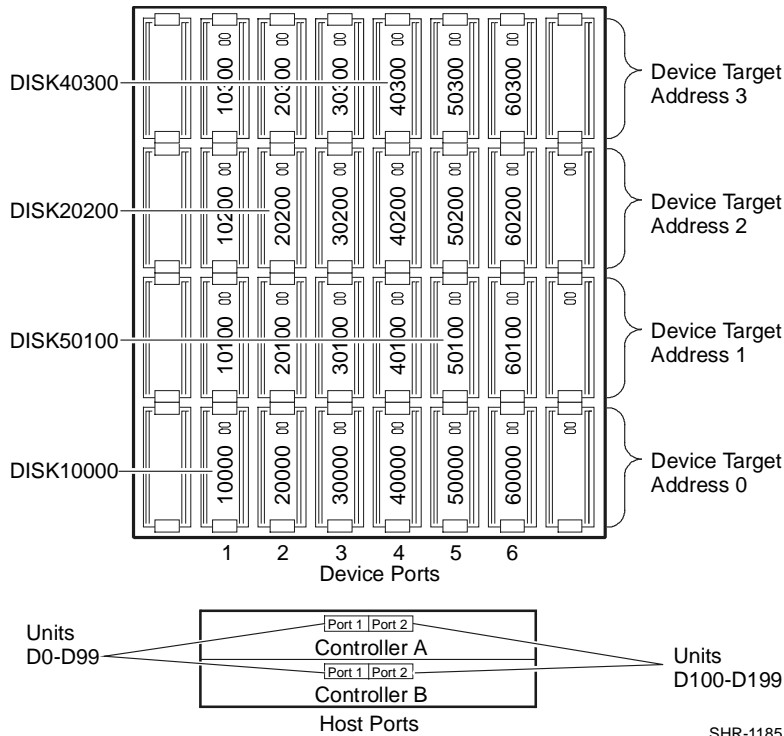
Figure 3-4 Dual Controllers/Two Hosts

Controller A	Port 1 Active	Port 2 Standby	
Controller B	Port 1 Standby	Port 2 Active	
Cache A		Cache B	

- For dual-redundant HSG80 controller configurations connected to two host systems, for one host you can configure up to 64 host logical units on Controller A - Host Port 1. Valid unit numbers are D0-D99. Controller B - Host Port 1 is automatically configured as a standby port for these same 64 units.

For the other host you can configure up to 64 host logical units on Controller B - Host Port 2. Valid unit numbers are D100-D199. Controller A - Host Port 2 is automatically configured as a standby port for these same 64 units.

Figure 3-5 Mapping of Device Ports/Targets and Host Ports



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3.2 Accessing the Command Line Interpreter (CLI)

The CLI is a command line user interface to the HSG80 controller. It provides a series of commands for you to create a configuration for the subsystem through the controller's firmware.

This chapter describes only the CLI commands required to create an initial configuration on the controller.

See the *COMPAQ StorageWorks HSG80 Array Controller ACS Version 8.3 User's Guide* for detailed descriptions of all CLI commands.

You must make a serial connection to the HSG80 controller to access the CLI.

The three methods of accomplishing the connection are:

- Using an ASCII terminal
- Using a PC running a communications program
- Using a SUN system with the "tip" command

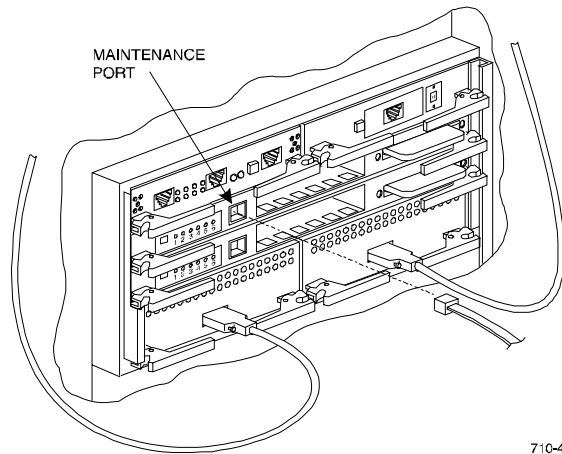
See *Command Line Interpreter* in the *HSG80 RAID Array Controller CLI Reference Manual* for detailed descriptions of all CLI commands.

3.2.1 Connecting the Cable to a PC or ASCII Terminal

To connect a maintenance terminal or PC to a HSG80 Controller follow these steps:

1. Locate the connecting cable that came with the RA8000/ESA12000 subsystem. It has an RJ12 connector (similar to standard telephone plug) on one end and a 9-pin serial connector on the other end.
2. Plug the serial connector into the 9-pin serial port/com port 1 of the PC. If a 9-pin serial port is not available on a PC, use the 9-pin to 25-pin adapter (P/N: 12-45238-01) supplied with your subsystem.
3. Plug the RJ12 connector from the PC or maintenance terminal into the maintenance port on the HSG80 Controller (see Figure 3-6).
4. Note which serial port on the PC you use; you will need that information if using a communications program.

Figure 3–6 Making a Serial Connection to the HSG80 Controller



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3.2.2 Establishing Connection with a SPARC System

To setup your SPARC system for connection with the HSG80 Controller, follow these steps:

1. Use the supplied serial cable, and the 9 to 25 pin RS-232 adapter (P/N=12-45238-01) to connect the serial port on the SPARC system to the serial port on the RAID array controller.
2. If you use a SUN A/B Serial Splitter Cable, and/or you attach the controller to serial port #1, you may need to modify the *remote* file to specify *ttya* as follows:
Open the file `/etc/remote` with an editor.
Locate the lines:
 `hardwire:\`
 `:dv:/dev/ttyb:br#9600...`
Change `ttyb` to **`ttya`**.
Save the file.
3. Open a *terminal window* from the Desktop Program menu.
4. Start the Terminal Interface Program (TIP), at the prompt type: `tip hardwire` and press the Enter key.
5. Press the Enter key again and the CLI prompt appears in the window similar to the following:

```
HSG80>
```

3.2.3 Establishing Connection with a Maintenance Terminal

To establish a connection between a maintenance terminal and the controller, follow these steps:

1. After connecting the maintenance terminal cable to the controller, press the Enter key. The CLI prompt appears in the window similar to the following:

```
HSG80 >
```

2. To view the status of the controller, type:

```
HSG80 > SHOW THIS_CONTROLLER FULL
```

The controller displays information similar to the following example: (dual-redundant configuration shown)

```
Controller:
HSG80 ZG74100091 Software V83G-0, Hardware E01
NODE_ID      = 5000-1FE1-FF00-0170
Allocation_Class=0
SCSI_Version=2
Configured for dual-redundancy with ZG74100121
  In dual-redundant configuration
Device Port SCSI address 7
Time: 28-SEP-1998 21:03:32
Host PORT_1:
  Reported PORT_ID = 5000-1FE1-FF00-0171
  PORT_1_PROFILE   = PLDA
  PORT_1_TOPOLOGY = LOOP_HARD (loop up)
  PORT_1_AL_PA    = 71 (71 negotiated)
Host PORT_2:
  Reported PORT_ID = 5000-1FE1-FF00-0172
  PORT_2_PROFILE   = PLDA
  PORT_2_TOPOLOGY = LOOP_HARD (loop up)
  PORT_2_AL_PA    = 72 (72 negotiated)
Cache:
  128 megabyte write cache, version 0012
  Cache is GOOD
  Battery is GOOD
  No unflushed data in cache
  CACHE_FLUSH_TIMER = DEFAULT (10 seconds)
Mirrored Cache:
  Not enabled
Battery:
  FULLY CHARGED
  Expires:
  NOCACHE_UPS
Extended information:
  Terminal speed 9600 baud, eight bit, no parity, 1 stop bit
  Operation control: 00000000 Security state code: 21429
  Configuration backup disabled
```

NOTE

Verify that the output of the "SHOW THIS" command from your subsystem is similar to that shown. If the controller presents a NODE_ID of all zeros (0000-0000-0000-0000), or the appropriate host port does not report a LOOP_UP condition, refer to the HSG80 User's Guide controller configuration chapter for more information.

