

**Command Console**  
**Version 2.3 for the MA6000**  
User Guide

First Edition (May 2000)  
Part Number AA-RMBDA-TE  
**Compaq Computer Corporation**

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Compaq StorageWorks Command Console Version 2.3 for the MA6000 User Guide  
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# About This Guide

Use this guide as a reference on how to use Compaq StorageWorks Command Console (SWCC).

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**IMPORTANT:** The MA6000 uses the HSG60 controller, which communicates with StorageWorks Command Console (SWCC). References to the HSG60 controller appear in the software, in the online Help, and in this Guide.

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## Intended Audience

This guide is intended for storage administrators. Before you use SWCC, you should have a basic understanding of the following:

- Your MA6000
- TCP/IP network
- RAID technology

## How to Use This Guide

This section summarizes the information in each chapter of this guide and allows you to link directly to each chapter.

<b>Read</b>	<b>For information about...</b>
Chapter 1	<ul style="list-style-type: none"><li>■ SWCC and its components</li><li>■ Connections available with SWCC</li></ul>
Chapter 2	<ul style="list-style-type: none"><li>■ Using the Navigation Tree</li><li>■ Stopping and starting the Asynchronous Event Service (AES)</li><li>■ Setting Up Pager Notification</li><li>■ Using SWCC with a third-party storage management program</li><li>■ Using SWCC with Event Viewer</li></ul>
Chapter 3	<ul style="list-style-type: none"><li>■ Accessing the Storage Window</li><li>■ Using the Storage Window</li><li>■ Creating Virtual Disks</li><li>■ Viewing Controller Properties</li></ul>
Chapter 4	<ul style="list-style-type: none"><li>■ Integrating SWCC with Compaq Insight Manager</li><li>■ Installing the integration patch</li></ul>
Chapter 5	<ul style="list-style-type: none"><li>■ Interpreting SNAP traps sent by the Agent</li></ul>
Chapter 6	<ul style="list-style-type: none"><li>■ Interpreting e-mail messages sent by the Agent</li></ul>
Chapter 7	<ul style="list-style-type: none"><li>■ Troubleshooting the software</li></ul>
Appendix A	<ul style="list-style-type: none"><li>■ Enabling and disabling the Command Console GUN</li></ul>
Glossary	<ul style="list-style-type: none"><li>■ Terms defined</li></ul>

## Style Conventions

Convention	Type of Information
<i>Italic type</i>	Use interface text and filenames
Type	Information that you <i>type</i> . Type information without pressing the Enter key.
Enter	Information that you <i>enter</i> . Type or select the information and then press the Enter key.
>	Menu path

## Related Publications

Document Title	Part Number
<i>Compaq StorageWorks HSG60 Array Controller ACS Version 8.5 Maintenance and Service Guide</i>	EK-HSG84-SV. C01
<i>Compaq StorageWorks MA6000 HSG60 Array Controller ACS V8.5 Solution Software for Windows NT and Windows 2000 Installation and Configuration Guide</i>	EK-HSG85-RG. B01
<i>Compaq StorageWorks HSG60/HSG80 Array Controller ACS Version 8.5 CLI Reference Guide</i>	AA-RHBZA-TE
<i>Compaq StorageWorks Fibre Channel Storage Switch User Guide</i>	AA-RHBYA-TE
<i>Compaq StorageWorks Fibre Channel Switch Quick Setup Guide</i>	AA-RHC0A-TE
<i>Compaq StorageWorks KGPSA PCI-to-Fibre Channel Host Adapter</i>	EK-KGPSA-UG
<i>The RAIDBOOK—A Source Book for Disk Array Technology RAID Advisory Board</i>	ISBN 1-879936-90-9
<i>Compaq StorageWorks Enclosure 4200 Family LVD Disk Enclosures User Guide</i>	EK-SW2ZS-UA. B01

## Online Help

Most of the information about using the Client is provided in the online Help, which is available from the following:

- Navigation Window – online Help provides information on pager notification and a tour of the Command Console Client, in addition to information on how to add a system to the Navigation Tree.
- Storage Window – online Help provides information about using the HSG60 Storage Window for monitoring devices connected to the controller.

## Compaq Technical Support

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- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Add-on boards or hardware
- Third-party hardware or software
- Operating system type and revision level

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In Canada, call 1-800-263-5868.

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

# Chapter 1

## About the StorageWorks Command Console

This information in this chapter is organized under the following topics:

Topic	Page Number
Components of StorageWorks Command Console	1-1
Connections Supported by SWCC	1-3

StorageWorks Command Console (SWCC) allows you to monitor and manage the storage connected to your HSG60 controller.

### Components of StorageWorks Command Console

SWCC includes:

- Command Console Client - The Command Console Client consists of the Navigation Tree, Navigation Window, Asynchronous Event Service and Pager Notification. For an explanation of each component, see Chapter 2, “Setting Up Notification.”
- HSG60 Client - provides a Storage Window that displays detailed information about a specific subsystem. From the Storage Window, you can manage your subsystem, for example, creating virtual disks.
- For information about how to use the features in the Storage Window, see Chapter 3, “Using the Storage Window.”

To access the Storage Window, do one of the following:

- Click *Start > Programs > Command Console > StorageWorks CC HSG60*. (serial, SCSI connection using Fibre Channel bus, and network connections)
- Double click the Storage Window icon in the Navigation Tree. (TCP/IP network connection only)
- CLI Window -You can monitor and configure your subsystem by typing commands into the Command Line Interpreter (CLI) Window. For more information, refer to the *Compaq StorageWorks HSG60/HSG80 Array Controller ACS Version 8.5 CLI Reference Guide*. You can access the CLI window by two methods:

To access the CLI Window, do one of the following:

- Click *Start > Programs > Command Console > StorageWorks CC CLI Window*.
- Double click the CLI Window icon in the Navigation Tree. (TCP/IP network connection only)
- HS-Series Agent does the following:
  - Obtains the status of the storage connected to the controller.
  - Passes the status of the devices connected to the controller to the Navigation Tree, which passes the information to the Storage Window.
  - Passes the status of the devices connected to the controller to the Event Viewer.
  - Provides E-mail notification (This feature is not available on NetWare, Microsoft Windows 2000, or Windows NT (4.0 with Service Pack 4 or later.)



For a summary of the SWCC features and components, see Table 1-1.

<b>Table 1-1 SWCC Features and Components</b>		
<b>Features</b>	<b>Agent Required?</b>	<b>Client Required?</b>
Able to create the following:	Yes	Yes
■ Striped device group (RAID 0)		
■ Mirrored device group (RAID 1)		
■ Striped mirrored device group (RAID 0+1)		
■ Striped parity device group (RAID 3/5)		
■ Individual device (JBOD)		
<b>NOTE:</b> Serial and SCSI connections do not require the Agent.		
Able to monitor many subsystems at once	Yes	Yes
Event logging	Yes	No
E-mail notification (Does not apply to Agents running on NetWare, Windows NT 4.0, or Windows 2000.)	Yes	No
Pager notification	Yes	Yes

## Connections Supported by SWCC

SWCC provides storage array management over the following connections, as summarized in Table 1-2:

- Serial connection
- SCSI connection using Fibre Channel cable
- Storage Area Network (SAN) and TCP/IP network

<b>Table 1-2 SWCC Connections for the HSG60</b>	
<b>Connection</b>	<b>Agent Required ?</b>
SAN and TCP/IP network connection	Yes
Direct serial connection*	No

**Table 1-2 SWCC Connections for the HSG60**

Connection	Agent Required ?
SCSI connection using Fibre Channel cable	No

**NOTE:** If you do not install Agent, you cannot use the Navigation Tree or pager notification.

**IMPORTANT:** SWCC does not support the Dynamic Host Configuration Protocol (DHCP) or the Windows Internet Name Service (WINS); however, you can still use these protocols on systems that do not run Command Console.

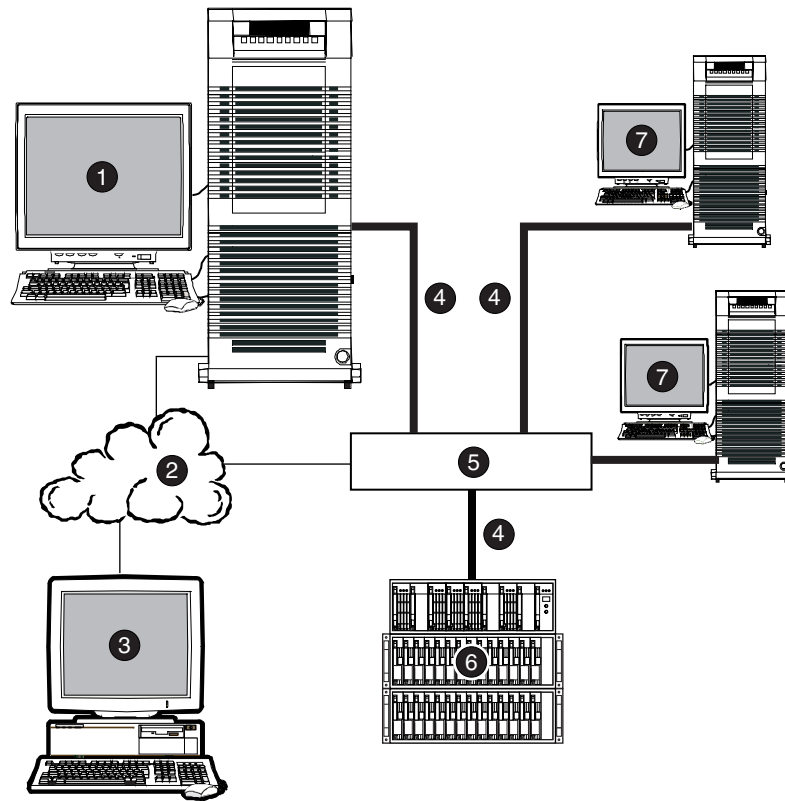
To determine whether your system is using DHCP or WINS on Windows 2000 or Windows NT 4.0:

1. Right-click Network Neighborhood on the desktop.
2. Select *Properties*.
3. Click the Protocols tab.
4. Select TCP/IP, then click *Properties*. You see the Microsoft TCP/IP Properties window.

## Storage Area Network (SAN) and TCP/IP network connection

By using a network connection, as shown in Figure 1-1, you can configure and monitor your storage subsystem from anywhere on your LAN. If you have a WAN or a connection to the Internet, you can monitor your subsystem with TCP/IP.

StorageWorks Command Console can include any number of Clients and Agents in a network. However, it is suggested that you install only one HS-Series Agent (except for the HSZ22 Agent) on the computer that has a connection to the HS-Series controller.



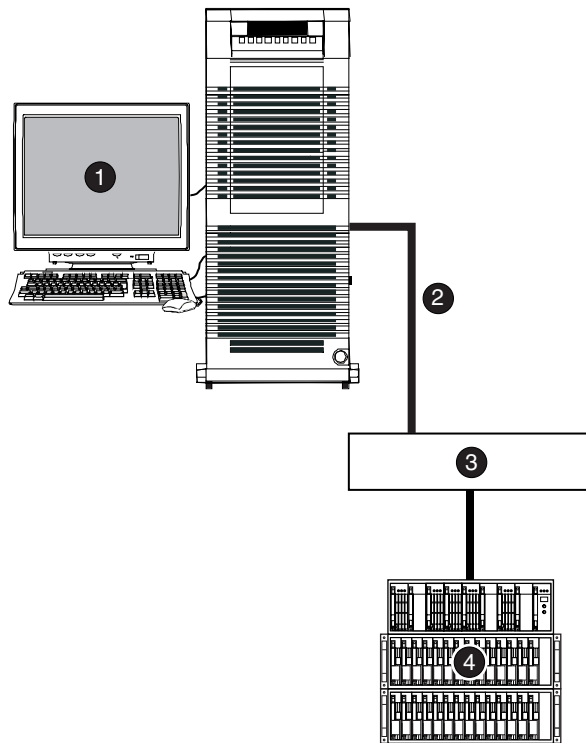
CXO7240A

Figure 1-1. SAN and TCP/IP Network connection

- |                                     |                                       |                         |
|-------------------------------------|---------------------------------------|-------------------------|
| ❶ Agent System (has Agent software) | ❸ Client System (has Client software) | ❹ MA6000 storage system |
| ❷ TCP/IP Network                    | ❺ Fibre Channel cable                 | ❻ Servers               |
|                                     | ❻ Hub or Switch                       |                         |

## Local Serial Port Connection

A local serial port connection uses only the Storage Window to manage your storage subsystems. In Figure 1-2, the client system is connected to the subsystem by a serial connection.



SHR-1597B

Figure 1-2. Local serial port connection

- ❶ Client system
- ❷ Serial connection
- ❸ MA6000 storage system

## SCSI Connection Using Fibre Channel Cable (Windows NT and Windows 2000)

A SCSI connection using the Fibre Channel bus (shown in Figure 1-3) uses only the Storage Window to manage your storage system.

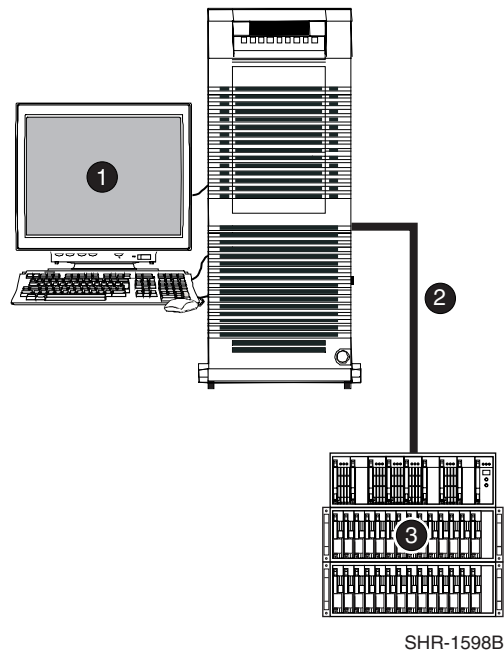


Figure 1-3. SCSI connection using Fibre Channel cable

- ① Client system that has the Storage Window
- ② Fibre Channel cable (using SCSI connection)
- ③ Hub or Switch
- ④ MA6000 storage system



# *Chapter 2*

## **Setting Up Notification**

The information in this chapter is organized under the following topics:

<b>Topic</b>	<b>Page Number</b>
Required Components for Notification	2-2
Using the Navigation Tree	2-3
About the Asynchronous Event Service	2-6
Setting Up Pager Notification	2-7
Using SWCC with a Third-Party Storage Management Program	2-7
Using Event Logging on the Client System to Monitor Your Subsystem	2-7

## Required Components for Notification

Table 2-1 lists the notification options available with SWCC and the component(s) required for each option.

<b>Notification Option</b>	<b>Required Components</b>
Navigation Tree	Client and Agent
Pager	Client and Agent
E-mail notification (applies to certain agents)	Agent
Event logging	Agent
SWCC with third-party storage management program	Agent and third-party storage management program

**NOTE:** Setup is explained in the Installation and Configuration Guide.



## Using the Navigation Tree

The Navigation Tree appears in the Navigation Window. The Navigation Tree lets you view the status of all your storage at once, as shown in Figure 2-1. Some items shown in this Navigation Tree may not represent the software in your release.

