Compaq StorageWorks™

HSJ80 Array Controller
ACS Version 8.5J-2

Installation and Configuration Guide

First Edition (August 2000)
Part Number: AA-RN17A-TE
Compaq Computer Corporation

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About This Guide

This guide describes the features of the HSJ80 Array Controller subsystem and presents the configuration procedures for the controller running Array Controller Software (ACS) Version 8.5J-2 and the storagesets that it manages.

This guide does not contain information about the operating environments to which the controller may be connected, nor does it contain detailed information about subsystem enclosures or their components. See the documentation that accompanied these peripherals for information about them.

Intended Audience

This guide is intended for administrators of StorageWorks RAID Array Subsystems. Configuring the subsystem requires a general understanding of the OpenVMS operating system and administration.

For the latest information on technical tips and documentation, visit our website:

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

Support and Services

Use the following three sections to determine who to contact in the Americas, Europe, and the Asia Pacific area.

Who to Contact in the Americas

Information and Product Questions	Local Sales Office/StorageWorks Hotline 1-800-767-7967
Installation Support	Contact the Compaq Distributor or Reseller from whom the StorageWorks Subsystem was purchased.
Compaq Multivendor Customer Service (MCS):	
■ Installation	Contact the Customer Support Center (CSC) at 1-800-354-9000.
■ Warranty	Contact the Customer Support Center (CSC) for warranty service after the subsystem is up and running.
■ Remedial	Contact the Customer Support Center (CSC). **NOTE:** In the event the equipment is out of warranty, contact the local Compaq Sales Office.

Who to Contact in Europe

Information and Product Questions, Installation Support, and Installation	Contact the Compaq Distributor or Reseller from whom the StorageWorks Subsystem was purchased.
Warranty	See the Warranty Card packaged with the product.
Remedial	Contact the Compaq Distributor or Reseller from whom the StorageWorks Subsystem was purchased. **NOTE:** A Service Contract is recommended when the equipment is out of warranty.

Who to Contact in Asia Pacific

For all services, contact the Compaq Distributor or Reseller from whom the equipment was purchased.

Conventions

This guide uses the text conventions and special notices as described in the following sections to help you find what you are looking for.

Text Conventions

The following table lists the conventions used in this document to describe features and commands of the subsystem:

Convention	Meaning
ALLCAPS (unbolded)	Command syntax that must be entered exactly as shown, for example: SET FAILOVER COPY=OTHER_CONTROLLER
ALLCAPS (unbolded)	CLI command syntax discussed within text, for example: "Use the SHOW SPARESET command to show the ....."
`Monospaced`	`Screen display as shown in the text.`
serif lower-case italic or *sans serif lower-case italic*	Command variable or numeric value that you supply, for example: SHOW *RAIDset-name* or **SET THIS_CONTROLLER PORT_1_SCS_NODENAME=***"xxxxxx"*
serif italic	Reference to other guide titles, for example: "See the *Compaq StorageWorks HSJ80 Array Controller...*for details."
. . .	Indicates that a portion of an example or figure has been omitted.

Special Notices

This guide does not contain detailed descriptions of standard safety procedures. However, it does contain warnings for procedures that could cause personal injury and cautions for procedures that could damage the controller or its related components. Look for these notices when you're carrying out the procedures in this guide:

WARNING: A *Warning* contains information essential to people's safety. It advises users that failure to take or avoid a specific action could result in physical harm to the user or hardware. Use a warning, not a caution, when such damage is possible.

CAUTION: A *Caution* contains information that the user needs to know to avoid damaging the software or hardware.

IMPORTANT: An *Important* note is a type of note that provides information essential to the completion of a task. Users can disregard information in a note and still complete a task, but they should not disregard an important note.

NOTE: A *Note* indicates neutral or positive information that emphasizes or supplements important points of the main text. A note supplies information that may apply only in special cases—for example, memory limitations, equipment configurations, or details that apply to specific versions of a program.

Related Publications

The following table lists some of the documents related to the use of the controller, cache module, and the external cache battery that make up the Array Controller subsystem.

Document Title	6-3 Part Number	2-5-2 Part Number
Compaq StorageWorks DS-BA356-MW Controller Enclosure User Guide	143875-001	EK-356MW-UA. A01
Compaq StorageWorks DS-BA356-MW Controller Enclosure Upgrade/Add-on Kit Installation Guide	143876-001	EK-356MW-IA. A01
Compaq StorageWorks DS-BA356-MW Controller Enclosure Quick Setup Guide	143877-001	EK-356MW-QA. A01
Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 Solution Software Kit Overview	N/A	EK-HSJSO-OA. A01
Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 CLI Reference Guide	163131-001	EK-HSJCL-RA. A01
Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 Configuration Planning Guide	163132-001	EK-HSJCP-PA. A01
Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 Configuration Procedures Guide	163133-001	EK-HSJAC-PA. A01
Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 Maintenance and Service Guide	163134-001	EK-HSJMS-SA. A01
Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 for OpenVMS Release Notes	163135-001	EK-HSJAA-RA. A01

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Chapter 1

Preparing the Hosts

The host OpenVMS system must be prepared to operate with the HSJ80 Array Controller subsystem before the controller and storagesets can be configured to operate with the OpenVMS cluster. The CIXCD host adapter firmware upgrade procedure found in this chapter must be completed for all clusters using CIXCD host bus adapters before the controller and storagesets are configured. The new firmware allows 4 KB data packet transfers.