3.3 Adding Disks to the Configuration

The CONFIG utility locates and adds disks to the controller. Run the CONFIG utility whenever you add new disks to the controller. Enter the following command to start the configuration utility. The disk numbers will correspond to the disk locations for your subsystem.

```
HSG80 > RUN CONFIG
```

The controller responds with a display similar to that shown below:

```
CONFIG LOCAL PROGRAM INVOKED
CONFIG IS BUILDING ITS TABLES AND DETERMINING WHAT DEVICES EXIST ON
THE SUBSYSTEM. PLEASE BE PATIENT.
ADD DISK12000 1 0 0
ADD DISK10100 1 1 0
ADD DISK10200 1 2 0
ADD DISK20000 2 0 0
ADD DISK20100 2 1 0
ADD DISK20200 2 2 0
ADD DISK30000 3 0 0
ADD DISK30100 3 1 0
ADD DISK30200 3 2 0
ADD DISK40000 4 0 0
ADD DISK40100 4 1 0
ADD DISK40200 4 2 0
ADD DISK40300 4 3 0
ADD DISK50000 5 0 0
ADD DISK50100 5 1 0
ADD DISK50200 5 2 0
ADD DISK50300 5 3 0
ADD DISK60000 6 0 0
ADD DISK60100 6 1 0
ADD DISK60200 6 2 0
ADD DISK60300 6 3 0
CONFIG - NORMAL TERMINATION
```


In this example, the controller has located 21 new disks. The 5 digit number associated with each disk corresponds to a one-digit Device Port Number, a two-digit Target Number and Controller Logical Unit Number. The Controller Logical Unit Number will always be 00. DISK40000, in this example, corresponds to the disk located on Device Port 4, on controller Target 0, and Controller Logical Unit 0. DISK50100 corresponds to the disk located on Device Port 5, controller Target 1, and Controller Logical Unit 0. Figure 3-5 shows the mapping of Device Ports, Targets and Host Ports.

3.4 Creating a RAIDset

RAIDsets stripe user data over multiple drives and calculate parity information for data redundancy. Create RAIDsets to use redundant stripesets in your array. RAIDsets must have at least three members and can have as many as fourteen. This example creates two three member RAIDsets using the ADD RAIDSET command.

```
HSG80 > ADD RAIDSET DVGRPR0 DISK12000 DISK20000 DISK30000
HSG80 > ADD RAIDSET DVGRPR1 DISK40000 DISK50000 DISK60000
```

In this example, “DVGRPR0” and “DVGRPR1” are the names of the RAIDsets, and they are followed by a list of disks to be included in each RAIDset. The names of the RAID sets are user selectable. Performance of your RAIDsets will be optimized if each RAIDset includes disks from different ports as shown in the example.

3.4.1 Initializing a RAIDset

Prior to putting a RAIDset(s) into service as a logical unit, you must initialize it. The INITIALIZE command copies controller metadata onto a small amount of disk space available on the RAIDset and makes this space inaccessible to the host.

When you initialize a RAIDset, you can specify a chunksize. A chunksize is the number of blocks of data that is transferred at one time. By using the default chunksize, the controller will optimize the chunksize by selecting a number equal to the number of blocks in one track of disk data. We recommend using the default chunksize.

```
HSG80 > INITIALIZE DVGRPR0 CHUNKSIZE=DEFAULT
HSG80 > INITIALIZE DVGRPR1 CHUNKSIZE=DEFAULT
```

3.4.2 Adding a RAIDset as a Logical Unit

To make a RAIDset available to the host computer, you must identify it as a host logical unit. For single controller subsystem, the unit numbers may range from D0 through D99 with a maximum of 64 units. These units are associated with Host Port 1. For dual controllers, the unit numbers may range from D0 through D99 for Host Port 1, and from D100 through D199 for Host Port 2, with a maximum of 64 units per Host Port. Add units by using the ADD UNIT command.

```
HSG80 > ADD UNIT D1 DVGRPR0
HSG80 > ADD UNIT D2 DVGRPR1
```

This example uses D1 and D2, as the first and second units identified on the controller.

3.4.3 Setting Writeback Cache

This feature is enabled by default; but if it is necessary, a single CLI command enables that feature for the entire RAIDset:

```
HSG80 > SET D1 WRITEBACK_CACHE
HSG80 > SET D2 WRITEBACK_CACHE
```

Where D1 and D2 represent the host logical units of the RAIDsets described above.

3.4.4 Setting Read Ahead Cache

This feature is enabled by default; but if it is necessary, a single CLI command enables that feature for the entire RAIDset:

```
HSG80 > SET D1 READAHEAD_CACHE
```

Where D1 represent the host logical unit of the RAIDsets described above.

3.5 Creating a Stripset

Use stripsets to stripe data across multiple disks. Striping data across multiple disks increases I/O performance compared with the performance of a single disk. Stripsets must have at least two members and can have as many as fourteen. All members must be single disks. This example creates a three member stripset using the ADD STRIPSET command.

```
HSG80 > ADD STRIPSET DVGRPS0 DISK10100 DISK20100 DISK30100
```

In this example, “DVGRPS0” is the name of the stripset, and it is followed by a list of the disks to be included in the stripset. The names of the stripsets are user selectable. Performance of your stripsets will be optimized if each stripset includes disks from different device ports as shown in the example.

3.5.1 Initializing a Stripeset

Prior to putting a stripeset into service as a logical unit, you must initialize it. The `INITIALIZE` command copies controller metadata onto a small amount of disk space available on the stripeset and makes this space inaccessible to the host.

When you initialize a stripeset, you can specify a chunksize. A chunksize is the number of blocks of data that is transferred at one time. By using the default chunksize, the controller will optimize the chunksize by selecting a number equal to the number of blocks in one track of disk data. We recommend using the default chunksize.

```
HSG80 > INITIALIZE DVGRPS0 CHUNKSIZE=DEFAULT
```

3.5.2 Adding a Stripeset as a Logical Unit

To make a stripeset available to the host computer, you must identify it as a host logical unit. For single or dual controllers on a single host, the unit numbers may range from D0 through D99 with a maximum of 64 units. For dual controllers/two hosts, the unit numbers may range from D0 through D99 for the first host and from D100 through D199 for the second host with a maximum of 64 units per host adapter. Add units by using the `ADD UNIT` command.

```
HSG80 > ADD UNIT D3 DVGRPS0
```

This example uses D3, since the stripeset is the third unit identified on the controller.

3.5.3 Setting Writeback Cache

This feature is enabled by default; but if it is necessary, a single CLI command enables that feature for the entire stripeset:

```
HSG80 > SET D3 WRITEBACK_CACHE
```

Where D3 represents the host logical unit of the stripeset described above.

3.6 Creating a Mirrorset

Create mirrorsets to increase data availability and achieve data redundancy by maintaining at least two drives that have exactly the same data. Mirrorsets must have at least two members, and can have as many as six. This example creates a two member mirrorset using the ADD MIRRORSET command.

```
HSG80 > ADD MIRRORSET DVGRPM0 DISK10200 DISK20200
```

In this example, DVGRPM0 is the name of the mirrorset, and it is followed by a list of the disks to be included in the mirrorset. The names of the mirrorsets are user selectable. Performance of your mirror sets will be optimized if each mirrorset includes disks from different ports as shown in the example.