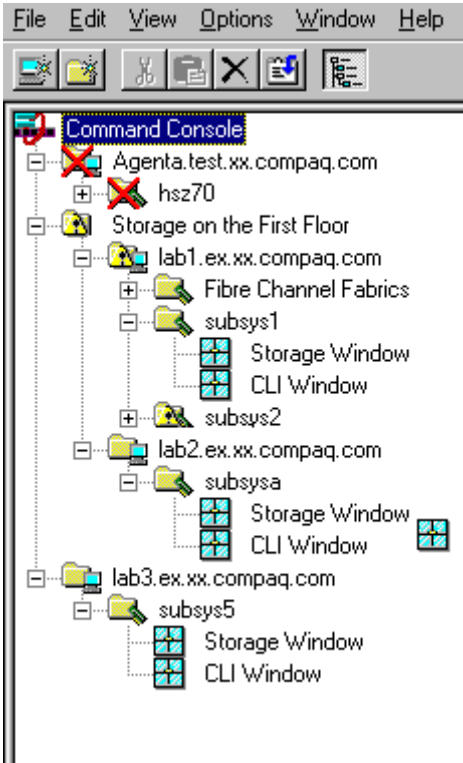


Figure 2-1. An example of the Navigation Tree

## Adding an Agent System to the Navigation Tree

The Navigation Tree allows you to manage your storage over the network from the Storage Window. If you plan to use pager notification, you must add the storage subsystem to the Navigation Tree.

To add the storage subsystem to the Navigation Tree:

1. Verify that you have properly installed and configured the HS-Series Agent on the storage subsystem host. For more information, refer to the Installation and Configuration Guide for your operating system.
2. To display the Navigation Window, click *Start > Programs > Command Console > StorageWorks Command Console*.
3. Click *File > Add System*. The Add System window appears.
4. Type the host name or its TCP/IP address and click *Apply*.
5. Click *Close*.
6. Click the plus sign (+) to expand the host icon. When expanded, the Navigation Window appears as an icon for the storage subsystem. To access the Storage Window for the subsystem, double click the Storage Window icon.

## Managing Storage Subsystems from the Navigation Tree

You can manage a storage subsystem from the Navigation Tree by double clicking the Storage Window or CLI Window icon

To access a subsystem management window:

1. Double click the folder for the storage subsystem. An icon appears underneath the folder.
2. Double click the Storage Window or CLI Window icon for the subsystem.

## Organizing Your Storage in the Navigation Tree

After you add systems to the Navigation Tree, you can organize your storage in folders:


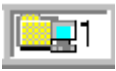


- You can place folders under the Command Console root or under another general folder in the Navigation Window.
- You can use folders to group systems and other general folders. Note that you cannot use folders to group controllers.

For example, in Figure 2-1, the general folder *Storage on the First floor* was created and two agent systems were placed in the folder. If a system in the folder is at a critical state, the status of the folder displays the same critical state.

**NOTE:** For a description of the Navigation Window, refer to the “Quick Tour” in the introduction of the Command Console Client Help.

### About the Navigation Tree Icons

The icons in the Navigation Tree (listed in Table 2-2) change to show system status. The Navigation Window status bar, located in the lower-right corner, summarizes the host system connection status.

<b>Icon</b>	<b>Description</b>
	Indicates the number of disconnected systems
	Indicates the number of fully functional systems
	Indicates the number of degraded systems
	Indicates a critically failed system

## About the Asynchronous Event Service

The Asynchronous Event Service (AES) does the following:

- Runs in the background as a service that provides status updates of the subsystems to its client system. For a client system to receive updates, it must run AES.
- Passes the trap (message) to the Navigation Tree. The Navigation Tree, in turn, passes the trap to the appropriate Storage Window or Fabric Window. When a trap provides information about a status change in a subsystem, one or more of the icons in the Navigation Tree change color.
- Send traps to pagers. To activate this feature, you must predefine each pager number in the *User Profile* section of the Event Notification menu in the Navigation Window.

**NOTE:** Refer to Command Console's Help for the latest information about how to diagnose problems that can occur when sending pages. Help provides instructions on how to put AES into a debug mode.

### Asynchronous Event Service (AES) Functionality

You can modify whether AES starts at boot time. You can also manually stop or start AES. However, you must run AES to receive page notifications of faults and to provide updates to the Navigation Tree, Storage Windows, and Event Viewer. If you stop AES, the Client software will stop the following functionality:

- Updates to the Navigation Tree and Storage Windows
- Updates from AES in the Application Log of the Event Viewer
- Page if a fault occurs

### To Stop or Start AES

#### From Windows NT

To stop or start AES manually:

1. Double click *Services* in Control Panel.
2. Click the *AsyncEventSvc* entry.
3. Click *Stop* or *Start*, then click *Close*.

To disable AES starting automatically when your system boots, change the startup option to manual in the Services window. Use the following steps:

1. Double click *Services* in Control Panel.
2. Double click the *AsyncEventSvc* entry. The Service window appears.
3. Select *Manual* under Startup Type, and click *OK*.

### From Windows 2000

To stop or start AES manually:

1. Click *Start > Settings > Control Panel > Administrative Tools > Component Services*.
2. Under Console Root, select *Services (Local)*.
3. Under Services (Local), right click *AsyncEventSvc*.
4. Click *Stop* or *Start*.

To disable the automatic start of AES at system boot, change the startup option to manual:

1. Click *Start > Settings > Control Panel > Administrative Tools > Component Services*.
2. Under Console Root, select *Services (Local)*.
3. Under Services (Local), right-click *AsyncEventSvc*.
4. From the drop-down menu, select *Properties*. The *AsyncEventSvc Properties (Local Computer)* window appears.
5. Under the General tab, select *Manual* from the Startup Type drop-down menu.
6. Click *OK*.

## Setting Up Pager Notification

You can set up Command Console to notify you by pager when a critical event occurs. This feature works with alphanumeric and numeric pagers. You can configure this feature to send pages to multiple people at various times. For example, if several people monitor your network in shifts, you can configure this feature so the software pages only people working the current shift.

To receive pages, the following must occur:

- The Asynchronous Event Service (AES) must be running on the client system on which you set up the pager notification.
- The Agent must be running.

- The client system must be added to the Agent’s list of client system entries.
- In the Agent’s list of client system entries, you must select the TCP/IP notification scheme for your client system.
- You must add the Agent system to the Navigation Tree of the client system on which you set up pager notification.

**NOTE:** Pager notification uses the Telocator Alphanumeric Protocol (TAP) adopted in 1988 by the Personal Communications Industry Association (PCIA). Verify that your paging company uses this protocol.

Table 2-3 lists and describes the steps to use to set up pager notification. Hyperlinks to chapter sections that provide detailed information for each step are included in the table.

<b>Table 2-3 Setting Up Pager Notification</b>		
<b>Step</b>	<b>Description</b>	<b>Refer to Section ...</b>
1	Numeric Pagers only - Assign pager codes to host systems and controllers.	See “Setting Up Pager Codes” on page 2-9
2	Set up user profiles.	See “Setting Up User Profiles” on page 2-10.
3	Set up notification lists.	See “Setting Up Notification Lists” on page 2-13.
4	Set up modem and polling intervals.	See “Setting Up Modem and Polling Preferences” on page 2-14.
5	Associate systems and controllers with notification list.	See “Associating Systems and Subsystems with Notification Lists” on page 2-14.

## Setting Up Pager Codes

Numeric pager support lets you receive notification about critical events.

A numeric pager usually has three fields separated by hyphens. The first field signifies the area code, the second field signifies the exchange, and the third field signifies the four-digit extension.

A page from Command Console is structured as follows:

- first field - signifies a three-digit number for the host system
- second field is a three-digit number for the subsystem
- last field is a four-digit code for the critical event.

To set up pager codes, first assign a three-digit code for each host system; then assign another three-digit code for each subsystem controller connected to that host. The last four digits are pre-assigned. You can change them.

### To Assign a Pager Code to a Host System:

1. Click a host system in the Navigation Window.
2. Click *File > Properties*.
3. Click the Event Notification tab.
4. Enter a three-digit number in the field "Pager identification number". Avoid entering a number that may be mistaken for an area code.

### To Assign a Pager Code to a Subsystem:

1. Click a subsystem controller in the Navigation Window.
2. Click *File > Properties*.
3. Click the Event Notification tab.
4. Enter a three-digit number in the field "Pager identification number".

### To View or Change a Pager Code for a Critical Event:

1. Click *Options > Event Notification > Pager Codes*.
2. Click the code you want to edit, then click *Edit*.
3. Type the new pager code in the edit field.

The default pager codes are listed in Table 2-4.

<b>Critical Event</b>	<b>Code</b>	<b>Notes</b>
Disk Fault	1000	Physical device failure
Power Supply Fault	1002	
Fan Fault	1003	
Battery Fault	1004	
Temperature Fault	1005	
Controller Fault	1006	The controller detected an internal fault
Communication Fault	1007	Agent cannot talk to the subsystem.
Other controller fault	1008	One controller is reporting a fault on the other.
External fault	1009	
LUN Fault	1010	Virtual disk failure

**NOTE:** All codes are numeric-only; alphanumeric pager codes are not supported.

## Setting Up User Profiles

1. Click *Options* > *Event Notification* > *User Profiles*.
2. Click *New*.
3. Enter a name. If you want, you can also enter a description.
4. Click the *Pager* tab.
5. Select *Enabled*.
6. Enter the phone number for your pager in the pager number field.
7. Select *Alphanumeric* for alphanumeric paging.
8. Enter the pager identification number (PIN). (This is required for alphanumeric pagers). If your numeric pager does not require a PIN, leave the field blank. For example, this field must be blank for numeric pagers that are assigned unique telephone number.



9. Enter the start and end times in the format HH:MM, using a 24-hour clock, for example, 08:00 as the start time and 17:00 as the end time. Set both fields to 00:00 for 24-hour a day notification.

Keep in mind the following:

- If you dial a code to access an outside number, the code must precede the phone number in the pager number field.
- Do not use commas with alphanumeric pagers, except to access an outside line.
- Alphanumeric pagers require you to supply the paging service provider's TAP service modem number in the pager number field.
- Optionally, you can use one or more commas to specify a two-second wait interval for numeric pager numbers. Each comma causes the pager dialer to wait two seconds before sending the PIN to the paging company. You may need to add more commas to make the Command Console pause long enough for the pager company greeting to complete.
- Not every paging company requires a PIN. If your pager is assigned a unique phone number for calling the paging company, do not enter a PIN.
- Alphanumeric pagers require a PIN.
- Refer to your pager documentation to determine which special characters are supported.

Figure 2-2 shows a sample user profile for an alphanumeric pager, and Figure 2-3 shows a sample user profile for a numeric pager.

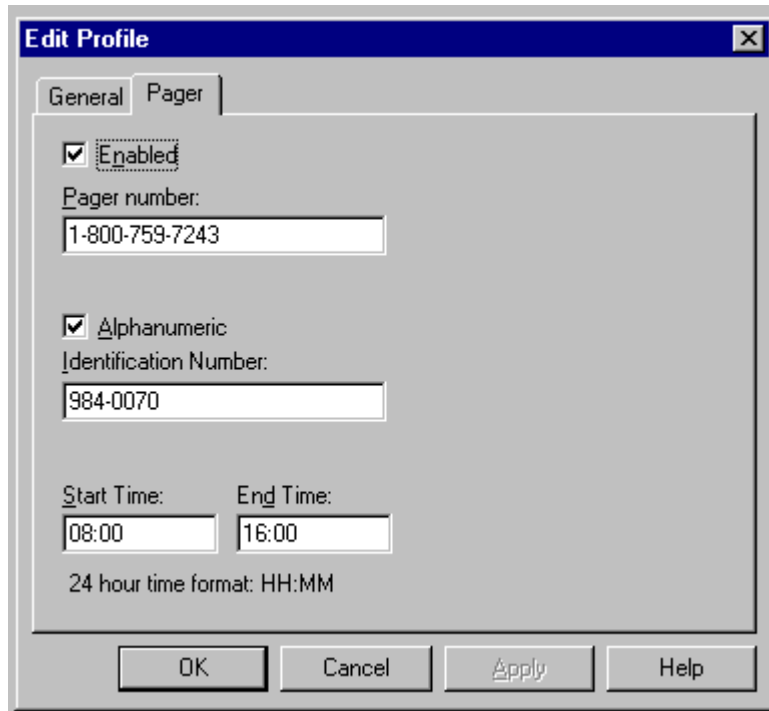


Figure 2-2. Sample user profile – alphanumeric paging

**Edit Profile**

General Pager

Enabled

Pager number:  
8,1-800-759-7243,..

Alphanumeric

Identification Number:  
984-0070#,..

Start Time: 08:00 End Time: 16:00

24 hour time format: HH:MM

OK Cancel Apply Help

Figure 2-3. Sample user profile – numeric paging

**NOTE:** The commas in the Identification Number field represent two-second wait intervals.

## Setting Up Notification Lists

Use notification lists to notify groups about critical events. Be sure to first create a user profile for each user in the group because you cannot add a user without an existing user profile to a notification list. Then, use the Properties pages to associate notification lists with systems and subsystem critical events.

1. Click *Options* > *Event Notification* > *Notification List*.
2. Click *New* and enter a name for the new notification list.
3. Write a brief description of the list (optional).
4. Add members to the list by clicking the check box next to the name.

## Setting Up Modem and Polling Preferences

The subsystem-polling interval is the frequency at which the Client pings an Agent to determine if it is running.

1. Click *Options > Preferences*
2. Enter the number of hours or minutes in the subsystem polling interval field. The default-polling interval is 30 minutes.
3. Select the COM port in your computer that your modem uses.
4. For alphanumeric pagers, select the baud rate of your paging service provider's TAP modem. Typically, this is 1200 baud.

## Associating Systems and Subsystems with Notification Lists

Before you can associate a system or controller with a notification list, You must first create a notification list. See "Setting Up Notification Lists" on page 2-13.

To associate a host system or a subsystem with a notification list for the purpose of paging a group if a critical event occurs:

1. Click a host system or a subsystem in the Navigation Window.
2. Click *File > Properties*.
3. Click the Event Notification tab.
4. Select a notification list from the drop-down list.

## Using SWCC with a Third-Party Storage Management Program

To use SWCC with a third-party storage management program:

1. Add the name of the computer on which the third-party storage management program resides to the Agent's list of client system entries. Select SNMP as the notification scheme. The Agent sends SNMP traps to every client system on its list.  
For more information on how to add client systems, see the Installation and Configuration Guide for your Agent.
2. Use the compiler that came with your third-party storage management program to compile the Management Information Base (MIB) file HS-agent.mib in this kit.

**NOTE:** Depending on the third-party software, you may need to perform additional steps. Refer to the third-party storage management program documentation.

## Using Event Logging on the Client System to Monitor Your Subsystem

The Agent can place SNMP and TCP/IP traps in the Application Log of Event Viewer, which is a part of Windows NT and Windows 2000. The HS-Series Agent collects events from the controllers and lists the events under the source, AsyncEventSvc. If the Agent is installed on Windows NT and Windows 2000, you can locate its entries in the Application Log by looking for steam under the Source column.

For a client system to receive event logs from an HS-Series Agent on another computer:

- The client system must appear on the Agent's list of client system entries and TCP/IP must be selected as a notification scheme. You can select TCP/IP and SNMP.
- The Asynchronous Event Service (AES) must be running on the client system.
- Agent must be running.