> **NOTE:** 4 KB packet transfers are enabled by default. If 4 KB packet transfers are not desired, make sure that you follow the configuration procedures in Chapter 2 to disable the feature.

There are three parts to preparing the host computer system for use with the storage subsystem:

- Software: verifying and installing the correct version of OS software
- Hardware: installing the host bus adapters into the hosts
- Firmware: installing the correct revision of firmware for CIXCD host adapters

Software: Verifying and Installing Required Versions

Compatibility with the controller subsystem requires that the hosts on the cluster run the following versions of VMS:

- VAX hosts must run version 6.2 OpenVMS at a minimum.
- Alpha hosts must run version 6.2-1H3 OpenVMS at a minimum.

You must also install the most recent TIMA kit for any ALPHA system running on the same cluster as the HSJ80 Array Controller subsystem.

To obtain the TIMA kit, go to the following website:

http://ftp.service.digital.com/public

NOTE: Installation directions are included in the kit.

Installation is verified as part of the installation procedure. You can also check the installation database on the host.

Hardware: The Physical Connection

To attach your subsystem to the cluster, you must install one or more host bus adapters into each host computer that will communicate with the HSJ80 subsystem. The HSJ80 Array Controller is qualified to operate with the following two host bus adapters:

- CIPCA (for ALPHA-powered hosts that use the PCI bus)
- CIXCD (for ALPHA and VAX-powered hosts that use the XMI bus)

CI bus cables are installed at the host bus adapter and are routed to one or more Star Couplers. If a host has more than one adapter installed, each adapter should be cabled to a Star Coupler.

Choose one of the following based upon the current host adapter installation:

- If the OS software and CIXCD adapters (if needed) are both already installed, go to the section “Host Adapter Firmware” on page 1–3 before continuing with the configuration in Chapter 2.
- If the OS software and CIPCA host adapters (if needed) are both already installed, go to the section “What’s Next?” on page 1–7.
- If you need to install new host bus adapters, go to the next section, “Preparing to Install the Host Adapter.”

Preparing to Install the Host Adapter

Perform the following steps:

1. Perform system backups of your operating system’s file systems.
2. Shut down your computer system.

Installing the Host Adapter

CAUTION: Protect the host bus adapter board from electrostatic discharge by wearing an ESD wriststrap. DO NOT remove the board from the antistatic cover until you are ready to install it.

1. Before beginning installation, you need the following:
   - The proper host bus adapter board (CIPCA or CIXCD) for your system
   - Your computer hardware manual
   - Appropriate tools to service your computer
2. Follow the procedure in the documentation that came with the host adapter module for the installation procedure.
3. Install the external CI Bus cable from the Star Coupler to the new adapter.
4. Did you install (or are you using previously installed) CIXCD adapters?
   - If yes—Continue to the next section, "Host Adapter Firmware".
   - If no—Go to the section “What’s Next?” on page 1–7.

NOTE: Do not power on anything at this time. The controllers in the subsystem are not yet configured to run with OpenVMS.

Host Adapter Firmware

CIPCA host adapters are already configured to operate with 4 KB data packet transfers that match the capability of the HSJ80 Array Controllers. No firmware upgrades are needed with these adapters. The firmware contained within CIXCD host adapters have not been updated to accommodate 4 KB packet transfers and, therefore, must be upgraded. If you have no CIXCD host adapters on your cluster (or you know they are already updated), you may skip this section and go to “What’s Next?” on page 1–7.

The new CIXCD firmware (CIXCD_4K) is identical to the standard CIXCD firmware except the maximum packet size has been increased to 4 KB. The version numbers for the CIXCD_4K firmware for VAX and ALPHA is 20 (hex) greater than the normal firmware, which supports a maximum packet size of 1 KB.

CAUTION: Clusters that do not use the following guidelines may fail, even though they operate properly with the normal firmware (1 KB). This is because older adapters and storage servers may not operate properly in an environment where there is 4 KB packet traffic.

CIXCD_4K Firmware-Supported Cluster Configuration

The CIXCD_4K firmware is supported using the standard Computer Interconnect (CI) configuration rules. Standard CI node count restrictions also apply to CIXCDs running CIXCD_4K firmware.