3.6.1 Initializing a Mirrorset

Prior to putting a mirrorset into service as a logical unit, you must initialize it. The INITIALIZE command copies controller metadata onto a small amount of disk space available on the mirrorset and makes this space inaccessible to the host.

```
HSG80 > INITIALIZE DVGRPM0
```

3.6.2 Adding a Mirrorset as a Logical Unit

To make a mirrorset available to the host computer, you must identify it as a host logical unit. For single or dual controllers on a single host, the unit numbers may range from D0 through D99 with a maximum of 64 units. For dual controllers/two hosts, the unit numbers may range from D0 through D99 for the first host and from D100 through D199 for the second host with a maximum of 64 units per host adapter. Add units by using the ADD UNIT command.

```
HSG80 > ADD UNIT D4 DVGRPM0
```

3.6.3 Setting Writeback Cache

This feature is enabled by default; but if it is necessary, a single CLI command enables that feature for the entire mirrorset:

```
HSG80 > SET D4 WRITEBACK_CACHE
```

Where D4 represents the host logical unit of the mirrorset described above.

3.7 Creating a Striped Mirrorset

Create a striped mirrorset to achieve high I/O performance and maximum data availability. striped mirrorsets must have at least two mirrorset members, and can have as many as fourteen. All members must be mirrorsets. To create striped mirrorsets, you first create mirrorsets and then you create stripesets with those mirrorsets.

3.7.1 Creating Mirrorsets

These examples create 2, two member mirrorsets for the striped mirrorset.

```
HSG80 > ADD MIRRORSET MIRR_0 DISK30200 DISK40200
HSG80 > ADD MIRRORSET MIRR_1 DISK50200 DISK60200
```

In these examples, MIRR_0 and MIRR_1 are the names of the mirrorsets. Each is followed by the list of disks to be included in it.

3.7.2 Striping the Mirrorsets

Striped mirrorsets must have at least two members, and can have as many as fourteen. This example uses the ADD STRIPESET command to create a two member stripeset with the mirrorsets that you just created.

```
HSG80 > ADD STRIPESET DVGRPSM0 MIRR_0 MIRR_1
```

In this example, DVGRPSM0 is the name of the striped mirrorset, and it is followed by a list of mirrorsets to include in it. The name of the stripeset is user selectable. Performance of your striped mirrorset will be optimized if each mirrorset includes disks from different device ports as shown the example.

3.7.3 Initializing the Striped Mirrorset

Prior to putting a striped mirrorset(s) into service as a logical unit, you must initialize it. The INITIALIZE command copies controller metadata onto a small amount of disk space available on the striped mirrorset and makes this space inaccessible to the host.

When you initialize a striped mirrorset you can specify a chunksize. A chunksize is the number of blocks of data that is transferred at one time. By using the default chunksize, the controller will optimize the chunksize by selecting a number equal to the number of blocks in one track of disk data. We recommend using the default chunksize.

```
HSG80 > INITIALIZE DVGRPSM0 CHUNKSIZE=DEFAULT
```

3.7.4 Adding a Striped Mirrorset as a Logical Unit

To make a striped mirrorset available to the host computer, you must identify it as a host logical unit. For single or dual controllers on a single host, the unit numbers may range from D0 through D99 with a maximum of 64 units. For dual controllers/two hosts, the unit numbers may range from D0 through D99 for the first host and from D100 through D199 for the second host with a maximum of 64 units per host adapter. Add units by using the ADD UNIT command.

```
HSG80 > ADD UNIT D5 DVGRPSM0
```

3.7.5 Setting Writeback Cache

This feature is enabled by default; but if it is necessary, a single CLI command enables that feature for the entire striped mirrorset:

```
HSG80 > SET D5 WRITEBACK_CACHE
```

Where D5 represents the host logical units of the striped mirrorset described above.

3.8 Adding Individual Disks as Logical Units

To use an individual disk in a RA8000 Fibre Channel subsystem, you must initialize it and then add it as a logical unit.

3.8.1 Initializing Individual Disks

Prior to putting an individual disk into service as a logical unit, you must initialize it. The INITIALIZE command copies controller metadata onto a small amount of disk space available on the disk and makes this space inaccessible to the host.

```
HSG80 > INITIALIZE DISK40100
HSG80 > INITIALIZE DISK50100
```

3.8.2 Adding as Logical Units

To make an individual disk available to the host computer, you must identify it as a host logical unit. For single or dual controllers on a single host, the unit numbers may range from D0 through D99 with a maximum of 64 units. For dual controllers/two hosts, the unit numbers may range from D0 through D99 for the first host and from D100 through D199 for the second host with a maximum of 64 units per host adapter. Add units by using the ADD UNIT command.

```
HSG80 > ADD UNIT D4 DISK40100
HSG80 > ADD UNIT D5 DISK50100
```

3.9 Adding Devices to the Spareset

It is advisable to add devices to the spareset to create a pool of devices for the controller to use as replacements for devices in a RAIDset, mirrorset or striped mirrorset that fail. If no spareset exists, these redundant types of storagesets will run “reduced,” and you should replace the disabled disk as soon as possible. To create the spareset, identify the drive(s) using the ADD SPARESET command.

```
HSG80 > ADD SPARESET DISK60100
```

In this example, DISK60100 was identified to the controller as a spareset.

NOTE

Please keep in mind that disks in the spareset must have at least the same storage capacity as those disks that they might replace.

3.10 Saving Copies of the Configuration

Use the following INITIALIZE command to save a copy of the entire controller configuration on a device or storageset in the subsystem. Save a copy of the controller configuration on a device or storageset so that in the event of a controller failure, you will not need to create a new controller configuration.

The controller automatically updates the saved copy of the configuration whenever the configuration changes.

We recommend keeping a copy of the configuration on at least two devices or storagesets.

To save a copy of the configuration on disk, use the INITIALIZE command as follows:

```
HSG80 > INITIALIZE DISK12000 SAVE_CONFIGURATION
```

The controller places a copy of the configuration onto the specified device or storageset and automatically updates this saved copy whenever the configuration changes. To ensure availability of a copy of the configuration, save the configuration on at least two devices.

NOTE

The save configuration option extends the metadata on the storageset by approximately 500 blocks. The remaining user data area can be used by the host operating system as it would any other storageset after a logical unit has been created. ALL disks in the storageset will receive a copy of the configuration data.

CAUTION

If user data already exists on a storageset, do NOT reinitialize it with the *save configuration* option, as this will change the site and position of the user data on the storageset. Compaq recommends backing up user data prior to reinitializing any storageset.

3.11 Recording your Configuration

You have now completed all the steps required to create an initial configuration for your controller. In the following steps, you should verify and record your configuration for future reference. Additional worksheets are provided in this chapter for recording future new or modified configurations.

First, verify the Logical Units you have configured:

```
HSG80 > SHOW UNITS
```


Next, verify the storagesets you have configured:

HSG80 > **SHOW STORAGESETS**

The controller responds with a display similar to that shown below:

Name	StorageSet	Uses	Used by
DVGRPS0	stripeset	DISK10100 DISK20100 DISK30100	D3
DVGRPSM0	stripeset	MIRR_0 MIRR_1	D5
DVGRPM0	mirrorset	DISK10200 DISK20200	D4
MIRR_0	mirrorset	DISK30200 DISK40200	DVGRPSM0
MIRR_1	mirrorset	DISK50200 DISK60200	DVGRPSM0
DVGRPR0	raidset	DISK12000 DISK20000 DISK30000	D1
DVGRPR1	raidset	DISK40000 DISK50000 DISK60000	D2
SPARESET	spareset	DISK60100	
FAILEDSET	failedset		

Individual devices are not displayed in this report. To display individual devices, enter the following:

HSG80 > **SHOW DEVICES**

Record the above information in the following table. In the event of a controller failure, the information that is recorded here will assist you in reconstruction of the storageset on your RA8000 Fibre Channel subsystem.

