RA8000/ESA12000 and MA8000/EMA12000 Solutions Software V8.5b for SGI IRIX

Installation Reference Guide

Notice

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About This Guide

This guide is designed to be used as step-by-step instructions for installation and as a reference for operation, troubleshooting, and future upgrades.

Text Conventions

This document uses the following conventions to distinguish elements of text:

Keys	Keys appear in boldface. A plus sign (+) between two keys indicates that they should be pressed simultaneously.
USER INPUT	User input appears in a different typeface and in uppercase.
FILENAMES	File names appear in uppercase italics.
Menu Options, Command Names, Dialog Box Names	These elements appear in initial capital letters.
COMMANDS, DIRECTORY NAMES, and DRIVE NAMES	These elements appear in uppercase.
Type	When you are instructed to *type* information, type the information **without** pressing the **Enter** key.
Enter	When you are instructed to *enter* information, type the information and then press the **Enter** key.

Symbols in Text

These symbols may be found in the text of this guide. They have the following meanings.

> **WARNING:** Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or loss of life.

> **CAUTION:** Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.

> **IMPORTANT:** Text set off in this manner presents clarifying information or specific instructions.

> **NOTE:** Text set off in this manner presents commentary, sidelights, or interesting points of information.

Symbols on Equipment

These icons may be located on equipment in areas where hazardous conditions may exist.

> Any surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.
> **WARNING:** To reduce the risk of injury from electrical shock hazards, do not open this enclosure.

> Any RJ-45 receptacle marked with these symbols indicates a Network Interface Connection.
> **WARNING:** To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.

Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists.

WARNING: To reduce the risk of injury from a hot component, allow the surface to cool before touching.

Power Supplies or Systems marked with these symbols indicate the equipment is supplied by multiple sources of power.

WARNING: To reduce the risk of injury from electrical shock, remove all power cords to completely disconnect power from the system.

Rack Stability

WARNING: To reduce the risk of personal injury or damage to the equipment, be sure that:

- ■ The leveling jacks are extended to the floor.

- ■ The full weight of the rack rests on the leveling jacks.

- ■ The stabilizing feet are attached to the rack if it is a single rack installations.

- ■ The racks are coupled together in multiple rack installations.

- ■ A rack may become unstable if more than one component is extended for any reason. Extend only one component at a time.

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 Technical Support

You are entitled to free hardware technical telephone support for your product for as long you own the product. A technical support specialist will help you diagnose the problem or guide you to the next step in the warranty process.

In North America, call the Compaq Technical Phone Support Center at 1-800-OK-COMPAQ[1]. This service is available 24 hours a day, 7 days a week.

Outside North America, call the nearest Compaq Technical Support Phone Center. Telephone numbers for world wide Technical Support Centers are listed on the Compaq website. Access the Compaq website by logging on to the Internet at http://www.compaq.com.

Be sure to have the following information available before you call Compaq:

■ Technical support registration number (if applicable)

■ Product serial number (s)

■ Product model name(s) and numbers(s)

■ Applicable error messages

■ Add-on boards or hardware

■ Third-party hardware or software

■ Operating system type and revision level

■ Detailed, specific questions

---

[1] For continuous quality improvement, calls may be recorded or monitored.

Compaq Website

The Compaq website has information on this product as well as the latest drivers. You can access the Compaq website by logging on to the Internet at http://www.compaq.com.

Compaq Authorized Reseller

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.

■ Elsewhere, see the Compaq website for locations and telephone numbers.

Chapter *1*

Installing StorageWorks on SGI IRIX

This chapter describes StorageWorks for SGI and the steps for installing it onto systems running IRIX.

1.1 Introduction

The procedures for installing StorageWorks for SGI require that you be familiar with IRIX system management and configuration. Installation and utilization of the StorageWorks RAID Array on IRIX requires the completion of the following major steps:

■ Setting the HSG80 Controllers to the correct mode.

■ Enabling the HSG80 Command Console LUN.

■ Installing the StorageWorks Command Console Agent.

■ Installing the StorageWorks Command Console Client.

■ Creating the storagesets and logical units on the RAID Array that meet the storage requirements of your application.

■ Labeling, partitioning, and creating filesystems on the new storage devices.

> **NOTE:** Prior to installation, make sure that the HSG80 array controller Writeback Cache Battery is fully charged. This is accomplished by supplying power to the HSG80 array controller for a minimum of six hours.

1.2 HSG80 Setup

Before the HSG80 RAID Array can be utilized by the Host System, the array must be properly configured. Use the HSG80 Command Line Interpreter (CLI) to complete the following tasks.

> **NOTE:** The exact command syntax can be found in the *Compaq StorageWorks HSG80 Array Controller ACS Version 8.5 CLI Reference Guide.*

Ensure that the HSG80 controller(s) have been set correctly for arbitrated loop or fabric. Compare the settings displayed by the CLI with those in Table 1-1 for arbitrated loop and Table 1-2 for fabric. The current settings can be obtained with the command:

HSG80> **SHOW THIS_CONTROLLER**

1.2.1 Arbitrated Loop Setup

Table 1-1
HSG80 Controller Parameters and Recommended Settings for Arbitrated Loop

Controller Parameter	Recommended Setting
PORT_1_AL_PA	71
PORT_2_AL_PA	72
PORT_1_Topology	Loop_Hard
PORT_2_Topology	Loop_Hard
This_Controller SCSI_Version	SCSI-2
Other_Controller SCSI_Version	SCSI-2

If the HSG80 controller parameter settings displayed do not match those in the recommended setting column in Table 1-1, the following CLI commands can be used to alter their values.

> **NOTE:** HSG80> is included in the CLI commands to show the prompt that will appear and is not to be typed as part of the command line.

Setting the ALPA:

HSG80 > **SET THIS_CONTROLLER PORT_1_AL_PA=71**
HSG80 > **SET THIS_CONTROLLER PORT_2_AL_PA=72**

Setting the Port Topology:

HSG80 > **SET OTHER_CONTROLLER PORT_1_TOPOLOGY=LOOP_HARD**
HSG80 > **SET OTHER_CONTROLLER PORT_2_TOPOLOGY=LOOP_HARD**

Setting the SCSI Version:

HSG80 > **SET THIS_CONTROLLER SCSI_VERSION=SCSI-2**
HSG80 > **SET THIS_CONTROLLER SCSI_VERSION=SCSI-2**

If the StorageWorks Command Console (SWCC) will be used, the HSG80 Command Console LUN must be enabled.

HSG80> **SET THIS_CONTROLLER COMMAND_CONSOLE_LUN**

Once all of the changes have been made, restart both controllers as follows:

HSG80> **RESTART OTHER_CONTROLLER**
HSG80> **RESTART THIS_CONTROLLER**

Once both controllers have been restarted, the connection type must be set. First examine the connection(s) by typing:

HSG80> **SHOW CONNECTIONS**

In the following command substitute the **[CONNECTIONNAME]** with the names shown in the output of the SHOW CONNECTIONS command.

Set the connection(s) to SGI by typing:

HSG80> **SET [CONNECTIONNAME] OPERATING _SYSTEM = SGI**

Repeat the command for each connection shown.

1.2.2 Fabric Setup

Ensure that the HSG80 controller(s) have been set correctly for fabric. Compare the settings displayed by the CLI with those in Table 1-2. The current settings can be obtained with the command:

HSG80> **SHOW THIS_CONTROLLER**

Table 1-2
HSG80 Controller Parameters and Recommended Settings for Fabric

Controller Parameter	Recommended Setting
PORT_1_Topology	Fabric
PORT_2_Topology	Fabric
This_Controller SCSI_Version	SCSI-2
Other_Controller SCSI_Version	SCSI-2

If the HSG80 controller parameter settings displayed do not match those in the recommended setting column in Table 1-2, the following CLI commands can be used to alter their values.

> **NOTE:** HSG80> is included in the CLI commands to show the prompt that will appear and is not to be typed as part of the command line.

Setting the Port Topology:

```
HSG80 > SET OTHER_CONTROLLER PORT_1_TOPOLOGY=FABRIC
HSG80 > SET OTHER_CONTROLLER PORT_2_TOPOLOGY=FABRIC
```

Setting the SCSI Version:

```
HSG80 > SET THIS_CONTROLLER SCSI_VERSION=SCSI-2
HSG80 > SET THIS_CONTROLLER SCSI_VERSION=SCSI-2
```

If the StorageWorks Command Console (SWCC) will be used, the HSG80 Command Console LUN must be enabled.

```
HSG80> SET THIS_CONTROLLER COMMAND_CONSOLE_LUN
```

Once all of the changes have been made, restart both controllers as follows:

```
HSG80> RESTART OTHER_CONTROLLER
HSG80> RESTART THIS_CONTROLLER
```

Once both controllers have been restarted, the connection type must be set. First examine the connection(s) by typing:

```
HSG80> SHOW CONNECTIONS
```

In the following command substitute the **[CONNECTIONNAME]** with the names shown in the output of the SHOW CONNECTIONS command.

Set the connection(s) to SGI by typing:

> HSG80> **SET [CONNECTIONNAME] OPERATING _SYSTEM = SGI**

Repeat the command for each connection shown.

1.3 Host System Setup

Once the RAID Array has been configured, the Host System must be set up.

1. Shutdown the Host Operating System, using your site-specific procedures. Once the Operating System has halted, power-off the SGI System enclosure.

2. If necessary, install the SGI Fibre Channel host adapter, and the optical to electrical Media Interface Adapter (MIA), FCAL only. The MIA should be secured to the host adapter with its two attached fastening screws. The MIA is available from SGI using the following part number: X-F-OE-KIT

3. Before starting the Host System, connect the optical cable(s) from the RAID Controller to the hub or switch. Then connect the Fibre Channel Host adapter in the SGI enclosure to the hub or switch with an optical cable.

4. Once the cable(s) are securely connected, power-on the SGI enclosure and start the operating system.

5. Once the bootstrap process has completed, login to the system as superuser *(root)*.

1.4 Loading the StorageWorks Software onto the Hard Disk

The StorageWorks software consists of the RAID Array software installation scripts, the support files, the Command Console Client, and the Command Console (CC) Agent. Installation and operation of the software will require temporary and permanent space on your hard disk. You will need approximately 4 Mbytes of permanent space on your hard disk to use the StorageWorks software and an additional 2 Mbytes of temporary space on your hard disk for installation purposes.