CIXCD_4K Firmware-Supported Node Counts

- Less than or equal to16 CI host systems
- Less than or equal to 16 CI Hierarchical Storage Controllers
- Less than or equal to 32 CI products and Star Coupler (16 without CISCE)
- Less than or equal to 96 VMS Cluster member systems

CIXCD_4K Firmware-Supported CI Hierarchal Storage Controllers

HSJxx and all HSCxx (except HSC50)

CIXCD_4K Firmware-Supported CI Host Adapters

CIPCA, CIXCD

Upgrading CIXCD Firmware to Run CIXCD_4K

All CIXCD adapters should be upgraded to accommodate the 4 KB packet transfers. Examples of upgrade procedures that follow describe the loading of the new firmware for the following OpenVMS systems:

- AS8400
- DEC7000 and DEC10000
- VAX7000 and VAX10000
- VAX6000
- VAX9000

Updating CIXCDs for the AS8400

The CIXCD firmware is built into a Maintenance Operations Protocol (MOP-loadable) image. The MOP network protocol loads firmware on platforms that use the Loadable Firmware Update utility (LFU). If another system serves as the MOP server, the subject firmware should be copied into the `MOM$SYSTEM:` directory. Ensure MOP serving is enabled on your system either using `NCP` or `LANACP`.

Loading From the Network—The following example accesses the firmware through the network. Customize the CIXCD device name and the network device name to match your configuration:

```
P00>>>SHO NET

POLLING FOR UNITS ON DEMNA0, SLOT 1, BUS 0, XM10...EXA0.0.0.1.6
08-00-2B-23-45-92

P00>>>LFU
```

The platform that has the LFU is identified in the following syntax:

```
UPD>UPDATE CIXCD0 - PATH MOPDL:CIMV27TL.SYS
```

Loading from the CD-ROM—Load the image from the CD-ROM by using the following example of an “update” command (customize this for your configuration):

```
UPD>UPDATE CIXCD0 -PATH ISO9660:[CIXCD]CIMV27TL.SYS/DKD400
```

Updating CIXCDs for the DEC7000 and DEC10000

The CIXCD firmware is built into a bootable LFU image. The image that contains the console also contains the normal version of the CIXCD firmware. Special versions of the CIXCD firmware are built into an LFU image that will load only the CIXCD firmware.

Loading From the Network—The following example accesses the firmware through the network. Customize the CIXCD device name and the network device name to match your configuration:

```
P00>>>BOOT EXA0 -FILE CIMNAV27.SYS
```

Loading From the CD-ROM—Load the image from the CD-ROM by using the following update command customized for your configuration:

```
UPD>UPDATE CIXCD0 -PATH ISO9660:[CIXCD]CIMNAV27.SYS/DK400
```

Updating CIXCDs for the VAX7000 and VAX10000

The CIXCD_4K firmware is built into a bootable LFU image. The image that contains the console also contains the normal version of the CIXCD firmware. Special versions of the CIXCD firmware are built into an LFU image that will load only the CIXCD firmware.

Loading From the Network—The following example accesses the firmware through the network. Customize the CIXCD device name and the network device name to match your configuration:

```
P00>>>BOOT EXA0 -FILE CIXCDV69.SYS
```

Loading From the CD-ROM—Load the image from the CD-ROM by using the following "update" command customized for your configuration:

```
UPD>UPDATE CIXCD0 -PATH ISO9660:[CIXCD]PCIXCDV69.SYS
```

Updating CIXCDs for the VAX6000

The VAX6000 is updated by the VDS (VAX Diagnostic Supervisor). Before starting the update procedure, the new firmware file (`CIXCDV69.BIN`) must be copied to the `[SYS0.SYSMAINT]` directory so that it is conveniently available to the VDS. After VDS is booted, the CIXCD must be attached and selected before the update diagnostic `EVGEA` or `EVGEB` can be run to update the firmware. The arguments for the ATTACH command are type, bus, name, bus slot, and CI node.

The following example demonstrates the procedure:

```
DS> ATTACH CIXCD HUB PAA0 C 5

DS> SELECT PAA0

DS> RUN EVGEA/SECTION=UPDATE CIXCDV69.BIN

DS> Setting up for network updates using MOP
```

Updating CIXCDs for the VAX9000

The VAX9000 is updated by the VDS (VAX Diagnostic Supervisor). Before starting the update procedure, the new firmware file (`CIXCDV69.BIN`) must be copied to the `[SYS0.SYSMAINT]` directory so that it is conveniently available to VDS. After VDS is booted, the CIXCD must be attached and selected before the update diagnostic `EVGEA` or `EVGEB` can be run to update the firmware. The arguments for the ATTACH command are type, bus, name, bus slot, and CI node.

The following example demonstrates the procedure:

```
DS> ATTACH CIXCD HUB PAA0 C 5
DS> SELECT PAA0
DS> RUN EVGEA/SECTION=UPDATE CIXCDV69.SYS
DS> Setting up for network updates using MOP
```

What's Next?