Date _____			
Name	StorageSet	Uses	Used by



Planning Your Storage Configuration

This appendix describes the RAID configuration options and RAID concepts which you need to know to create your storage configuration.

A.1 Planning Your Configuration

RAID stands for Redundant Array of Independent Disks. It is a way of configuring multiple physical disk drives to achieve high data availability and/or larger virtual disk devices. RAID is implemented as a set of multiple storage devices (disks, tapes, and solid-state disks), called an array, and a specialized array controller, that manages the distribution of data across the array.

A RAID array, whether it contains two, five, or seven physical drives, can be configured to look like one or more large virtual disk drives. Use a RAID array virtual drive just as you would a physical drive. You can partition it if you want, and you do not need to make any application changes to realize the benefits of RAID. A RAID array provides higher levels of data availability and performance than a single physical disk drive of similar capacity.

Data for a given file is divided into chunks that is then be written across multiple drives. A *chunk* is a group of contiguous data blocks that are stored on a single physical disk drive. By using more than one physical drive, the data is transferred in chunks to multiple physical devices simultaneously, achieving transfer rates greater than each physical disk. Depending on the RAID level used, arrays also provide redundancy to protect the data availability. Arrays provide redundancy in two main ways: by mirroring and by generating parity.

The storage configuration options available depend upon your storage needs and the number of disks that you purchased for your RAID array. Table A-1 describes the storage options available and the minimum number of physical disks required to implement each.

You can use a variety of storageset type containers within a single subsystem, providing you have the disk device resources to support them.

Table A-1 Storage Configuration Options

Storage Method	Storageset Type	Number of Devices	Offers
RAID 3/5 A redundant-stripeset combining the optimized data transfers of RAID 3 with the striping of parity of RAID 5.	RAIDset	3 - 14	Good throughput and read bandwidth for a high request rate of small to medium transfers. High Data Availability.
RAID 0	Stripeset	2 - 14	Good performance for both read and write requests. Provides load balancing with each request requiring a single data operation. Data availability equivalent to that of an individual disk device.
RAID 1	Mirrorset	2 - 6 devices per mirrorset, up to 20 mirrorsets per RAID array	Good performance for read requests. High Data Availability
RAID 0 + 1	Striped mirrorsets	2 - 14 mirrorsets	Performance for read requests surpassing that of an unstriped mirrorset since it can achieve load balancing. High Data Availability.
Individual Devices (JBOD)	Disk Drive	1	Provides the storage capacity and access speed of the disk used. If device fails, data is lost.

Once you select the type of storagesets that you want to use in your subsystem, you must create them using an appropriate configuration manager.

B

Valid ALPA Settings

This appendix provides a table of the valid arbitrated loop physical addresses (AL_PAs) available for hard addressing the devices on a fibre channel arbitrated loop.

B.1 Valid AL_PA Settings

Table B-1 lists the AL_PA settings and corresponding SCSI target numbers for hard addressing the fibre channel arbitrated loop using the CPQfca or CPQfcaw drivers. Use this table when setting the PORT_1_AL_PA and PORT_2_AL_PA addresses on the HSG80 controller.

The values are ordered from lowest to highest priority. AL_PA = 00 is reserved for the FL_Port. AL_PA 0x01 through 0x70 are reserved for FC adapters installed in a Host system. When setting AL_PA addresses on the HSG80 controllers, use AL_PA 0x71 through 0xEF. The default setting for port 1 is AL_PA=71 and port 2 is AL_PA=72.

If you will be configuring multiple HSG80 controllers on a loop, you must ensure that all ports on a loop have unique AL_PAs. You will also have to manually configure your `\kernel\drv\sd.conf` file to add support for the correct target ids.

For more information, refer to the `sd(7D)` and `driver.conf(4)` man pages.

Table B-1 Arbitrated Loop Physical Address (ALPA) Settings

AL_PA (hex)	Target (hex)	Target (dec)	AL_PA (hex)	Target (hex)	Target (dec)	AL_PA (hex)	Target (hex)	Target (dec)
EF	00	0	A3	2B	43	4D	56	86
E8	01	1	9F	2C	44	4C	57	87
E4	02	2	9E	2D	45	4B	58	88
E2	03	3	9D	2E	46	4A	59	89
E1	04	4	9B	2F	47	49	5A	90
E0	05	5	98	30	48	47	5B	91
DC	06	6	97	31	49	46	5C	92
DA	07	7	90	32	50	45	5D	93
D9	08	8	8F	33	51	43	5E	94

Table B-1 Arbitrated Loop Physical Address (ALPA) Settings (cont)

AL_PA (hex)	Target (hex)	Target (dec)	AL_PA (hex)	Target (hex)	Target (dec)	AL_PA (hex)	Target (hex)	Target (dec)
D6	09	9	88	34	52	3C	5F	95
D5	0A	10	84	35	53	3A	60	96
D4	0B	11	82	36	54	39	61	97
D3	0C	12	81	37	55	36	62	98
D2	0D	13	80	38	56	35	63	99
D1	0E	14	7C	39	57	34	64	100
CE	0F	15	7A	3A	58	33	65	101
CD	10	16	79	3B	59	32	66	102
CC	11	17	76	3C	60	31	67	103
CB	12	18	75	3D	61	2E	68	104
CA	13	19	74	3E	62	2D	69	105
C9	14	20	73	3F	63	2C	6A	106
C7	15	21	72	40	64	2B	6B	107
C6	16	22	71	41	65	2A	6C	108
C5	17	23	6E	42	66	29	6D	109
C3	18	24	6D	43	67	27	6E	110
BC	10	25	6C	44	68	26	6F	111
BA	1A	26	6B	45	69	25	70	112
B9	1B	27	6A	46	70	23	71	113
B6	1C	28	69	47	71	1F	72	114
B5	1D	29	67	48	72	1E	73	115
B4	1E	30	66	49	73	1D	74	116
B3	1F	31	65	4A	74	1B	75	117
B2	20	32	63	4B	75	18	76	118
B1	21	33	5C	4C	76	17	77	119
AE	22	34	5A	4D	77	10	78	120
AD	23	35	59	4E	78	0F	79	121
AC	24	36	56	4F	79	08	7A	122
AB	25	37	55	50	80	04	7B	123
AA	26	38	54	51	81	02	7C	124
A9	27	39	53	52	82	01	7D	125
A7	28	40	52	53	83	00	7E	126
A6	29	41	51	54	84			
A5	2A	42	4E	55	85			

NOTE

Gray area denotes entries that are reserved for host bus adapters, and should not be used by HSG80 controllers.



Command Console LUN

This appendix discusses the Command Console LUN.

C.1 Command Console LUN

The StorageWorks RAID Array is configured by creating various types of storagesets and associating them with specific IDs called Logical Unit Numbers (LUNs). The Host uses these LUNs to access the underlying storageset. The RAID Array is preconfigured with a virtual LUN, located on Controller A, LUN 0. This device, called the Command Console LUN (CCL), allows the RAID Array to be recognized by the Host System as soon as it is attached to the SCSI bus and configured into the operating system. The CCL also serves as a communications device for the StorageWorks Command Console (SWCC) Agent. The CCL identifies itself to the Host via a unique identification string. This string, **HSG80CCL**, is returned in response to the Inquiry command.