To access Event Viewer:

- Windows NT 4.0 – (*Start > Programs > Administrative Tools > Event Viewer*) to access the Application Log, select *A*pplication from the Log menu.
- Windows 2000 – (*Settings > Control Panel > Administrative Tools > Event Viewer*) to access the Application Log, select *A*pplication Log in the Tree panel.

For more information about SNMP traps, see Chapter 5, "Interpreting SNMP Traps."



# Chapter 3

## Using the Storage Window

The information in this chapter is organized under the following topics:

<b>Topic</b>	<b>Page Number</b>
Why Use the Storage Window?	3-2
Accessing the Storage Window from the Start Menu	3-2
Configuring a Controller	3-5
Creating Virtual Disks	3-9
Deleting Virtual Disks	3-10
Modifying Virtual Disks	3-11
Setting Passwords and Security Options (Network Only)	3-12
Managing and Creating Spare Devices	3-13
Using Configuration Files	3-13
Updating the Controller Firmware	3-15
Understanding the Icons	3-16

## Why Use the Storage Window?

The Storage Window allows you to configure your storage subsystem. Use the Storage Window to do the following:

- Configure the properties of the controller, host ports, and cache
- Create:
  - Striped device group (RAID 0)
  - Mirrored device group (RAID 1)
  - Striped mirrored device group (RAID 0+1)
  - Striped parity device group (RAID 3/5)
  - Individual device (JBOD)
- View the status of virtual disks, communications LUN, and battery
- Update the controller firmware

## Accessing the Storage Window from the Start Menu

You can access the HSG60 Storage Window from the Start menu. You can connect to the Storage Window over a serial connection, a SCSI connection using the Fibre Channel bus, and a TCP/IP network.

Before you can make either a SCSI connection using the Fibre Channel bus or a network connection, you must have one of the following:

- A virtual disk created on the subsystem
- Command Console LUN (CCL) enabled

For more information about:

- Creating a virtual disk, see “Creating Virtual Disks” on page 3-9.
- Enabling and disabling the Command Console LUN, see Appendix A, “About the Command Console LUN.”
- Accessing the Storage Window from the Navigation Tree, see “Managing Storage Subsystems from the Navigation Tree” on page 2-4.



## Establishing a Serial Connection

The simplest connection to a subsystem is a direct cable connection from the Client's host system to a serial port on the subsystem.

To set up a serial connection:

1. Click *Start > Programs > Command Console > StorageWorks CC HSG60*.
2. When the Connection Selected window displays, select Serial and then click *OK*. The Connect Serial window, shown in Figure 3-1, appears.
3. From the drop-down menu, select the COM port used by the RAID HSG60 controller.
4. Select a baud rate, a Subsystem Physical View, and a Subsystem Grid View. Click *Connect*. When the Storage Window appears, you are connected to your subsystem.

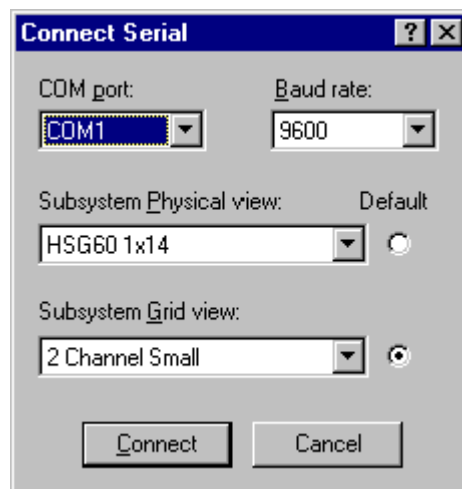


Figure 3-1. Connect Serial dialog box for Storage Window

## Establishing a SCSI Connection Using the Fibre Channel Bus

1. Click *Start > Programs > Command Console > StorageWorks CC HSG60*.
2. When the Connection Selection dialog box displays, select the *SCSI* option. The SCSI Setup window, shown in Figure 3-2, displays.
3. Select a drive mapped to the subsystem, then click *Connect*.

After a brief delay, Command Console connects to the MA6000 and displays the corresponding Storage Window.

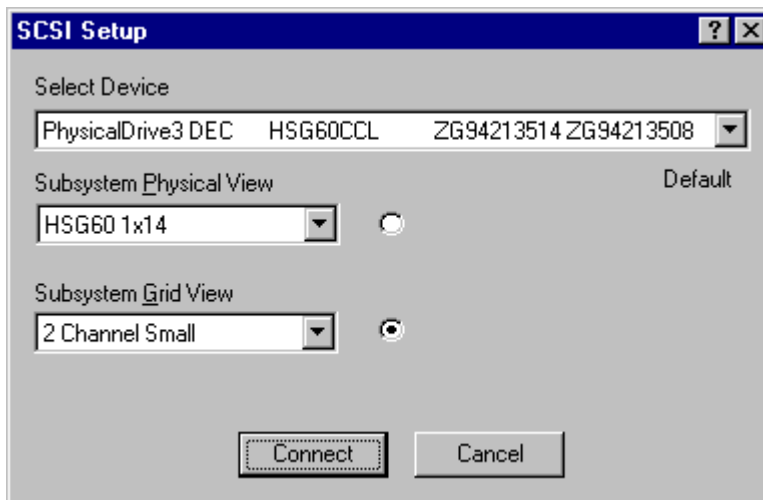


Figure 3-2. SCSI Setup window

## Establishing a Network Connection


To use SWCC to manage the HSG60 controller over a network, you must install the Command Console Client, the HSG60 Client (Storage Window), and the HS-Series Agent. The Command Console Client and the HSG60 Client are installed together.

To set up SWCC to manage the HSG60 over a network:

1. Click *Start > Programs > Command Console > StorageWorks CC HSG60*. The Client displays the Connection Selection window.
2. Select the Network (TCP/IP). Client displays the Connect Network (TCP/IP) window.
3. Enter the host IP name or address in the text box, then click *Detect Subsystems*. Client locates the subsystem connected to the host.
4. Select the subsystem, then click *Connect*. The Client displays the Storage Window.

## Configuring a Controller

Your controller's operating parameters are stored under six tabs in the Controller Properties window, which you can access by one of two methods:

- Double clicking a controller icon  in the Storage Window
- Right clicking a controller icon in the Storage Window and selecting *Properties*.

Changes to controller settings require a controller restart for to take effect. The program prompts you to confirm the restart.

## Modifying the General Properties of the Controller

The properties of the top and bottom controllers, such as type, serial number, SCSI address, firmware revision, hardware revision, and common parameters are stored under the General tab.

To configure the general properties of the controller, click the General tab, and refer to Table 3-1 for a description of each general property.

**Table 3-1 General Tab in the Controller Properties Window**

What you can change	Description
Enable Command Console LUN alias	<p>The Command Console LUN (CCL) appears as a virtual device to your host. If your host allows device aliases, you can assign an alias to the CCL.</p> <p>To use this feature, enable your CCL. Click the Enable box and enter a name in the text box. Ensure the format of the name follows the guidelines for your operating system.</p>
Allocation class	<p>Use extreme caution when changing the setting of this field.</p> <p>Changing the setting of the allocation class of your controller may cause data corruption and your host system may require restarting.</p>
Enable autospare	<p>If a replacement policy is in place and autospare is enabled, a failed drive will look for a spare drive. Check your legend for icons that show the status of this process. To determine whether a replacement policy is set, click the Settings tab in the Virtual Disk Properties window.</p> <p>Note that this option is not available on devices using RAID 0 or JBOD storage.</p>
Time and date	<p>The controller uses the internal clock to time stamp event logs and status messages.</p> <p>Both the time and date fields must have values to change either parameter. In other words, you cannot change or enter a time and leave the date field blank.</p>
Enable remote copy mode	<p>Enable remote copy mode activates remote copy for a controller pair (subsystem). This feature requires you to first enable remote copy mode for the controller.</p> <p>To disable this feature, first remove all remote copy sets and remote copy set connections from the Connections tab of the Controller Properties window</p>
Remote copy node	<p>The Remote copy node field displays the name assigned to the controller pair when remote copy was enabled. To change the value for this field, you must first delete all existing remote copy connections from the Connections tab of the Controller Properties window.</p>

## Viewing the Properties of the Host Port

The host ports tab displays the following information:

- Port ID
- Fibre Channel profile
- Requested topology
- Actual topology
- Remote copy node name that was assigned when remote copy was enabled

## Modifying Properties of the Cache

The Cache tab provides the following information:

- Write cache size
- Cache version
- Cache status
- Unflushed data in cache
- Cache flush time (seconds)
- Cache uninterruptible power supply (UPS) settings
- Enables mirrored cache

Confirm the following:

- Cache flush\_time: (seconds): is 10
- No UPS is selected

## Viewing the Communications LUN

Click the Communications LUN tab to display the properties of the Command Console LUN. If the Command Console LUN (SWCC virtual LUN) is disabled, the options under this tab are unavailable. For more information about Floating and Fixed options and about the Command Console LUN, see Appendix A, “About the Command Console LUN.”

## Modifying the Connection Properties

Click the Connections tab to modify the connections properties, shown in Table 3-2.

**Table 3-2 Connections Tab in the Controller Properties Window**

What you can change	Description
Connection name	<p>The connection name is a unique string of alphanumeric or punctuation characters that identifies a connection between a host adapter and the HSG controller. The host performs a Fibre Channel bus scan when it receives notification of a change to the fabric. As part of its device discovery process, the host then identifies the HSG60 as a SCSI device and login to the HSG controller. As the host performs the login, the HSG controller allocates an entry in the host connections table and assigns a connection name to the new connection. Subsequent logins by the host will use this same connection name and entry.</p> <p>Controller-produced connection names take the form "NEWCONNnn", where nn is a two-character, decimal integer. This string format is not allowed for user-created connections.</p>
Operating system	You can set your controller to operate with a variety of operating systems. Refer to the release notes for operating systems compatibility.
Unit offset	A decimal integer used to determine the LUN address of a virtual disk on a specific connection. Offsets can range from decimal 0-199.

## Viewing Properties of the Battery

The Battery tab provides the following information:

- The state of the battery
- The expiration date of the battery

## Creating Virtual Disks

You can use the Virtual Disk Wizard to create different types of logical storage units (called virtual disks) on your subsystem.

You can create the following types of virtual disks:

- Single-device virtual disks (JBODs)
- Striped virtual disks (RAID 0)
- Mirrored virtual disks (RAID 1)
- Striped mirrored virtual disks (RAID 0+1)
- Striped parity virtual disks with parity across all drives (RAID 3/5)

**NOTE:** The capacity of the smallest member, not the largest, determines the maximum capacity of RAID-based virtual disks.

- The maximum capacity of RAID 0 virtual disks is equal to the number of members times the capacity of the *smallest* member.
- The maximum capacity of RAID 1 virtual disks is equal to the capacity of the *smallest* member.
- The maximum capacity of RAID 0+1 virtual disks is equal to the number of members in one stripe times the capacity of the *smallest* mirrorset member.
- The maximum capacity of RAID 3/5 virtual disks is equal to the number of members minus one times the capacity of the *smallest* member.

Before you can create virtual disks from a physical device, your controller must know of the device. You can add devices online without restarting the controller. In the following procedure, you add a physical device before you create a virtual disk.

To add a physical device and then create a virtual disk:

1. From the Navigation Window open a Storage Window within a desired subsystem.
2. Click *Storage > Add* in the Navigation Window.
3. If there is no user input in the Storage Window within an hour, you are prompted to enter a password. Type the SWCC password in the Security Check window and click *OK*.

The SWCC password was created when you installed the Agent. To change the password, open the Agent Configuration utility on the agent system (host).

4. Select the type of virtual disk that you want to create, and click *Next* in the Add Virtual Disk Wizard – Step 1 of 5 window.
5. Select the devices to include in the virtual disk by clicking them in the Available Storage field in Add Virtual Disk Wizard – Step 2 of 5 window.  
  
As you click a device, it is added to the Selected Devices field. If you selected JBOD in the previous step, you can select only one device.
6. Click *Next*. You see the Add Virtual Disk Wizard – Step 3 of 5.
7. Type the capacity of the virtual disk in the Capacity for Virtual Disk field, and click *Next* in the Add Virtual Disk Wizard – Step 3 of 5 window. This window provides you with the maximum and minimum megabytes that you can choose for a capacity.
8. Type the unit number, operating parameters, and options for the virtual disk, then click *Next*. To save the controller configuration, select the *Save controller configuration to virtual disk setting* in the Add Virtual Disk Wizard – Step 4 of 5 window.
9. The Add Virtual Disk Wizard – Step 5 of 5 window – displays the selections that you made in steps 1-4.
10. If you are satisfied with your choices, click *Finish* to create the virtual disk.

---

**IMPORTANT:** The time required to initialize a virtual disk depends on the number of members and its size. During initialization, the virtual disk is unavailable for I/O. You should not use the virtual disks until initialization is complete.

---

## Deleting Virtual Disks

The virtual disks in your subsystem are logical units that contain your user data. Although virtual disks do not exist in a physical sense, their logical structure ties together the physical pieces of your data spread across the members. Use extreme caution when deleting a virtual disk. You may delete valuable user data.

To delete a virtual disk:

1. Do one of the following:
  - From Windows NT 4.0 and Windows 2000, use the Disk Administrator to delete the partition.
  - From UNIX or OpenVMS, ensure that any file systems that were mounted on the device are unmounted and removed. If the drive was part of a logical volume, remove the device from the logical volume system.



2. Click the icon of the virtual disk that you want to delete.
3. Select *Storage > Virtual Disk > Delete* in the Storage Window.
4. If Client prompts you for your password, enter it.
5. When Client prompts to confirm the change, click *Yes* to continue. Client deletes your virtual disk from your configuration and refreshes the Storage Window.

## Modifying Virtual Disks

You can modify the characteristics of your virtual disks in two ways:


- Change their operating characteristics
- Remove their members



**CAUTION:** Use extreme caution when modifying the characteristics of a virtual disk. You may be putting valuable user data at risk.

You can change the characteristics of a virtual disk by accessing its property sheets.

To access the property sheets of a virtual disk, refer to Table 3-3 and do one of the following:

- Double click the virtual disk icon  .
- Right click a virtual disk icon and select *Properties*.

**Table 3-3 Virtual Disk Properties Window**

Tab	Information
General	Lists the characteristics of the virtual disk.
Settings	<ul style="list-style-type: none"> <li>■ You can change chunk size, reconstruction rate, replacement policy, and maximum cached transfer blocks.</li> <li>■ You can also enable or disable writeback cache by clicking the checkbox. Click the <i>OK</i> button to save the changes and to exit.</li> </ul>
Membership	<ul style="list-style-type: none"> <li>■ Displays the member devices.</li> <li>■ Can view a device by name and its current state, channel, target, and capacity.</li> </ul>

## Setting Passwords and Security Options (Network Only)

Password security prevents unauthorized users from changing or removing storage configurations. In SWCC, the following operations require a password:

- Changing controller configuration
- Changing virtual disk configuration
- Changing device settings

### Security Options

There are two security options, View Only and Make Changes, which are available from the Storage Window Options menu.

### Password Security

Password security prevents unauthorized users from changing or removing storage configurations.

You create a password when you install the HS-Series Agent on a system. The password is encrypted and stored in the file where the Command Console Agent resides. To set or change a password, use the Agent Configuration menu.

Command Console allows a user with a valid password to make configuration changes for one hour. If an hour elapses without user input, the Command Console resets itself to View only. Any configuration change resets the timer and keeps the current password active for one hour.

