

Compaq StorageWorks

RA8000/ESA12000 HSG80 Solution
Software V8.3 for HP-UX

Installation Reference Guide

AA-RFBEC-TE

387374-003

Compaq Computer Corporation

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Attention!

Ceci est un produit de Classe A. Dans un environnement domestique, ce produit risque de créer des interférences radioélectriques, il appartiendra alors à l'utilisateur de prendre les mesures spécifiques appropriées.

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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 summary of changes.

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 StorageWorks RA8000/ESA12000 HSG80 Subsystem for the HP-UX Operating Systems.

<u>Revision Level</u>	<u>Date</u>	<u>Summary of Changes</u>
AA-RFBEA-TE / 387374-001	November 1998	Original Release
AA-RFBEB-TE / 387374-002	December 1998	Supports Configuration of the Command Console for Multiple Paths
AA-RFBEC-TE / 387374-003	March 1999	Added support for the HP T and V class systems.

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 prepare your HP host for use with the HSG80 Controller
- How to install and configure the Command Console Agent
- How to configure the HP-UX file system for use with the RAID subsystem

Intended Audience

This guide is intended for administrators of StorageWorks RAID Array Subsystems. Installing the StorageWorks RAID Array Subsystem requires a general understanding of HP-UX System administration and installation procedures and RAID terminology.

Document Structure

This guide contains the following chapters:

Chapter 1: Preparing Your Host for Use with the HSG80 Controller

This chapter describes the steps for installing the required device drivers onto HP 9000 Series Systems running HP-UX 10.20 or 11.00. The installation steps include loading the device driver(s) to communicate through the fibre channel host adapter to the HSG80 Controller. This chapter also provides the procedures for configuring for a high availability, two-hub cluster using MC/ServiceGuard.

Chapter 2: Installing the Command Console Agent on Your Host System

This chapter describes how to install a copy of the Command Console (CC) Agent on each of your host systems connected to StorageWorks RAID Array 8000 subsystems using the installation and configuration script.

Chapter 3: Configuring the HP-UX File System

This chapter explains how to configure the HP-UX file system for use with the RAID subsystem.

Appendix A: Creating Your Storage Configuration with the Command Line Interpreter (CLI)

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

Appendix B: Planning Your Storage Configuration

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

Appendix C: Command Console LUN

This appendix discusses the Command Console LUN.

Appendix D: 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 E: Agent Data Files

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

Appendix F: Understanding RaidManager's Mail Messages

This appendix provides information to help you understand the contents of the automatic mail message(s) sent by RaidManager upon the occurrence of an event.

Appendix G: SNMP MIB Information

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

Related Documents

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

Document Title	Order Number
<i>RA8000 and ESA12000 Storage Subsystems User's Guide</i>	387404-001 / EK-SMCP-UG
<i>Quick Setup Guide (HSG80) for Hewlett Packard HP-UX</i>	387373-001 / AA-RFBCA-TE
<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>	387405-001 / AA-RFA2A-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 HP-UX system prompt. Do not type it as part of information given here as to be input by the user.

Nomenclature Conventions

RAID Advisory Board Description	RA8000/ESA12000 Usage
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. You can access the Compaq Web Site by logging on to the Internet at :

<http://www.compaq.com/products/storageworks>

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

Preparing Your Host for Use with the HSG80 Controller

This chapter describes the steps for installing the required device drivers onto HP 9000 Series Systems running HP-UX 10.20 or 11.00. The installation steps include loading the device driver(s) to communicate through the FC Adapter to the HSG80 Controller.

1.1 Installing Hardware

Fibre Channel (FC) mass storage host adapters manufactured by HP can be used with the RA8000/ESA12000 Subsystem and your HP platform. Install the host adapter in your HP System using the instructions provided with the host adapter documentation before preparing the system to interface with the RA8000/ESA12000 Subsystem.

1.2 Verify Host Adapter and Driver

Ensure that you have the required FC host adapter and drivers available to your system.

```
# ioscan -f |grep fc
```

The output from this command will be similar to:

Class	I	H/W Path	Driver	S/W State	H/W Type	Description
fc	0	10/8	fcT1	CLAIMED	INTERFACE	HP FC Mass Storage Adapter
lan	1	10/8.5	fcT1_cnt	CLAIMED	INTERFACE	HP FC Mass Storage Cntl
fcp	0	10/8.8	fcp	CLAIMED	INTERFACE	FCP Protocol Adapter

1.3 Connecting the RA8000/ESA12000 to Your Host System

1. Shut down the HP System and ensure all power switches on the RAID Array Controller and on the Host Computer System are in the OFF position.
2. Connect a FC cable between the FC adapter's connector on the back of the HP System and a port on the Compaq FC hub.

3. Connect fibre channel cables from each RAID Array controller to the Compaq fibre channel hub.
4. Turn ON the power to the FC hub
5. Turn ON the power to the RA8000/ESA12000 Subsystem.
6. Turn ON power to the HP System.
7. Use the Command Line Interface (CLI) to configure your RAID Array (as described in Appendix A) if it is not yet configured.
8. During the boot process, device *special* files are created for each logical unit configured on the HSG80 Controller, and a Logical Unit (LUN) Number is assigned to each storage set configured on the HSG80 Controller. If you need to reconfigure the RAID Array at a later time, device *special* files can be created without Reboot either manually or automatically, by using the *insf -e* command.

After rebooting the new kernel, run *ioscan -f* to verify that the drivers are installed, the host adapter status is OK and all the target LUNs are identified.

1.4 Configuring a High Availability Cluster Using MC/Service Guard

With MC/Service Guard version 10.10 on HP-UX version 10.20, multi-host configuration is supported on HP systems. The SWCC agent and installation scripts have been modified to allow agent failover.

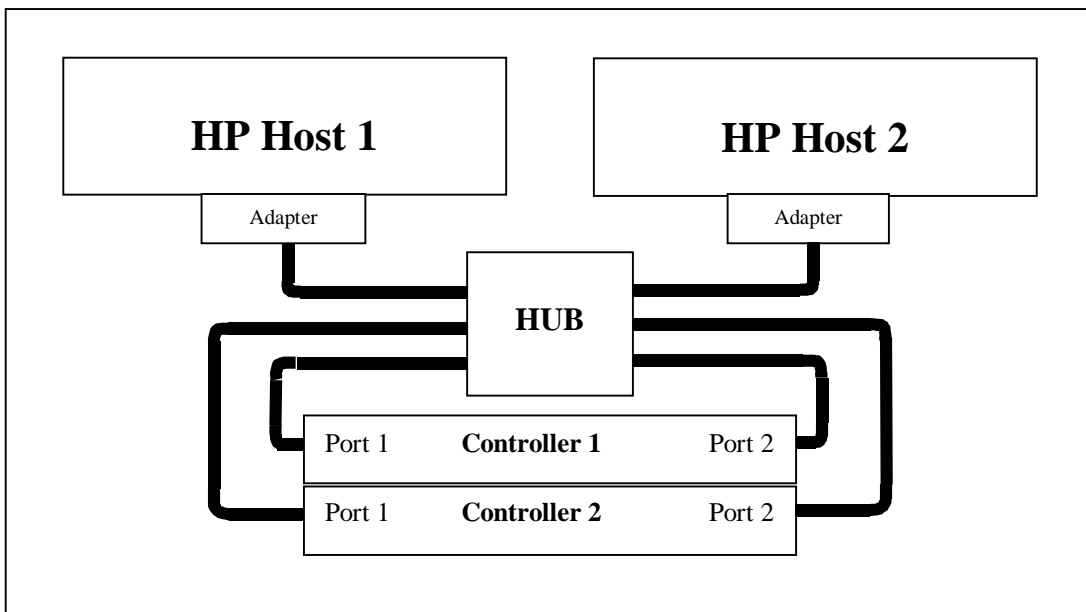
NOTE

Use this configuration and not the configuration in Section 1.4 High Availability Cluster using MC / Service Guard of the "RA8000/ESA12000 HSG80 Solution Software V8.3 for HP-UX – Installation Reference Guide, AA-RFBEB-TE" as it is not supported at this time.