Loading the StorageWorks software on IRIX requires the following major steps:

■ Mounting the CD-ROM which contains the software.

■ Extracting the files from the file archive to a temporary storage area.

■ Executing the installation and configuration script.

1.5 Copying the File Archive from CD-ROM to Temporary Storage

Before the installation script can be run, the file archive that contains the StorageWorks software for IRIX will need to be copied from the CD-ROM to a temporary directory. The scripts can then be executed. You will need approximately 2 MBytes of temporary space to load the file archive from CD-ROM.

1. Insert the StorageWorks software distribution CD-ROM into the drive.

2. Login as root (superuser).

3. Change the directory to a temporary storage area (/tmp). For example, type:

   # cd /tmp

4. Create a directory into which the file archive can be loaded:

   # mkdir hsg80

5. Change to that directory:

   # cd hsg80

6. If the IRIX automounter does not mount the CD-ROM, use the following command:

   # mount –t iso9660 -r /dev/rdsk/dks0d7vol /mnt

   NOTE: The name *of dks0d7vol* may be different on your system.

7. Extract the file archive from the CD-ROM by entering the following command:

   # tar xvf /mnt/agent/sgi/stm_sgi.tar

8. All of the files necessary to complete the StorageWorks Software installation have now been copied to this directory.

1.6 Executing the Installation Script

Perform the following procedure to install the StorageWorks software onto your system:

1. Enter the following command and press RETURN.

   # ./stgwks_sgi.sh

The installation options menu appears.

```
StorageWorks and Command Console Agent
Installation and Configuration Menu
_____

StorageWorks Options:
--------------------
1) Install StorageWorks software
2) StorageWorks Maintenance

Agent Options:
-------------
3) Install Agent
4) Agent Maintenance

Q) Quit

Enter Selection: 1
```

2. Type **1** to install StorageWorks Software. The Copyright Notice and the following information will be displayed:

```
Copyright Compaq Computer Corp. 1994 - 2000. All rights reserved.

Restricted Rights: Use, duplication by the U.S. Government is subject to restriction as
set forth in subparagraph (c) (1) (ii) of DFARS 252.227-7013, or in FAR 52.227-19, or in
FAR 52.227-14 Alt. III, as applicable

Portions of this software are proprietary to and embody the confidential technology of
Compaq Computer Corporation. Possession, use, or copying of this software and media
is authorized only pursuant to a valid written license from Compaq or an authorized
sublicensor.

Checking User...OK
Checking IRIX Revision Level...OK
Checking that Host Adapter is installed and correctly configured...OK
Copying installation files to /usr/stgwks directory...OK
StorageWorks Software Installed
-- Hit RETURN to continue --
```

Once the StorageWorks software has been installed, logical units may be created on the RAID Array and configured into the system. These logical units can be created using the StorageWorks Command Console (SWCC) Client or the HSG80 Command Line Interpreter (CLI). In order to utilize SWCC Client to create logical units, the SWCC Agent and Client must first be installed on the host SGI System. Agent installation instructions can be found in *Chapter 2, Installing the Command Console (CC) Agent on your Host System*. Client installation instructions can be found in *Chapter 3, Installing SWCC Client*. Once the Agent and Client have been installed, the following sections will guide you through the remaining steps in the configuration and initialization process.

Whether you are using StorageWorks Command Console or the CLI to create logical units on the RAID Array, these new logical units need to be recognized and configured into the system. Additionally, the logical units need to labeled, partitioned and initialized with file systems. The following sections contain the steps necessary to perform those procedures.

1.7 Host Device Initialization

New logical units created on the RAID Array with SWCC or the CLI must be initialized and partitioned before they can be utilized by the Host operating system. Once the logical unit has been created, the system must be rebooted for the logical unit to be recognized by the operating system. The following steps outline the process.

1. Using the CLI or the StorageWorks Command Console Client, create the logical units on the RAID Array.

2. Reboot IRIX according to the established local system administration procedures.

3. Once the bootstrap process has completed, login to the system as the superuser (root).

4. Verify that Host has located and configured the new RAID Array devices into the operating system with the command:

   # **hinv -v**

The output of this command should show the logical units that were created on the RAID Array. In the following portion of the command output, an HSG80 with logical units at IDs 1,2,3,4,5 are connected to controller 10 of an XIO Arbitrated Loop Fibre Channel host adapter. In this example, the first disk drive, unit 64, logical unit 0, is the Command Console LUN (CCL).

```
Integral SCSI controller 10: Version Fibre Channel AIC-1160, revision 2
  Disk drive: unit 64 on SCSI controller 10
  Disk drive: unit 64 lun 1 on SCSI controller 10   1
  Disk drive: unit 64 lun 2 on SCSI controller 10   2
  Disk drive: unit 64 lun 3 on SCSI controller 10   3
  Disk drive: unit 64 lun 4 on SCSI controller 10   4
  Disk drive: unit 64 lun 5 on SCSI controller 10   5
Integral SCSI controller 3: Version QL1040B (rev. 2)
Integral SCSI controller 4: Version QL1040B (rev. 2)
Integral SCSI controller 5: Version QL1040B (rev. 2)
Integral SCSI controller 6: Version QL1040B (rev. 2)
Integral SCSI controller 7: Version QL1040B (rev. 2)
Integral SCSI controller 8: Version QL1040B (rev. 2)
Integral SCSI controller 9: Version QL1040B (rev. 2)
```

5. If the devices have been correctly recognized by the operating system, they can now be labeled and partitioned. If the devices were not recognized, recheck the status of the RAID Controller, logical units, and fibre connections.

6. If the RAID controller is properly configured and the optical cables are connected, then use the following command sequence to re-initialize the loop and configure the devices into IRIX that are attached to controller #10:

   ```
   # scsiha -r -p 10
   # cd /hw
   # ioconfig -f ./
   # hinv -v
   ```

If necessary, repeat the sequence for each host controller with Fibre Channel RAID devices attached.

7. The logical units that were recognized by the operating system must be initialized before they can be used for data storage. This initialization includes:

   ■ Creating and writing the disk label

   ■ Partitioning the storage

   ■ Creating the filesystem, if required

1.7.1 Arbitrated Loop Device Name Convention

SGI IRIX creates unique device names for devices attached to the Arbitrated Loop Fibre Channel host adapters on the system. Understanding the device

nomenclature will help in providing device name related answers in the following section.

Format used for LUN 0: *dksxdysa*
Format used for other LUNs: *dksxdylzsa*

NOTE: : The "l" in the example is the letter "el")

x = controller (host Fibre Channel adapter) number assigned by host.

y = Loop ID in decimal

z = Logical Unit Number, LUN

a = Slice or partition number

The fourth slice (partition) on RAID Array logical unit D4 on fibre channel controller 10 would be seen as: **dks10d64l4s3**

1.7.2 Fabric Device Name Convention

SGI IRIX creates unique device names for devices attached to the Fabric Fibre Channel host adapters on the system. Understanding the device nomenclature will help in providing device name related answers in the following section.

Format used for LUNs: */dev/rdsk/<nodeWWN>/lunzvol/cxp<portID>*

NOTE: : The "l" in the example is the letter "el")

Z (in lunzvol) = Logical Unit Number, LUN, (varies from 0-7)

X (in cxp<portID>) = controller (host Fibre Channel adapter) number assigned by host.

<nodeWWN> = worldwide name (Node ID) of HSG80 controllers (THIS and OTHER)

<portID> = Port ID of the HSG80 controller (THIS or OTHER)

1.7.3 Creating the Disk Label

The disk label contains a variety of information about the storage device. Included in the label are settings for a performance enhancement feature called Command Tagged Queuing (CTQ). In order to utilize CTQ, it must be enabled in the disk label for each RAID Array logical unit that is visible to the host. In the following example, CTQ is enabled and the queue depth is set.

NOTE: To partition the device, follow the prompts and enter the answers displayed in the large ***bold face italic*** type. The default answers are shown in ( ) braces. Press the **Return** key to utilize the default answer.

The controller number, drive number and LUN number of your drive will probably be different for Arbitrated Loop or Fabric.

NOTE: The following steps are for Arbitrated Loop only.

fx -x

fx version 6.5, Jan 20,, 2000
fx: "device-name" = (dksc) ***dksc***
fx: ctlr# = (0) ***10***
fx: drive# = (1) ***64***
fx: lun# = (0) ***4***
...opening dksc(10,64,4)
...drive selftest...OK

NOTE: The following steps are for Fabric only.

fx −x −d /dev/rdsk/50001fe1000007e0/lun0vol/c5p50001fe1000007e1

fx version 6.5, Jan 20,, 2000
...opening c5p50001FE1000007e1
...drive selftest...OK

NOTE: The following steps are for both Arbitrated Loop and Fabric.