## Managing and Creating Spare Devices

Making a spare device part of a virtual disk protects the integrity of the RAID setup. A spare is especially important for virtual disks that have RAID requirements of two or more devices. If one device fails, the virtual disk instantly and automatically activates the spare device as a replacement.

A spare works as follows: if a device fails in a RAID 1, RAID 0+1, RAID 3/5, or RAID 5 virtual disk, the spare automatically replaces the failed device and the controller reconstructs all virtual disks of which the failed device was a member.

After the controller writes data to a spare, the spare becomes part of the same device group in which a device failed.

### Creating a Spare Device

To create a spare device:

1. In the Storage Window, click the device that you want to use as a spare. (For an automatic failed drive replacement, the device must be available and have a capacity equal to or greater than the lowest capacity drive in the group.)
2. From the Storage menu, choose *Device*, then choose *Make Spare*.

### Clearing Failed Devices

In the Storage Window, the icon of a failed device appears with a X covering it.

To clear the failed device:

1. From the Storage menu, select *Device*.
2. Then select *Delete*.

## Using Configuration Files

You can use a configuration file to save a subsystem configuration to view or reconstruct it at another time. You can revert to a saved configuration at any time. Client reads the configuration file that you choose and sets up your subsystem accordingly.

## Saving Configuration Settings to a File

To save the configuration settings for a subsystem:

1. Click *Storage > Controller Configuration > Save*.
2. Follow the instructions on the screen.

The current configuration settings, including caches, LUNs, host port, and stripe size, are saved to a file at the location that you specify.

## Restoring Configuration Settings from a File

You can restore your entire subsystem from a saved configuration file. Client can restore your subsystem only if the configuration file corresponds to your subsystem's hardware configuration and if all of the controllers are attached to a serial connection.



**CAUTION:** Be aware of the configuration information in the configuration file that you choose. If you choose a file that is incompatible with the current configuration of data on your devices, you put your data at risk.

---

To restore your subsystem from a saved configuration file:

1. Select one of the displayed options:
  - If you need to reconfigure a failed controller that has existing virtual disks, select *Load configuration only*. The Client recreates your virtual disks, but it does not initialize them. Your data is not overwritten.
  - If you are configuring a new system, select *Load configuration and initialize virtual disks*.
2. Click *OK*.
3. When the Open dialog box displays, specify the location (path) and file name in the text box, then click *Open*. The configuration settings, such as caches, LUNs, host port, and stripe size are restored.



**CAUTION:** If the original hardware and connections are replaced or if the original configuration settings are not saved before making new changes, you cannot restore the original configuration settings.

---

## Updating the Controller Firmware

For information and restrictions about downloading various versions of controller software, refer to the release notes for your version of Client. You can upgrade your firmware over a network or a SCSI connection.









1. Click *Storage > Update Controller Software* in the Storage Window. A window appears asking you to specify the firmware file that you want to load.
2. Enter the name of the firmware file name (Its extension is *.fdi*). Then click *Start Update*. When the firmware update is complete, the system automatically reboots and updates the controller firmware.

## Understanding the Icons

You can obtain a definition of the icons by clicking *View > Legend* in the Storage Window.

The Storage Window provides detailed information in both physical and logical views of a subsystem in the Storage Window. In each view, icons represent device and virtual disk states. These icons change to indicate status. An X through a device indicates device failure. The Storage Window status bar indicates power, fan, temperature, and battery states.

**Table 3–4 Description of Icons in the Storage Window Status Bar**

Icon	Description
	Indicates that the cabinet fans are all operating normally
	Indicates a problem with the cabinet fans
	Indicates that the cabinet temperature is within its acceptable range
	Indicates that the cabinet temperature is out of its acceptable range
	Indicates that all power supplies are operating normally
	Indicates that the cache backup batteries are fully charged and operating normally
	Indicates a low charge condition on the cache backup batteries
	Indicates that the cache backup batteries have failed or are discharged

# Chapter 4

## Integrating SWCC with Compaq Insight Manager

You can use the HSG60 Storage Window within Compaq Insight Manager version 4.23. If your HSG60 controller uses Array Controller Software (ACS) version 8.5 or later, install the integration patch (HSG80 Shim). This patch allows you to use the HSG60 Storage Window within Compaq Insight Manager to monitor and manage the controller.

The information in this chapter is organized under the following topics:

<b>Topic</b>	<b>Page Number</b>
Installing the Integration Patch	4-2
Integrating the HSG60 Storage Window with Compaq Insight Manager	4-2
Compaq Insight Manager Unable to Find the HSG60 Storage Window	4-3
Removing the Integration Patch Corrupts Storage Window	4-3

## Installing the Integration Patch

To install the integration patch:

1. Verify that the HSG60 Storage Window for ACS 8.5 or later is installed by looking in Add/Remove Programs. (Click *Start > Settings > Control Panel > Add/Remove Programs*)
2. Verify that the HSG80 Storage Window version 2.1 is installed by looking in Add/Remove Programs (*StorageWorks HSG80 V2.1*). HSG80 Storage Window version 2.1 is required to run the integration patch.
3. Verify that Compaq Insight Manager version 4.23 is installed.
4. Install the integration patch from the Solution Software CD-ROM by double clicking *setup.exe* in the top-level directory. The SWCC Setup window appears.
5. Select HSG80 Controller Shim. If you do not have the HSG80 Storage Window version 2.1, also select HSG80 Controller.
6. Click Next.

The patch is installed in the same location as the original SWCC installation.

## Integrating the HSG60 Storage Window with Compaq Insight Manager

You can open the HSG60 Storage Window from within the Windows-based Compaq Insight Manager 4.23.

To open the HSG60 Storage Window:

1. Look in Add/Remove Programs in the Control Panel to verify that the following are installed:
  - The HSG60 Storage Window for ACS 8.5 or later (required to open the correct Storage Window for your firmware).
  - The HSG80 Storage Window 2.1 (*StorageWorks HSG80 V2.1*). The integration patch uses files in this program.
  - Compaq Insight Manager 4.23.
  - Compaq Insight Manager integration patch (*HSG80 Insight Manager Shim*).
2. Verify that you have installed the Compaq Insight Manager Agent and the StorageWorks Command Console HS-Series Agent on the same computer.



3. Add the name of the client system running Compaq Insight Manager to the Agent's list of client system entries and choose SNMP as a notification scheme.
4. Open Compaq Insight Manager.
5. To open the Server window, click the device that you want to observe in the Compaq Insight Manager Navigation window.
6. Click *Mass Storage* in the Server window. The Compaq Insight Manager Navigation Tree is displayed.
7. Click the + symbol next to *RAID Storage System*. The Navigation Tree expands to display the listing called *Storage System Information*.
8. Double click *Storage System Information*. You are given the status of the system.
9. Click *Launch*. The controller's Storage Window appears.

## Compaq Insight Manager Unable to Find the HSG60 Storage Window

If you install Compaq Insight Manager before you install SWCC, Compaq Insight Manager cannot find the HSG60 Storage Window.

To fix this, do the following:

1. Double click the Insight Agents icon (*Start > Settings > Control Panel*). A window appears showing you the active and inactive Agents under the Services tab.
2. Highlight the entry for Fibre Array Information and click Add. The Fibre Array Information entry is moved from Inactive Agents to Active Agents.

## Removing the Integration Patch Corrupts Storage Window

If you remove the integration patch, HSG80 Storage Window version 2.1 cannot work. You have to reinstall HSG80 Storage Window version 2.1. The integration patch uses some of the same files as the HSG80 Storage Window version 2.1.



# Chapter 5

## Interpreting SNMP Traps

This chapter describes the format of an SNMP trap. When a physical storage device, a logical storage unit, or a physical enclosure component changes state, the HS-Series Agent sends an SNMP trap to every system, with its the SNMP option enabled, that appears in the Agent's list of client system entries.

An Agent SNMP trap consists of the following information fields:

- Source IP address
- GENERIC = 6 (6 = ENTERPRISE-SPECIFIC VALUE TO FOLLOW)
- SPECIFIC = 0 or 1, where:
  - "0" indicates that the storage component transitioned from a bad to a good state
  - "1" indicates that the storage component transitioned from a good to a bad state
- Object ID (OID) Variable of the offending storage component
- OCTET STRING Value returning the name of the subsystem containing the storage component specified by the OID Variable

The information in this chapter is organized under the following topics:

Topic	Page Number
Object ID (OID) Variables	5-2
Octet String Values	5-3
ID and State Values	5-3
Trap Example	5-5

## Object ID (OID) Variables

Each object ID (OID) is prefixed by a Base Enterprise Number (BEN) for the Command Console product. The default BEN for Command Console Agents is as follows:

1.3.6.1.4.1.36.2.15.21

(iso.org.dod.internet.private.enterprises.dec.ema.sysobjects.raidmanager)

The following are the OID values used by Command Console:

- Disk Status = BEN + .3.2.1.4  
(BEN + .subsys.ssStatusTable.ssEntry.ssDiskStatus)
- Power Supply Status = BEN + .3.2.1.5  
(BEN + .subsys.ssStatusTable.ssEntry.ssPowerStatus)
- Cooling Status = BEN + .3.2.1.6  
(BEN + .subsys.ssStatusTable.ssEntry.ssFanStatus)
- Cache Battery Charge Status = BEN + .3.2.1.7  
(BEN + .subsys.ssStatusTable.ssEntry.ssCacheBatteryStatus)
- OverTemperature Status = BEN + .3.2.1.8  
(BEN + .subsys.ssStatusTable.ssEntry.ssTemperatureStatus)
- Communication Status = BEN + .3.2.1.9  
(BEN + .subsys.ssStatusTable.ssEntry.ssCommStatus)
- EMU External Input Status = BEN + .3.2.1.10  
(BEN + .subsys.ssStatusTable.ssEntry.ssEmuExtInputStatus)
- THIS Controller Status = BEN + .3.2.1.12  
(BEN + .subsys.ssStatusTable.ssEntry.ssController1Status)
- OTHER Controller Status = BEN + .3.2.1.19  
(BEN + .subsys.ssStatusTable.ssEntry.ssController2Status)
- LUN Status = BEN + .3.2.1.27  
(BEN + .subsys.ssStatusTable.ssEntry.ssLUNStatus)

If your SNMP Management Utility has the Agent MIB compiled, the utility should display the character string values (shown in parentheses above). Note that some OID values specified in the MIB are not used for SNMP traps.

## Octet String Values

The octet string value attached to a trap takes the form:

*subsystem\_name controller\_type ID:state*

where:

*subsystem\_name* = the name of the subsystem to which the trap applies

*controller\_type* = the model number of the controller in the subsystem

*ID* = the identification of the storage component that caused the trap

**NOTE:** A "storage component" can be a physical storage device, a logical storage unit, or a physical enclosure component.

*state* = the status of the storage component that caused the trap

## ID and State Values

The range of values in the ID and status value fields varies, depending upon the type of storage component causing a trap. Acceptable values for various component are as follows:

- For disk drives:

*disk\_name:state*

where:

*disk\_name* = the name of the disk drive in the subsystem (for example, "disk20100")

*state* = either of the following:

1 = drive went from bad to good

2 = drive went from good to bad

- For temperature sensors:

*cabinet\_number:sensor\_type:state*

where:

*cabinet\_number* = the cabinet ID, from 0-3, in a BA370 enclosure

*sensor\_type* = EMU sensor, sensor 1, or sensor 2 in a 2100 enclosure

*state* = either of the following:

1 = temperature went from bad to good

2 = temperature went from good to bad

■ For cabinet fans:

*cabinet\_number:fan\_position:state*

where:

*cabinet\_number* = the cabinet ID, from 0-3, in a BA370 enclosure

*fan\_position* = fan location, from 1-3

*state* = either of the following:

1 = went from bad to good

2 = fan went from good to bad

■ For power supplies:

*cabinet\_number:pwr\_position:state*

where:

*cabinet\_number* = the cabinet ID, from x-x, in a BA370 enclosure

*pwr\_position* = power supply location, from 1-2

*state* = any of the following:

1 = power supply went from bad to good

2 = power supply went from good to bad

3 = power supply not present

■ For batteries:

*controller\_device\_scsi\_id:state*

where:

*controller\_device\_scsi\_id* = the SCSI ID of the reporting controller on the controller's device bus

*state* = any of the following:

good = battery is good

low = battery voltage is low

fail = battery has failed

■ For LUNs:

virtual\_disk\_number:state

where:

*virtual\_disk\_number* = the unit number of the virtual disk

*state* = any of the following:

0 = good

1 = reduced

2 = reconstructing

3 = failed

## Trap Example

An example SNMP trap for subsystem “subsys1” with a failing power supply on an Agent at IP address “16.82.16.01” would contain the following information:

```
Source address = 16.82.16.01
GENERIC = 6
SPECIFIC = 1
OID Value = 1.3.6.1.4.1.36.2.15.21.3.2.1.5 (iso.org.dod.internet.private.enterprises.
dec.ema.sysobjects.raidmanager.subsys.ssStatusTable.ssEntry.ssPowerStatus)
OCTET STRING = subsys1 HSZ70 1:3:2
```

```
--
-- iso(1) org(3) dod(6) internet(1) private(4) enterprises(1) dec(36)
-- ema(2) sysobjids(15) raidmanager(21)
RAIDMANAGER-MIB DEFINITIONS ::= BEGIN
```

```
imports
enterprises
FROM RFC1155-SMI
OBJECT-TYPE
FROM RFC-1212
Displaystring
FROM RFC-1213;
```

```
dec      OBJECT IDENTIFIER ::= { enterprises 36 }
ema      OBJECT IDENTIFIER ::= { dec 2 }
sysobjids OBJECT IDENTIFIER ::= { ema 15 }
raidmanager OBJECT IDENTIFIER ::= { sysobjids 21 }
```

```
-- raidmanager MIB
agent      OBJECT IDENTIFIER ::= { raidmanager 1 }
workstation OBJECT IDENTIFIER ::= { raidmanager 2 }
subsys     OBJECT IDENTIFIER ::= { raidmanager 3 }

-- Agent Information Group
agManufacturer OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The name of the Enterprise Storage Manager Agent manufacturer."
    ::= { agent 1 }

agMajVersion OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "Enterprise Storage Manager Agent Major Version Number (e.g., 3 for 3.0).\"
    ::= { agent 2 }

agMinVersion OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION "Enterprise Storage Manager Agent Minor Version Number (e.g., 0 for 3.0).\"
    ::= { agent 3 }

agHostName OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The Host System Network Name where the agent resides.\"
    ::= { agent 4 }

agEnterprise OBJECT-TYPE
    SYNTAX OBJECT IDENTIFIER
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The Enterprise ID subtree for Enterprise Storage Manager Agent MIB is registered.\"
    ::= { agent 5 }
```



```
agDescription OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The Enterprise Array Storage Agent description."
::= { agent 6 }

-- Workstation Group

wsCPU OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The workstation CPU type (e.g., 80486)."
```

```
 ::= { workstation 1 }

wsComputerType OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The workstation Computer type (e.g., PC/AT)."
```

```
 ::= { workstation 2 }

wsModel OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The workstation model number."

 ::= { workstation 3 }

wsSubModel OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The workstation submodel number."

 ::= { workstation 4 }
```

```
wsBiosVersion OBJECT-TYPE
  SYNTAX DisplayString
  ACCESS read-only
  STATUS mandatory
  DESCRIPTION
    "The workstation BIOS Version."

 ::= { workstation 5 }

wsOS OBJECT-TYPE
  SYNTAX DisplayString
  ACCESS read-only
  STATUS mandatory
  DESCRIPTION
    "The workstation operating system name (e.g., WINNT)."

 ::= { workstation 6 }

wsOSMajVersion OBJECT-TYPE
  SYNTAX INTEGER
  ACCESS read-only
  STATUS mandatory
  DESCRIPTION
    "The workstation OS major version number (e.g., 3 for WINNT 3.51)."

 ::= { workstation 7 }

wsOSMinVersion OBJECT-TYPE
  SYNTAX INTEGER
  ACCESS read-only
  STATUS mandatory
  DESCRIPTION
    "The workstation OS minor version number (e.g., 51 for WINNT 3.51)."

 ::= { workstation 8 }

-- Subsystem Group

ssTotalSubSystems OBJECT-TYPE
  SYNTAX INTEGER
  ACCESS read-only
  STATUS mandatory
  DESCRIPTION
    "The total number of subsystems presently serviced by this agent."

 ::= { subsys 1 }

-- Subsystem Status Group
```

ssStatusTable OBJECT-TYPE  
SYNTAX SEQUENCE OF SsEntry  
ACCESS not-accessible  
STATUS mandatory  
DESCRIPTION  
"This table holds the status information for each subsystem."