When configuring RA8000/ESA12000 for use with HP-UX MC/Service Guard, perform the following:

- a) On each host, connect the Fibre Channel adapter to the hub.
- b) Connect each port of the array controller to the hub.
- c) Ensure that the controller is in transparent failover dual-redundant mode.

Figure 1 Single HUB HP MC/Service Guard Cluster, High Availability Configuration



2

Installing Command Console (CC) Agent on Your Host System

This chapter describes how to install a copy of the CC Agent on each of your Host Systems connected to StorageWorks RAID Array 8000/ESA12000 Subsystems. You can install and configure the CC Agent automatically, using a script, or manually by copying files from the CC Agent distribution CD-ROM and editing Agent configuration and your Host System ASCII files.

2.1 Introduction

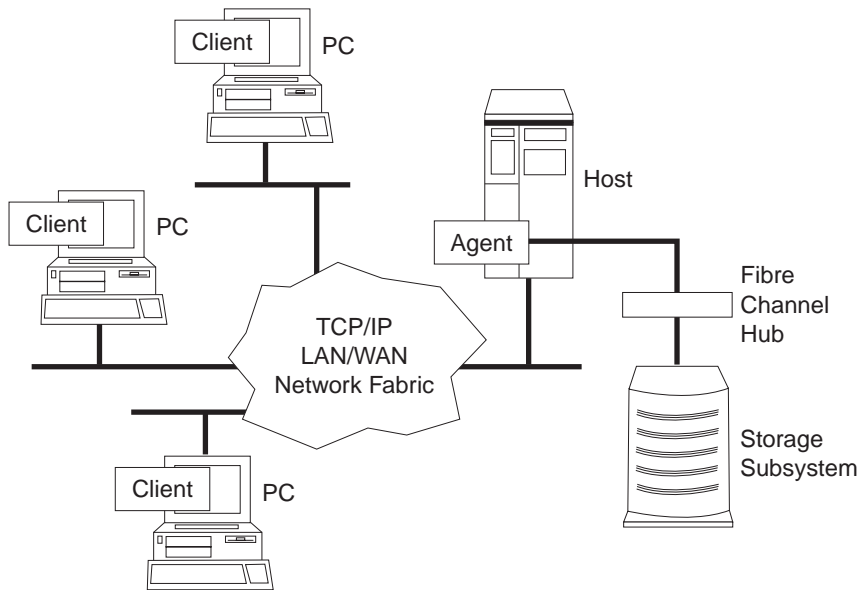
Command Console (CC) Agent for HP-UX is a companion application to the Command Console (CC) Client graphical user interface (GUI) program. CC Agent serves as Client's assistant in configuring, operating, and monitoring your Host's Storage Subsystems. CC Agent runs on your Host System as a server application. It connects to CC Client sessions via the TCP/IP network protocol, as shown in Figure 2-1.

CC Agent can also be used as a standalone application without the CC Client. In this mode of operation, referred to as Agent Only, the CC Agent monitors the status of the subsystem and provides local and remote notification in the event of a failure. Local notification can be made via E-mail and /or the syslog facility. Remote notification can be made via SNMP messages to an SNMP Monitor. The CC Client is not required for these types of notification. In order to configure the subsystem, use of the CC Client or the CLI would be required.

NOTE

If you plan to use a PC to configure and monitor your RAID Array Subsystem, you must install the StorageWorks Command Console client. The client is located on the distribution CD in your platform kit, and the instructions are in the Command Console User's Guide, also in your platform kit.

Figure 2-1 Command Console Client/Agent Connection



shr-1184

CC Agent provides a network connection between a Host Storage Subsystem and any number of CC Client sessions running on remote systems. Agent provides access protection on a network address-by-network address basis. You can configure Agent to allow, for instance, one Client session complete configuration access to the storage subsystem, and another Client session might only monitoring capability.

Agent also provides asynchronous fault notification. The program monitors your Host 's Storage Subsystems and sends notification messages to all Client sessions connected to it the moment a fault occurs. You can configure Agent to use TCP notification to Client and SNMP notification to an SNMP-compatible monitoring application.

2.2 Minimum System Requirements

Agent requires the minimum Host System resources shown in Table 2–1. The program is designed to operate with Command Console Client Version 2.1 for Windows NT and Windows 95.

Table 2–1 Minimum System Requirements

Host Feature	Requirement
Platform	HP 9000 Series K-Class; Models 2xx, 3xx, 4xx, and 5xx HP 9000 Series D-Class; Models 2xx, 3xx HP 9000 Series T-Class; Models T6xx HP 9000 Series V-Class Models V22xx
Architecture	2 MB free space in /tmp directory, and 4 MB free space for Agent installation directory
Operating System	HP-UX version 10.20 or 11.00
Controller Compatibility	StorageWorks HSG80 Controller running operating firmware Version 8.3.

2.3 Installing and Configuring Command Console Agent for HP-UX[®]

CC Agent is the CC Client's (the Graphic User Interface) network assistant. You must install and run CC Agent for HP-UX on each Host System you wish to connect to the CC Client over the network.

Before you can install an Agent:

- The resources of your HP Host System must meet the minimum requirements specified in Section 2.2.
- Command Console LUN must be enabled (refer to Appendix C).

The fastest way to install and configure the StorageWorks Command Console Agent is automatically, using the installation program script, as described in the following section.

2.4 Installing and Configuring Command Console

This section describes how to install the Command Console at the local host and explains how to configure CC for multiple paths.

2.4.1 Installing Command Console at the Local Host

To configure the CC at the local host, you must have access to the superuser (*root*) account on the host.

Installing and configuring the CC Agent is accomplished by running the installation script, as described in the following steps:

1. Place the Command Console CD-ROM labeled, *Solution Software V8.3B* in your local system's CD-ROM drive.
2. Mount the CD-ROM. (e.g., `mount /dev/dsk/c1t2d0 /cdrom`).
3. Change directories to `/tmp`. Type:

```
cd /tmp.
```

4. Unpack the *STM83_HP.TAR* file in `/tmp`. Type:

```
tar xvf /cdrom/SWCC/AGENT/STM83_HP.TAR
```

5. To start the installation and configuration scripts, type:

```
./install.sh
```

The installation program begins, displaying the copyright screen.

6. At the copyright screen, press the **Enter** key to continue; the following screen appears:

```
Enter a target directory for installation or press
return to use the default (default = opt/steam):
```

Pressing return to use the default displays the following decision:

```
Installing the steam Agent in "/opt/steam"
Is this okay? [Y/n]
```

Selecting Y displays the installation menu:

```
*****
* Enterprise Storage Management (steam) *
* Agent and SCSI pass-through driver *
* Installation Script *
*****
1. For StorageWorks SCSI subsystems connected to a
   28696A FWD SCSI Adapter, install the SCSI pass-
   through driver and re-boot the system.
2. Install Agent for all HP-UX systems.
3. Exit.
```

NOTE

If you are using HP **MC/ServiceGuard** software and want to install it automatically into a MC/ServiceGuard package and configure the Command Console, proceed to Section 2.5.

Select **2** to install agent for all HP-UX systems.

NOTE

The boxed entries in the following example are inquiries from the platform. The text following the entries is a suggested response for the initial install.

Updating services file...

NOTE

Both the Client and the STEAM Agent applications **MUST** specify the same port numbers for "spgui" and "spagent." It is imperative that the numbers entered here are consistent with all other Client and Agent applications throughout your network enterprise!!!

Type **y**, then press the **Enter** key.

```
Adding an entry to /etc/services for the Client using port 4998 Is this OK?  
[Y,n]
```

Specifies the port number the installation program will assign for the Command Console Client GUI to communicate with the Command Console Agent. If the default port is already used, press **N** and specify a new even-numbered port.

Type **y**, then the **Enter** key.

```
Adding an entry to /etc/services for STEAM AGENT using port 4999 Is this OK?  
[Y,n] y
```

Specifies the port number the installation program will assign for the Command Console Agent to send notifications to the Command Console Client GUI. If the default port is already used, press **N** and specify a new port (port specified above + 1).

Type **y**, then press the **Enter** key.

```
Updating inittab file...done
```

The Install program updates the *inittab* file so that every time the Host System boots the Agent starts.

Next, configure the Agent and create necessary files.