Scsi drive type == DEC   HSG80   V85F

fx: Warning: no sgilabel on disk
fx: Warning: can't read sgilabel on disk

creating new sgilabel

----- please choose one (? for help, .. to quit this menu)-----
[exi]t   [d]ebug/   [l]abel/   [a]uto
[b]adblock/   [exe]rcise/   [r]epartition/   [f]ormat
fx> ***label***

```
----- please choose one (? for help, .. to quit this menu)-----
[sh]ow/       [sy]nc      [se]t/        [c]reate/
fx/label> set

----- please choose one (? for help, .. to quit this menu)-----
[para]meters         [part]itions        [s]giinfo
[g]eometry           [m]anufacturer_params   [b]ootinfo
fx/label/set> parameters

fx/label/set/parameters: Error correction = (enabled)
fx/label/set/parameters: Data transfer on error = (enabled)
fx/label/set/parameters: Report recovered errors = (enabled) disabled
fx/label/set/parameters: Delay for error recovery = (enabled)
fx/label/set/parameters: Err retry count = (4)
fx/label/set/parameters: Transfer of bad data blocks = (enabled)
fx/label/set/parameters: Auto bad block reallocation (write) = (enabled)
fx/label/set/parameters: Auto bad block reallocation (read) = (enabled)
fx/label/set/parameters: Read ahead caching = (enabled)
fx/label/set/parameters: Write buffering = (disabled)
fx/label/set/parameters: Drive disable prefetch = (0)
fx/label/set/parameters: Drive minimum prefetch = (0)
fx/label/set/parameters: Drive maximum prefetch = (0)
fx/label/set/parameters: Drive prefetch ceiling = (0)
fx/label/set/parameters: Enable CTQ = (disabled) enabled
fx/label/set/parameters: CTQ depth = (2) 3
fx/label/set/parameters: Read buffer ratio = (0/256)
fx/label/set/parameters: Write buffer ratio = (0/256)
 * * * * * W A R N I N G * * * * *
about to modify drive parameters on disk dksc(10,64,4)! ok? yes
----- please choose one (? for help, .. to quit this menu)-----
[para]meters         [part]itions        [s]giinfo
[g]eometry           [m]anufacturer_params   [b]ootinfo
fx/label/set>

----- please choose one (? for help, .. to quit this menu)-----
[sh]ow/       [sy]nc      [se]t/        [c]reate/
fx/label> ..

----- please choose one (? for help, .. to quit this menu)-----
[exi]t        [d]ebug/      [l]abel/      [a]uto
[b]adblock/    [exe]rcise/    [r]epartition/   [f]ormat
fx> exit

label info has changed for disk dksc(10,64,4).  write out changes? (yes)
yes
#
```

As IRIX writes the disk label to the RAID Array, an error message is usually displayed on the system console. The error message:

dks10d64: [Alert] Illegal Request: Illegal Field in CDB………

is caused by the Host adapter sending an illegal command to the RAID Array. The error message can be ignored.

1.7.4 Partitioning the Storage

After the disk label has been successfully written, the storage can be divided into the slices or partitions that are required by the user application. Since it is not possible to alter the partition structure of the storage device once it contains user data, this step should be carefully planned. A few factors to consider when deciding on the partition/slice size include the:

■ Total storage space required for application and user data, now and in the future.

■ Maximum amount of storage space in one partition that can be addressed by the application.

■ Backup time, strategy, and tool capabilities.

The following simple example, shows ID 64, LUN 4 being partitioned with the default partition allocation used by the **fx** utility.

> **NOTE:** To partition the device, follow the prompts and enter the answers displayed in the large ***bold face italic*** type. The default answers are shown in ( ) braces. Press the **Return** key to utilize the default answer
>
> The controller number, drive number and LUN number of your drive will probably be different for arbitrated loop or fabric.

> **NOTE:** The following steps are for Arbitrated Loop only.

fx -x

fx version 6.5, Jan 20, 2000
fx: "device-name" = (dksc) ***dksc***
fx: ctlr# = (0) **10**
fx: drive# = (1) **64**

fx: lun# = (0) **4**
...opening dksc(10,64,4)
...drive selftest...OK

NOTE: The following steps are for Fabric only.

fx –x –d /dev/rdsk/50001fe1000007e0/lun0vol/c5p50001fe1000007e1

fx version 6.5, Jan 20,, 2000
...opening c5p50001FE1000007e1
...drive selftest...OK

NOTE: The following steps are for both Arbitrated Loop and Fabric.

Scsi drive type == DEC   HSG80   V85F

----- please choose one (? for help, .. to quit this menu)-----
[exi]t   [d]ebug/   [l]abel/
[b]adblock/   [exe]rcise/   [r]epartition/
fx> *repartition*
----- partitions-----
part type   blocks   Megabytes (base+size)
  7: xfs   4096 + 20538224   2 + 10028
  8: volhdr   0 + 4096   0 + 2
 10: volume   0 + 20542320   0 + 10030
capacity is 20542320 blocks

----- please choose one (? for help, .. to quit this menu)-----
[ro]otdrive   [u]srrootdrive   [o]ptiondrive   [re]size
fx/repartition> *optiondrive*

fx/repartition/optiondrive: type of data partition = (xfs) **xfs**
Warning: you will need to re-install all software and restore user data
from backups after changing the partition layout. Changing partitions will cause all
data on the drive to be lost. Be sure you have the drive
backed up if it contains any user data. Continue? *yes*

----- partitions-----
part type   blocks   Megabytes (base+size)
  7: xfs   4096 + 20538224   2 + 10028
  8: volhdr   0 + 4096   0 + 2
 10: volume   0 + 20542320   0 + 10030

capacity is 20542320 blocks

----- please choose one (? for help, .. to quit this menu)-----
[ro]otdrive   [u]srrootdrive   [o]ptiondrive   [re]size
fx/repartition> ▄▄
----- please choose one (? for help, .. to quit this menu)-----
[exi]t   [d]ebug/   [l]abel/
[b]adblock/   [exe]rcise/   [r]epartition/
fx> *exit*

#

1.7.5 Creating Filesystems

Once the storage space has been divided into partitions, filesystems can be created. Filesystems can be constructed from one storage device or multiple storage devices. To create a filesystem using multiple storage devices, use the SGI XLV Volume Manager. The XLV utilities are easily accessed through the graphical system management tool, **sysmgr**.

To create and mount an XFS filesystem on an arbitrated loop host adapter, use:

> **# mkfs /dev/dsk/dks10d64l4s7**
> **# mount /dev/dsk/dks10d64l4s7 /mnt**

To create and mount an XFS filesystem on a fabric host adapter, use:

> **# mkfs /dev/dsk/50001fe1000007e0/lun0s7/c5p50001fe1000007e1**
> **# mount /dev/dsk/50001fe1000007e0/lun0vol/c5p50001fe1000007e1 /mnt**

The logical units on the StorageWorks RAID Array are now ready for use.

1.8 Online Documentation

The StorageWorks documentation set for the HSG80 is provided on the enclosed CDROM. The documentation is stored in Adobe Acrobat Portable Document Format (PDF) and PostScript (PS) formats. To access the documentation, insert the CDROM into the drive and mount the CDROM as described in the section titled, *Copying the File Archive from CD-ROM to Temporary Storage* of this chapter. Two documentation-related directories are included on the CD-ROM.

1. Adobe – Contains the IRIX and Windows versions of Acrobat Reader. The IRIX tar archive includes installation instructions. The Windows version, stored as a self-extracting file also includes installation instructions.

2. Docs – contains Acrobat PDF and PS versions of the HSG80 documentation.

Chapter *2*

Installing the Command Console (CC) 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 System using the installation and configuration script.

2.1 Installing and Configuring CC Agent

Command Console (CC) Agent is a companion application to the Command Console (CC) Client graphical user interface (GUI) program. 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 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.

CXO7220
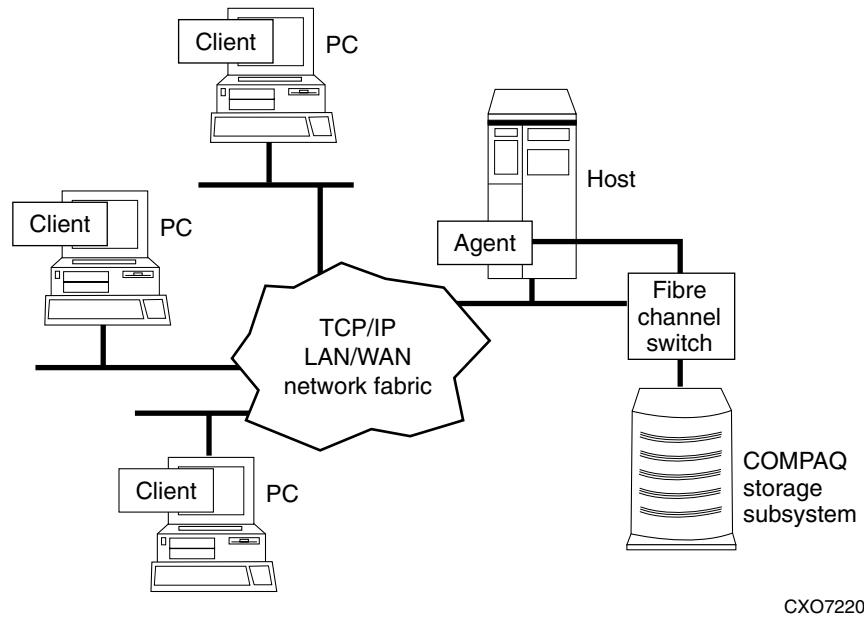
Figure 2-1. Command console client/agent connection

CC 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 CC Agent to use TCP/IP notification to Client and SNMP notification to an SNMP-compatible monitoring application.

2.1.1 Minimum Requirements

CC Agent is designed to operate with Command Console Client Version 2.3 for Windows 2000 andWindows NT.

Before you can install a CC Agent:

■   Your Host's System resources must meet the minimum requirements specified in Table 2–1.

■   You must have enabled the Command Console LUN (CCL) on each storage subsystem that you want to connect. If each of your subsystems do not contain a CCL, see *Appendix A* to use the controller's Command Line Interpreter (CLI) software to enable one. Subsystems without a communications logical unit are invisible to CC Agent and the Host Operating System.

Table 2-1
Minimum System Requirements

Host Feature	Requirement
Architecture	SGI System as listed in the *Release Notes,* 2 MB free space in /tmp directory, 4 MB free space for CC Agent installation directory
Operating System	SGI IRIX Version 6.4.1 and 6.5. See the Release Notes for exact versions and applicable patches.
Controller Compatibility	Controller running ACS Version 8.5F

2.1.2 Selecting a CC Agent Installation and Configuration Method

You must install and run CC Agent for SGI IRIX on each system you wish to connect to the CC Client over the network. The fastest method of configuring the CC Agent is automatically, using the StorageWorks Installation and Configuration Script.

2.1.3 Installing and Configuring Automatically

The Installation and Configuration script performs the installation using software retrieved from the CD-ROM in Section titled, *Copying the File Archive from the CD-ROM to Temporary Storage*. You must have access to the superuser (root) account to perform this installation.