::= { subsys 2 }

ssEntry OBJECT-TYPE  
SYNTAX SsEntry  
ACCESS not-accessible  
STATUS mandatory  
DESCRIPTION  
"The subsystem information entry."  
INDEX { ssEntryIndex }

::= { ssStatusTable 1 }

SsEntry ::=

SEQUENCE{  
ssEntryIndex  
INTEGER,  
ssSubsysName  
DisplayString,  
ssOverallStatus  
INTEGER,  
ssDiskStatus  
INTEGER,  
ssPowerStatus  
INTEGER,  
ssFanStatus  
INTEGER,  
ssCacheBatteryStatus  
INTEGER,  
ssTemperatureStatus  
INTEGER,  
ssCommStatus  
INTEGER,  
ssEmuExtInputStatus  
INTEGER,  
ssEmuPresent  
INTEGER,  
ssController1Status  
INTEGER,  
ssController1SerNum  
DisplayString,

```
ssController1RDAC
INTEGER,
ssController1Type
DisplayString,
ssController1ProdID
DisplayString,
ssController1FwRev
DisplayString,
ssController1HwRev
DisplayString,
ssController2Status
INTEGER,
ssController2SerNum
DisplayString,
ssController2RDAC
INTEGER,
ssController2Type
DisplayString,
ssController2ProdID
DisplayString,
ssController2FwRev
DisplayString,
ssController2HwRev
DisplayString,
ssUpsStatus
INTEGER,
ssLunStatus
INTEGER
}

ssEntryIndex OBJECT-TYPE
SYNTAX INTEGER
ACCESS read-only
STATUS mandatory
DESCRIPTION
"The index into ssStatusTable .

 ::= { ssEntry 1 }

ssSubsysName OBJECT-TYPE
SYNTAX DisplayString
ACCESS read-only
STATUS mandatory
DESCRIPTION
"The local Subsystem Name."

 ::= { ssEntry 2 }
```

```

ssOverallStatus OBJECT-TYPE
    SYNTAX INTEGER {
                                                GREEN(0),
                                                YELLOW(1),
                                                RED(2)
    }

    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "This variable reports the overall status of the subsystem.
        GREEN: Normal Operating Condition
        YELLOW: Warning Condition
        RED: Subsystem Communication Failure; No response to Agent requests."

    ::= { ssEntry 3 }

ssDiskStatus OBJECT-TYPE
    SYNTAX INTEGER {
        ALL_OK(0),
        AT_LEAST_1_FAILURE(1)
    }
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "This variable reports the overall status for the
        physical devices in the subsystem."

    ::= { ssEntry 4 }

ssPowerStatus OBJECT-TYPE
    SYNTAX INTEGER {
        ALL_OK(0),
        AT_LEAST_1_FAILURE(1)
    }
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "This variable reports the status for the
        Power Supply system in the subsystem."

    ::= { ssEntry 5 }

ssFanStatus OBJECT-TYPE
    SYNTAX INTEGER {
        ALL_OK(0),
        AT_LEAST_1_FAILURE(1)
    }

```

```
ACCESS read-only
STATUS mandatory
DESCRIPTION
    "This variable reports the status for the
    FAN system in the subsystem."

::= { ssEntry 6 }

ssCacheBatteryStatus OBJECT-TYPE
    SYNTAX INTEGER {
        NORMAL_CHARGE(0),
        LOW_CHARGE(1)
    }
ACCESS read-only
STATUS mandatory
DESCRIPTION
    "This variable reports the status for the
    Cache Battery in the subsystem. This status object is currently
    non-functional but in place for future use."

::= { ssEntry 7 }

ssTemperatureStatus OBJECT-TYPE
    SYNTAX INTEGER {
        NORMAL(0),
        OVER_TEMP_CONDITION(1)
    }
ACCESS read-only
STATUS mandatory
DESCRIPTION
    "This variable reports the status for the
    Temperature in the subsystem."

::= { ssEntry 8 }

ssCommStatus OBJECT-TYPE
    SYNTAX INTEGER {
        NORMAL(0),
        COMMUNICATION_FAILURE(1)
    }
ACCESS read-only
STATUS mandatory
DESCRIPTION
    "This variable reports the status for the
    communication to the Primary Controller."

::= { ssEntry 9 }
```

```

ssEmuExtInputStatus OBJECT-TYPE
    SYNTAX INTEGER {
        ALL_OK(0),
        AT_LEAST_1_FAILURE(1)
    }
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
    "This variable reports the status for the
    EMU external input."
    ::= { ssEntry 10 }

ssEmuPresent OBJECT-TYPE
    SYNTAX INTEGER {
        EMU_NOT_PRESENT(0),
        EMU_PRESENT(1)
    }
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
    "This variable reports the availability of the
    Environment Monitoring Unit for the subsystem."
    ::= { ssEntry 11 }

ssController1Status OBJECT-TYPE
    SYNTAX INTEGER {
        NORMAL(0),
        FAILED(1)
    }
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
    "This variable reports the status for the
    Primary Controller."
    ::= { ssEntry 12 }

ssController1SerNum OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
    "The Primary Controller's Serial Number."
    ::= { ssEntry 13 }

```

```
ssController1RDAC OBJECT-TYPE
    SYNTAX INTEGER {

        SINGLE_MODE(0),
        DUAL_MODE(1)
    }
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The Primary Controller MODE."
    ::= { ssEntry 14 }

ssController1Type OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The Primary Controller's Type indicator."
    ::= { ssEntry 15 }

ssController1ProdID OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The Primary Controller's Product ID."
    ::= { ssEntry 16 }

ssController1FwRev OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The Primary Controller's Firmware Revision."
    ::= { ssEntry 17 }

ssController1HwRev OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The Primary Controller's Hardware Revision."
    ::= { ssEntry 18 }
```



```
ssController2Status OBJECT-TYPE
    SYNTAX INTEGER {
        NORMAL(0),
        FAILED(1)
    }
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "This variable reports the status for the
        Secondary Controller."
    ::= { ssEntry 19 }

ssController2SerNum OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The Secondary Controller's Serial Number."
    ::= { ssEntry 20 }

ssController2RDAC OBJECT-TYPE
    SYNTAX INTEGER {

    SINGLE_MODE(0),
    DUAL_MODE(1)
    }
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The Secondary Controller MODE."
    ::= { ssEntry 21 }

ssController2Type OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The Secondary Controller's Type indicator."
    ::= { ssEntry 22 }

ssController2ProdID OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The Secondary Controller's Product ID."
```

```
 ::= { ssEntry 23 }
ssController2FwRev OBJECT-TYPE
    SYNTAX DisplayString
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The Secondary Controller's Firmware Revision."
 ::= { ssEntry 24 }
    ssController2HwRev OBJECT-TYPE
        SYNTAX DisplayString
        ACCESS read-only
        STATUS mandatory
        DESCRIPTION
            "The Secondary Controller's Hardware Revision."
 ::= { ssEntry 25 }
ssUpsStatus OBJECT-TYPE
    SYNTAX INTEGER {
        UPS_NOT_PRESENT(0),
        UPS_PRESENT(1)
    }
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "Uninterruptable Power Supply status (Currently for future use)."
 ::= { ssEntry 26 }
ssLunStatus OBJECT-TYPE
    SYNTAX INTEGER {
        UPS_NOT_PRESENT(0),
        UPS_PRESENT(1)
    }
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "LUN status."
 ::= { ssEntry 27 }
END
```

# Chapter 6

## Understanding E-Mail Messages Sent By the Agent

Most of the information in this chapter pertains to the event information e-mail messages that RaidManager sends when an event occurs.

The information in this chapter is organized under the following topics:

Topic	Page Number
About Event Information Fields	6-2
Mapping State Change Digits to RAID System Components	6-3

**NOTE:** This chapter does not apply to the HS-Series Agents running on NetWare, Windows NT 4.0, and Windows 2000.

If the Agent e-mail notification feature is enabled, when a RAID system event occurs, the Agent e-mails notification to the specified e-mail addresses. A storage system event can be a change in the state of a physical storage device, of a logical storage unit, or of a component of the physical enclosure.

The message specifies the name of the host to which the RAID array reporting the event is connected. The message states the severity of the problem as one of these three levels:

- Critical
- Warning
- Informational

The mail message appears in the following format:

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

```
This is an automatic message from your StorageWorks  
RAID Agent, steamd. The following message was just received.  
Please check your syslog files and RAID box!  
Hostname: Suncity  
CRITICAL: Validation failed - Unauthorized client (shr-dhcp-24-188.shr.dec.com, access level: -1); connection  
refused (SP_TCP: ClientConnect)
```

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

## About Event Information Fields

Event information messages report on the state of the RAID system. The event information fields appear in the line following the problem severity level.

Example:

```
WARNING:-  
Suncity HSG60 12000000000 HSG60 disks(disk21100:2) (SP_MONITOR: MonitorSubsys)  
  \      \      \  
  \      \      \  
 (1)   (2)   (3)
```

Use the following information to help you to understand event information fields:

1. Host Name - the name of the host to which the RAID experiencing the event is connected.
2. Storage system - where the problem occurred.
3. State Change - of the specified component of the storage system. This is an 11-digit field that provides important information about the status of your RAID Array.

## Mapping State Change Digits to RAID System Components

Each of the 11 digits in the state change field can be mapped to a RAID system component. Table 6-1 lists the digits and their relationship.

**Table 6-1 State Change Digit Position and Corresponding RAID System Component**

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

### The First Digit of the State Change Field (Overall RAID System)

The first digit in the state change field reports state changes in the overall RAID system.

Example:

WARNING: -  
Suncity HSG60 12000000000 HSG60 disks(disk21100:2)(SP\_MONITOR: MonitorSubsys)



The first digit can have one of two values:

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

## The Second Digit of the State Change Field (Disks)

The second digit of the state change field reports state changes in disks.

Example:

```
WARNING: -  
Suncity HSG60 12000000000 HSG60 disks(disk21100:2)(SP_MONITOR: MonitorSubsys)  
      ↑
```

This digit can have one of 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 two is displayed in the disk digit position, indicating that a drive went from good to bad.

The disk name (in parentheses) follows, in the format:

disk\_name:state

where:

*disk\_name* is the name of the disk

*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.

## The Third Digit of the State Change Field (Power Supply)

The third digit of the state change field reports state changes in the power supply.

Example:

WARNING: -  
Suncity HSG60 10200000000 HSG60 pwr(0:1:2) (SP\_MONITOR: MonitorSubsys)



The third digit can have one of three values:

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

The position (in parentheses) of the failed power supply usually follows. Three numbers indicate the position in the format:

cabinet\_number:power\_position:state

where:

*cabinet\_number* is the cabinet ID from 0 to 1

*power\_position* is the power supply location (1 or 2)

*state* is one 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.

## The Fourth Digit of the State Change Field (Fans)

The fourth digit of the state change field reports state changes in fans.

Example:

```
WARNING: -  
Suncity HSG60 10020000000 HSG60 fans(0:A:2) (SP_MONITOR: MonitorSubsys)  
      ↑
```

The fourth digit can have one of three values:

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

The position (in parentheses) of the fan follows, in the format:

*cabinet\_number*:*fan\_position*:*state*

where:

*cabinet\_number* is the cabinet ID from 0 to 1

*fan\_position* is the position of the fan

*state* is either of the following:

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

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



## The Fifth Digit of the State Change Field (Battery)

The fifth digit tells reports battery state change.

Example:

```
WARNING: -  
Suncity HSG60 10002000000 HSG60 batt(6:fail) (SP_MONITOR: MonitorSubsys)  
      ↑
```

The fifth digit can have one of 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 parentheses, 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)

*state* is one of the following:

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

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

## The Sixth Digit of the State Change Field (Temperature)

The sixth digit of the state change field reports temperature state changes.

Example:

```
WARNING: -  
Suncity HSG60 10000200000 HSG60 temp(0:2:2) (SP_MONITOR: Monitor_Subsys)  
                ↑
```

The sixth digit can have one of 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 follow in parentheses, in the format:

*cabinet\_number*:*sensor\_type*:*state*

where

*cabinet\_number* is the cabinet ID from 0-1

*sensor\_type* is the EMU sensor, (sensor 1 or sensor 2)

*state* is either of the following:

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

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

## The Seventh Digit of the State Change Field (This\_Controller)

The seventh digit reports state changes in This\_Controller.

**NOTE:** This value is always 0 for a dual redundant configuration.

The seventh digit changes to 1 in case of the failure of the controller in a single-controller configuration.

## The Eighth Digit of the State Change Field (Communications LUN)

The eighth digit reports the state changes in the communications LUN.

Example:

CRITICAL: - Suncity HSG60 1000000**2**000 HSG60 (SP\_MONITOR: MonitorSubsys)



CRITICAL: Unable to open device - hdisk1 (SP\_MONITOR: MonitorSubsys)

This digit can have one of three values:

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

In this example, two mail messages appear. The first message indicates that a communications LUN changed state from good to bad. The second message indicates that the Agent is unable to open the communications LUN for monitoring the RAID system.

## The Ninth Digit of the State Change Field (Other\_Controller)

The ninth digit reports states changes in the Other\_Controller.

Example:

WARNING: -  
Suncity HSG60 10000000**2**00 HSG60 (SP\_MONITOR: MonitorSubsys)



This value never changes for a single controller configuration. It always changes if either controller in a dual redundant configuration fails.

This digit can have one of 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 failed, as indicated by a solid green indicator light (not blinking).

## The 10th Digit of the State Change Field (External Factors)

The 10th digit indicates state changes caused by external factors.

Example:

WARNING: -  
Suncity HSG60 10000000020 HSG60 (SP\_MONITOR: MonitorSubsys)



This digit can have one of three values:

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

## The 11th Digit of the State Change Field (Logical Units)

The 11th digit reports state changes in logical units.

Example:

WARNING: -  
Suncity HSG60 10000000002 HSG60 lun(d100:4) (SP\_MONITOR: MonitorSubsys)



This digit can have 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 parentheses, in the format:

`virtual_disk:state`

where:

*virtual\_disk* is the unit number of the virtual disk

*state* is any of the following:

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

In this example, logical unit D100 failed.