The next three entries are mandatory; do you wish to continue [Y, n]

```
Enter a password for use with the STEAM Agent (4-> characters):  
Verify the password :
```

To Configure the subsystem using the Command Console GUI, you need to setup a password. The install program does not echo what you type.

```
The STEAM Agent can operate with other SNMP applications. For this reason,  
it needs information about the Agent manufacturer and the Enterprise object  
identifier for use with its MIB.
```

Enter the name of the Agent manufacturer (no default) :

Type: **Digital Equipment Corporation** then press the **Enter** key.

```
The Enterprise OID can be customized. Note that this value
must be consistent with the Agent's MIB!
The default vendor-specific setting is "36.2.15.21."
```

Would you like to enter a new value? [y, n]:

Type **n**, then press the **Enter** key.

```
Adding a Client system
-----
Enter the Host name of the Client system :
```

In the event of a component failure, the CC Agent is capable of providing local or remote notification. Local notification is provided via E-mail and a system error log. Remote notification is provided to the command console for display or paging. Users that wish to only have local HP platform notification can disable messages to the client by entering the following information during CC Agent installation or Agent Maintenance (Adding a Client System):

1. Enter the Host name of the Client System: **local Host**
2. Enter the Access Level: **0**
3. Enter the notification level: **0**

```
Specify names for the Hosts from which you will run the GUI.
Enter the Host name of the Client system :
```

Type "Host _name" of the machine running the GUI, then press the Enter key.

```
Enter the subsystem access privilege (which controls the level of access a
client has for communicating with the storage subsystems).
The possible options are:

0 = Overall Status
    Monitor Event Changes with Notification
1 = Detailed Status
    View Event Changes with the GUI
2 = Configuration
All of the options in this category
Enter Access Level (0, 1, 2) :
```

Type **2**, then press the **Enter** key.

```
The Agent server can notify a client when an error condition occurs.
Notification schemes available are:
```

```
0 = No Error Notification
    (Still have E-Mail and Syslog)
1 = Notification via a TCP/IP Socket
(E-Mail, syslog, GUI shows color status indications.)
2 = Notification via the SNMP protocol
    (E-Mail, syslog, and Informed of only predefined events)
3 = Notification via both TCP/IP and SNMP
    (All of the options in this category)
```

```
Enter Error Notification Level (0, 1, 2, 3) :
```

Type **1**, then press the **Enter** key.

```
Adding client--
name: <Host name>
access level: 2
error notification: 0
Is this information correct? [Y,n]
```

Verify the information then type **y** or **n**, and then press the **Enter** key.

```
Would you like to add another client? [y,N]
```

Type **n**, then press the **Enter** key.

```
Adding a storage subsystem
```

```
A RA8000/ESA12000 Command Console Lun has been found.
```

```
Do you wish to install? [Y,n] Y
```


Here is the output from an `ioscan -fnCdisk` command.

Class	I	H/W Path	Driver	S/W State	H/W Type	Description
disk	11	8/12.8.0.255.0.0.0	sdisk	CLAIMED	DEVICE	DEC HSG80CCL
		/dev/dsk/c3t0d0		/dev/rdisk/c3t0d0		
disk	23	8/12.8.0.255.0.0.1	sdisk	CLAIMED	DEVICE	DEC HSG80
		/dev/dsk/c3t0d1		/dev/rdisk/c3t0d1		
disk	24	8/12.8.0.255.0.0.2	sdisk	CLAIMED	DEVICE	DEC HSG80
		/dev/dsk/c3t0d2		/dev/rdisk/c3t0d2		
disk	25	8/12.8.0.255.0.0.3	sdisk	CLAIMED	DEVICE	DEC HSG80
		/dev/dsk/c3t0d3		/dev/rdisk/c3t0d3		
disk	2	8/16/5.2.0	sdisk	CLAIMED	DEVICE	TOSHIBA CD-ROM XM-5401TA
		/dev/dsk/c1t2d0		/dev/rdisk/c1t2d0		

Enter raw device file for HSG80CCL, or CTRL-C to cancel: **/dev/rdisk/c3t0d0**

Is this correct? /dev/rdisk/c3t0d0 [y,N] **y**

The following subsystem has been found:

Controller type : HSG80
Firmware version : V83G
Serial numbers : ZG75000154, ZG75000191
EMU type : Enhanced

Would you like to add this subsystem to the 'storage.ini' file? [Y,n] : **Y**

Enter a name for this subsystem (? displays list) or CTRL-C to cancel: **RA8000**

Enter a monitoring interval, in secs (0 => no monitoring) **180**

Subsystem RA8000 has been added to the 'storage.ini' file.

Type **y** or **n**, and then press the **Enter** key.

Would you like to enable mail notification? [Y,n]

Type **y**, then press the **Enter** key.

Adding a User for Mail Notification
Enter the e-mail address of the user:

Type the User E-mail address, then the **Enter** key.

```
Enter the error notification level for this user.  
  
The user will be notified of errors at this level and above.  
  
The possible options are:  
1 = Fatal Errors  
2 = Warning and Fatal Errors  
3 = Info, Warning and Fatal Errors  
  
Enter Notification Level (1, 2, 3) :
```

Type **1**, then press the **Enter** key.

```
Adding Notification User-- name:  
Error Notification Level: Fatal Errors  
Is this information correct? [Y,n]
```

Type **y**, then press the **Enter** key.

```
Would you like to add another user? [y,N]
```

Type **n**, then the **Enter** key.

```
                Authorized mail notification list  
  
Username      Notification Level  
  
-- Hit RETURN to continue --
```

```
The STEAM Agent package has been successfully installed.  
Would you like to start the Agent now? [Y,n]
```

Type **y**, then press the **Enter** key.

```

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

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

Exit:
----
  Q) Quit

```

Type **Q** to exit.

At the StorageWorks and Command Console Agent Installation and Configuration Menu, you can make configuration changes at any time by typing:

`/installation_directory/steam/bin/config.sh`

This allows changes to be made to the configuration and operation of the CC Agent. When changes are made to the CC Agent, it must be restarted for changes to become effective. The changes which require a restart of the CC Agent include:

- Change Agent Password
- Change SNMP Enterprise OID
- Add, Remove or Modify a Client
- Add, Remove or Modify a Subsystem
- Toggle Error Log Notification

To restart the CC Agent from the Agent Maintenance Menu:

- Select Start/Stop the Agent from the Agent Maintenance Menu.

If STEAM Agent is Running is displayed, enter **y** to terminate the Agent. Then repeat the menu selection and enter **y** to start the Agent.

If STEAM Agent is Not Running is displayed, enter **y** to start the Agent. Type **y**, then press the **Enter** key.

```

                RAID Array Configuration Menu
                -----
Agent Admin Options          Storage Subsystem Options
-----
1) Change Agent Password    12) View Subsystems
2) Change SNMP Enterprise  13) Add a Subsystem
3) Start/Stop the Agent     14) Remove a Subsystem
4) Toggle Agent Startup on  15) Modify a Subsystem
5) Uninstall Agent
Agent Notification Options   Client Options
-----
6) Toggle Error Log         16) View Clients
7) Toggle Mail Notification 17) Add a Client
8) View Mail Notification   18) Remove a Client
9) Add User to Mail         19) Modify a Client
10) Remove User from Mail
11) Modify Mail Notification
Exit:
----
  Q) Quit

```

For example to stop the Agent type **3**, then press the **Enter** key.

```

Agent Start/Stop
-----
The STEAM Agent's current state is : RUNNING
Would you like to terminate it? [Y,n]

```

NOTE

If you type "y", the output is shown below. Be sure to re-enter the configuration menu and restart the Agent.

Type **y**, then press the **Enter** key.

```

The STEAM Agent has been terminated.

-- Hit RETURN to continue --

```

The Agent configuration menu is displayed again.

Type **q**, then the **Enter** key to return to the main menu.

2.4.2 Configuring CC for an Alternate Path

To configure the Command Console for an alternate path, go to the RAID Array Configuration Menu: **Note:** For HP-UX, only one alternate path is supported.