You need to gather some information prior to starting the installation. See Table 2–2. Entries in Table 2–2 appearing with a ***** specify the information you need prior to starting the installation.

The CC Agent will automatically start when you install it and will restart automatically if it stops for any reason.

To install and configure CC Agent, follow these steps:

1. Log on to the Host System as root (superuser).

2. Type: `cd /tmp/hsg80` to change your working directory to the */tmp* directory containing the CC Agent software loaded from CD–ROM.

3. Type: `./stgwks_sgi.sh` to start the StorageWorks Installation and Configuration script. The StorageWorks Installation and Configuration menu appears.

```
StorageWorks and Command Console Agent
Installation and Configuration Menu
_____

StorageWorks Options:
--------------------------
1) Install StorageWorks software
2) StorageWorks Maintenance

Agent Options:
-----------------
3) Install Agent
4) Agent Maintenance

Q) Quit
Enter Selection: 3
```

4. Type: **3** to install the CC Agent.

5. Follow the text-based prompts and enter the appropriate information. Table 2–2 guides you in responding to many of the prompts.

Table 2-2
Information Required for Install Program Prompts

Information Required to Complete Installation	How to Respond
Target directory for installation	*/usr/stgwks* is the directory where StorageWorks will be installed. Ensure that it has a minimum of 4 MB of space available.
*Port the Command Console Client GUI uses to communicate with the Command Console Agent for subsystem configuration and maintenance.	*Default is 4998. If the default port is already used, press N and specify a new port.
*Port number that the Command Console Agent uses to send notifications to the Command Console Client GUI.	*Default is 4999. If the default port is already used, press N and specify a new port.

Table 2-2
Information Required for Install Program Prompts *continued*

Information Required to Complete Installation	How to Respond
The directory that contains the device special files for SCSI pass-through devices.	IRIX pass-through device special files are located in the */dev/scsi* directory.
A password to gain access to the agent to configure the subsystem with the GUI.	Enter a 4–16 character password. The install program does not echo what you type.
*The name of CC Agent manufacturer and the Enterprise object identifier for use with its MIB, so that it can operate with other SNMP applications.	*Enter Compaq Computer Corporation as the CC Agent manufacturer.
*The Enterprise Object Identifier (OID) is a vendor specific value used to identify SNMP messages.	*Default is 36.2.15.21
*Names of the Host Systems on which you will run the Client.	*Enter the Network names for the Hosts from which you will run the GUI.
Level of access a client has for communicating with the storage subsystems. The possible options are: **0** = Navigation Tree monitoring only **1** = Navigation Tree and Storage Window monitoring only **2** = Navigation Tree monitoring, Storage Window monitoring and Configuration	You can give a client configuration level access only if you specified an access password.

Table 2-2
Information Required for Install Program Prompts *continued*

Information Required to Complete Installation	How to Respond
How do you want a CC Agent server to notify a client when an error condition occurs? Notification schemes available are: **0** = No Error Notification **1** = Notification via a TCP/IP Socket **2** = Notification via the SNMP protocol **3** = Notification via both TCP/IP and SNMP	Selecting this option results in: **0** = No notification over network, but local notification through e-mail and an entry in the CC Agent error log file. **1** = Notification messages sent to the GUI and local notification sent through e-mail and an entry in the CC Agent error log file. **2** = Notification messages sent to the SNMP monitor and local notification sent through e-mail and an entry in the CC Agent error log file. **3** = Notification messages sent to the GUI, the SNMP monitor, and local notification sent through e-mail and an entry in the CC Agent error log file.
Do you want e-mail notification of errors or failures on the RAID subsystem? *If yes to e-mail notification, specify e-mail address and notification level. **1** = Fatal error only **2** = Warning and fatal errors **3** = Info, warning and fatal errors	Type Y to receive e-mail and syslog notification. Type N for syslog notification only. *Enter e-mail address and notification level for each user. **1** = Notification for serious errors, which require immediate attention. **2** = Notification for serious errors and warning messages. **3** = Notification for serious errors, warnings and informational messages. **NOTE:** SWCC Agent Mail Messages are described in *Appendix F*.

Table 2-2
Information Required for Install Program Prompts *continued*

Information Required to Complete Installation	How to Respond
Names of your subsystems.	Specify unique names for each subsystem in your configuration.
*The pass-through device special file name used to access the storage system.	*Enter the device name that your operating system assigned to the command console LUN (CCL) that you enabled in Appendix C. From the choices displayed, select the device that corresponds to the HSG80 CCL.

Your CC Agent program is installed. It was automatically started if you typed Y to start the CC Agent during the installation. It will restart automatically after a system reboot or if it stops for any reason.

2.2 System Clean Up

Having successfully completed the installation of the StorageWorks software and the CC Agent, it is now possible to delete the temporary directory. For example, type:

```
# rm -r /tmp/hsg80
```

2.3 Running CC Agent

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

The installation script places an entry in the "/etc/inittab" file to implement automatic execution of the Agent. The tag field in the file is "steam."

2.4 Reconfiguring CC Agent

You can reconfigure previously-installed Agents using the configuration and installation program. To reconfigure an Agent, execute the *./stgwks_sgi.sh*, script in */usr/stgwks*, the StorageWorks Installation and Configuration, directory (*/usr/stgwks)* and follow the prompts to CC Agent maintenance.

2.5 Uninstalling CC Agent

You can remove the CC Agent program using the Agent Maintenance option from the *stgwks_sgi.sh* Bourne-shell script.

To remove the Agent follow these steps:

1. Run the *./stgwks_sgi.sh* script from the */usr/stgwks* directory.

2. Select option 4, Agent Maintenance.

3. Select option 5, Uninstall Agent, from the Agent Configuration Menu.

Uninstalling CC Agent stops the Agent and permanently removes all of its files.

2.6 Troubleshooting/Avoiding Problem Situations

Command Console Client may indicate that it cannot find your subsystem when you attempt to connect via the network.

■ A RAID storage system is connected to the host, but the subsystem has no volumes configured on it, or the Command Console LUN (CCL) is not enabled.

■ A RAID storage system is not connected to the host.

■ The Command Console Agent is not installed and running on the Host System.

To avoid these problems, a Controller Subsystem with the CCL enabled must be connected to the host before you attempt to connect CC Client.

Mail messages sent by the CC Agent are useful in troubleshooting subsystem problems. To receive CC Agent mail messages, you must enable "e-mail notification" via the Agent installation program option, as described in the section titled, *Installing and Configuring Automatically,* of this chapter. If you receive a mail message from CC Agent, refer to *Appendix F* for assistance in determining the cause of the problem.

Chapter **3**

Installing SWCC Client

This chapter contains instructions for installing StorageWorks Command Console (SWCC) Client, a Graphical User Interface (GUI), and setting the controller properties.

NOTE: For more information, use the on-line HELP in the SWCC Storage and CLI Windows.

3.1 Introduction

This chapter describes how to install and use Command Console Client software.

Procedure summary:

■ Install Command Console software

■ Launch Command Console Client

■ Establish communications with the HSG80 controller over the network.

■ Configure the HSG80 controller for operation

3.2 Installing Command Console Client

The minimum requirements to run Command Console Client are:

■ PC Requirements:
Intel 486, 66 MHz, 16 MB memory, 2 MB free disk space, and CD-ROM drive

■ Operating System:
Microsoft Windows 2000 or Windows NT 4.0

Command Console Client installs from a CD-ROM disk using a standard Windows installation routine on a Windows 2000 or Windows NT platform. The program is self-extracting and stores Command Console Client into the directory C:\Program Files\SWCC by default. During setup, you have the option to change the disk or directory location.

To install Command Console:

1. Place the CD in the CD-ROM drive.

2. Run *File Manager* or *Windows Explorer.*

3. Navigate to the folder: *drive_letter*:*\SWCC\Client.*

4. Double click on *Setup.*

5. Follow the instructions in the setup program to complete the installation.

3.3 Launching Command Console Client

NOTE: The software placed the items that you selected to install under *Start > Programs > Command Console*

To start Command Console from the Start Menu, click on the HSG80 Storage Window name.
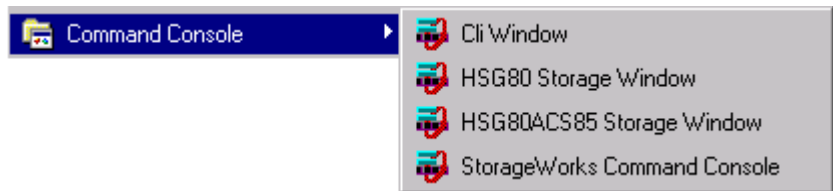
Figure 3-1. Command console client's start menu

The four choices Client provides you with at startup are:

■ CLI Window: HS-series controllers provide a feature called the Command Line Interpreter (CLI) for configuring and monitoring your storage controllers using text-based commands. With the CLI, you can connect a maintenance terminal directly to your controller and manage it using the complete set of CLI commands. You can also use a host-based, virtual terminal, such as Command Console's CLI Window, to make the connection. Refer to *Appendix A, Creating Your Storage Configuration with the CLI*, for details.

■ HSG80 Storage Window: Displays the Storage Window. This choice lets you monitor and configure one storage subsystem using Client's graphical user interface. All connection choices are provided: serial line, SCSI bus and network (TCP/IP).

   NOTE: HSG80ACS85 Storage Window is used with RA8000/ESA12000 and MA8000/EMA12000 storage systems using ACS V8.5 software. Older ACS versions (8.3 or 8.4) require the HSG80 Storage Window.

■ StorageWorks Command Console: Displays the Navigation Window. The Navigation Window is a network navigation tool used to manage and monitor storage subsystems over a TCP/IP network. This choice lets you monitor and configure one or many storage subsystems over a network using Client's graphical tools. Refer to *Chapter 4, Communicating Over a Network*, for details.