Continue with the subsystem configuration by using the accompanying text and flowchart (Figure 1–1):

- If you have not configured (or if you need to modify) the controller configuration settings or if you need to implement dual host port capabilities, go to Chapter 2, "Configuring the HSJ80 Controller".
- If you are not modifying the controller configuration but are using SWCC, go to Chapter 3 and install the new version of the SWCC Agent. Then go to Chapter 4 ("Installing and Removing SWCC Client"). After the installation of the SWCC, go to Chapter 5, "Configuring the Subsystem with SWCC" and configure or modify the configuration of the storagesets.
- If you are not modifying the controller configuration and do not use SWCC to configure your storagesets, go to Chapter 6, "Configuring and Modifying Storagesets with the CLI" to use the CLI to configure or modify the configuration of the storagesets.
- If you need to modify some or all of the optional controller settings (for example, changing the CLI controller prompt), go to Chapter 7, "Other Configuration Procedures Using the CLI".
- If you need to cable (or recable) the subsystem (perhaps because you are taking advantage of the dual host port capabilities), go to Chapter 8, "Subsystem Cabling Procedures".
- If you are not doing any of the above, you are finished and ready to go with this subsystem. If you have HSJ80 Array Controller upgrades to add to the cluster, go to the *Compaq StorageWorks DA-BA356-MW Upgrade/Add-on Kits Quick Setup Guide* for an overview of the upgrade or add-on.

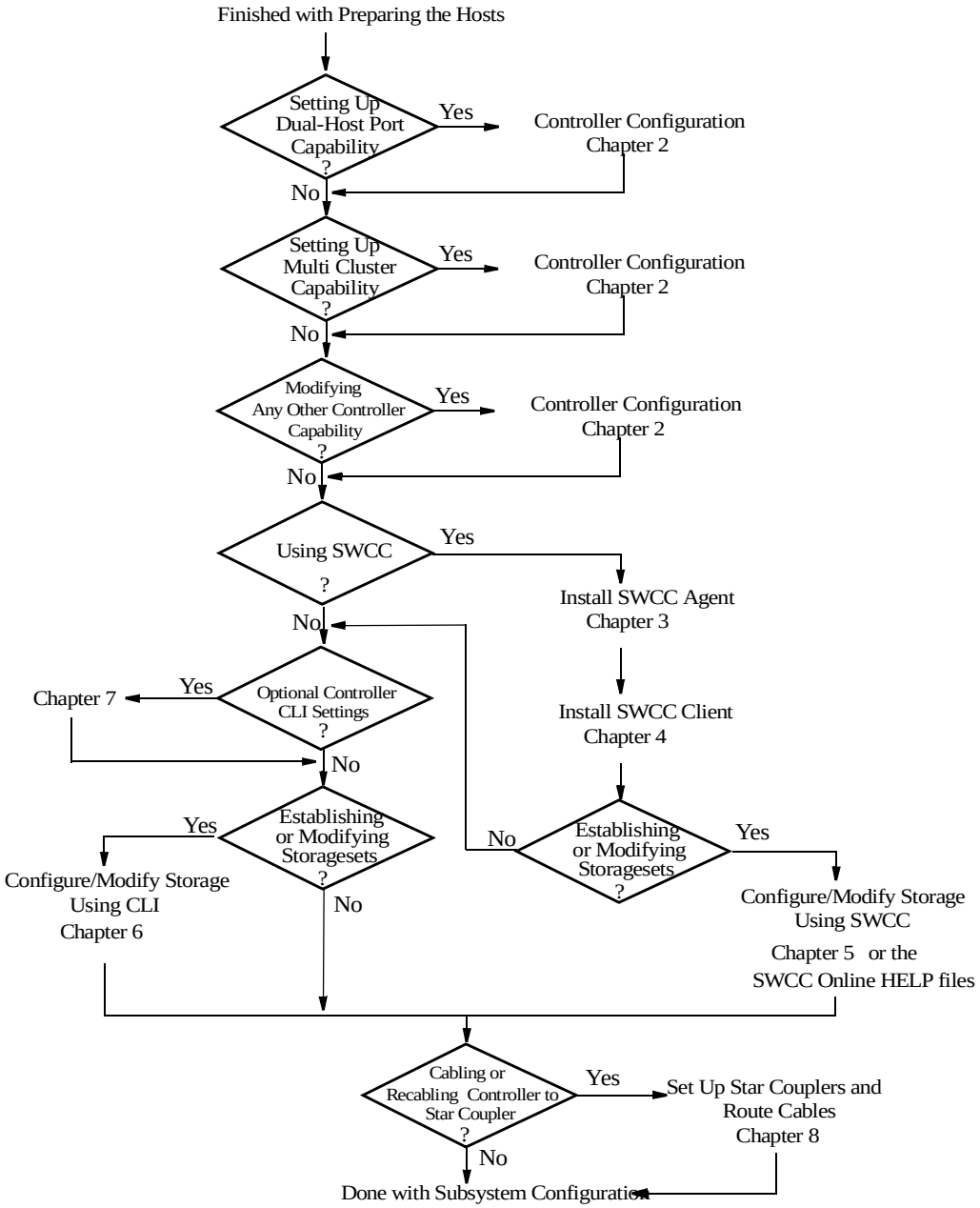


Figure 1–1. Configuration Flow

Chapter 2

Configuring the HSJ80 Controller

New HSJ80 Array Controllers must be configured to work in the subsystem when:

- Upgrading a single controller subsystem to a dual-redundant subsystem.
- Upgrading an existing HSJ40 or HSJ50 subsystem to an HSJ80 Array Controller subsystem.
- Installing new or replacement HSJ80 Array Controllers.