In most cases, the RaidManager sends at least two consecutive mail messages. The first message is always in the form:

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

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

Hostname: Suncity

WARNING: - A RAID system change has been detected: Suncity HSG60 OVRL=1 (SP\_MONITOR: MonitorSubsys)

End Of Automatic Message.  
-----

The text of the second message will be similar to the following (depending on the error):

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

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

Hostname: Suncity

WARNING: - Suncity HSG60 1200000000 HSG60 disks(disk10200:1 disk10300:2) (SP\_MONITOR: MonitorSubsys)

End Of Automatic Message.  
-----



# ***Chapter 7***

## **Troubleshooting**

The information in this chapter is organized under the following topics:

<b>Topic</b>	<b>Page Number</b>
Troubleshooting Connection Problems	7-2
Troubleshooting the Client	7-6
Troubleshooting the HS-Series Agent	7-10
Cluster Integration for the HS-Series Agents	7-12

## Troubleshooting Connection Problems

SWCC is a TCP/IP socket-based application. As a result, SWCC requires that each node running a SWCC Client or Agent have access to a valid hosts file or Domain Name Service (DNS) server. Minimally, the valid hosts file must include the system itself and all systems running the SWCC Client and/or Agent.

---

**IMPORTANT:** SWCC does not support the dynamic host configuration protocol (DHCP) or the Windows Internet Name Service (WINS); however, you can still use these protocols on systems that do not run Command Console. To determine whether your system is using DHCP or WINS on Windows 2000 or Windows NT 4.0:

- Right click Network Neighborhood on the desktop.
  - Select *Properties*.
  - Click the Protocols tab.
  - Select TCP/IP, then click *Properties*. You see the Microsoft TCP/IP Properties window.
- 

**NOTE:** First verify that your network is running.

- For Windows NT or Windows 2000, run `netstat` at the command prompt on the Agent and check the active TCP/IP connections.
- For UNIX, run `netstat` with the correct options (Reference `netstat` man pages in UNIX help information).
- For other operating systems, refer to the operating system documentation.

The Troubleshooting Connection Problems section includes the following topics:

Topic	Page Number
"Access Denied" Message"	7-3
Adding New System by Using Internet Protocol Address May Cause Client to Stop Responding	7-5
"No Agent Running" Message When Adding System to the Navigation Tree	7-5

---



## “Access Denied” Message

This section describes some common reasons for a Client to receive an “Access Denied” message when it attempts to add an agent system to the Navigation Tree.

### Aliases Not Checked

Ensure that the Agent's host system is configured to recognize the Client by its assigned name rather than by an alias. If the host system has been configured to recognize the Client by an alias, remove the alias from the system's “hosts” file.

When SWCC Agents scan the Client authorization list, they do not check aliases. SWCC will not scan the hosts alias list to verify if an alias matches the Client authorization list.

### Entry in the Client Authorization List Does Not Match

You may see an “access denied” message if the name of the client system that you entered in the Agent configuration utility does not match the one for DNS or in the agent system's hosts file. The hosts file on Windows NT 4.0 and Windows 2000 is at *winn\system32\drivers\etc*.

Your system may be configured to do one the following:

- Check its local hosts file first, then go to DNS (most common setup for Windows NT and Windows 2000).
- Go to DNS first, then check its local hosts file.
- Ignore DNS even if configured.
- Ignore the local hosts file.

To determine your system configuration (Windows NT and Windows 2000):

1. Right click Network Neighborhood (on the desktop).
2. Select Properties.
3. Click the Protocols tab.
4. Select TCP/IP, then click Properties. The Microsoft TCP/IP Properties window appears.
5. Click the WINS Address tab. If your computer uses DNS, the Enable DNS for Windows resolution option is selected; you do not need to have Enable LMHOSTS Lookup selected.

If WINS servers are available on the network, the *LMHOSTS* file can be used. SWCC does not support WINS.

6. To determine the IP address for the system, click the IP Address tab in the Microsoft TCP/IP Properties window.
7. To determine the full name of the system, click the DNS tab.

For other operating systems

Generally, the entry for an Agent in the Client authorization list must match what `gethostbyaddr(<client IP address>)` returns in the hosts agent `h_name` field if `gethostbyaddr(<client IP address>)` is executed on the Agent system. If the hosts files names on all systems are not identical, the `h_name` returned may vary on different Agent systems. For example,

```
xxx.xxx.xxx.xxxclient.somewhere.comclient
```

returns `client.somewhere.com` in the `h_name` field, but

```
xxx.xxx.xxx.xxxclientclient.somewhere.com
```

returns `client` in the `h_name` field.

The best way to determine what to use for a Client name in the Client authorization list is to write a program that runs on the Agent system and prints the `h_name` field returned by `gethostbyaddr(<client IP address>)`.

## Multiple Agents

If the Agent system is running multiple SWCC Agents (for example, to support different controller types), the client system must be authorized for all Agents. If the client system is missing from any authorized Client list of an Agent, that Agent cannot be added to the Navigation Tree.

## Adding New System by Using Internet Protocol Address May Cause Client to Stop Responding

The SWCC Client may stop responding if you attempt to add a system by using the agent system's IP address rather than its node name. This occurs when the client system does not have a DNS server configured that knows the agent system, and the agent system is not included in the client system's hosts file. To correct this situation, add the agent system to the hosts file on the client system.

If you receive an "Invalid host" or "Host not known" message when you attempt to connect to an agent system, do not enter the IP address. Correct your DNS server configuration. If it is correct, confirm that the DNS server knows the agent system. If you are not using DNS, verify the agent system is in the client system's hosts file.

## "No Agent Running" Message When Adding System to the Navigation Tree

While attempting to add a new system to the Navigation Tree, you may see the message "No Agent running on specified system." This message may appear for several reasons; the following are the most likely:

- The wrong system name was entered.
- The Agent was not installed on the entered system.
- The Agent was installed on a system that stopped functioning.
- Client and Agent port names and numbers in the services file may not match. This may occur if the default value for an SWCC port was already in use.
- The specific Client required to support an Agent is not installed. For example, if the Agent system has only a KZPCC Agent and the client system has only an HSZ22 Client, the "No Agent Running" message appears.

To verify that there is Client support for an Agent, look at the following registry key:

HKEY\_LOCAL\_MACHINE\Software\DigitalEquipmentCorporation\Command Console\AppletManager

You should see a series of keys for supported products.

- Make sure the system names used for the Client and Agent match exactly. As a general rule, use lowercase letters when entering names.
- You entered the host name in the `\winn\system32\drivers\etc\hosts` file. The host name is not required here, but TCP/IP looks at this file first to resolve a host name.

## Troubleshooting the Client

This section includes the following topics:

Topic	Page Number
Authorization Error When Adding an Agent System	7-6
Cannot Open Storage Window	7-6
Client Hangs When LUN Is Deleted	7-7
Command Line Interpreter (CLI) RUN Commands	7-7
Event Notification for Subsystems Connected to a Client System	7-7
Invalid or Missing Fault Displays and Event Logs	7-7
Pager Notification Continues After Exiting the Command Console Client	7-8
Reconfiguration After Controller Replacement	7-8
Some Graphics Do Not Scale Well with Large Fonts	7-8
Starting Client from the Command Prompt	7-9
Warning Message Windows	7-9
Virtual Disk Recovery from a Configuration File	7-9

### Authorization Error When Adding an Agent System

If you receive an authorization error when you add an agent system to the Navigation Tree, your client system may be missing from the Agent's list of client system entries. If you have more than one type of Agent installed on that agent system, the name of your client system appears on each Agent's list of client system entries.

### Cannot Open Storage Window

If you cannot open a Storage Window from the Navigation Tree or in stand-alone mode, the client system access option for the subsystem to which you want to connect is probably set to Overall Status (0), disabling access to the Storage Window.

## Client Hangs When LUN Is Deleted

If you delete the logical unit number (LUN) that is used by the communication drive, you cannot communicate with the controller. You must assign another LUN to the monitored subsystem before deleting the original LUN.

If you disable the Command Console LUN (HSZ70), the Client may lose its connection with the subsystem. If you need to disable the communications LUN, first assign another LUN as the communications LUN.

## Command Line Interpreter (CLI) RUN Commands

Do not issue RUN commands in the Command Line Interpreter (CLI) window. Instead, issue RUN commands from a maintenance terminal connection.

## Event Notification for Subsystems Connected to a Client System

To use the event notification features, an Agent must be installed and running. Create a local network connection by running Client and Agent on the same Windows NT host computer. Install each component as if Client were running on a remote system.

## Invalid or Missing Fault Displays and Event Logs

Invalid or lost notifications may occur when the client system connection with a subsystem is lost. The client system receives notification about most of the changing subsystem faults at monitored intervals. If the client system no longer receives notification about subsystem faults, then changes to that subsystem will not appear in the client system's Navigation Tree, Storage Window (if applicable), Fabric Window (if applicable), and Event Viewer.

For example, while client system's connection with a subsystem is broken, you will not receive event logs about that subsystem, except the lost connection notification.

The following list describes common causes for lost connections. After you fix the physical and/or software problem that is listed below, you need to close and reopen the Storage Window for that subsystem to get its latest status.

- RAS connections - Remote Access Service (RAS) connections are not full time. If no RAS connection exists, events are not logged to the Event Viewer Application Log.

- Serial controller connections - There may be a bad or missing serial cable. To correct this situation, replace or plug in the cable.
- Network connections - Agent may be missing or not running.
- Network connections - There may be network discontinuity.
- The Agent may not be properly configured for a client system.
- If your setup includes a controller, the controller may have halted, reset, or hung. To repair the situation, restart or replace the controller.
- If your setup includes virtual disks, the virtual disk being used for communicating with the subsystem is no longer available.

## **Pager Notification Continues After Exiting the Command Console Client**

You may have noticed continuous pager notification in response to subsystem faults, even though you have exited Command Console Client. This behavior is normal.

AES runs as a service under Windows NT and Windows 2000. It continues to run after you exit the Command Console Client. AES communicates with Agents, and it activates paging when a subsystem event occurs.

To stop pager notification, stop AES. For information about stopping AES, see “About the Asynchronous Event Service” on page 2-6.

## **Reconfiguration After Controller Replacement**

If you replace a controller in your subsystem, you must reconfigure your Agent's storage list to match the new hardware.

## **Some Graphics Do Not Scale Well with Large Fonts**

Display small fonts when using Client. Some graphics do not scale as well if large fonts are used.

## Starting Client from the Command Prompt

To start the Client with network connections from the command prompt, enter the following at the command prompt on the client system:

```
\path_to_client_directory\swcc.exe -d your_host_system your_host_subsystem
```

where `-d your_host_system your_host_subsystem` is an optional set of parameters that enables you to specify a system and a subsystem to start Client.

For example:

```
C:\>\Program Files\Compaq\SWCC\swcc.exe -d hostsystem subsystem
```

If you specify these parameters, when Client opens, the system is selected and the subsystem is displayed in the Storage Window. If Client is not already aware of the system and the subsystem, it adds them to the Navigation Tree.

## Warning Message Windows

You may see “Warning” messages, such as “Command Execution Error” along with detailed information. These messages indicate problems with the controller, rather than with the software. The controller is responding to problems in parsing and executing commands from Client and Agent.

## Virtual Disk Recovery from a Configuration File

If you delete a virtual disk, the member drives are all reinitialized and data is lost. You cannot restore a virtual disk's data by changing your configuration. A configuration file contains information only about the structure of a virtual disk. It does not store data.

## Troubleshooting the HS-Series Agent

This section describes how to troubleshoot the HS-Series Agent. This section includes the following topics:

Topic	Page Number
Agent Sensitive to Alphanumeric Names	7-10
HS-Series Agent Interaction	7-10
HSZterm Utility Interaction Problems	7-11
Invalid Cache Errors	7-11

### Agent Sensitive to Alphanumeric Names

Agent may not accept some numeric name forms, particularly those with embedded underscores. If you experience difficulties with a node name, change the node name to one that the Agent accepts.

### HS-Series Agent Interaction

If an HSZ22 controller is connected to a system, when the controller scans for subsystems, the HS-Series Agent (except for the HSZ22) for Tru64 UNIX and Windows NT will identify the HSZ22 controller as an HSZ20. The Agent scans for subsystems in two instances: during installation and upon request.

There are two ways to correct this issue:

- Avoid the problem - Shut off the HSZ22 controller during the HS-Series Agent installation. After installation, turn on the HSZ22 controller and reboot the system.
- Repair the problem - During installation of the HS-Series Agent, delete the erroneous entry. The HSZ22 entry appears on the second screen of the configuration utility. You can identify it by its serial number, firmware version, and by the drive used to access the subsystem.



## **HSZterm Utility Interaction Problems**

If you use the HSZterm Utility (Set host/SCSI), do not use the same controller that SWCC is accessing. If you do, the connection will interfere with SWCC.

## **Invalid Cache Errors**

Your controller module, cache module, and subsystem contain the configuration information that is used for synchronization. This configuration information is called metadata. The firmware reports an invalid cache error on an affected controller if there is a mismatch between the metadata in the controller module and a cache module containing unwritten data. This mismatch may result in the loss of the unwritten cache data if the error is not cleared properly.

You may lose valid data if you clear unwritten cache data. Client displays a message and prompt box when an invalid cache error occurs. Use the CLI window to clear unwritten cache data as the error is cleared. For information about how to clear unwritten cache data, see the “Invalid Cache Errors” topic in Help.

## Cluster Integration for the HS-Series Agents

This section describes how to integrate the SWCC with the Windows NT Server, Enterprise Edition (with Microsoft Cluster Server). This section includes the following topics:

Topic	Page Number
How to Integrate SWCC with Windows NT	7-12
Multiple Communication Lost Messages	7-14
Event Updates	7-14
Multiple Pages	7-14

### How to Integrate SWCC with Windows NT

Integrating SWCC with the Windows NT Server, Enterprise Edition (with Microsoft Cluster Server) allows you to configure and monitor a subsystem within the cluster environment. You need the following to perform cluster integration:

- A valid, working stable cluster
- An Agent installed on a disk that is on a non-shared SCSI bus
- An Agent on each cluster node of the cluster

To integrate a Windows NT cluster with SWCC:

1. Click Settings under the Start menu, then click Control Panel. Double click Services. The Services window appears.
2. Select Steam from the drop-down list for the Service field, and then click the Stop button. STEAM, which stands for StorageWorks Enterprise Array Manager, is the name for the HS-Series Agent service. This action stops Steam, and its status no longer displays as Started in the Services window.
3. Click the Startup button. A smaller Services window appears.
4. Select Manual, and then click OK to disable the automatic start of the service. You are returned to the main Services window.
5. Click Close to exit the Services window.

6. Repeat steps 1 through 5 for each cluster node.
7. Click the Cluster Administrator Utility entry under the Administrative Tools group. The program's main screen displays.

**NOTE:** Microsoft develops Cluster Administrator Utility™. For further information about the software, see Microsoft's documentation.