3.4 Establishing a Network Connection

To establish a network proceed as follows:

1. Click on the *Start* button on the taskbar.

2. Click on *Programs*.

3. Click on *Command Console*.

4. Click on Storage Window.

5. When the Connection Selection dialog box displays, click the *Network* radio button (Figure 3-2), then click *OK* to display the *Connect Network* dialog box (Figure 3-3).
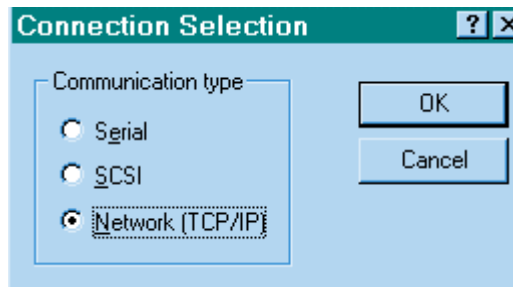
Figure 3-2. Connection selection dialog box
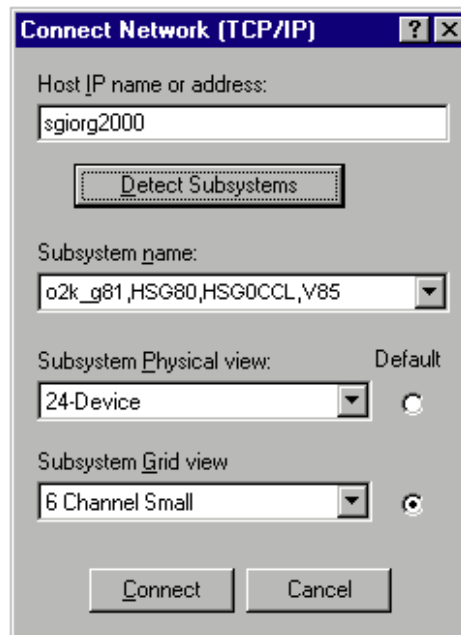
Figure 3-3. Connect network dialog box for storage window

6. On the *Connect Network* dialog box, from the drop-down menu, enter the HOST name or IP address where your HSG80 controller is connected. Then click the *Detect Subsystems* button to display the storage subsystem name. Then click *Connect* to connect to your storage subsystem. The next step is to configure the controller.

NOTE: The top window displays the virtual disks that have been created. The bottom windowpane shows the devices you have installed in the RAID Subsystem. On startup, Command Console finds installed drives and displays then in a grid by channel and SCSI ID number.
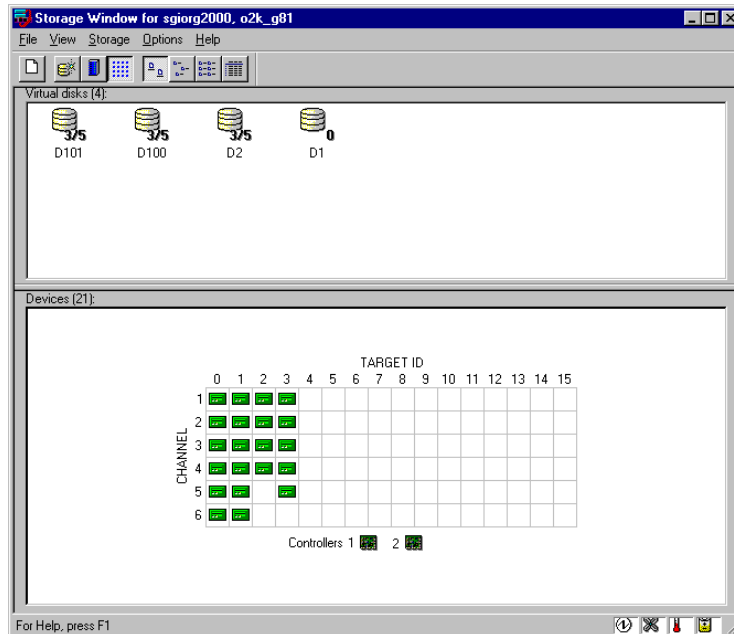
Figure 3-4. Storage window

3.5 Controller Properties

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

Changes in all fields cause a controller restart to place the changes in effect. The program prompts you for confirmation before it restarts your controller. A restart of the controller will be detected by the host system. Do not make changes to the controller settings when either file systems are mounted on the RAID Array or applications are using the RAID Array.

NOTE: After you change a parameter that causes a controller restart, there is approximately a 90-second delay while the controller reinitializes.

1. Access the controller's property sheets by double-clicking the controller's icon in the Storage Window. When you double-click on a controller's icon the *General* controller properties sheet displays (Figure 3-5). The controller has five property sheets. Each sheet is accessed by clicking on its tab.

Confirm the following:

■ Allocation class is 0

(You may also set the time and date.)
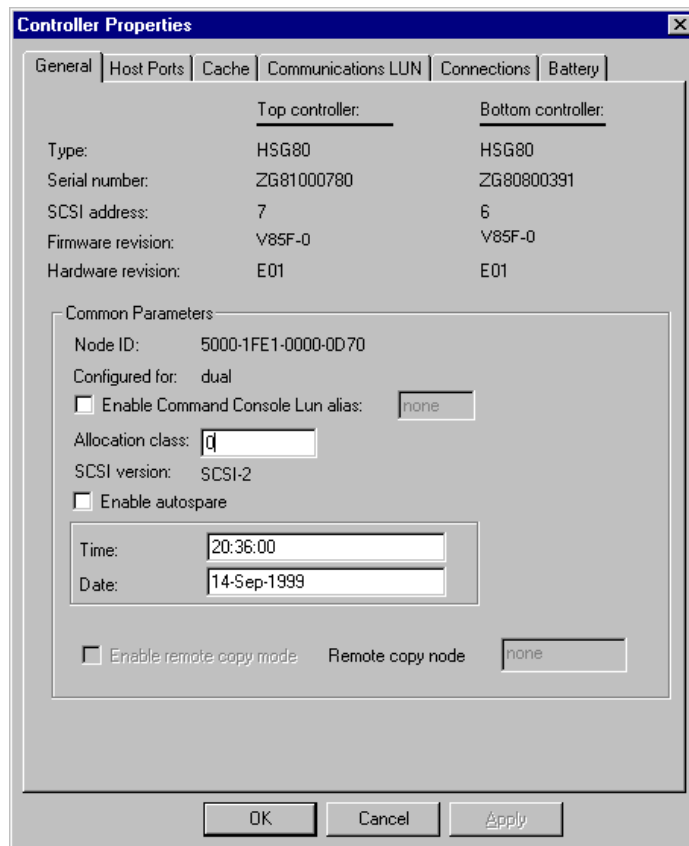
Figure 3-5. General controller properties tab

2. Click the *Host Ports* tab to display the host port operating parameters and verify the host port operating parameters shown in Figure 3-6.

The settings displayed for:

■ Port ID

■ Requested Topology

■ Actual Topology

■ Requested Port Address

■ Actual Port Address

will vary depending upon your cabling, loop configuration, ALPA settings and number of host ports in use.
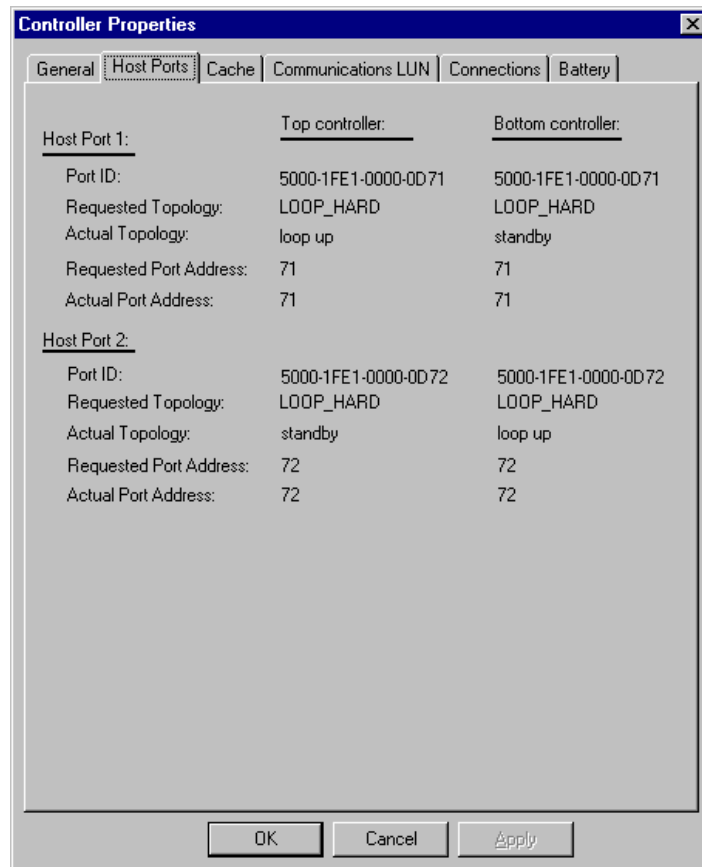
Figure 3-6. Host ports controller properties tab

3. Click the *Cache* tab to check cache size (Figure 3-7).

Confirm the following:

■ Cache flush_time: (seconds): is 10
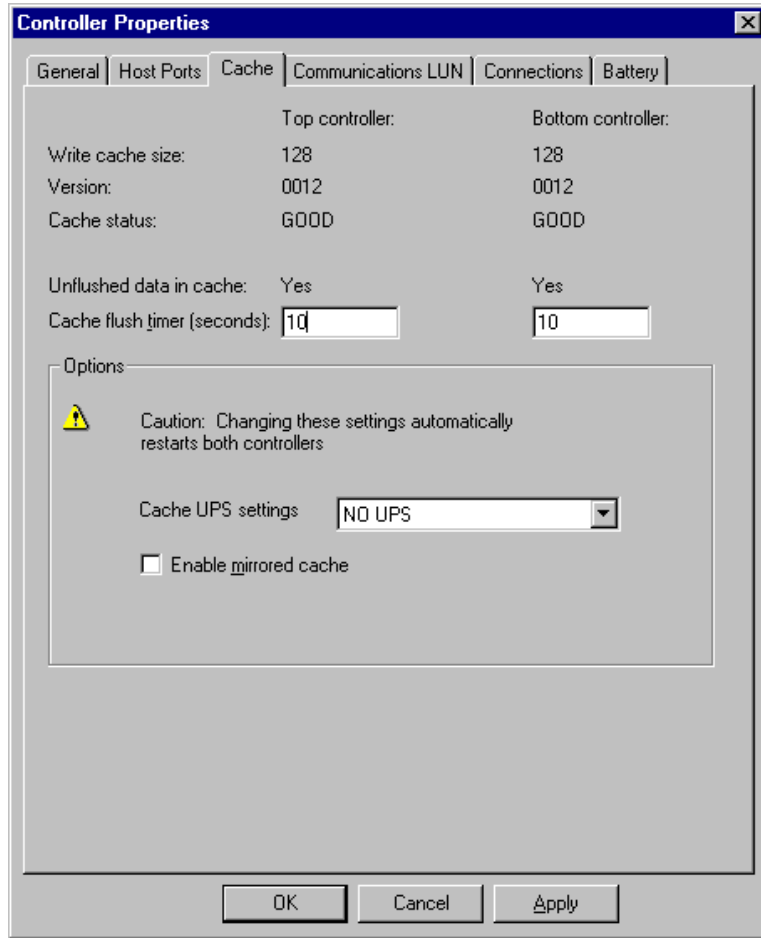
Figure 3-7. Cache controller properties tab