If you are configuring a controller for the first time, you must establish a local connection to the serial maintenance port on one of the controllers. After you have configured the controller, you may then configure the subsystem storage using the local connection and CLI commands, or by loading the StorageWorks Command Console (SWCC) agent and client to configure the storage (the SWCC is described in Chapters 3, 4, and 5).

As an alternative, you can establish a remote connection using the Diagnostic and Utility Protocol (DUP) from a host terminal:

- Appendix A describes how to set up a local connection.
- Appendix B describes how to set up a remote connection.

This chapter contains the following sections:

- "Configuring an Add-On Controller" on page 2–2.
- "Configuring a Replacement Single Controller" on page 2–7.
- "Configuring Dual-Redundant Controllers" on page 2–12.

Configuring an Add-On Controller

This section outlines the procedure to configure a new controller that is to be added to a single-controller subsystem to make it a dual-redundant controller subsystem. To arrive at this point, you will have used the controller module installation procedure in the *Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 Maintenance and Service Guide* to install the new controller to upgrade a single to a dual-redundant subsystem.

The configuration procedure consists of two sections. The first describes the powering up of the controller and the establishing of the subsystem configuration by recalling the saved configuration. The new controller needs to be powered on and configured before it may be cabled to the cluster. The second section describes the complete reentering of the subsystem parameters, if needed.

Recovering the Saved Configuration

1. Apply power to the subsystem (the power-up sequence takes approximately one minute).
2. Establish a local connection to the original controller in the subsystem (see Appendix A, "Establishing a Local Connection").
3. Place both controllers into nofailover mode:

   SET NOFAILOVER
4. Place the pair of controllers into dual-redundant failover mode using the controller that contains the accurate subsystem configuration (in this example it is “this controller”):

   SET FAILOVER COPY=THIS_CONTROLLER

   The new controller (“other controller”) inherits the configuration file from “this controller,” then restarts. Wait for both controllers to return to normal operation before continuing.
5. Choose one of the following:
   - If the configuration file recovery was successful and there are no changes to be made to the subsystem configuration, go to the cabling description in Chapter 8.
   - If the configuration file recovery was unsuccessful (or changes are to be made to the subsystem configuration), continue to the next section, “Configuration Entry Procedure”.

Configuration Entry Procedure

The new controller must be powered on and configured before it is cabled to the Star Coupler. The following procedure establishes the initial configuration of the new controller:

1. Apply power to the subsystem (the powerup sequence takes about one minute).
2. Establish a local connection to the original controller in the subsystem (see Appendix A, "Establishing a Local Connection").
3. Place the controllers into nofailover mode (“other controller” shuts down; “this controller” remains active):

   SET NOFAILOVER
4. Set “this controller” to operate with a single cluster or dual clusters:

   SET THIS_CONTROLLER MULTI_CLUSTER (places controller into multicluster mode)
   or
   SET THIS_CONTROLLER NOMULTI_CLUSTER (places controller into single cluster mode)

   CAUTION: When configuring the controllers for multi-cluster operation, the port access of the controllers and the logical units must be set correctly or data loss may occur. See Chapter 1 of the *Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 Configuration Planning Guide* for additional information.

   NOTE: If using the new HSJ80 array controller module in single-host port mode, then issue only the CLI command that specifies the port being used and ignore the other CLI command shown in the steps that follow step 8.
5. Perform a RESTART of the controller that is shut down (“other controller”).
6. Perform a RESTART of the controller that is active (“this controller”).
7. Push the RESET button on the “other controller.”
8. Place the pair of controllers into dual-redundant failover mode using the controller (“this controller”) that contains the accurate subsystem configuration:

   SET FAILOVER COPY=THIS_CONTROLLER

   The new controller (“other controller”) inherits the configuration file from “this controller,” then restarts. Wait for both controllers to return to normal operation before continuing.

9. Set the maximum number of nodes in the CI cluster on each CI host port being used:

   SET THIS_CONTROLLER PORT_1_MAX_NODES=*n*
   SET THIS_CONTROLLER PORT_2_MAX_NODES=*n*

   where *n* is either 16 or 32 (use the smaller value that is greater than the total number of nodes in the cluster).

10. Declare the CI node number to be used by the controller on each CI host port being used:

    SET THIS_CONTROLLER PORT_1_ID=*n*
    SET THIS_CONTROLLER PORT_2_ID=*n*

    where *n* is a number between 0 and (MAX_NODES-1) that is not already assigned to a node in this cluster.

11. Declare the number of host adapters on the CI cluster that this controller is aware of on each host port:

    SET THIS_CONTROLLER PORT_1_MAXIMUM_HOSTS=*n*
    SET THIS_CONTROLLER PORT_2_MAXIMUM_HOSTS=*n*

    where *n* is the number of host adapters. A CPU may have more than one host adapter, and if you are planning to add more adapters to the cluster in the future, you should declare the anticipated amount so you can add them without having to reconfigure the controller. The maximum number may not exceed the number used for MAX_NODES-1 in step 9.