When the CCL is enabled, as it is upon delivery, its address can be determined using the CLI command:

```
HSG80 > SHOW THIS_CONTROLLER
```

The CCL can be disabled using the CLI command:

```
HSG80 > SET THIS_CONTROLLER NOCOMMAND_CONSOLE_LUN
```

The CCL is enabled using the CLI command:

```
HSG80 > SET THIS_CONTROLLER COMMAND_CONSOLE_LUN
```

In Dual-Redundant Controller configurations, these commands alter the setting of the CCL on both Controllers. The CCL is enabled only on Host Port 1. At least one storage device must be configured on Host Port 2 before installing the Agent on a Host System connected to Host Port 2. This can be any type of storage device.

Select a storageset that you plan to configure and that is not likely to change. This storageset can be used by the agent to communicate with the RAID Array. Deleting this storageset (LUN) later will break the connection between the agent and the RAID Array.

NOTE

The CCL is a read-only device; the Solaris format command cannot write a disk label on it. Therefore, you will see an error message similar to the following: "(sd32): corrupt label - wrong magic number" while booting Solaris. To prevent this, you may disable the CCL and use another unit as a communication device. Use a unit that is not likely to change, as deleting it will break the connection between the Agent and the RAID Array.



For Advanced Users

This appendix provides information about Agent data files and formats for advanced level troubleshooting of agent installation problems.

D.1 For Advanced Users

The fastest and most user-friendly method of configuring an Agent is to use the configuration scripts. Use of the scripts is the recommended method for Agent configuration.

If you wish, however, you can manually configure any Agent by editing the Agent's configuration files with a text editor on the Agent's host system. To configure Command Console Agent for access protection and proper connection with your subsystems, you must edit five ASCII files.

- Services file
- Agent Configuration file
- Client Access file
- Subsystem Identification file
- Mail Notification file

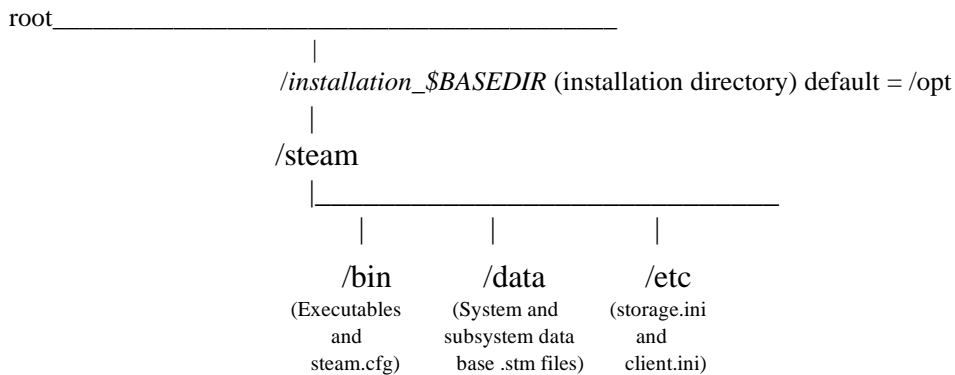
The following sections describe the function of each file, along with the process of editing it.

NOTE

To place any changes in these files in effect, you must stop and restart Agent after you edit them.

D.1.1 Locating the Files

The directory structure for Agent is as follows:



When you install Agent, you have the option to change the location of its file structure. If you accept the default installation directory, the setup routine installs Agent’s directory structure in the */opt* subdirectory under the root.

Note that the *steam.cfg* file is in the *bin* subdirectory, and that the *storage.ini* and *client.ini* files are both in the *etc* subdirectory.

D.1.2 Editing the Services File

The agent uses sockets (sometimes called “network ports”) to communicate with its Clients. The socket numbers at the Client and Agent ends must match for network communication to occur.

In Solaris 2.x-based systems, the socket numbers are assigned in the *services* file in the */etc/inet* subdirectory. In the unlikely event that you experience a conflict with the socket numbers, you may edit the *services* file manually.

The default socket numbers for Command Console are 4998 and 4999. If you are installing the agent and these numbers are already taken by another application, the installation program warns you that you must choose another pair.

To select another pair for Agent, open the *services* file with a text editor. Pick two numbers above 1023 that are not already used in the file, and add the following two lines:

```
spgui      number1/tcp # StorageWorks® Command Console
spagent    number2/tcp # StorageWorks® Command Console
```

NOTES

- You must use the same port numbers with any clients with which you want to communicate. (For further details, refer to your Windows 95 or Windows NT documentation).
- If you are running NIS+, you must do one of the following:
 - Add the spgui and spagent port numbers to the NIS+ services table.
 - or**
 - Edit your */etc/nsswitch.conf* file and ensure that the "files" entry comes before the "[NOTFOUND=return]" entry.

D.1.3 Editing the Agent Configuration File

The agent configuration file, *steam.cfg*, configures Command Console Agent within its operating system.

File Format

The file contains five lines of ASCII text, formatted as follows:

device_special_file_path

The device special file path, */dev*.

agent_executable_file_path

The full path to the *steamd*, *client.ini*, and *storage.ini* files.

encrypted_password

The encrypted password from the password generation program.

manufacturer_name

Your manufacturer name. The default is "Digital Equipment Corporation" You can use up to 80 characters.

snmp_enterprise_assignment

Your SNMP enterprise assignment number. The default is "36.1.15.21.". (Note that this parameter is *not* your numerical TCP/IP address.) If you are unsure about this parameter, use the default or contact your network administrator.

Editing the File

Edit the *\$BASEDIR/steam/bin/steam.cfg* file by performing the following actions:

1. Run the password generation program by changing to the directory that the *steamd*, *client.ini*, and *storage.ini* files are installed in and entering the following at a command prompt:

```
sp_passwd "yourpassword"
```

where "yourpassword" is a 4 to 16-character text string of your choosing.

The program generates an encrypted password string and displays it on the screen.

2. Use an ASCII editor to modify the *steam.cfg* file you copied during the installation process. Use the encrypted password from Step 1 as line 3 in the file.

Sample File

Following is a sample *steam.cfg* file:

```
/dev
/opt
Q1</Sn_k
Digital Equipment Corporation
36.1.15.21.
```

D.1.4 Editing the Client Access File

The client access file, *client.ini*, configures Command Console Agent for proper operation with its Command Console Client companions. The file is located in the directory *\$BASEDIR/steam/etc*.

NOTE

Blank lines are not allowed in the *client.ini* file and the file must end with a carriage return. An embedded blank line or lack of a trailing carriage return may interfere with Agent execution.

File Format

The line for each client system must be in the following format:

```
system_network_address|notification_method|access_allowed <CR>
```

where:

system_network_address

The network name, including the domain information if appropriate, of the remote system to which you wish to grant access. The address may be an alphanumeric alias or a numeric IP address. The address can be up to 128 characters long, including periods. If you are unsure of this address, consult your network administrator.

notification_method

The mechanism you wish Agent to use to notify Client sessions of a fault, where:

- 0 = no notification
- 1 = notify via TCP
- 2 = notify via SNMP
- 3 = notify via both TCP and SNMP

If you are unsure of which mechanism to use, use "1" for this parameter. To avoid significant delays in fault notification, set this parameter to "0" for Clients using RAS connections to the network.

access_allowed

You can configure Agent for three levels of subsystem access:

- Navigation Tree monitoring—Good/Bad indication in the Navigation Tree only. No Storage Window can be opened for the subsystem by this Client.
- Storage Window monitoring—All detailed information about the status of the storage subsystem available in a Storage Window, in addition to Navigation Tree monitoring capabilities.
- Storage Window configuration—Capability of changing the configuration of the storage subsystem in the Storage Window, in addition to monitoring the subsystem in both the Navigation Tree and Storage Window.