4. Click the *Communications LUN* tab (Figure 3-8).

   NOTE: Ensure that *Fixed* is set, and that the SWCC virtual LUN is enabled.
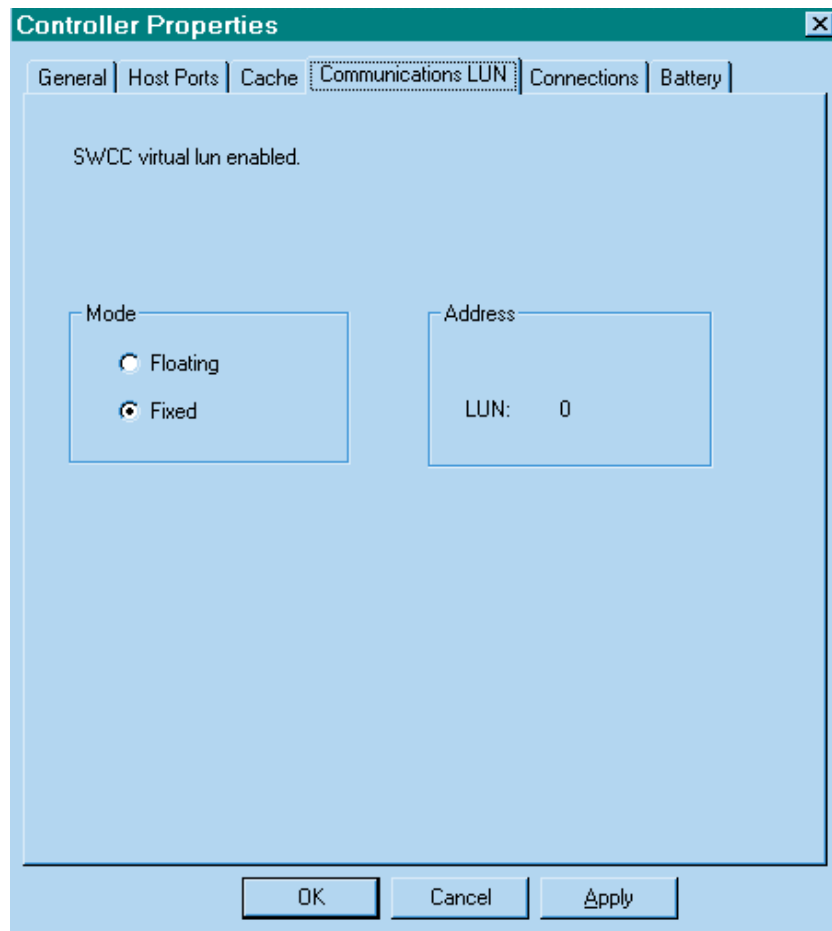
Figure 3-8. Communications LUN controller properties tab

5. Click the *Connections* tab (Figure 3-9).

Confirm the following:

■ For each highlighted (not grayed-out) online *Connection Name*, change the Operating System from WINNT to SGI, if necessary.

■ Unit Offset should be 0 for Port 1

■ Unit Offset should be 100 for Port 2

Figure 3-9. Connections controller properties tab

6. Click the *Battery* tab (Figure 3–10).

> **NOTE:** Confirm that the battery is fully charged. If not, wait until it is fully charged, before using the system.
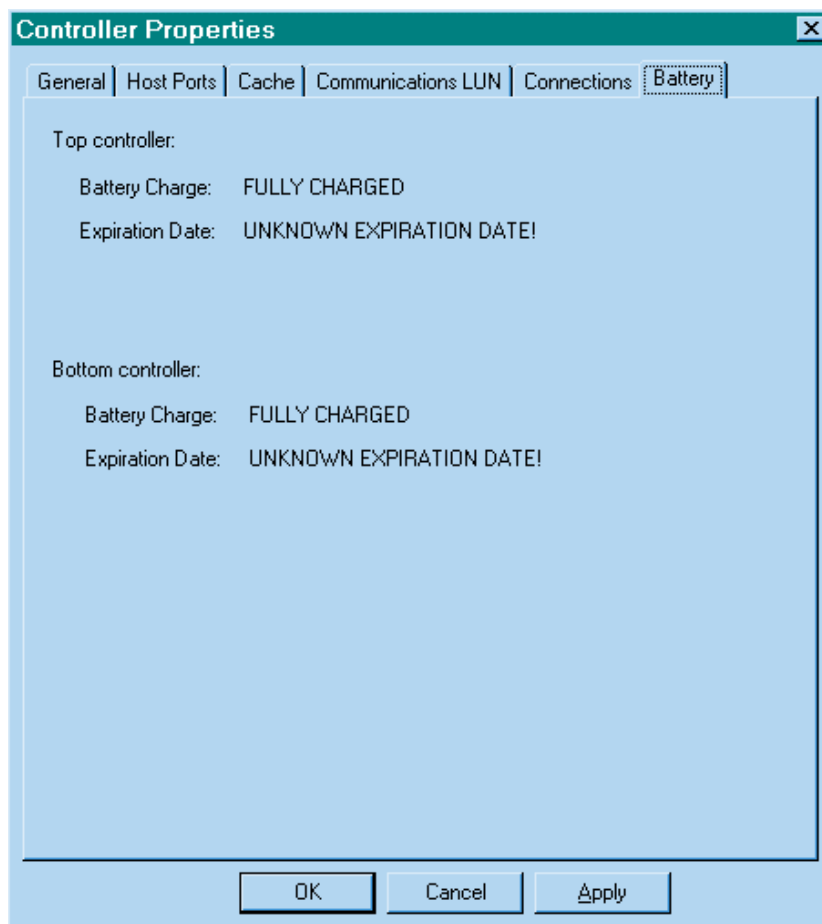
Figure 3-10. Battery controller properties tab

7. Click on the *Apply* button. Once all of the changes have been made, click the OK button to complete controller configuration. The storage window is now displayed. To begin using SWCC to create Virtual Disks, refer to the *Compaq StorageWorks Command Console V2.3 User Guide*, to the section entitled *Creating Your First Virtual Disk*.

Chapter 4

Communicating Over a Network

This chapter introduces you to Command Console's agent and provides instructions on how to establish communication over a network to multiple hosts and storage subsystems.

> **NOTE:** For more information, use the on-line HELP in the SWCC Storage and CLI Windows.

4.1 Introduction

To communicate with your RA8000/ESA12000 or MA8000/EMA12000 Fibre Channel Subsystem over a network, two software applications are required: a client and an agent. Command Console Client is a graphical user interface which installs and runs on a Windows 2000 or Windows NT host, while Command Console Agent installs and runs unseen in the background on the storage subsystem's host computer. Client was installed in Chapter 3, *Installing SWCC Client*. The SWCC Agent was installed in Chapter 2. Together the two provide the software link required for communication over a network.

4.1.1 Agent

Agent runs on a host system as a server application. To establish communication over a network, you must install Agent on the host system that the storage subsystem is connected to.

Agent provides the software interface between the host storage subsystem and any number of Command Console Client sessions running on the remote system, allowing you to configure and monitor your storage subsystem from many locations.

Agent also provides access protection and asynchronous fault notification. You can configure Agent to use TCP notification to Command Console Client or SNMP notification to an SNMP-compatible monitoring application.

4.1.2 Client

Command Console Client is the control interface for your RA8000/ESA12000 or MA8000/EMA12000 Fibre Channel Subsystem. Before you can communicate with your storage subsystem over a network, the client address must be added to the agent database using the Agent Maintenance menu.

4.2 Adding Storage Subsystems and Their Hosts to the Network

Storage subsystems and their host systems are added to the network using Command Console Client. Command Console Client is installed in a remotely located PC connected to the network. Client installs and runs only on Windows 2000 or Windows NT PCs. To complete the network link proceed as follows:

1. Install Command Console Client (Refer to Chapter 3 in this guide). In the system you will use to configure and monitor your RAID Array.