`/installation_directory/steam/bin/config.sh`

At the menu, proceed as follows:

```

                                RAID Array 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 Package                  14) Remove a Subsystem
 4) Enable/disable Agent Package Switching         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:
----
  Q) Quit

Enter Selection:
    
```

Type **15**

Modify a storage subsystem

Position	Subsystem Name	Controller Type	Firm-ware	EMU Type	Access Device	Access Device 2	Monitoring Period, secs
1	ra8000	HSG80	V83G	Enhanced	c8t1d0		120

Enter the position number of the subsystem to modify (c to cancel) : **1**

Current settings for subsystem 'ra8000' are:

- 1) Subsystem name - ra8000
- 2) Access device - c8t1d0
- 3) Monitoring interval, secs - 120
- 4) Alternate device - 0

Which setting would you like to change (c to cancel, d if done)? 4

Change number of devices? (A => Add device R => Remove device) : A

Here is the output from an ioscan -fnCdisk command.

Class	I	H/W Path	Driver	S/W State	H/W Type	Description
disk	149	8/12.8.0.255.4.0.0	sdisk	CLAIMED	DEVICE	DEC HSG80
		/dev/dsk/c9t0d0			/dev/rdisk/c9t0d0	
disk	165	8/12.8.0.255.4.0.1	sdisk	CLAIMED	DEVICE	DEC HSG80
		/dev/dsk/c9t0d1			/dev/rdisk/c9t0d1	
disk	154	8/12.8.0.255.4.1.0	sdisk	CLAIMED	DEVICE	DEC HSG80CCL
		/dev/dsk/c9t1d0			/dev/rdisk/c9t1d0	
disk	0	10/0.6.0	sdisk	CLAIMED	DEVICE	SEAGATE ST31230W
		/dev/dsk/c0t6d0			/dev/rdisk/c0t6d0	
disk	1	10/4/4.5.0	disc3	CLAIMED	DEVICE	DEC RZ28D (C) DEC
		/dev/dsk/c1t5d0			/dev/rdisk/c1t5d0	
		/dev/floppy/c1t5d0			/dev/ffloppy/c1t5d0	
disk	164	10/8.8.0.255.4.0.0	sdisk	CLAIMED	DEVICE	DEC HSG80
		/dev/dsk/c8t0d0			/dev/rdisk/c8t0d0	
disk	167	10/8.8.0.255.4.0.1	sdisk	CLAIMED	DEVICE	DEC HSG80
		/dev/dsk/c8t0d1			/dev/rdisk/c8t0d1	
disk	166	10/8.8.0.255.4.1.0	sdisk	CLAIMED	DEVICE	DEC HSG80CCL
		/dev/dsk/c8t1d0			/dev/rdisk/c8t1d0	
disk	2	10/12/5.2.0	sdisk	CLAIMED	DEVICE	TOSHIBA CD-ROM XM-4101TA
		/dev/dsk/c2t2d0			/dev/rdisk/c2t2d0	

Alternate access device? Ex. /dev/rdisk/c8t1d0 : **/dev/rdisk/c9t1d0**

Is this correct? /dev/rdisk/c9t1d0 [y,N] y

Change another storage subsystem entry? [y,N] N

[Q]uit or [E]xit with save ? **E**

All changes have been saved!

-- Press ENTER to continue --

```

                                RAID Array 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 Package  14) Remove a Subsystem
 4) Enable/disable Agent Package   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  19) Modify a Client
10) Remove User from Mail Notific
11) Modify Mail Notification List

Exit:
----
  Q) Quit

Enter Selection:
```

Type **12**

Storage subsystem List

```

-----
Subsystem  Controller  Firm-  EMU   Access  Access  Monitoring
Name       Type        ware  Type  Device 1  Device 2  Period, secs
-----
ra8000    HSG80      V83G  Enhanced  c8t1d0  c9t1d0  120
```

2.5 Installing and Configuring with MC/Service Guard

All hosts in the MC/Service Guard cluster must have entered into their “/rhosts” file “host_name root” of all hosts in the cluster enabling access by the root account.

NOTE

All members of the cluster must be remotely accessible before the installation can be successfully completed.

When the CC agent is being installed into a MC/Service Guard package, it is recommended that selection 2 is used even if pass through drivers are not installed.

```
MC/ServiceGuard has been found on your system.

The RAID Controller must be connected to ALL hosts in the cluster.
If you have another RAID Controller that is not connected to all the
hosts in the cluster, then the failover algorithm must be modified
to suit your cluster needs.

NOTE:

Running the CC Agent on an MC/ServiceGuard cluster requires that the
name (or IP address) and root account of all hosts in the cluster
are included in the "/.rhost" file on each host.

Example:   A_host           B_host           C_host
File:     /.rhost         /.rhost         /.rhost
Entries:  A_host root     A_host root     A_host root
          B_host root     B_host root     B_host root
          C_host root     C_host root     C_host root

This section will install CC agent software on the other host(s)
in the cluster. Is this OK? [Y,n]
```

NOTE

The boxed entries in the following example are inquiries from the platform. The text following the entries is a suggested response for the initial install.

Updating services file...

NOTE

Both the Client and the STEAM Agent applications MUST specify the same port numbers for “spgui” and “spagent.” It is imperative that the numbers entered here are consistent with all other Client and Agent applications throughout your network enterprise!!!


```
Adding an entry to /etc/services for the Client using port 4998 Is this OK?  
[Y,n]
```

Type **y**, then press the **Enter** key.

Specifies the port number the installation program will assign for the Command Console Client GUI to communicate with the Command Console Agent. If the default port is already used, press **N** and specify a new even-numbered port.

```
Adding an entry to /etc/services for STEAM AGENT using port 4999 Is this OK?  
[Y,n] y
```

Type **y**, then the **Enter** key.

Specifies the port number the installation program will assign for the Command Console Agent to send notifications to the Command Console Client GUI. If the default port is already used, press **N** and specify a new port (port specified above + 1).

```
The next three (3) questions are required for the installation.  
Would you like to continue? [Y,n]:  
Enter a password for use with the STEAM Agent (4->16 characters) :  
Verify the password :
```

To configure the subsystem using the Command Console GUI, you need to setup a password. The install program does not echo what you type.

```
The STEAM Agent can operate with other SNMP applications. For this reason,  
it needs information about the Agent manufacturer and the Enterprise object  
identifier for use with its MIB.
```

Enter the name of the Agent manufacturer (no default) :

Type: **Digital Equipment Corporation**, then press the **Enter** key.

```
The Enterprise OID can be customized. Note that this value  
must be consistent with the Agent's MIB!  
The default vendor-specific setting is "36.2.15.21."
```

Would you like to enter a new value? [y, n]:

Type **n**, then press the **Enter** key.

```
Adding a Client system
-----
Enter the Host name of the Client system:
```

In the event of a component failure, the CC Agent is capable of providing local or remote notification. Local notification is provided via E-mail and a system error log. Remote notification is provided to the command console for display or paging. Users that wish to only have local HP platform notification can disable messages to the client by entering the following information during CC Agent installation or Agent Maintenance (Adding a Client System):

1. Enter the Host name of the Client System: **local Host**
2. Enter the Access Level: **0**
3. Enter the notification level: **0**

```
Specify names for the Hosts from which you will run the GUI.
Enter the Host name of the Client system:
```

Type "Host_name" of the machine running the GUI, then press the Enter key.

```
Enter the subsystem access privilege (which controls the level of access a
client has for communicating with the storage subsystems).
The possible options are:
  0 = Overall Status
      Monitor Event Changes with Notification
  1 = Detailed Status
      View Event Changes with the GUI
  2 = Configuration
All of the options in this category
Enter Access Level (0, 1, 2) :
```

Type **2**, then press the **Enter** key.

```
The Agent server can notify a client when an error condition occurs.
Notification schemes available are:

0 = No Error Notification
    (Still have E-Mail and Syslog)
1 = Notification via a TCP/IP Socket
    (E-Mail, syslog, GUI shows color status indications.)
2 = Notification via the SNMP protocol
    (E-Mail, syslog, and Informed of only predefined events)
3 = Notification via both TCP/IP and SNMP
    (All of the options in this category)
Enter Error Notification Level (0, 1, 2, 3) :
```

Type **1**, then press the **Enter** key.

```
Adding client--
name: <Host name>
access level: 2
error notification: 0
Is this information correct? [Y,n]
```

Verify the information then type **y** or **n**, and then press the **Enter** key.

```
Would you like to add another client? [y,N]
```