12. Declare an SCS node name to be used by the controller on each CI bus host port being used:

    SET THIS_CONTROLLER PORT_1_SCS_NODENAME= "*nodename*"
    SET THIS_CONTROLLER PORT_2_SCS_NODENAME= "*nodename*"

    Where *nodename* is a set of alphanumeric characters identifying the controller (for example, "J801A1"). The node name may contain a maximum of six characters. The new nodename must begin with a letter and be enclosed in quotes.

13. Set the MSCP allocation class of this new controller on each host port being used:

    SET THIS_CONTROLLER PORT_1_MSCP_ALLOCATION _CLASS=*n*
    SET THIS_CONTROLLER PORT_2_MSCP_ALLOCATION _CLASS=*n*

    Set the TMSCP allocation class of this new controller on each host port being used:

    SET THIS_CONTROLLER PORT_1_TMSCP_ALLOCATION _CLASS=*n*
    SET THIS_CONTROLLER PORT_2_TMSCP_ALLOCATION _CLASS=*n*

    where *n* is a number from 0 through 255. Each controller pair must have a unique number in the cluster.

14. If 4 KB packet transfers are not desired, disable 4 KB packet transfers on each CI bus host port being used:

    NOTE: The use of 4 KB packet transfers is enabled as a default.

    ```
    SET THIS_CONTROLLER NOPORT_1_CI_4K_PACKET_CAPABILITY
    SET THIS_CONTROLLER NOPORT_2_CI_4K_PACKET_CAPABILITY
    ```

    The larger packet size normally provides an increased throughput to the host. The controller has the capability to use both 4 KB packets and smaller packets simultaneously, depending on the capabilities of each host and its adapters.

    NOTE: If CIXCD host adapters are installed on this cluster, then each of them must have the CIXCD_4K firmware upgrade installed for this feature to work. CIPCA host adapters are already set up to use 4 KB packet transfers.

15. Deactivate (turn off) the CI ports on the new controller (regardless of which port is being used) along with their respective A and B paths:

    ```
    SET THIS_CONTROLLER NOPORT_1_PATH_A
    SET THIS_CONTROLLER NOPORT_1_PATH_B
    SET THIS_CONTROLLER NOPORT_2_PATH_A
    SET THIS_CONTROLLER NOPORT_2_PATH_B
    ```

    The CI ports need to be deactivated prior cabling or recabling the controller to the cluster. The desired host ports are turned on after cabling. Deactivating all ports prevents possible extraneous “broadcasting” of noise on the CI bus during the cabling process.

    NOTE: All unused ports must remain deactivated after cabling.

16. If you are adding a new cache module and external cache battery, you must also set the time on the controller by using the SET *controller* TIME= switch:

    ```
    SET THIS_CONTROLLER TIME= dd-mmm-yyyy:hh:mm:ss
    ```

    NOTE: This step (and the next) may be bypassed if you are not adding a new cache module or battery.

17. Use the FRUTIL utility to set up the battery discharge timer:

    RUN FRUTIL

    Enter Y at the following FRUTIL message to set the battery discharge timer:

    ```
    Do you intend to replace this controller's cache battery? Y/N [N]
    ```

    NOTE: Memory diagnostics may start at this time. Allow the diagnostics to complete.

    FRUTIL displays a procedure, but does not issue a prompt. Ignore the procedure and press Enter.

18. Restart the controller:

    RESTART THIS_CONTROLLER

    This allows the configuration changes to be saved and activated.

    NOTE: The RESTART THIS_CONTROLLER command begins a series of memory tests, which take a few minutes to run. If the diagnostics are still running, FRUTIL will not start and a message informs you that memory tests are running. FRUTIL starts after the tests complete.

19. Enter a SHOW *this_controller* command to verify that all changes have taken place:

    SHOW THIS_CONTROLLER

20. Set up any desired subsystem storage configuration changes (see Chapter 6, "Configuring and Modifying Storagesets with the CLI").

21. Set up any desired optional controller commands (see Chapter 7, "Other Configuration Procedures Using the CLI").

22. Cable the controller to the cluster (Chapter 8, "Subsystem Cabling Procedures").

    NOTE: If no cabling changes are being made, ensure you turn on the host ports being used. All host ports were turned off in step 15.

23. Turn on paths for active ports; the possible commands are:

    SET THIS_CONTROLLER PORT_1_PATH_A
    SET THIS_CONTROLLER PORT_2_PATH_A
    SET THIS_CONTROLLER PORT_1_PATH_B
    SET THIS_CONTROLLER PORT_2_PATH_B

Configuring a Replacement Single Controller

The procedure outlined in this section is to be used when replacing a defective single controller with a spare. You will have used the standalone installation procedure that came with the module to install the replacement controller in the enclosure. After installation of the module, certain controller CLI parameters and switches must be set to allow the controller to be used in the subsystem.

The configuration procedure consists of two sections. The first describes the powering up of the controller and the establishment of the subsystem configuration by recalling the saved configuration. The second section describes the complete reentering of the subsystem parameters, if needed.