2. Make sure that you have properly installed and configured an agent on the storage subsystem host system.

3. Select StorageWorks Command Console from the *Command Console Start* Menu (Figure 4-1). After a short wait, Client will display the *Navigation Window* (Figure 4-2). The Navigation Window lets you monitor and manage storage subsystems over the network.
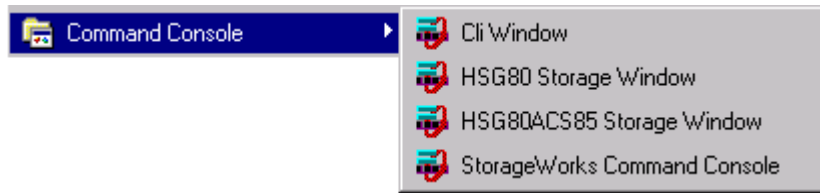
Figure 4-1. Command console start menu
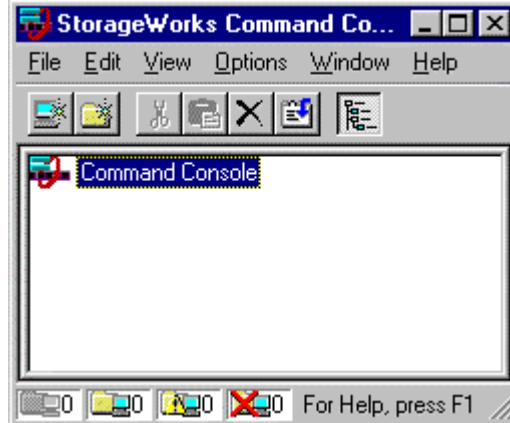
Figure 4-2. Navigation window

4. From the *Navigation Window's File* Menu (Figure 4-3), select *Add System* to display the *Add System Dialog* Box (Figure 4-4).
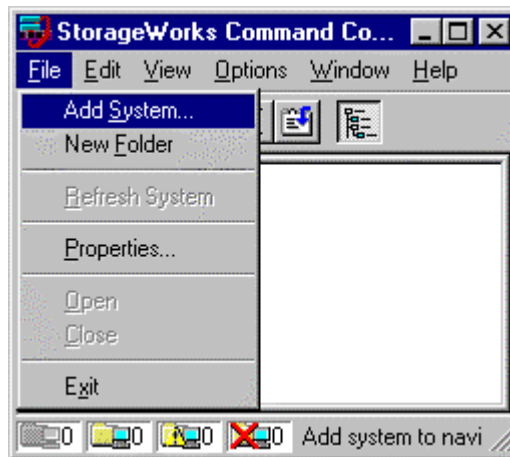
Figure 4-3. Navigation window's file menu
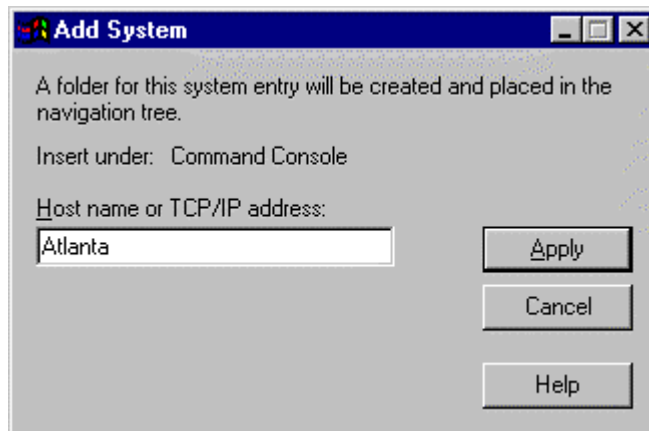
Figure 4-4. Add system dialog box

5. Enter the host platform name, as defined in Agent, then click the *Apply* button. Command Console Client searches for, finds; then displays the storage subsystem's host system as an icon in the *Navigation Window* (Figure 4-5).
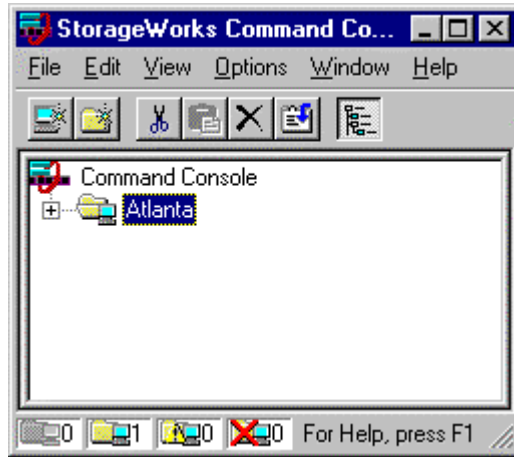
Figure 4-5. Navigation window showing storage host system "Atlanta"

6. Click on the plus sign to expand the host computer icon. When expanded, the Navigation Window displays an icon for the storage subsystem (Figure 4-6). In this example the storage subsystem is named *subsys1*. To access the subsys1's Storage System, double-click on the *Storage Window* icon.

Figure 4-6. Navigation window showing expanded "Atlanta" host icon

Double-click on the Storage Window icon to open a Storage Window to monitor and manage your RA8000/ESA12000 or MA8000/EMA12000.

Appendix A

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 *Compaq StorageWorks Command Console V2.3 User 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. You can specify a maximum of 64 host logical units per host port, for a total of 128 host units when access is from two Fibre Channel host adapter ports.

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

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

Figure A-1. Single controller/single host

■ 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.

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

Figure A-2. Single controller/two hosts

■ 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.

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

Figure A-3. Dual controller/single host

■ 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.

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

Figure A-4. Dual controllers/two hosts

- 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.
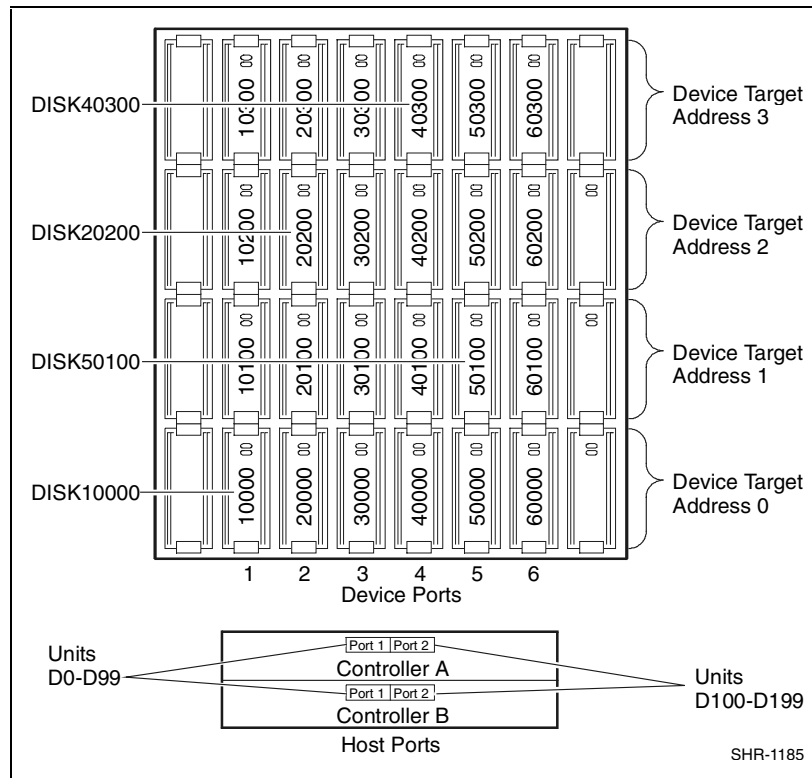
Figure A-5. Mapping of device ports/targets and host ports in a BA370
enclosure (RA8000/ESA12000)

Model 4214 Disk Enclosure Shelf 1 (Single-Bus)						
Bay	1	2	3	4	5	6	7
SCSI ID	00	01	02	03	04	05	08
	DISK10000	DISK10100	DISK10200	DISK10300	DISK10400	DISK10500	DISK10800
Bay	8	9	10	11	12	13	14
SCSI ID	09	10	11	12	13	14	15
	DISK10900	DISK11000	DISK11100	DISK11200	DISK11300	DISK11400	DISK11500

Model 4254 Disk Enclosure Shelf 1 (Dual-Bus)						
Bay	1	2	3	4	5	6	7
SCSI ID	00	01	02	03	04	05	08
	DISK10000	DISK10100	DISK10200	DISK10300	DISK10400	DISK10500	DISK10800
Bay	8	9	10	11	12	13	14
SCSI ID	00	01	02	03	04	05	08
	DISK20000	DISK20100	DISK20200	DISK20300	DISK20400	DISK20500	DISK20800

Figure A-6. Mapping of device ports/targets and host ports in a Model 4214
or Model 4254 disk enclosure (MA8000/EMA12000)

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 HSG80 Array Controller ACS V8.5 CLI
Reference Guide,* (in your platform kit), 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 HSG80 array controller. 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-7).

4. Note which serial port you use; you will need that information if using a communications program.

CXO6484B
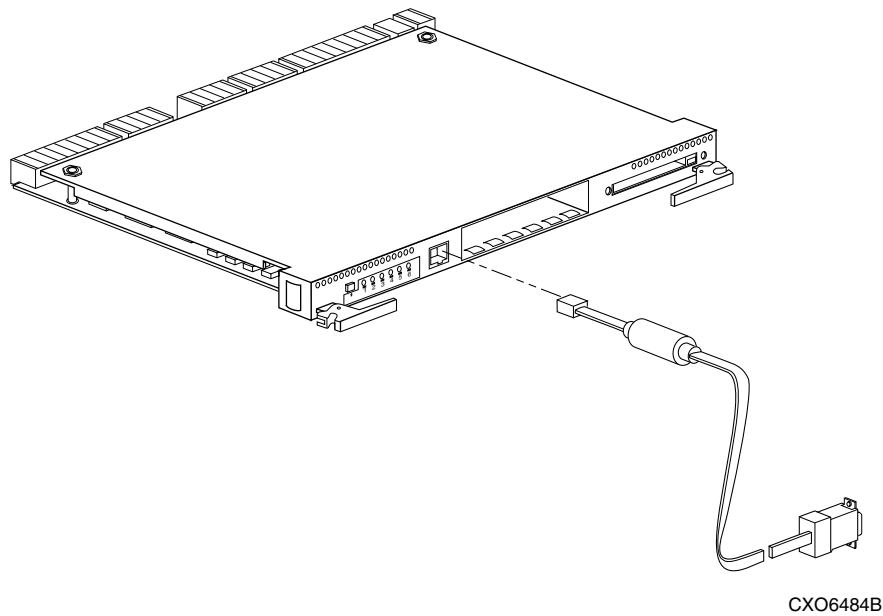
Figure A-7. Making a serial connection to the HSG80 controller