The *access_allowed* parameter sets the level of access you are granting to this remote system, where:

- 0 = Navigation Tree monitoring only. A Storage Window cannot be opened. No Storage Window monitoring or configuration changes allowed.
- 1 = Navigation Tree and Storage Window monitoring. No storage subsystem configuration changes allowed in the Storage Window.
- 2 = Navigation Tree monitoring and Storage Window monitoring and configuration access.

<CR>

A carriage return is required at the end of the file.

Editing the File

Use an ASCII editor to modify the *client.ini* file you copied during the installation process. Add a separate line in the file for each system that you wish to grant access to this host system. Use vertical bars (sometimes called the “pipe” character) to delimit the fields. You may add comment lines as long as they start in very first position and begin with the pound character, "#".

Sample File

Following is a sample *client.ini* file. This file enables full access for the remote Client system at network address *dreamon.your.company.com*, and sends fault notifications to Client using the TCP mechanism. It also disables configuration access by Client running on the system at network address *wanderlust.your.company.com*, but still enables asynchronous fault notification via the TCP mechanism.

```
# Access list for system HOST123:
dreamon.your.company.com|1|2
wanderlust.your.company.com|1|1
```

D.1.5 Editing the Subsystem Identification File

The subsystem identification file, *storage.ini*, configures Agent to communicate with the storage subsystems on the host on which Agent is running. The file is located in the directory *\$BASEDIR/steam/etc*.

NOTE

Blank lines are not allowed in the *storage.ini* file and the file cannot end with a carriage return. An embedded blank line or a trailing carriage return may interfere with Agent execution.

File Format

The line for each system must have the following format:

```
subsystem_name|monitor_interval|Reserved|controller_type|emu_type|this_sn|other_sn|f  
fw_version|access_device|ccl_device|num_virtual_disks|device_ID1|device_IDn
```

where:

subsystem_name

The name you wish to refer to the subsystem by when using the Client GUI. The name must be alphanumeric and can consist of up to 32 characters.

monitor_interval

The time interval, in seconds, between Agent's periodic status checks on this subsystem. The range of intervals is from 1 to 99,999 seconds. If you set this parameter to 0, Agent does not perform periodic status checks on the subsystem.

Reserved

This field is reserved for future use.

controller_type

A numeric identifier for the controller model used in the subsystem, as follows:

NOTE

All controller types may not be supported by your software version. Check the release notes for your specific software version to determine which controllers are supported.

- 0=HSZ20 controller
- 2=HSD40 controller
- 3=HSJ40 controller
- 4=HSZ40 controller
- 5=HSD50 controller
- 6=HSJ50 controller
- 7=HSZ50 controller
- 8=HSZ70 controller
- 9=HSZ80 controller
- 10=HSG80 controller

emu_type

A numeric identifier for the type of environmental monitoring unit (EMU) used in the subsystem, as follows:

- 0=no EMUs installed
- 1=standard EMUs installed
- 2=enhanced EMUs installed

this_sn

The serial number of the controller with which the Agent is communicating.

other_sn

The serial number of the companion to the controller with which the Agent is communicating.

fw_version

The version number of ACS software running on the RAID Array.

access_device

The device name that identifies this storage subsystem in the operating system. Agent uses this device to communicate with the controller. The name has the format *cxydzs2* where:

x = controller number

y = target ID

z = lun number

For an HSG80 controller with an enabled communications LUN, this field contains the device name representing the communications LUN in the operating system. If the communications LUN is disabled, this device is one of the virtual disks listed in the *device_ID1/device_IDn* fields, below.

ccl_device

If a controller communications LUN (CCL), is enabled, this field contains information about that LUN.

For HSG80 controllers, this field contains either of the following:

—The text string “disabled”, indicating that the communications LUN is disabled in the controller.

—The operating system device name representing the communications LUN. The format is the same as the *access_device* field.

For all other controller types, this field contains the text string “none”, indicating that there is no communications LUN available. In this case, Agent uses the device specified in the *access_device* field to connect to the controller. This device is a virtual disk, also listed in the *device_ID1/device_IDn* fields, below.

num_devices

A numeric value indicating the total number of virtual disks configured in the storage subsystem and added to the operating system as devices. Each virtual disk represents one or more physical devices attached to the controller.

This field contains the value 0 if no virtual disks are configured on this system, or if the ones that have been configured have not been added to the operating system as accessible devices. In this case, the controller’s communications LUN must be enabled for Agent/controller communication to occur.

device_ID1/device_IDn

A listing of the operating system device names for the virtual disks configured in the storage subsystem. The format is the same as the *access_device* field.

Vertical bars (sometimes called the “pipe” character) are used to delimit the virtual disk names. The total number of names listed must equal the value in the *num_devices* field.

Editing the File

Use an ASCII editor to modify the *storage.ini* file you copied during the installation process. Add a separate line in the file for each system that you wish to grant access to this host system. Use vertical bars (sometimes called the “pipe” character) to delimit the fields in each line. You may add comment lines as long as they start in very first position and begin with the exclamation point character, "#".

Sample File

Following is a sample *storage.ini* file. This file configures the Agent to communicate with and monitor subsystems g80 and ra410. Subsystem g80 is a dual-redundant HSG80 based system with the CCL enabled. It is connected to device file c4t65d4s2 (the CCL), and it is checked every thirty seconds. Subsystem ra410 is a single-controller HSZ40 based system, connected to device c3t0d0s2.

```
# Storage subsystems for myhost.com
```

```
g80|30|0|10|2|ZG80900660|ZG80900624|V83G|c4t65d4s2|c4t65d4s2|8|c4t64d0s2|c4t64d1s2|c4t64d2s2|c4t64d3s2|c4t65d0s2|c4t65d1s2|c4t65d2s2|c4t65d3s2|
ra410|60|0|4|1|ZG60205297|N/A|V32Z|c3t0d0s2|none|2|c3t0d0s2|c3t2d0s2|
```

D.1.6 Editing the Mail Notification File

The mail notification file, *notify.ini*, configures Agent to send messages to specified network email addresses when a storage subsystem event occurs. The file is located in the directory */\$BASEDIR/steam/etc*.

NOTE

Blank lines are not allowed in the *notify.ini* file. A blank line may interfere with Agent execution.

File Format

The line for each e-mail address must be in the following format:

M|notification_level|network_email_address

where:

M

The ASCII character “M”.

notification_level

The levels of subsystem faults that generate an e-mail message for the e-mail address in this line, where:

- 1 = notify when fatal events occur
- 2 = notify when fatal events or events requiring warnings to the user occur
- 3 = notify when fatal events, events requiring warnings to the user, or events requiring only informational messages to the user occur

network_email_address

The complete network e-mail address you wish the notification message to be sent to.

Editing the File

Use an ASCII editor to modify the *notify.ini* file you copied during the installation process. Add a separate line in the file for each address you wish to notify when a storage subsystem event occurs. Use vertical bars (sometimes called the “pipe” character) to delimit the three fields in each line. You may add comment lines as long as they start in very first position and begin with the pound character, “#”.

Sample File

Following is a sample *notify.ini* file. This file configures Agent to use e-mail notification to you at *youall@yourcompany.com* for fatal events only.

```
# Email notification for HOST123
M|1|youall@yourcompany.com
```



Understanding RAID Manager's Mail Messages

This appendix provides information to help you understand the contents of the automatic mail message(s) RaidManager sends upon the occurrence of an event, if so enabled.