Recovering the Saved Configuration

The new controller needs to be powered on and configured before recabling to the CI bus. The subsystem configuration information should previously have been saved to one (or more) of the subsystem storage disks. The following procedure recovers this information:

1. Apply power to the subsystem (the power-up sequence takes approximately one minute).
2. Establish a local connection to the controller (see Appendix A, "Establishing a Local Connection").
3. If you have previously saved your configuration to a storage container, enter:

   RESTORE CONFIGURATION

   See the *Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 CLI Reference Guide* for additional details.

   If you have failed to save the subsystem configuration to a storage container, use the procedure in the next section ("Entering the Controller Subsystem Configuration") to reestablish the subsystem.
4. Choose one of the following:
   - If the RESTORE CONFIGURATION command was successful, continue with step 5.
   - If the RESTORE CONFIGURATION command was unsuccessful, go to the next section, "Entering the Controller Subsystem Configuration".
5. Set up any changes to the subsystem storage configuration (see Chapter 6, "Configuring and Modifying Storagesets with the CLI").

6. Set up any optional controller commands (see Chapter 7, "Other Configuration Procedures Using the CLI").
7. Recable the controller to the cluster if changing from single-host port to dual-host port (see Chapter 8, "Subsystem Cabling Procedures").

Entering the Controller Subsystem Configuration

1. Apply power to the subsystem. The power-up sequence takes approximately one minute.
2. Establish a local connection to the controller (see Appendix A, "Establishing a Local Connection").
3. Set the new controller to operate with a single cluster (dual controllers are required for multi-cluster mode of operation):

   SET THIS_CONTROLLER NOMULTI_CLUSTER

   NOTE: If using the new HSJ80 array controller module in single-host port mode, then issue only the CLI command that specifies the port being used and ignore the other CLI command shown in the steps that follow step 4.

4. Set the maximum number of nodes in the CI cluster on the host port being used:

   SET THIS_CONTROLLER PORT_1_MAX_NODES=*n*

   or

   SET THIS_CONTROLLER PORT_2_MAX_NODES=*n*

   where *n* is either 16 or 32. Use the smaller value that is greater than the total number of nodes in the cluster.

5. Declare the CI node number to be used by the controller on the CI bus host port being used:

   SET THIS_CONTROLLER PORT_1_ID=*n*

   or

   SET THIS_CONTROLLER PORT_2_ID=*n*

   where *n* is a number between 0 and (MAX_NODES-1) that is not already assigned to a node in the cluster.

6. Declare the number of host adapters on the CI cluster that this controller is aware of on the selected host port:

   SET THIS_CONTROLLER PORT_1_MAXIMUM_HOSTS=*n*

   or

   SET THIS_CONTROLLER PORT_2_MAXIMUM_HOSTS=*n*

   where *n* is the number of host adapters. Keep in mind that one CPU may have more than one host adapter. If you are going to add more adapters to the cluster in the future, you should declare the anticipated amount so you can add them without having to reconfigure the controller. The maximum number may not exceed the number used for MAX_NODES-1 in step 4.

7. Declare an SCS node name to be used by the controller on the CI host port being used:

   SET THIS_CONTROLLER PORT_1_SCS_NODENAME="*nodename*"

   or

   SET THIS_CONTROLLER PORT_2_SCS_NODENAME="*nodename*"

   where *nodename* is a set of alphanumeric characters identifying the controller (for example, "J801A1"). The node name may contain up to six characters. The new nodename must begin with a letter and be enclosed in quotes.

8. Set the MSCP allocation class on the host port being used on this new controller:

   SET THIS_CONTROLLER PORT_1_MSCP_ALLOCATION _CLASS=*n*

   or

   SET THIS_CONTROLLER PORT_2_MSCP_ALLOCATION _CLASS=*n*

   where *n* may be a number from 0 through 255. Each controller pair must have a unique number in the cluster.

9. Set the TMSCP allocation class on the host port being used on this new controller:

   SET THIS_CONTROLLER PORT_1_TMSCP_ALLOCATION _CLASS=*n*

   or

   SET THIS_CONTROLLER PORT_2_TMSCP_ALLOCATION _CLASS=*n*

   where *n* may be a number from 0 through 255. Each controller pair must have a unique number in the cluster.

10. If 4 KB packet transfers are not desired, disable 4 KB packet transfers on the CI bus channel (host port) being used:

    NOTE: The use of 4 KB packet transfers are enabled as a default.

    SET THIS_CONTROLLER NOPORT_1_CI_4K_PACKET_CAPABILITY

    or

    SET THIS_CONTROLLER NOPORT_2_CI_4K_PACKET_CAPABILITY

    The larger packet size normally provides an increased throughput to the host. The controller has the capability to use both 4 KB packets and smaller packets simultaneously, depending on the capabilities of each host and its adapters.

    NOTE: If CIXCD host adapters are installed on this cluster, then each must have the CIXCD_4K firmware upgrade installed for this feature to work. CIPCA host adapters are already set up to use 4 KB packet transfers.