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 V8.5, 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
     Command Console LUN is lun 0 (NOIDENTIFIER)
Host PORT_1:
     Reported PORT_ID = 5000-1FE1-FF00-0171
     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_TOPOLOGY  = LOOP_HARD (loop up)
     PORT_2_AL_PA     = 72 (72 negotiated)
     NOREMOTE_COPY
Cache:
     128 megabyte write cache, version 0012
     Cache is GOOD
     No unflushed data in cache
     CACHE_FLUSH_TIMER = DEFAULT (10 seconds)
Mirrored Cache:
     Not enabled
Battery:
     NOUPS
     FULLY CHARGED
```

Expires:
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 *Compaq StorageWorks HSG80 Array Controller ACS V8.5 Configuration Guide* 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 V8.5, 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
                                 Command Console LUN is lun 0 (NOIDENTIFIER)
                           Host PORT_1:
                                 Reported PORT_ID = 5000-1FE1-FF00-0171
                                 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_TOPOLOGY  = LOOP_HARD (loop up)
                                 PORT_2_AL_PA     = 72 (72 negotiated)
                                 NOREMOTE_COPY
                           Cache:
                                 128 megabyte write cache, version 0012
                                 Cache is GOOD
                                 No unflushed data in cache
                                 CACHE_FLUSH_TIMER = DEFAULT (10 seconds)
                           Mirrored Cache:
                                 Not enabled
                           Battery:
                                 NOUPS
                                 FULLY CHARGED
                                 Expires:
                           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 *Compaq StorageWorks HSG80 Array Controller ACS V8.5 Configuration Guide* 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. 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 D99 with a maximum of 64 units. For dual controllers/two hosts, the unit numbers may range from D0 through D99 for the first host and from D100 through D199 for the second host with a maximum of 64 units per host adapter. Add units by using the ADD UNIT command.

HSG80 > **ADD UNIT 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 Stripeset

Use stripesets 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 stripeset using the ADD STRIPESET command.

HSG80 > **ADD STRIPESET DVGRPS0 DISK10100 DISK20100 DISK30100**

In this example, "DVGRPS0" is the name of the stripeset, and it is followed by a list of the disks to be included in the stripeset. The names of the stripesets are user selectable. Performance of your stripesets will be optimized if each stripeset includes disks from different device ports as shown in Figure A-5.

A.5.1 Initializing a Stripeset

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

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

HSG80 > **INITIALIZE DVGRPS0 CHUNKSIZE=DEFAULT**

A.5.2 Adding a Stripeset as a Logical Unit

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

HSG80 > **ADD UNIT D3 DVGRPS0**

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

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 stripeset:

HSG80 > **SET D3 WRITEBACK_CACHE**

Where D3 represents the host logical unit of the stripeset 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, DVGRPMO 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 D99 with a maximum of 64 units. For dual controllers/two hosts, the unit numbers may range from D0 through D99 for the first host and from D100 through D199 for the second host with a maximum of 64 units per host adapter. Add units by using the ADD UNIT command.

> HSG80 > **ADD UNIT D4 DVGRPM0**

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 D99 with a maximum of 64 units. For dual controllers/two hosts, the unit numbers may range from D0 through D99 for the first host and from D100 through D199 for the second host with a maximum of 64 units per host adapter. Add units by using the ADD UNIT command.

> HSG80 > **ADD UNIT D5 DVGRPSM0**

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/ESA12000 or MA8000/EMA12000 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 D99 with a maximum of 64 units. For dual controllers/two hosts, the unit numbers may range from D0 through D99 for the first host and from D100 through D199 for the second host with a maximum of 64 units per host adapter. Add units by using the ADD UNIT command.

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

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 *Compaq StorageWorks HSG80 Array Controller ACS V8.5 CLI Reference 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**

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

```
LUN   Uses
D1    DVGRPR0
D2    DVGRPR1
D3    DVGRPS0
D4    DISK40100
D5    DISK50100
```

Record the information in the following table:

Date_____	
LUN	Uses

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	D3
		DISK20100	
		DISK30100	
DVGRPSM0	stripeset	MIRR_0 D	5
		MIRR_1	
DVGRPM0	mirrorset	DISK10200	D4
		DISK20200	
MIRR_0	mirrorset	DISK30200	DVGRPSM0
		DISK40200	
MIRR_1	mirrorset	DISK50200	DVGRPSM0
		DISK60200	
DVGRPR0	raidset	DISK10000	D1
		DISK20000	
		DISK30000	
DVGRPR1	raidset	DISK40000	D2
		DISK50000	
		DISK60000	
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/ESA 12000 or MA8000/EMA12000 Fibre Channel subsystem.

Date_____

Name	StorageSet	Uses	Used by

Appendix **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
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.

continued

Table B-1
Configuration Options *continued*

Storage Method	Storageset Type	Number of Devices	Offers
RAID 0 + 1	Striped mirrorsets	2 - 14 mirrorsets	Performance for read requests surpassing that of an unstriped mirrorset since it can achieve load balancing.
			High Data Availability.
Individual Devices (JBOD)	Disk Drive	1	Provides the storage capacity and access speed of the disk used.
			If device fails, data is lost.

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

Appendix *C*

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.

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Appendix **D**

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Valid ALPA Settings

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

D.1 Valid ALPA Settings

Table D-1 lists the ALPA settings and corresponding 7-bit Loop IDs for hard addressing the fibre channel arbitrated loop on SGI IRIX. Use this table when setting the PORT_1_AL_PA and PORT_2_AL_PA addresses on the HSG80 controller.

The hexadecimal Arbitrated Loop Physical Address is used when setting the HSG80 Port ALPA with the CLI. However, the IRIX command, hinv –v, displays a converted form of the ALPA as the Disk Drive Unit Number. The Disk Drive Unit Number is the decimal representation of the 7-bit Loop ID.

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

AL_PA (hex)	7-Bit Loop ID (decimal)	AL_PA (hex)	7-Bit Loop ID (decimal)	AL_PA (hex)	7-Bit Loop ID (decimal)
71	65	A3	43	C7	21
72	64	A5	42	C9	20
73	63	A6	41	CA	19
74	62	A7	40	CB	18
75	61	A9	39	CC	17
76	60	AA	38	CD	16
79	59	AB	37	CE	15
7A	58	AC	36	D1	14
7C	57	AD	35	D2	13
80	56	AE	34	D3	12
81	55	B1	33	D4	11
82	54	B2	32	D5	10
84	53	B3	31	D6	9
88	52	B4	30	D9	8
8F	51	B5	29	DA	7
90	50	B6	28	DC	6
97	49	B9	27	E0	5
98	48	BA	26	E1	4
9B	47	BC	25	E2	3
9D	46	C3	24	E4	2
9E	45	C5	23	E8	1
9F	44	C6	22	EF	0

Appendix **E**

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 Windows 95, the socket numbers are assigned in the *services* file in the *windows* 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 "Compaq Computer 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

To edit the *steam.cfg* file:

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/scsi
   Q1</Sn_k
   Compaq Computer 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.

A carriage return <CR> 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
The device name that identifies this storage subsystem in the operating system. This subsystem virtual disk is represented by a drive letter in Windows NT Disk Administrator. For SGI, the name may be of the form: sc10d6510

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.

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 SGI IRIX, 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.

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

The field contains the value of 0 if no virtual disks are configured on this system, or if the ones that have been configured have not been added to the operating system as accessible devices. In this case, you must use a maintenance terminal and the CLI to create at least one virtual disk for use as a communications virtual disk.

For Windows NT systems, this parameter must be greater than zero.

device_ID1\device_IDn
A listing of the operating system device names for the virtual disks configured in the storage subsystem. The format is the same as the *access_device* field. Vertical bars (sometimes called the "pipe" character) are used to delimit the virtual disk names. The total number of names listed must equal the value in the *num_devices* field.

The listing must include the communications 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 RA7000 / ESA10000 on drive E, and mini_b on drive E. Agent will check RA7000 / ESA10000 at 20-second intervals, and mini_b at 30-second intervals. Subsystem RA7000 / ESA10000 is an HSZ70-based subsystem using a communications LUN for communication. Subsystem mini_b is an HSZ20-based subsystem using a listed device for communication. Each subsystem has six devices attached to it.

```
# Storage subsystems for HOST123
ra7000|20|0|4|2|cx3459688|cx3459699|v70z|E|E|6|F|G|H|I|J|K
mini_b|30|0|0|1|cx34596888|cx3459899|v30z|E|none|6|E|F|G|H|I|J
```

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.

Appendix **F**

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: sgiorg2000
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:-
sgiorg2000 Hsg80 12000000000 HSG80 disks(disk21100:2) (SP_MONITOR: Subsys)
      \         \         \
       \         \         \
      (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: -
sgiorg2000 Hsg80 12000000000 HSG80 disks(disk21100:2) (SP_MONITOR: Subsys)
              ↑
```

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: -
sgiorg2000 Hsg80 12000000000 HSG80 disks(disk21100:2) (SP_MONITOR: Subsys)
               ↑
```

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: -
sgiorg2000 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: -
sgiorg2000 Hsg80 10020000000 HSG80 fans(0:A:2)  (SP_MONITOR: MonitorSubsys)
              ↑
```

The fourth digit can take three values:

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

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

cabinet_number:fan_position:state

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

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

In this example, a fan failure in position A of cabinet 0, (main cabinet) failed.

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

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

Example:

```
WARNING: -
sgiorg2000 Hsg80 10002000000 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: -
 sgiorg2000 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 cabinet 0 (main cabinet).

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: - sgiorg2000 Hsg80 10000002000 HSG80 (SP_MONITOR: MonitorSubsys)

CRITICAL: Unable to open device - sc10d65l0 (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: -
sgiorg2000 Hsg80 10000000200 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: -
sgiorg2000 Hsg80 10000000020 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: -
sgiorg2000 Hsg80 10000000002 HSG80  lun(d100:4) (SP_MONITOR: MonitorSubsys)
```

This digit can take 3 values:

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

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

virtual_disk:state

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

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

In this example, Logical Unit D100 failed.

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

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

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

Hostname: sgiorg2000

WARNING:  - A subsystem change has been detected: sgiorg2000 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: sgiorg2000

WARNING:  - sgiorg2000 Hsg80 12000000000 HSG80 disks(disk10200:1 disk60300:2)
(SP_MONITOR: MonitorSubsys)

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

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