E.1 Mail Message Information

If you have enabled *email notification* via the Agent installation program, (Chapter 2), the Agent sends email notification to the specified network email addresses when a storage subsystem event occurs. The storage subsystem event can be a state change of a physical storage device, logical storage unit or a component of the physical enclosure.

You will always receive this message as being from the RaidManager. The message will specify the name of the Host to which the Raid Array (reporting the event) is connected. The message also tells the severity of the problem, which will be one of three levels:

- Critical
- Warning
- Informational

The mail message appears in the following form:

```
-----  
From RaidManager Tue Oct 6 15:59:59 1998  
Date: Tue, 6 Oct 1998 15:59:58 -0500 (EST)  
From: RaidManager
```

```
This is an automatic message from your StorageWorks  
RAID Agent, steamd. The following message was just received.  
Please check your syslog files and RAID box!
```

```
Hostname: Suncity
```

```
CRITICAL: Validation failed - Unauthorized client (shr-dhcp-24-  
188.shr.dec.com, access level: -1); connection refused (SP_TCP:  
ClientConnect)
```

```
End Of Automatic Message.  
-----
```

E.2 Event Information Fields

Often the message is self-explanatory, as shown in the previous example. Other messages reflect the state of the RAID subsystem by displaying event information fields in a line following the problem severity level.

Example:

```
WARNING:-
Suncity Hsg80 12000000000 HSG80 disks(disk21100:2) (SP_MONITOR: MonitorSubsys)
  \      \      \
  (1)   (2)   (3)
```

The event information fields can be deciphered as follows:

- (1) **Host Name** - to which the RAID experiencing the event is connected.
- (2) **Storage Subsystem** - where the problem occurred.
- (3) **State Change** - of a particular component of the storage subsystem. This is an eleven digit field that provides the crucial information about the status of your RAID Array.

E.2.1 Mapping State Change Digits to RAID Subsystem Components

Each of the eleven digits in the state change field can be mapped to a RAID subsystem component for deciphering event reports. Table F-1 lists the relationship.

Table E-1 State Change Digit Position and Corresponding Subsystem Component

“State Change” Digit Position	Corresponding RAID Subsystem Component
1	Overall Subsystem
2	Disks
3	Power Supply
4	Fans
5	Battery
6	Temperature
7	This Controller
8	Communications LUN
9	Other Controller
10	External Factors
11	Logical Units

E.2.1.1 The First Digit of the State Change Field - (Overall Subsystem)

The **first digit** of the state change field tells about the state change of the **overall subsystem**.

Example:

```
WARNING: -  
Suncity Hsg80 12000000000 HSG80 disks(disk21100:2) (SP_MONITOR: MonitorSubsys)
```



This digit can take 2 values:

- 0 - Everything is fine
- 1 - Something has changed state

E.2.1.2 The Second Digit of the State Change Field - (Disks)

The **second digit** of the state change field tells about the state change of **disks**.

Example:

```
WARNING: -  
Suncity Hsg80 12000000000 HSG80 disks(disk21100:2) (SP_MONITOR: MonitorSubsys)
```



This digit can take three values.

- 0 - Everything is fine
- 1 - Drive went from bad to good
- 2 - Drive went from good to bad

In this example, a value of 2 is displayed in the disk digit position, which indicates that a drive went from good to bad.

The disknames follow in the message line, (in parenthesis), in the format:

disk_name:state

where *disk_name* is the name of the disk and *state* can be either of the following:

- 1 - disk went from bad to good
- 2 - disk went from good to bad

In this example, the failed drive is disk21100.

E.2.1.3 The Third Digit of the State Change Field - (Power Supply)

The **third digit** of the state change field tells about state change of **power supply**.

Example:

```
WARNING: -  
Suncity Hsg80 10200000000 HSG80 pwr(0:1:2) (SP_MONITOR: MonitorSubsys)  
      ↑
```

The third digit can take three values:

- 0 - Everything is fine
- 1 - Power Supply went from bad to good
- 2 - Power Supply went from good to bad

The position of the failed power supply usually follows in the message line, in parenthesis, as three numbers that indicate the position in the format:

cabinet_number:power_position:state

where *cabinet_number* is the cabinet ID from 0 to 3, the *power-position* is the power supply location from 1 to 8 and *state* can be any of the following:

- 1 - Power Supply went from bad to good
- 2 - Power Supply went from good to bad
- 3 - Power Supply is not present.

In this example, the Power Supply in position 1 of Cabinet 0 (main cabinet) went from good to bad.

E.2.1.4 The Fourth Digit of the State Change Field - (Fans)

The **fourth digit** of the state change field tells about the state change of **fans**.

Example:

```
WARNING: -  
Suncity Hsg80 10020000000 HSG80 fans(0:A:2) (SP_MONITOR: MonitorSubsys)  
      ↑
```

The fourth digit can take three values:

- 0 - Everything is fine
- 1 - Fan state went from bad to good
- 2 - Fan state went from good to bad

The position of the fan follows in the message line, in parenthesis, in the format:

cabinet_number:fan_position:state

where *cabinet_number* is the cabinet ID from 0 to 3, *fan_position* is the position of the fan and *state* is either of the following:

- 1 - Fan went from bad to good
- 2 - Fan went from good to bad

In this example, a fan failure occurred in cabinet 0, the main cabinet.

E.2.1.5 The Fifth Digit of the State Change Field - (Battery)

The **fifth digit** tells about the **battery** state change.

Example:

WARNING: -
Suncity Hsg80 1000**2**000000 HSG80 batt(6:fail) (SP_MONITOR: MonitorSubsys)



This digit can take three values:

- 0 - Everything is fine
- 1 - Battery state went from bad to good
- 2 - Battery state went from good to bad

The details of the battery failure follow in the message line, in parenthesis, in the format:

controller_id:state

where *controller_id* is the SCSI ID of the **reporting** controller (in other words, the cache battery failed for the other controller), and *state* is any of the following:

- good - Battery is good
- low - Battery voltage is low
- fail - Battery has failed

In this example, the cache battery failed for the controller with SCSI ID 7.

E.2.1.6 The Sixth Digit of the State Change Field - (Temperature)

The **sixth digit** of the state change field is about **temperature** state changes.

Example:

WARNING: -
Suncity Hsg80 10000**2**00000 HSG80 temp(0:2:2) (SP_MONITOR: Monitor_Subsys)
 ↑

The sixth digit can take three values:

- 0 - Everything is fine
- 1 - Temperature state went from bad to good
- 2 - Temperature state went from good to bad

The details regarding the temperature change follows in the message, in parenthesis, in the format:

cabinet_number:sensor_type:state

where *cabinet_number* is the cabinet ID from 0 to 3, *sensor_type* is the EMU sensor, (sensor 1 or sensor 2), and *state* is either of the following:

- 1 - Temperature went from bad to good
- 2 - Temperature went from good to bad

In this example, an adverse temperature change is detected by sensor 2 of the main cabinet (0).

E.2.1.7 The Seventh Digit of the State Change Field - (This_Controller)

The **seventh digit** tells about the changes in **This_Controller**.

NOTE

| This value is always zero for a dual redundant configuration. |

The seventh digit will change to 1 in case of the failure of the controller in a single controller configuration.

E.2.1.8 The Eighth Digit of the State Change Field - (Communications LUN)

The **eighth digit** tells about the state changes of the **Communications LUN**.