Type **n**, then press the **Enter** key.

```
Would you like to enable mail notification? [Y,n]
```

Type **y**, then press the **Enter** key.

```
Adding a User for Mail Notification
Enter the e-mail address of the user:
```

Type the User E-mail address, then the **Enter** key.

```
Enter the error notification level for this user.

The user will be notified of errors at this level and above.

The possible options are:
1 = Fatal Errors
2 = Warning and Fatal Errors
3 = Info, Warning and Fatal Errors

Enter Notification Level (1, 2, 3) :
```

Type **1**, then press the **Enter** key.

```
Adding Notification User-- name:
Error Notification Level: Fatal Errors
Is this information correct? [Y,n]
```

Type **y**, then press the **Enter** key.

```
Would you like to add another user? [y,N]
```

Type **n**, then the **Enter** key.

```
Starting MC/ServiceGuard Package creation for CC agent.

This MC/ServiceGuard package will monitor subnets.
The subnets that are used by this CC agent package
should be entered, so that this agent package will
failover in the event that the subnet fails.

Enter the subnets you want this package to monitor.
(or press ENTER to continue installation) :
```

Enter the subnet that will have your package IP on it. If this subnet goes down this package will failover to the next enabled host in the package list. When all subnets you wish to monitor have been entered, press Enter to continue.

```
Communications with services in a MC/ServiceGuard Package can use a
dedicated IP address that will failover if the host fails. This will allow
continuous monitoring and control of the RAID Subsystem using the SWCC
Client.
```

```
Enter IP address(es) used by this package
(or press ENTER to continue installation):
```

Enter the unique IP address that is assigned to this package. This will be the IP address that fails over to the next host when the package fails over.

```
The MC/ServiceGuard package configuration file "steam_pkgconf.ascii"
and package control script "steam_control.sh" will be stored on each
host in directory path "/etc/cmcluster/steam_pkg".
```

```
Would you like to view the steam_pkgconf.ascii? [y,N] :
```

```
Would you like to view the steam_control.sh? [y,N] :
```

You may view the files by entering “y” for each file. The viewer is more. When you have finished viewing the document either by spacing to the end or typing “q”, you may edit the document. If your favorite editor is defined by EDITOR, then that will be used. The default editor is vi.

```
Begin package verification...
```

```
Verification completed with no errors found.
Use the cmapplyconf command to apply the configuration.
Applying "steam_pkg" package to MC/ServiceGuard.

Begin package verification...
Completed the cluster update.
Cmmmodpkg : Warning: Node aries is already able to run package steam_pkg.
Cmmmodpkg:Warning: Node gemini is already able to run package steam_pkg.
cmmmodpkg : Completed successfully on all packages specified.
```

This indicates that the package has successfully been installed.

```
The STEAM Agent package has been successfully installed.

steam_pkg    down          halted        disabled     unowned
```

No subsystems are defined so the steam_pkg has not been started.

```
Scanning I/O Bus cluster: aries gemini
Processing Host aries
Node      HW Path                Driver      Device
-----  -
aries     8/0.8.0.255.0.2.0      sdisk      HSG80CCL
aries     8/4.8.0.255.0.2.0      sdisk      HSG80CCL
aries     8/8.0.0                 sdisk      HSZ70CCL
aries     10/4/4.0.0             disc3      HSZ70CCL

Found 4 Command Console LUN(s) on host aries.
To remove a CCL enter: "r hardware_path", to add enter "a"
Would you like to Add, Remove or Continue? [a,r,C]
```

If there are CCLs that are not being shown you may answer "a" and select the hardware path from the list. You should not include the CCLs for the RA3000 as they are not supported by this agent. Note that the disc3 driver indicates that this CCL is on a HP-PB bus. The spt driver will be attached to this Hardware Path and will require this node to be rebooted.

Otherwise, press C to Continue.

```
Processing Host gemini
Node      HW Path                Driver      Device
-----  -
gemini    8/0.8.0.255.0.2.0      sdisk      HSG80CCL
gemini    8/4.8.0.255.0.2.0      sdisk      HSG80CCL
gemini    10/4/4.0.0             disc3      HSZ70CCL
gemini    10/4/12.0.0           disc3      HSZ70CCL

Found 4 Command Console LUN(s) on host gemini.
To remove a CCL enter: "r hardware_path", to add enter "a"
Would you like to Add, Remove or Continue? [a,r,C]
```

This shows that on the other host, both CCLs are on different HP-PB buses.

Press C to continue.

```
No pass thru driver found on aries for path 10/4/4.0.0
/usr/sbin/mknod /dev/rdisk/spt2t0d0 c 75 0x020000
"/dev/rdisk/spt2t0d0" has been created on host aries

No pass thru driver found on gemini for path 10/4/4.0.0
remsh gemini /usr/sbin/mknod /dev/rdisk/spt1t0d0 c 76 0x010000
"/dev/rdisk/spt1t0d0" has been created on host gemini
No pass thru driver found on gemini for path 10/4/12.0.0
gemini and aries will require rebooting before installation can be
completed.

On gemini:
Compiling conf.c...
Loading the kernel...
/usr/ccs/bin/ld: (Warning) Linker features were used that may not be
supported in future releases. The +vallcompatwarnings option can be used to
display more details, and the ld(1) man page contains additional
information. This warning can be suppressed with the +vnocompatwarnings
option.
```

```
On aries:
Compiling conf.c...
Loading the kernel...
/usr/ccs/bin/ld: (Warning) Linker features were used that may not be
supported in future releases. The +vallcompatwarnings option can be used to
display more details, and the ld(1) man page contains additional
information. This warning can be suppressed with the +vnocompatwarnings
option.
```

Informational message showing the making of special files and kernel compilation and linking for each host.

```
Reboot gemini and aries before continuing the installation.
Steps are: 1) Reboot the above machines.
           2) Log in as root.
           3) Enter:
                /opt/steam/bin/config.sh
           4) Select "13) Add a Subsystem"
```

After rebooting all necessary hosts, log in as root and enter this command:

`/installation_directory/steam/bin/config.sh`

```

                                RAID Array 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 Package  14) Remove a Subsystem
  4) Enable/disable Agent Package    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   19) Modify a Client
 10) Remove User from Mail Notifica
 11) Modify Mail Notification List

Exit:
----
  Q) Quit

Enter Selection:
```

Select **13)** Add a Subsystem

Scanning I/O Bus cluster: aries gemini

```

Processing Host aries
Node      HW Path          Driver      Device
-----
aries    8/0.8.0.255.0.2.0  sdisk      HSG80CCL
aries    8/4.8.0.255.0.2.0  sdisk      HSG80CCL
aries    8/8.0.0             sdisk      HSZ70CCL
aries    10/4/4.0.0         spt        HSZ70CCL

Found 4 Command Console LUN(s) on host aries.
To remove a CCL enter: "r hardware_path", to add enter "a"
Would you like to Add, Remove or Continue? [a,r,C]
```

Notice spt is now the driver on the HP-PB bus adapter.

Press **C** to continue.


```
Processing Host gemini
Node      HW Path          Driver      Device
-----
gemini    8/0.8.0.255.0.2.0  sdisk      HSG80CCL
gemini    8/4.8.0.255.0.2.0  sdisk      HSG80CCL
gemini    10/4/4.0.0        spt        HSZ70CCL
gemini    10/4/12.0.0       spt        HSZ70CCL

Found 4 Command Console LUN(s) on host aries.
To remove a CCL enter: "r hardware_path", to add enter "a"
Would you like to Add, Remove or Continue? [a,r,C]
```

spt driver is now attached to both HP-PB bus adapter.

Press **C** to continue.

```
Completed checking pass thru driver installation and special files.
Updating storage.ini files for each host.
HSG80 2 ZG81701016 ZG82001218 U018 c6t2d0 c6t2d0
Enter a subsystem name. [default: HSG80.0]:
```

You may now personalize your subsystem name.

```
Enter the desired monitoring period. [default: 180]:
```

Enter the monitoring period if a change is desired.

```
Completed checking pass thru driver installation and special files.
Updating storage.ini files for each host.
```

The above two questions will be repeated for each subsystem.

```
Would you like to start Steam_pkg? [Y,n]:
```

Default will start the steam_pkg package.

```
cmrunpkg : Completed successfully on all packages specified.
cmmodpkg : Completed successfully on all packages specified.
```

```

                                RAID Array 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 Package  14) Remove a Subsystem
 4) Enable/disable Agent Package   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  19) Modify a Client
List
10) Remove User from Mail Notific
List
11) Modify Mail Notification List

Exit:
----
  Q) Quit

Enter Selection:
```

Type **Q** to exit.