To complete the Cluster Administrator Utility information:

1. Click your cluster group. The resources in your cluster group appear.
2. Verify that your cluster group includes the quorum disk.
3. Right click the cluster group. A drop-down menu displays.
4. Select New, then Resource. The New Resource window displays.
5. Type the SWCC Agent's name and description. Under Resource Type choose "Generic Service" from the drop-down menu. Under Group select "cluster group."
6. Click *Next*. The Possible Owners window displays.
7. In the Possible Owners field, select the nodes in your cluster where you want the SWCC Agent to run.
8. Click *Next*. The Dependencies window displays.
9. Select the following resources, then click Add: Cluster IP Address, Cluster Name, and quorum disk to bring these resources online before starting the SWCC Agent.
10. Click *Next*. The Generic Service Parameters window displays.
11. Type Steam in the Service Name field. STEAM stands for StorageWorks Enterprise Array Manager. Leave the Start-up Parameters field empty.
12. Select Use Network Name for computer name.
13. Click *Next*. The Registry Replication window displays.
14. Click *Finish*. A message, saying that you have successfully created a generic service resource, displays.

## **Multiple Communication Lost Messages**

On a client system, AES monitors every agent system that is included in the Client's Navigation Tree. If an Agent fails on a system that AES is monitoring, at every polling interval, AES generates a page and an event log entry for the Agent indicating that communication has been lost. To stop the page and event log entries, remove the system entry in the Command Console's Navigation Tree.

## **Event Updates**

You must manually update any node added to the Navigation Tree by using cluster alias and any Storage Window that opens off of that cluster alias. If you have a pager configured, for automatic updating, you must add the individual nodes of the cluster to the Navigation Tree.

## **Multiple Pages**

AES may send multiple pages if an Agent moves from a failing node to a working node. When the Agent fails over, a TCP/IP peer reset error may appear in the active Storage Window that had been connected to that Agent.

# Appendix **A**

## About the Command Console LUN

This appendix explains how to avoid errors when configuring the Command Console LUN (CCL). Note that Windows NT and Windows 2000 with SCSI-2 do not support the Command Console LUN (CCL).

The information in this appendix is organized under the following topics:

<b>Topic</b>	<b>Page Number</b>
Enabling and Disabling the Command Console LUN	A-2
Using an Initial Configuration	A-3
Setting the Fixed/Floating Option	A-4
Cautions When Using the Command Console LUN	A-5

The CCL is a preconfigured virtual Logical Unit Number (LUN), located on controller A, LUN 0. LUNs identify different types of storagesets. The host uses LUNs to access the storageset.

Command Console sees the CCL as a virtual disk; however, the CCL cannot store information. The CCL is used only as a communication path between the controller and Command Console.

If you enable the CCL, the controller reserves one LUN address for Client or Agent use. The reserved LUN address is stored under the Communications LUN tab.

The CCL does the following:

- Allows the host to recognize the RAID Array as soon as it is attached to the SCSI bus and configured on the operating system.
- Serves as a communications device for the HS-Series Agent. The CCL identifies itself to the host by a unique identification string. This string, HSG60CCL, is returned in response to the inquiry command.

The default state for the CCL is enabled. To determine the address of the CCL, enter the following command:

```
HSG60 > SHOW THIS_CONTROLLER
```

## Enabling and Disabling the Command Console LUN

Do not use your controller's Command Line Interpreter (CLI) to disable the Command Console LUN while the Command Console is running. You may lose not only communication between the Client and the Agent, but also your data. Typically, the Command Console LUN remains enabled when you use Command Console. If the Agent system is running Windows NT or Windows 2000 with SCSI-2, disable the Command Console LUN and create a virtual disk before you run Command Console.

To disable the CCL, enter the following CLI command:

```
HSG60 > SET THIS_CONTROLLER NOCOMMAND_CONSOLE_LUN
```

To enable the CCL, enter the following CLI command:

```
HSG60 > SET THIS_CONTROLLER COMMAND_CONSOLE_LUN
```

In dual-redundant controller configurations, these commands change the CCL setting on both controllers. The CCL is enabled only on host port 1. At least one storage device of any type must be configured on host port 2 before you install the Agent on a host connected to host port 2.

Select a storageset that is not likely to change, and configure it. The Agent can use this storageset to communicate with the RAID Array. If you later delete this storageset (LUN), the connection between the Agent and the RAID Array is lost.

## **Using an Initial Configuration**

Your storage subsystem may not be configured when you first install it so there may be no virtual disks for Command Console to use. You cannot configure virtual disks because you cannot establish a connection. The Command Console LUN allows you to establish the first connection.

Before you run Command Console, from the CLI window enable the Command Console LUN. Note that if you are using SWCC with a SCSI-2 connection with an Agent running on Windows NT or Windows 2000, you must disable the Command Console LUN and create a virtual disk.

## **Preserving Virtual Disk IDs**

In some operating systems, you may disable the Command Console LUN to preserve virtual disk IDs. On Windows NT and Windows 2000 systems with SCSI-2, the LUN appears as a drive letter that you can use only for this purpose. In this case, before you run Command Console, you must use the controller's CLI window to configure at least one virtual disk for communication.

## **Safely Disabling the CCL**

To disable the Command Console LUN while the Command Console is connected, you need to have at least one virtual disk remain on your subsystem. Then, exit Client and stop running the Agent. Disable the CCL from the CLI window. Reconfigure Agent and Client to use the remaining virtual disk for communications.

## Setting the Fixed/Floating Option

In Command Console, if you select the Fixed option from the Add Virtual Disk wizard, the Command Console LUN remains assigned to that location. Client reserves the address of the LUN, and you cannot use the Add Virtual Disk wizard to create virtual disks.



**CAUTION:** The Fixed option works only with the Add Virtual Disk wizard. You can still overwrite a LUN address assigned to the communications LUN, from CLI window, even if the Fixed option is selected.

---

If you select the Floating option, you can use the LUN address currently assigned to the communications LUN to create a virtual disk. If you use this address, your controller automatically “floats” the Command Console LUN to another address and you lose communication with your subsystem.

To select the fixed/floating option:

1. In the Device window, double click the icon for your controller to display its property sheets. If you have a dual-redundant controller configuration, you can use the property sheets of either controller.
2. Click the Communications LUN tab. The operating parameters for the communications LUN are displayed.
3. Click either Floating or Fixed to select it.

**NOTE:** Changes to your controller configuration require password access. The program prompts you for the appropriate password on your first attempt to modify the controller.



## **Cautions When Using the Command Console LUN**

Be aware of the following cautions when using the Command Console LUN:

- If you select Client's Floating option and use the Command Console LUN's address to create a virtual disk, you lose communication between Client and your Agent. You must reconfigure and restart your Agent to have it recognize either the new Command Console LUN address or an existing virtual disk that is used for communication.
- Within your controller, the Command Console LUN always floats to another LUN address if you attempt to use its address to create a virtual disk. The Client's Floating/Fixed option affects only the way the Client presents available LUNs to the Add Virtual Disk Wizard.
- Regardless of Client's Floating/Fixed option setting, if you restart your controller, its Command Console LUN becomes the lowest available LUN combination that is not already assigned to a virtual disk. If you delete a virtual disk with a LUN address lower than that of the Command Console LUN and then restart the controller, the Command Console LUN automatically moves to the lower address. The result is a loss of communication with your subsystem. You must reconfigure and restart your Agent to have it recognize either the new Command Console LUN address or the address of an existing virtual disk used for communication.



# Glossary

## **adapter**

A device that converts the protocol and hardware interface of one bus type into that of another without changing the functionality of the bus.

## **Agent (HS-Series Agent)**

Command Console's secure TCP/IP network communication program. Agent runs on your subsystems' host computer. It is available on several operating systems. One or more Client programs can access the HS-Series Agent running on a host system. Using the system's SCSI or Fibre Channel bus, the Agent can communicate with multiple subsystems on the same host system. You can configure the HS-Series Agent with password protection to prevent unauthorized users from accessing your subsystems.

Collects data from the devices connected to the HSG60 controller and sends them to the Client. Enables the Client to communicate with storage connected to the HSG60 controller.

## **Allocation Class**

A number that uniquely identifies a controller or group of controllers in a cluster. The allocation class provides a way of grouping disk-based virtual disks across controllers and distinguishing identical virtual disk names within the cluster. Legal values are 0-65535. The allocation class attribute applies to both controllers in a dual-redundant configuration.

## **array controller**

A hardware and software device that provide communication between a system and one or more devices in an array.

## **Asynchronous Event Service (AES)**

AES, which runs as a service in the background, collects and passes all traps from the subsystems to the appropriate Navigation Trees and individual pagers. AES needs to be running for Client to receive updates.

**available**

A state in which a device is operational but not yet in use as a member of a virtual disk.

**bad block replacement (BBR)**

Substitution of defect-free device blocks for defective ones. The procedure used to locate a replacement block, mark a bad block as replaced, and move data from the bad block to the replacement block. In some controllers this process occurs automatically.

**block**

Consecutive bytes of data stored on a storage device. In most subsystems, a block is the same size as a physical disk sector.

**blower**

An airflow device mounted in a device or controller shelf.

**cache**

A fast temporary storage buffer in a controller or computer.

**capacity**

The total amount of data that a physical or virtual disk can store.

**channel**

A SCSI device bus. Narrow SCSI device buses support up to 7 devices, and wide buses support up to 15 devices. Also called a “port.”

**chunk**

HS-series controller term for strip.

**chunk size**

HS-series controller term for strip size.

**Client**

The Command Console uses its associate program -- Agent -- for network connections to multiple subsystems. Client can use either a serial maintenance port or a host SCSI bus connection to connect to a single subsystem. From Client, you can view multiple storage systems and set up pager notification.

**client list**

List of Client nodes that are allowed to connect to an Agent over the network. The list is maintained in the *client.ini* file on the host where the Agent is installed. A client list entry includes the TCP/IP address or network name and the allowed access level for the host's subsystems of each Client.

**client system**

Computer on which the Client software is installed.

**cold swap**

Device replacement requiring that you power off the controller and cabinet shelves. This method is used if conditions preclude using the warm swap or hot swap method.

**Command Console Client**

Provides event notification and the Navigation Window.

**configuration file**

A file in which configuration information for a subsystem is stored. The file can be used to automatically configure the subsystem.

**container**

HS-series controller term for a device group.

**controller**

A firmware-driven hardware device used for communication between a host and storage devices. A controller translates bus protocols and hardware interfaces and adds functionality to the subsystem. Some controllers provide additional functionality by mapping storage devices to host-addressable, virtual disks with specific performance and availability features that use RAID techniques.

**controller shelf**

A shelf designed to contain controller and cache memory modules. A controller shelf can contain two controllers in a dual-redundant configuration.

**copy speed**

For HS-series controllers, the rate at which the controller writes mirrored data in a mirrored virtual disk. There are two speeds:

- Normal -- uses relatively few controller resources to perform the copy and has little impact on controller performance.
- Fast -- uses more controller resources, which reduces the time it takes to complete the copy, but also reduces overall controller performance.

**device**

In its physical form, a magnetic or optical disk, tape, or CD-ROM that can be attached to a SCSI bus. A device provides large amounts of addressable storage to a host.

This term also means a physical device that is part of a controller's configuration. That is, it is known to the controller. After a device is made known to the controller, you can create virtual disks from it.

**device driver**

A program that processes I/O requests for a particular type of device.

**device group**

A logical, internal controller structure representing one or more devices that are linked as a group. Some controllers require that you must create device groups before you can create a virtual disk from them. Device groups are also known as containers. There are different types of device groups:

- Single-device virtual disks (JBODs)
- Striped virtual disks (RAID 0)
- Mirrored virtual disks (RAID 1)
- Striped mirrored virtual disks (RAID 0+1)
- Striped parity virtual disks with parity across all drives (RAID 3/5)
- Striped parity virtual disks with floating parity disk (RAID 5)

**disk**

A storage device that uses rotating magnetic media to store data.

**disk array**

A collection of disk devices that are physically connected in an ordered structure.

**dual-redundant configuration**

For HS-series controllers, a configuration consisting of a primary and backup controller in one controller shelf. If the primary controller fails, the backup controller assumes control of the failing controller's devices.

**environmental monitoring unit (EMU)**

Some subsystem enclosures include an environmental monitoring unit that provides increased protection against catastrophic faults. The EMU works with the controller to warn about impending subsystem failures. The EMU senses such conditions as failed power supplies, failed blowers, elevated temperatures, and external air sense faults.

**failed**

A device state indicating that a device is inoperable and unavailable for use in a virtual disk. In some controllers, you can force a failed state, for instance to remove the device from the storage enclosure. In others, a device is marked as failed if you remove it as a member of a virtual disk.

**failover**

For HS-Series controllers, the process that takes place when one controller in a dual-redundant configuration fails and the other controller takes over. The other controller continues to direct the subsystem until the failed controller is again operational or is replaced.

**good**

A device state that indicates that a device is operational and in use by a virtual disk.

**host**

The primary or controlling computer to which a subsystem is attached.

**host access ID**

The target ID of the host computer allows exclusive access to a particular virtual disk. A virtual disk can be set to allow all or only one host target ID access to it.

**host adapter**

A device connecting a host system to a SCSI bus. Typically, the host adapter performs the functions of the lowest layers of the SCSI protocol. This function may be logically and physically integrated into the host system.

**host functionality**

You can configure your controller's host port targets for optimum performance and compatibility.

**hot disks**

Hot disks occur if the workload is poorly distributed across storage devices. A hot disk is a device with multiple hot spots. On a hot disk, host I/O requests begin to back up because of the concentrated request load. Hot disks cause subsystem performance to suffer.

**hot spare**

In a virtual disk, a device configured to automatically replace a failed device. If a virtual disk member fails, the controller automatically replaces the member with the spare device, and it rebuilds the member's data from the remaining devices in the virtual disk.

**hot spots**

Hot spots occur if the workload is poorly distributed across storage devices. A hot spot is a file or a group of files located on the same device that receive a very high concentration of I/O requests.

**hot swap**

A method of device replacement in which the system remains operational during device removal and reinstallation. The device being removed or reinstalled is the only device that is not operational during the process.

**HSG60 Client**

Provides the HSG60 Storage Window for storage connected to the HSG60 controller.

**initialization**

For subsystems, the process of restarting the controllers and reestablishing the subsystem's configuration and operation; that is, bootstrapping the subsystem. For virtual disks, the process of writing the controller's file structure to the virtual disk member devices. On the member disks, the file structure is represented by metadata.

**JBOD (Just a Bunch of Disks)**

JBOD is an industry term for a single-device virtual disk. A JBOD virtual disk does not provide any level of data redundancy.

**known client list**

See client list.

**local area network (LAN)**

A network that is confined to a single geographic location.

**local connection**

A direct hardware connection from Client to a single subsystem using either of two methods:

- A connection from a standalone computer running Client to the serial maintenance port on the controller
- A connection from a host system running Client to a subsystem on the host's SCSI bus

A local connection enables you to connect Client to one subsystem controller within the physical range of the serial or host SCSI cable.

**logical drive**

See virtual disk.



**logical storage unit**

See virtual disk.

**logical unit number (LUN)**

A SCSI bus supports a number of target devices, each of which has a number of logical units. A logical unit number is a logical unit's address on a target. A controller maps one or more SCSI logical units to a virtual disk that the host can access. The term "LUN" is also used to refer to the virtual disk itself.

**mapping**

The internal controller process of organizing single or grouped devices into virtual storage units (that is, virtual disks).

**maximum block transfer**

For HS-series controllers, the virtual disk parameter that specifies the maximum number of data blocks to be cached before writing data to virtual disk members. A data transfer greater than this size is not cached and is written immediately to disk. Valid values are 1-1024 (blocks).

**member**

Any device used in a virtual disk based on multiple devices. Any device in the device group on which the virtual disk is based.