Example:

CRITICAL: - Suncity Hsg80 1000000**2**000 HSG80 (SP_MONITOR: MonitorSubsys)



CRITICAL: Unable to open device - hdisk1 (SP_MONITOR: MonitorSubsys)

This digit can take three values:

- 0 - Everything is fine
- 1 - Communication LUN is available to the host machine
- 2 - Communication LUN is not available to the host machine

In this example, two mail messages appear. The first message indicates a Communications LUN change of state from good to bad. The second message indicates that the Agent is not able to open the Communications LUN for monitoring the subsystem.

E.2.1.9 The Ninth Digit of the State Change Field - (Other_Controller)

The **ninth digit** indicates the state change of the **Other_Controller**.

Example:

WARNING: -
Suncity Hsg80 10000000**2**00 HSG80 (SP_MONITOR: MonitorSubsys)



This value will never change for a single controller configuration. It will always change when either of the controllers fail in a dual redundant configuration.

This digit can take three values:

- 0 - Everything is fine
- 1 - Both controllers are functioning
- 2 - One of the two controllers failed

Physically inspect the controllers to verify which one has failed, as indicated by a solid green indicator light (not blinking).

E.2.1.10 The Tenth Digit of the State Change Field - (External Factors)

The **tenth digit** indicates the a state change detected as caused by **external factors**.

Example:

```
WARNING: -  
Suncity Hsg80 1000000002 HSG80 (SP_MONITOR: MonitorSubsys)  
                ↑
```

This digit can take three values:

- 0 - Everything is fine
- 1 - State changed from bad to good
- 2 - State changed from good to bad

E.2.1.11 The Eleventh Digit of the State Change Field (Logical Units)

The **eleventh digit** indicates a state change of Logical Units.

Example:

```
WARNING: -  
Suncity Hsg80 10000000002 HSG80 lun(d100:4) (SP_MONITOR: MonitorSubsys)  
                ↑
```

This digit can take 3 values:

- 0 - Everything is fine
- 1 - A LUN state changed from bad to good
- 2 - A LUN state changed from good to bad

The details about the failure of the LUN follow in the message line, in parenthesis, in the format:

virtual_disk:state

where *virtual_disk* is the unit number of the virtual disk and *state* is any of the following:

- 0 - good
- 1 - reduced
- 2 - reconstructing
- 4 - failed

In this example, Logical Unit D100 failed.

In most cases, the RaidManager will send at least two consecutive mail messages. The first one is always of the form:

From RaidManager Tue Oct 6 16:09:37 1998
Date: Tue, 6 Oct 1998 16:09:37 -0500 (EST)
From: RaidManager

This is an automatic message from your StorageWorks
RAID Agent, steamd. The following message was just received.
Please check your syslog files and RAID box!

Hostname: Suncity

WARNING: - A subsystem change has been detected: Suncity HSG80 OVRL=1
(SP_MONITOR: MonitorSubsys)

End Of Automatic Message.

It is the second mail message that deciphering is required by applying the data provided in this appendix. The second message will be similar to the following (depending on the error that is occurring):

From RaidManager Tue Oct 6 16:09:37 1998
Date: Tue, 6 Oct 1998 16:09:37 -0500 (EST)
From: RaidManager

This is an automatic message from your StorageWorks
RAID Agent, steamd. The following message was just received.
Please check your syslog files and RAID box!

Hostname: Suncity

WARNING: - Suncity Hsg80 12000000000 HSG80 disks(disk10200:1 disk60300:2)
(SP_MONITOR: MonitorSubsys)

End Of Automatic Message.



SNMP MIB Information

This appendix provides information about the SNMP traps that may be generated by the Agent.

F.1 SNMP Trap Information

When a physical storage device, a logical storage unit, or a physical enclosure component changes state, the Agent sends out an SNMP trap (that is, an asynchronous event notification) to any hosts that are listed in the CLIENT.INI file with this option enabled. (See Appendix E, *For Advanced Users*, for more information on client.ini settings.)

This section describes the format of the SNMP traps that may be generated. There are 21 trap types, one for each FRU type and state.

F.1.1 Disk Device Failure Trap

```
Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 1
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.28
Value 3 = <disk device name>
Object 4 = 1.3.6.1.4.1.36.2.15.21.3.2.1.33
Value 4 = <cabinet>
Object 5 = 1.3.6.1.4.1.36.2.15.21.3.2.1.35
Value 5 = <channel>
Object 6 = 1.3.6.1.4.1.36.2.15.21.3.2.1.36
Value 6 = <target ID>
```

F.1.2 Disk Device Recovery Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 2
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.28
Value 3 = <disk device name>
Object 4 = 1.3.6.1.4.1.36.2.15.21.3.2.1.33
Value 4 = <cabinet>
Object 5 = 1.3.6.1.4.1.36.2.15.21.3.2.1.35
Value 5 = <channel>
Object 6 = 1.3.6.1.4.1.36.2.15.21.3.2.1.36
Value 6 = <target ID>

F.1.3 Power Supply Device Failure Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 3
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.33
Value 3 = <cabinet>
Object 4 = 1.3.6.1.4.1.36.2.15.21.3.2.1.29
Value 4 = <power supply location>

F.1.4 Power Supply Device Recovery Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 4
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.33
Value 3 = <cabinet>
Object 4 = 1.3.6.1.4.1.36.2.15.21.3.2.1.29
Value 4 = <power supply location>

F.1.5 Fan Device Failure Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 5
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.33
Value 3 = <cabinet>
Object 4 = 1.3.6.1.4.1.36.2.15.21.3.2.1.30
Value 4 = <fan location>

F.1.6 Fan Device Recovery Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 6
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.33
Value 3 = <cabinet>
Object 4 = 1.3.6.1.4.1.36.2.15.21.3.2.1.30
Value 4 = <fan location>

F.1.7 Cache Battery Failure Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 7
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.31
Value 3 = <cache battery location>

F.1.8 Cache Battery Low Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 8
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.31
Value 3 = <cache battery location>

F.1.9 Cache Battery Recovery Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 9
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.31
Value 3 = <cache battery location>

F.1.10 Temperature Sensor Over Threshold Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 10
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.33
Value 3 = <cabinet>
Object 4 = 1.3.6.1.4.1.36.2.15.21.3.2.1.32
Value 4 = <temperature sensor location>

F.1.11 Temperature Sensor Below Threshold Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 11
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.33
Value 3 = <cabinet>
Object 4 = 1.3.6.1.4.1.36.2.15.21.3.2.1.32
Value 4 = <temperature sensor location>

F.1.12 Communication Failure Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 12
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>

F.1.13 Communication Recovery Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 13
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>

F.1.14 Controller Failure Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 14
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>

F.1.15 Controller Recovery Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 15
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>

F.1.16 LUN Failure Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 16
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.34
Value 3 = <lun name>

F.1.17 LUN Reconstructing Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 17
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.34
Value 3 = <lun name>

F.1.18 LUN Reduced Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 18

Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.34
Value 3 = <lun name>

F.1.19 LUN Recovery Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 19
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.34
Value 3 = <lun name>

F.1.20 EMU External Input Failure Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 20
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.33
Value 3 = <cabinet>

F.1.21 EMU External Input Recovery Trap

Enterprise = 1.3.6.1.4.1.36.2.15.21
Source address = <ip address>
Generic = 6
Specific = 21
Variable Binding List :
Object 1 = 1.3.6.1.4.1.36.2.15.21.1.4
Value 1 = <host name>
Object 2 = 1.3.6.1.4.1.36.2.15.21.3.2.1.2
Value 2 = <subsystem name>
Object 3 = 1.3.6.1.4.1.36.2.15.21.3.2.1.33
Value 3 = <cabinet>