The StorageWorks and Command Console Agent Installation and Configuration Menu. You can make configuration changes at any time by typing:

/installation_directory/steam/bin/config.sh

This allows changes to be made to the configuration and operation of the CC Agent. When changes are made to the CC Agent, it must be restarted for changes to become effective. The changes which require a restart of the CC Agent include:

- Change Agent Password
- Change SNMP Enterprise OID
- Add, Remove or Modify a Client
- Add, Remove or Modify a Subsystem
- Toggle Error Log Notification

To restart the CC Agent from the Agent Maintenance Menu:

- Select Start/Stop the Agent from the Agent Maintenance Menu.

If STEAM Agent is Running is displayed, enter **y** to terminate the Agent. Then repeat the menu selection and enter **y** to start the Agent. 2

2.6 Running CC Agent

Your Agent program was automatically started when you installed it, and it was installed to restart automatically if it stops for any reason.

The installation script places two entries in the “*/etc/inittab*” file to implement automatic execution of the Agent. The tag fields in the file are “*stmd*” and “*ntfy*”.

2.7 Reconfiguring CC Agent

You can reconfigure previously-installed Agents using the configuration program. To reconfigure an Agent, execute the “*config.sh*” Bourne-shell script in the “*/installation_directory/steam/bin*” subdirectory and follow the prompts.

2.8 Uninstalling CC Agent

You can remove any Agent program using the uninstall program. You have two options to remove an Agent:

- Run the Agent configuration script on the Host and Select Option 5. Run the “*config.sh*” script in the “*/installation_directory/steam/bin*” subdirectory.

- Run the Agent uninstall script on the Host . Execute the command:

```
# /installation_directory/steam/bin/uninstall.sh
/installation_directory
```

If you do not know what the location is, examine the file “*/etc/STEAMDIR*”.

2.9 Troubleshooting/Avoiding Problem Situations

Command Console Client may indicate that it cannot find your subsystem if you attempt to connect via the host FC port in either of the following situations:

- A storage subsystem is connected to the host, but the `command_console_LUN` is disabled
- A storage subsystem is not connected to the host.

You cannot make a network connection to any subsystem via Agent unless `command_console_LUN` is enabled.

Configuring the HP-UX File System

This chapter explains how to configure the HP-UX file system for use with the RAID subsystem.

3.1 Configuring the HP-UX File System

The HP-UX Operating System has now been modified to communicate with the RAID Array Controller.

In order to use the RAID array from the HP system, you must do the following steps.

1. Create new virtual disks on your RAID Array and assign LUN Ids to each virtual disk created.

NOTE

If not yet created, you can use either the Command Console Client (refer to the Command Console User's Guide) or the CLI (refer to the Command Line Interface users guide). LUNS created on the Array must be assigned consecutively starting with LUN 0.

Currently there is an HP-UX limit of eight LUNs per ALPA (controller), so plan accordingly.

Refer to the *HP System Administration Tasks Manual* for instructions on the following tasks:

- Adding the RAID storageset to a volume group.

NOTE

Do not use System Administration Manager (SAM) to Create/Extend Volume Groups. Creating/Extending Volume Groups must be done using HP-UX Commands.

This is because, when SAM scans for hardware, any HSG80 RAID controller LUNs created after the first LUN are not parsed correctly by SAM and consequently, cannot be selected to create a volume group. The solution around this problem is to use HP-UX commands to create/extend the volume groups and then use SAM to create and manage logical volumes.

- Determining the mount point directory on your system.
 - Using the mount command to mount the device on your system.
 - Editing the etc/fstab file if you want this device mounted each time you boot the system.
2. Create a directory for the volume group. This is located in the /dev directory. It is recommended to first check to verify which volume groups exist.

```
# ls /dev
beep          lan0          ptyp5        ptyqe        strlog       ttypl        ttyqa
c2t0d0_lp    log          ptyp6        ptyqf        syscon       ttyp2        ttyqb
config       mem          ptyp7        ptyr0        systty       ttyp3        ttyqc
console      mux0         ptyp8        ptyr1        telnet       ttyp4        ttyqd
crt          mux1         ptyp9        ptyr2        tty          ttyp5        ttyqe
crt0         netlog       ptypa        ptyr3        tty0p0       ttyp6        ttyqf
cua0p7       netman       ptypb        ptyr4        tty0p1       ttyp7        ttyr0
cul0p7       nettrace     ptypc        ptyr5        tty0p10      ttyp8        ttyr1
diag         ni           ptypd        ptyr6        tty0p11      ttyp9        ttyr2
dlpi         null         ptype        ptyr7        tty0p12      ttypa        ttyr3
dlpi0        ocrtptypf   ptypf        ptyr8        tty0p13      ttypb        ttyr4
dlpi1        ocrt0       ptyp0        ptyr9        tty0p14      ttypc        ttyr5
dlpi2        ps2_0       ptyq1        ptyra        tty0p15      ttypd        ttyr6
dlpi3        ps2_1       ptyq2        ptyrb        tty0p2       ttype        ttyr7
dlpi4        ps2kbd      ptyq3        ptyrc        tty0p3       ttypf        ttyr8
dsk          ps2mouse    ptyq4        ptyrd        tty0p4       ttyq0        ttyr91
echo         ptmx        ptyq5        ptyre        tty0p5       ttyq1        ttyra
eeprom       pts         ptyq6        ptyrf        tty0p6       ttyq2        ttyrb
ether0       pty         ptyq7        rdsk         tty0p7       ttyq3        ttyrc
fcms1        ptym        ptyq8        rmt          tty0p8       ttyq4        ttyrd
inet_clts    ptyp0       ptyq9        root         tty0p9       ttyq5        ttyre
inet_cots    ttypl       ptyqa        rroot        tty1p0       ttyq6        ttyrf
kepd         ptyp2       ptyqb        rscsi        ttyconf      ttyq7        vg00
klog         ptyp3       ptypc        sad          ttyd0p7      ttyq8
kmem         ptyp4       ptyqd        screen       ttyp0        ttyq9
```

From the above list, the only volume group that exists is vg00. For the purpose of this example, we will create vg01:

```
# mkdir /dev/vg01
```

NOTE

The standard HP-UX kernel supports vg00 to vg09. Creation of volume groups greater than vg09 requires kernel tuning. Please refer to the appropriate HP-UX documentation for this information.

3. Create a control file named **group** in the `/dev/vg0n` directory created in Step 1. This is done with the **mknod** command:

```
# mknod /dev/vg0n/group c 64 minor_number
```

The *minor_number* for the **group** file is hexadecimal. This *minor_number* always ends in '0000' and is in the form `0x0n0000` where again *n* is the identity of the volume group being created.

```
# mknod /dev/vg01/group c 64 0x010000
```

4. Make the LVM disks (physical volumes) using the *pvcreate* command. The *pvcreate* command is of the form `pvcreate /dev/rdisk/cntndn`. This information is obtained from the `ioscan -fnCdisk` command. An example of this is shown below:

```
# ioscan -fnCdisk
```

Class	I	H/W Path	Driver	S/W State	H/W Type	Description
disk	36	8/12.8.0.255.4.0.0	sdisk	CLAIMED	DEVICE	DEC HSG80 /dev/dsk/c5t0d0 /dev/rdisk/c5t0d0
disk	37	8/12.8.0.255.4.0.1	sdisk	CLAIMED	DEVICE	DEC HSG80 /dev/dsk/c5t0d1 /dev/rdisk/c5t0d1
disk	38	8/12.8.0.255.4.0.2	sdisk	CLAIMED	DEVICE	DEC HSG80 /dev/dsk/c5t0d2 /dev/rdisk/c5t0d2
disk	28	8/12.8.0.255.4.1.0	sdisk	CLAIMED	DEVICE	DEC HSG80CCL /dev/dsk/c5t1d0 /dev/rdisk/c5t1d0
disk	29	8/12.8.0.255.4.1.1	sdisk	CLAIMED	DEVICE	DEC HSG80 /dev/dsk/c5t1d1 /dev/rdisk/c5t1d1
disk	30	8/12.8.0.255.4.1.2	sdisk	CLAIMED	DEVICE	DEC HSG80 /dev/dsk/c5t1d2 /dev/rdisk/c5t1d2
disk	2	8/16/5.2.0	sdisk	CLAIMED	DEVICE	TOSHIBA CD-ROM XM-5401TA /dev/dsk/c1t2d0 /dev/rdisk/c1t2d0
disk	3	8/16/5.5.0	sdisk	CLAIMED	DEVICE	DEC RZ28M (C) DEC /dev/dsk/c1t5d0 /dev/rdisk/c1t5d0

```
# pvcreate /dev/rdisk/c5t0d1
```

Physical volume "/dev/rdisk/c5t0d1" has been successfully created.