**metadata**

Special data written to a device for the purpose of controller administration. Metadata improves error detection and media defect management for a device. It is also used to define device and virtual disk configuration.

**mirrored cache**

Some controllers offer high-performance cache hardware that can be set to operate in mirrored mode. In this mode, the cache data is duplicated and stored in cache memory in physically separate locations. If one copy of the data becomes corrupted or unavailable for some reason, the other copy is available for use.

A mirrored cache configuration provides complete protection for cached data. However, the cache memory effectively contains twice as much data for each host request, so the effective size of the cache is cut in half.

**mirrored virtual disk**

A group of storage devices organized as duplicate copies of each other. Mirrored virtual disks provide the highest level of data availability at the highest cost. Another name for RAID 1.

### **mirroring**

The simplest form of data redundancy. Two or more devices form a mirrored device group. Each device is an exact copy of the other.

For read requests, data can be read from either device therefore increasing the throughput. Both devices can handle different requests simultaneously.

For write requests, data is written to both devices. If one device fails, all reads/writes are executed on the mirrored device group's other device. Therefore, mirroring provides excellent availability (unless the second device fails before the first (failing) device can be repaired or replaced).

Sometimes called shadowing.

The mirroring technique can also be applied to cache memory.

### **Navigation Tree**

- Provides access to the HSG60 Storage Window
- Displays the status of your systems. It shows your systems in a hierarchical order.

### **Navigation Window**

It contains the Navigation Tree and the menu options for configuring pager notification and the Navigation Tree.

### **network connection**

A remote connection from Client to multiple subsystems using Agent over a TCP/IP-compatible network. Network connections enable you to concurrently monitor thousands of subsystems over a LAN or WAN anywhere in the world.

### **nonredundant**

For HS-series controllers, a single-controller configuration.

The term is also sometimes used to refer to a RAID level that does not provide fault tolerance (for example, RAID 0).

### **normal**

In mirrored virtual disks, a member state that indicates that a member contains exactly the same data as the other members do

### **parameter**

A setting or value that defines a particular operating characteristic of a device, virtual disk, controller, or subsystem.

**parity**

Binary value calculated from user data used to detect if associated data becomes corrupt. Parity can also be used to correct corrupted data. Striped parity virtual disks use parity to improve data availability.

**parity check**

A virtual disk state that indicates that the controller is checking the integrity of a virtual disk's data.

**partition**

A logical division of a virtual disk, represented itself as a virtual disk to the host. Command Console enables the creation of virtual device partitions, but they are transparent to the user.

**password**

A code string used by Client with network connections to restrict configuration functions to privileged users. Passwords are set at the Agent at each host.

**pedestal**

A desk-side, floor-standing, storage enclosure capable of housing one or more controllers and associated devices to make up a complete subsystem.

**physical device**

A storage component installed in a subsystem.

**physical disk**

A storage component with rotating magnetic media that is installed in a subsystem.

**port**

The hardware and software used to connect a host controller to a communications bus, such as a SCSI bus or serial bus. On the device side of the controller, a port is called a channel. The term is sometimes also used to refer to the logical TCP/IP port that is used to access the Agent over the network.

**port/target/LUN (PTL)**

For HS-series controllers, the complete address of a physical disk on a device bus from which the controller derives the device name. The name, "disk11300", for instance, indicates a physical device at port 1, target 13, and LUN 00.

**RAID (Redundant Array of Independent Disks)**

RAID is an industry-standard set of techniques for configuring an array of storage devices into host-accessible, virtual disks with various cost, availability, and performance options.

Some common RAID levels are RAID 0, RAID 1, RAID 0+1, RAID 3, RAID 3/5, and RAID 5.

### **RAID 0**

RAID 0 is the industry-standard name for disk striping. A RAID 0 virtual disk is also called a striped virtual disk.

In a RAID 0 virtual disk, host data is divided into strips spread in a stripe across virtual disk member devices. This technique provides much faster read and write performance than does reading and writing to a single device. A three-device, RAID 0 virtual disk has potentially three times the bandwidth of a single device because three separate small pieces of host data move in parallel.

RAID 0 is the only RAID level that does not provide some level of data redundancy. Because more devices can potentially fail and because there is no way to recover data for a failed device, RAID 0 virtual disks have less availability than equivalent-sized single disks.

### **RAID 0+1**

RAID 0+1 combines the striping of RAID 0 and the mirroring of RAID 1 to provide the best combination of high performance and high availability. A RAID 0+1 virtual disk is also known as a striped mirrored virtual disk.

In a RAID 0+1 virtual disk, each RAID 0 stripe is mirrored to one or more duplicate device sets. This technique allows much faster read and write performance than does reading and writing to a single device. A six-device, RAID 0+1 virtual disk has potentially three times the bandwidth of a single device because three separate, small pieces of host data move in parallel.

In addition, the data is completely mirrored to one or more device sets so there is complete data redundancy for very high availability.

A RAID 0+1 virtual disk offers the highest performance and the highest availability of any RAID virtual disk type, but its cost is high. Such a configuration requires at least twice the number of devices that a RAID 0 configuration requires.

### **RAID 1**

RAID 1 is the industry-standard term for device mirroring. A RAID 1 virtual disk is also called a mirrored virtual disk.

In a RAID 1 virtual disk, host data is written as a single large block to one device and the data is mirrored to one or more duplicate disks.

A RAID 1 virtual disk provides very high availability because the data is completely mirrored to one or more devices. Its performance is no better than that of a single device, however, because the data is transferred as one large block to and from these devices.

### **RAID 3**

RAID 3 virtual disks use parity for data redundancy. A RAID 3 virtual disk is a type of striped parity virtual disk.

In a RAID 0 virtual disk, host data is divided into strips spread in a stripe across virtual disk member devices. An additional strip for parity information is appended to each stripe. This technique allows much faster read and write performance than does reading and writing to a single device. A three-device, RAID 3 virtual disk has potentially three times the bandwidth of a single device because three separate, small pieces of host data move in parallel.

In addition, because each data stripe is protected by parity information, there is a significant level of data redundancy for high availability. Some RAID 3 configurations use a dedicated parity device, but most controllers intersperse the parity strips within the data strips to maximize the read performance.

RAID 3 virtual disks provide high performance and high availability at reasonable cost. They are optimal for use in applications requiring relatively high data transfer rates and having relatively low I/O request rates.

### **RAID 3/5**

RAID 3/5 sets are enhanced stripsets – they use striping to increase I/O performance and distributed-parity data to ensure data availability.

RAID 3/5 sets are similar to stripsets in that the I/O requests are broken into smaller “chunks” and striped across the disk drives. RAID sets also create chunks of parity data and stripe them across all members of the RAIDset. This parity data is derived mathematically from the I/O data and enables the controller to reconstruct the I/O data if a single disk drive fails. Thus, it becomes possible to lose a disk drive without losing its data it contained. Data can be lost, however, if a second disk drive fails before the controller replaces the first failed disk drive and reconstructs the data.

### **RAID 5**

RAID 5 virtual disks use parity for data redundancy. A RAID 5 virtual disk is a type of striped parity virtual disk.

In a RAID 5 virtual disk, host data is written in its entirety as a strip representing one I/O request into a much larger stripe of I/O requests stored across the virtual disk membership. An additional strip for parity information is written into each stripe. This technique offers the same read performance as reading from a single device. However, in a RAID 5 virtual disk, multiple read I/O requests can occur resulting in a very high overall subsystem read performance.

Write performance, however, is much worse. Because writing a small strip of data into a larger amount of data on a device is really a read-modify-write operation, writing becomes time-consuming. In addition, because each data stripe is protected by parity information, there is a significant level of data redundancy for high availability.

RAID 5 virtual disks provide high read performance and high availability at reasonable cost. They are optimal for use in applications that have relatively high I/O read request rates and require relatively low data transfer rates.

#### **read cache**

A block of high-speed memory used to buffer data being read from storage devices by a host. A read cache responds to host read requests from local cache memory if possible rather than from external storage devices. Therefore, it increases the controller's effective device access speed.

The controller maintains copies of data recently requested by the host in cache, and it may fetch blocks of data ahead of a request in anticipation that the controller will access the next sequential blocks. In a typical read cache, host write requests are handled without involving caching.

#### **read source**

For HS-series controllers, a mirrored virtual disk option that controls the way data is read from the virtual disk's members. There are two Read Source options:

- **Least Busy (default)** -- the Normal, virtual disk member with the smallest I/O load is the target of all read operations.
- **Round Robin** -- each Normal, virtual disk member is the target of a read operation in sequential membership order. No preference is given to any member.

#### **rebuild rate**

The rate at which the controller reconstructs a failed device on a spare. To devote more or fewer cycles to rebuilding a failed device on a spare, adjust the rate using a scale from 1-100. A rebuild rate of 100 rebuilds the device at the fastest rate possible.

#### **reconstructing**

A physical device state that indicates that the controller is regenerating a failed device's data onto a replacement device that is part of a redundant virtual disk.

All user data remains available during the reconstruction process, but some performance reduction occurs if a request requires access to a device while it is being reconstructed.

#### **reconstruction**

Process of regenerating all of a failed member's data, writing it to a spare device, and incorporating the spare device as a redundant RAID virtual disk member.

All user data remains available during the reconstruction process, but some performance reduction occurs if a request requires access to a device while it is being reconstructed.

**reconstruction rate**

The speed at which a failed member's data is regenerated. The rate is adjustable. See rebuild rate.

**reduced**

A virtual disk state that indicates that a member device is missing, failed, or physically removed from a virtual disk.

**redundant RAID**

Any RAID level that uses redundant information to provide some level of data protection. RAID 1 (mirroring), RAID 0+1 (striped mirroring), RAID 3 (striped parity), RAID 5 (striped parity), and RAID 3/5 (striped parity) virtual disks are all examples of virtual disks that use redundant-RAID techniques.

**regeneration**

The process of recreating all or a portion of the data from a failed device using the surviving data and parity from the other virtual disk members.

In most controllers, data from all members remains available during regeneration, and the user is unaware that regeneration is occurring, except for a slight reduction in performance.

Regeneration of an entire disk member is called reconstruction.

Data regeneration occurs under one of the following conditions:

- The controller detects a hard read error on a virtual disk member. In this case, the controller transparently corrects the data and continues the read operation.
- The controller detects that a virtual disk member failed. In this case, the controller completely reconstructs the failed member.

**SCSI (Small Computer System Interface)**

An industry-standard parallel bus used to interconnect systems and physical devices.

**SCSI device**

A computer, a host adapter, a peripheral controller, or any storage element that can be attached to a SCSI bus.

**SCSI ID**

See target ID.

**shadowing**

See mirroring.

**spare**

A device state indicating that a device is designated as a hot spare for a failed device within a redundant RAID virtual disk. If a virtual disk member fails, the controller automatically replaces it with a spare device from the pool of spare devices.

The term is also used to refer to a spare device itself.

**storageset**

HS-series controller term for device group.

**Storage Window**

The Storage Window is a Client component that provides a graphical interface for configuring and monitoring to a selected subsystem.

**strip**

A RAID virtual disk using striping stores host data in pieces called strips. One strip is stored on each member device in the virtual disk. Together, the strips make up a stripe.

In some controllers, the strip size is used to tune the striped virtual disk for a specific application:

- If a virtual disk uses a small strip size compared to the size of the average host request, the controller can break the host data up into strips and can perform device accesses in parallel using RAID 3 techniques. This optimizes the virtual disk for applications requiring high data transfer rates.
- If a virtual disk uses a large strip size compared to the size of the average host request, the controller can use RAID 5 techniques to perform multiple read accesses in parallel on any device. This optimizes the virtual disk for applications requiring high I/O request rates.

Also called a chunk, segment, or stripe element.

**stripe**

A RAID virtual disk using striping stores host data in pieces called strips. One strip is stored on each member device in the virtual disk. Together, the strips spread across the member devices that make up a stripe.

**strip size**

The number of blocks of data that make up a strip.



In some controllers offering multiple-RAID-level virtual disks such as RAID 3/5, the relationship between the strip size and the average host I/O request size determines how the controller accesses the devices in the virtual disk and affects the request and data transfer performance of the subsystem.

**striped virtual disk**

Another name for a RAID 0 virtual disk.

**striped mirrored virtual disk**

Another name for a RAID 0+1 virtual disk.

**striped parity virtual disk**

Another name for a RAID 3, or RAID 3/5 virtual disk.

**striping**

A RAID technique in which host data is stored in pieces called strips. One strip is stored on each member device in the virtual disk. Together, the strips spread across the member devices make up a stripe.

**subsystem for the HSG60**

A controller and an array of physical devices attached to a host.

**supported device**

A device tested as functionally compatible with a controller in an approved hardware and software configuration.

**surviving controller**

The controller in a dual-redundant pair of HS-series controllers that assumes service to its companion's devices when the companion controller fails.

**target**

A SCSI bus device. When one device addresses another device on a SCSI bus, it uses the target device's target ID to uniquely identify it.

**target ID**

The physical address a bus initiator uses to connect with a bus target. Each bus target is assigned a unique target address. Also used to refer to a SCSI device ID itself.

**TCP/IP**

An acronym for Transmission Control Protocol/Internet Protocol. This popular Internet network protocol uses IP addressing, where each network node has a unique network address. Client uses the TCP/IP to communicate with Agent.

**transfer rate**

Date transfer speed over a SCSI bus. The transfer rate depends on the bus speed and width. Transfer rates are usually expressed in units of megabytes per second.

The following table shows the typical transfer rates for some common SCSI bus types:

<b>SCSI Bus Type</b>	<b>Width</b>	<b>Maximum Transfer Rate</b>
Fast Narrow	8 bits	10 MB/s
Fast Wide	16 bits	20 MB/s
Ultra	16 bits	40 MB/s

Some controllers allow you to set the maximum transfer rate on either their host or device bus. This feature allows you to limit the rate in special situations, such as those that require long bus cabling.

**unit**

See virtual disk.

**volume**

See virtual disk.

**volume set**

See virtual disk.

**virtual disk**

A series of physical drives linked together so that the software interprets the drives as being a single device. Logical storage units are called virtual disks and are accessible by the host. Each virtual disk has its own user-configurable parameters.

Some controllers use RAID techniques to provide virtual disks with various cost, availability, and performance options.

Also called logical drives, volumes, volume sets, logical storage units, logical units, units, and LUNs.

**warm swap**

In some controllers, a feature that allows devices to be added, removed, or replaced while the subsystem remains operational, but with all activity on the controller's device buses stopped.

**wide area network (WAN)**

A network that spans a large geographic area.

**write-back cache**

A cache configuration that increases the performance of host write requests. If a host requests a write operation, the controller writes the host's data first to the cache memory, completing the request quickly. It performs the slower operation of flushing data to the external storage device at a later time. The host sees the write operation as complete when the data reaches the cache.

For most controllers using write-back cache, the cache also increases performance with read cache techniques.

**write only**

A device state that indicates that while a member was being reconstructed an error was found on another member of the virtual disk.

**write-through cache**

A technique for handling host write requests in read caches. If the host requests a write operation, the controller writes data directly to the external storage device and updates the cache memory to ensure that the memory does not contain obsolete data. This technique increases the chances that future host read requests can be filled from the cache. The host sees the write operation as complete only after the external storage device is updated.

For some controller fault conditions, write-back cache resorts to write-through cache operation to protect your data.



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