5. Create the volume group. This is done with the *vgcreate* command in the form:

```
# vgcreate /dev/vg0n /dev/dsk/cntndn
```

Next, if necessary, extend the volume group:

```
#vgextend /dev/vg0n /dev/dsk/cntndn
```

The volume group may be displayed after creation with the *vgdisplay* command. This is done in the form:

```
#vgdisplay -v /dev/vg0n
```

An example of this is below:

```
#vgcreate /dev/vg01 /dev/dsk/c5t0d0
```

Increased the number of physical extents per physical volume to 8678.

Volume group "/dev/vg01" has been successfully created.

Volume Group configuration for /dev/vg01 has been saved in /etc/lvmconf/vg01.conf

```
#vgextend /dev/vg01 /dev/dsk/c5t0d1
```

Finally, display the volume group.

```
#vgdisplay -v /dev/vg01
```

```
--- Volume groups ---
VG Name                /dev/vg01
VG Write Access        read/write
VG Status              available
Max LV                 255
Cur LV                0
Open LV                0
Max PV                 16
Cur PV                1
Act PV                 1
Max PE per PV         8678
VGDA                   2
PE Size (Mbytes)      4
Total PE               8677
Alloc PE               0
Free PE                8677
Total PVG              0

--- Physical volumes ---

PV Name                /dev/dsk/c5t0d1
PV Status              available
Total PE               8677
Free PE                7677

PV Name                /dev/dsk/c5t0d0
PV Status              available
Total PE               8677
Free PE                8677
```


6. Creation and Management of the Logical Volumes may now be accomplished via the HP-UX SAM utility or by using the following HP-UX commands:

An example of doing this with HP-UX commands is shown below:

```
# lvcreate /dev/vg01
```

Logical volume "/dev/vg01/lvol1" has been successfully created with character device "/dev/vg01/rlvol1".

Volume Group configuration for /dev/vg01 has been saved in /etc/lvmconf/vg01.conf

```
# lvextend -L 100 /dev/vg01/lvol1
```

Logical volume "/dev/vg01/lvol1" has been successfully extended.

Volume Group configuration for /dev/vg01 has been saved in /etc/lvmconf/vg01.conf

```
# lvdisplay /dev/vg01/lvol1
```

```
--- Logical volumes ---
```

```
LV Name                /dev/vg01/lvol1
VG Name                /dev/vg01
LV Permission          read/write
LV Status              available/syncd
Mirror copies          0
Consistency Recovery   MWC
Schedule               parallel
LV Size (Mbytes)       100
Current LE             25
Allocated PE           25
Stripes                0
Stripe Size (Kbytes)   0
Bad block              on
Allocation              strict
```




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 B.)
- Add disks to the controller
- Create storagesets
- Save the configuration
- Record the configuration

A.1 Configuration Guidelines

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

A.1.1 Controller Device Configuration Guidelines

- The enclosure has six device ports (SCSI buses). Evenly distribute disk devices across the separate six 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 DISK10000 DISK20000
ADD MIRRORSET MIRR_2 DISK20100 DISK10100
```

A.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.

NOTE

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

Figure A-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 A-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 A-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.

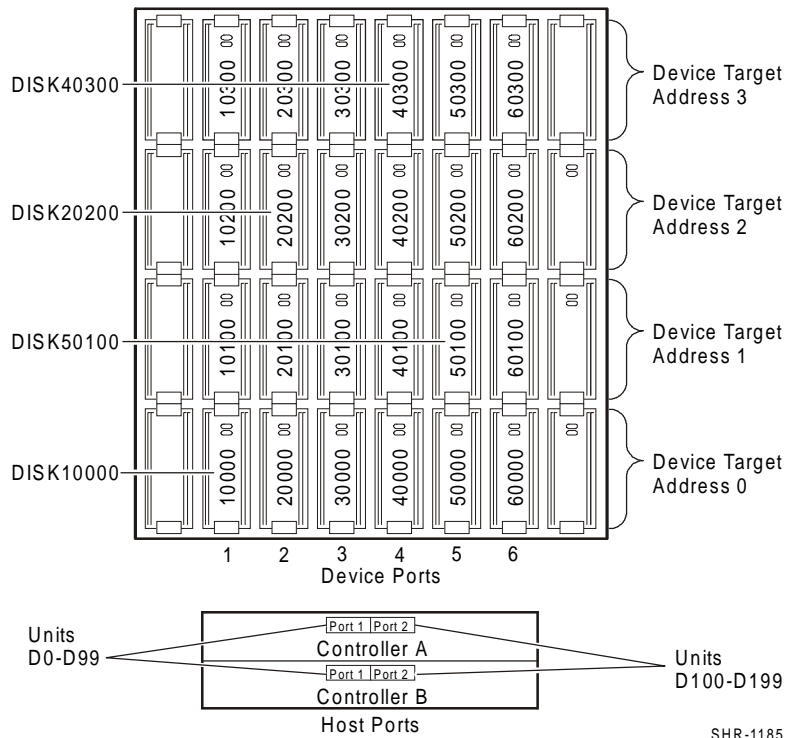
Figure A-4 Dual Controllers/Two Hosts

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 A-5 Mapping of Device Ports/Targets and Host Ports



A.2 Accessing the CLI

The Command Line Interpreter (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 Command Line Interpreter (HSG80) Reference Manual* for detailed descriptions of all CLI commands.

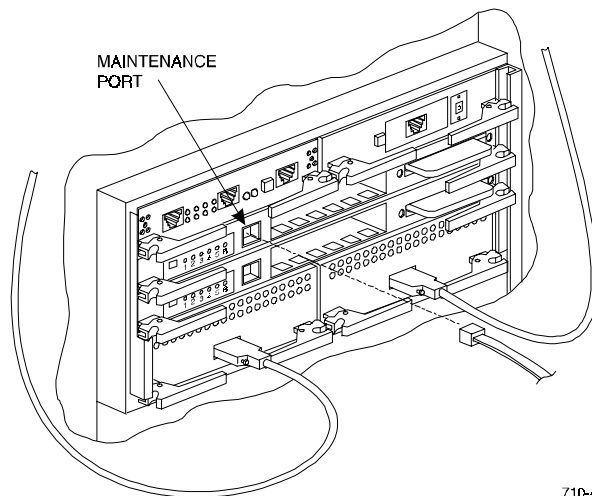
You must make a serial connection to the HSG80 controller to access the CLI.

A.2.1 Connecting the Cable

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

1. Locate the connecting cable that came with the RA8000 Fibre Channel 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.
3. Plug the RJ12 connector from the PC or maintenance terminal into the maintenance port on the HSG80 controller (see Figure A-6).
4. Note which serial port you use; you will need that information if using a communications program.

Figure A-6 Making a Serial Connection to the HSG80 Controller



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A.2.2 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 Array Controller V8.3 User's Guide (EK-HSG80-UG.C01) controller configuration chapter for more information.

A.2.3 Establishing Connection with a Host System

To establish a connection between your PC and controller, you must use a communications program. Follow these steps to make the connection:

1. Start a communications program on your PC.
2. Set the communications program to use the serial port that is connected to the controller.
3. Set the communications parameters to:
 - 8 bits
 - 9600 baud
 - 1 stop bit
 - No parity
4. From your communications program, issue a connect command to establish a connection with the controller, and then press the Enter key. You should see the CLI prompt, which looks similar to:
HSG80 >
5. 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 Array Controller V8.3 User's Guide (EK-HSG80-UG.C01) controller configuration chapter for more information.

A.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. (Refer to the *RA8000 / ESAI2000 Subsystem User's Guide* in your platform kit regarding installing/adding disks in the StorageWorks enclosure.) 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 DISK10000 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 Device Port Number, Target Number and Controller Logical Unit Number. The Controller Logical Unit Number will always be 0. 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 A-5 shows the mapping of Device Ports, Targets and Host Ports.

A.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 DISK10000 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.

A.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
```

A.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 or dual controllers on a single host, the unit numbers may range from D0 through D7 with a maximum of 8 units. For dual controllers, the unit numbers may range from D0 through D7 for the first controller and from D100 through D107 for the second controller with a maximum of 8 units per host adapter. 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.

A.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.

A.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.

A.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 STRIPESSET command.

```
HSG80 > ADD STRIPESSET 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 Figure A-5.

A.5.1 Initializing a Stripset

Prior to putting a stripset 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 stripset and makes this space inaccessible to the host.

When you initialize a stripset, 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
```

A.5.2 Adding a Stripset as a Logical Unit

To make a stripset 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 D7 with a maximum of 8 units. For dual controllers, the unit numbers may range from D0 through D7 for the first controller and from D100 through D107 for the second controller with a maximum of 8 units per host adapter. Add units by using the ADD UNIT command.

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

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

A.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 stripset:

```
HSG80 > SET D3 WRITEBACK_CACHE
```

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

A.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.

A.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.

When you initialize a 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 DVGRPM0
```

A.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 D7 with a maximum of 8 units. For dual controllers, the unit numbers may range from D0 through D7 for the first controller and from D100 through D107 for the second controller with a maximum of 8 units per host adapter. Add units by using the ADD UNIT command.

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

A.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.

A.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.

A.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.

A.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 in Figure A-4.

A.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
```

A.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 D7 with a maximum of 8 units. For dual controllers, the unit numbers may range from D0 through D7 for the first controller and from D100 through D107 for the second controller with a maximum of 8 units per host adapter. Add units by using the ADD UNIT command.

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

A.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.

A.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.

A.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.

When you initialize a disk, 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 DISK40100 CHUNKSIZE=DEFAULT
HSG80 > INITIALIZE DISK50100 CHUNKSIZE=DEFAULT
```

A.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 D7 with a maximum of 8 units. For dual controllers, the unit numbers may range from D0 through D7 for the first controller and from D100 through D107 for the second controller with a maximum of 8 units per host adapter. Add units by using the ADD UNIT command.

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

A.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

Any disk member added to the spareset must have the same storage capacity as the largest existing individual disk member of your logical storagesets.

A.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 DISK10000 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

This command applies to single controller configurations. For dual controller configurations use the "SET FAILOVER COPY" command to save the configuration. Refer to the HSG80 User's Guide for more information.

A.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	DISK10000 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.

B

Planning Your Storage Configuration

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

B.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, which 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 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 B-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 B-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 12 mirrorsets per RAID array	Good performance for read requests. High Data Availability
RAID 0 + 1	Striped mirrorsets	2 - 12 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.



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 Fibre Channel 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 SCSI 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. When the CCL is enabled, its ID is the lowest LUN of the lowest loop ID. When creating storagesets and logical units on the RAID Array using the CLI, the address of the CCL should be reserved and not used. However, if the CCL's LUN is assigned to a storageset, the CCL will "float" to the next lowest LUN that is available. On some Host Systems, the SWCC Agent requires that the CCL remain in a fixed location. If the CCL is moved to a new address, the SWCC Agent will no longer be able to communicate with the RAID Array for configuration and monitoring purposes.

D

Valid ALPA Settings

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

D.1 Valid ALPA Settings

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

NOTES

AL_PA 0x00 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 values are intentionally from lowest to highest priority. AL_PA = 00 is reserved for the FL_Port; -- it is not available.

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

AL_PA (hex)	Switch (hex)	Setting (dec)	AL_PA (hex)	Switch (hex)	Setting (dec)	AL_PA (hex)	Switch (hex)	Setting (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 D-1 Arbitrated Loop Physical Address (ALPA) Settings (cont)

AL_PA (hex)	Switch (hex)	Setting (dec)	AL_PA (hex)	Switch (hex)	Setting (dec)	AL_PA (hex)	Switch (hex)	Setting (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			



Agent Data Files

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

E.1 Editing the Services File

SWCC Agent uses Windows 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 Windows NT, the socket numbers are assigned in the *services* file in the `\winnt\system32\drivers\etc` 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 SWCC Agent and these numbers are already taken by another application, the installation program prompts to warn you that you must choose another pair. If you do not choose another pair, the program uses the defaults, regardless of any conflicts with other programs.

To select another pair for Agent, open the *services* file in an ASCII 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
```

Note that the port numbers that you select must match the port numbers used by all of the Clients to which you wish to connect your Agent.

E.2 Editing the Agent Configuration File

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

E.2.1 File Format

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

device_special_file_path

In Windows NT, this line must be blank.

agent_executable_file_path

The full path to the steam.exe, 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 "36.2.15.21.". (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.

E.2.2 Editing the File

Edit the *steam.cfg* file by performing the following actions:

1. Run the password generation program by changing to the directory that the *steam.exe*, *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 a 4 to 16-character, 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/rdisk  
/opt/steam  
-2V1 (z05)  
Digital Equipment Corporation  
36.2.15.21.
```

E.3 Editing the Client Access File

The client access file, *client.ini*, configures Agent for proper operation with its Clients.

E.3.1 File Format

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.

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. This parameter is case sensitive.

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.

E.3.2 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
```

E.4 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.

E.4.1 File Format

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.

The line for each system must have the following format:

```
subsystem_name|monitor_interval|Reserved|controller_type|emu_type|this_sn|other_sn|  
fw_version|access_device|ccl_access|num_alt_dev
```

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, and any event notification from the subsystem is disabled..

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
1=HSZ22 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
99=Unknown controller type

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 to which the Agent is communicating.

other_sn

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

fw_version

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

access_device

For HP-UX, the name will be of the form: *c5t0d0*

ccl_device

Note that the communications LUN is not compatible with the Windows NT operating system. Do not enable the LUN if your operating system is Windows NT.

If a controller communications LUN is used to connect Agent to the subsystem controller, this field contains information about the LUN.

num_alt_dev

This number will be zero (0) when there is no alternate access device. It will be one (1) when there is an alternate access device.

For controllers offering the communications LUN feature, this field contains either of the following:

- The text string “disabled”, indicating that the communications LUN is not enabled in the controller.
- The operating system device name representing the communications LUN. The format is the same as the *access_device* field. For HP HP-UX, the *ccl_device* is the same as the *access_device*.

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.

E.4.2 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 Agent to communicate with and to periodically monitor subsystems RA8000 / ESA12000 c8t0d0. Agent will check RA8000 / ESA12000 at 20-second intervals. Subsystem RA8000 / ESA12000 is an HSG80-based subsystem using a communications LUN for communication.

```
# Storage subsystems for HOST123
ra8000|20|0|4|2|cx3459688|cx3459699|v83g|c8t0d0|c8t0d0|0|
```

E.5 Agent/Controller Communications

Command Console 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 use it to make a connection.

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



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.

F.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: hpK400
```

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

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

F.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:-
hpK400 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.

F.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 F-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

F.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: -  
hpK400 Hsg80 12000000000 HSG80 disks(disk21100:2) (SP_MONITOR: MonitorSubsys)
```



This digit can take 2 values:

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

F.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: -  
hpK400 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.

F.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: -  
hpK400 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.

F.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: -  
hpK400 Hsg80 100200000000 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.

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

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

Example:

WARNING: -
hpK400 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.

F.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: -  
hpK400 Hsg80 10000200000 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).

F.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.

F.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: - hpK400 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.

F.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: -
hpK400 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).

F.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: -
hpK400 Hsg80 100000000**2** 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

F.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: -
hpK400 Hsg80 1000000000**2** 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: hpK400

WARNING: - A subsystem change has been detected: hpK400 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: hpK400

WARNING: - hpK400 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.

G.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.

G.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>
```

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

G.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>