11. Deactivate (turn off) the controller CI ports (regardless of which is being used) along with their respective A and B paths:

    ```
    SET THIS_CONTROLLER NOPORT_1_PATH_A
    SET THIS_CONTROLLER NOPORT_1_PATH_B

    SET THIS_CONTROLLER NOPORT_2_PATH_A
    SET THIS_CONTROLLER NOPORT_2_PATH_B
    ```

    The CI ports need to be deactivated before the cabling or recabling of the controller to the cluster. The desired host ports are turned on after cabling. Deactivating all ports prevents possible extraneous “broadcasting” of noise on the CI bus during the cabling process.

    NOTE: All unused ports are required to remain deactivated after cabling.

12. If adding a new cache module and external cache battery, you must also set the time on the controller by using the SET *controller* command with the TIME= switch:

    SET THIS_CONTROLLER TIME= *dd-mmm-yyyy:hh:mm:ss*

    NOTE: This step (and the next) may be bypassed if not adding a new cache module or battery.

13. Use the FRUTIL utility to set up the battery discharge timer:

    RUN FRUTIL

    Type Y as an answer to the following FRUTIL message to set the battery discharge timer:

    ```
    Do you intend to replace this controller's cache battery? Y/N [N]
    ```

    FRUTIL displays a procedure, but does issue a prompt. Ignore the procedure and press Enter.

14. Restart the controller:

    RESTART THIS_CONTROLLER

    This allows the configuration changes to be saved and activated.

15. Enter a SHOW *this_controller* command to verify that all changes have taken place:

    SHOW THIS_CONTROLLER

16. Set up the subsystem storage configuration (see Chapter 6, "Configuring and Modifying Storagesets with the CLI").

17. Set up any optional controller commands (see Chapter 7, "Other Configuration Procedures Using the CLI").

18. Restart the controller.

19. Cable the controller to the cluster if changing from single-host port to dual-host port (see Chapter 8, "Subsystem Cabling Procedures").

    NOTE: If no cabling changes are being made, ensure you turn on the host ports being used. All host ports were turned off in step 11.

20. Turn on the paths for the active ports:

    SET THIS_CONTROLLER PORT_1_PATH_A
    or
    SET THIS_CONTROLLER PORT_2_PATH_A

    SET THIS_CONTROLLER PORT_1_PATH_B
    or
    SET THIS_CONTROLLER PORT_2_PATH_B

Configuring Dual-Redundant Controllers

This section outlines the procedure to install both controllers in the subsystem at the same time. One example of this situation is the upgrading of an HSJ40 or HSJ50 subsystem to an HSJ80 Array Controller subsystem. You will have used the *Compaq StorageWorks DS-BA356-MW Controller Enclosure Upgrade/Add-On Kits Installation Guide* to arrive at this point.

If you have arrived at this point from a repair situation, that is, replacing two failed controllers simultaneously, you will have used the *Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 Maintenance and Service Guide* to arrive at this point.

The controller CLI parameters and switches now need to be set to allow the controllers to be used in the subsystem.

The configuration procedure consists of two sections. The first describes the powering up of the controller and the establishment of the subsystem configuration by recalling the saved configuration. The second section describes the complete reentering of the subsystem parameters, if needed.

Recovering the Saved Configuration

The new controllers need to be powered on and configured before recabling to the Star Coupler. The existing configuration information should have been saved to one (or more) of the subsystem storage disks before powering the subsystem down in the upgrade process.

This procedure describes the recovery of the configuration information.

1. Apply power to one of the controllers (leaving the other controller with the program card *not* inserted).

   NOTE: The recommendation is to power up using controller A (the top controller in a horizontal mount and the left controller in a vertical mount).

   The power-up sequence takes approximately one minute.

2. Establish a local connection to the controller (see Appendix A, "Establishing a Local Connection").

3. If you have previously saved your configuration to a storage container, enter:

   RESTORE CONFIGURATION

   See the *Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 CLI Reference Guide* for additional details. If you have failed to save the subsystem configuration to a container, use the procedure in the next section (“Entering the Controller Subsystem Configuration”) to reestablish the subsystem.
4. Insert the program card into the second controller.
5. Place both controllers into nofailover mode:

   SET NOFAILOVER
6. Place the pair of controllers into dual-redundant failover mode using the controller that contains the accurate subsystem configuration. The following example uses “this controller”:

   SET FAILOVER COPY=THIS_CONTROLLER

   The “other controller” inherits the configuration from “this controller” then restarts. Wait for the controllers to return to normal operation before continuing.

   NOTE: If this was an HSJ40 or HSJ50 upgrade to an HSJ80 Array Controller subsystem, then some of the configuration information will need to be entered using CLI commands. For example, the HSJ40 and HSJ50 subsystems did not have dual-host port capabilities, so this feature needs to be set. See “Entering the Controller Subsystem Configuration” for these procedures.
7. Set up any changes to the subsystem storage configuration (see Chapter 6, "Configuring and Modifying Storagesets with the CLI").
8. Set up any optional controller commands (see Chapter 7, "Other Configuration Procedures Using the CLI").
9. Cable the controllers to the Star Coupler (see Chapter 8, "Subsystem Cabling Procedures").

Entering the Controller Subsystem Configuration

1. Apply power to the controller being configured (ensure that the other controller does not have its program card inserted).

   NOTE: The recommendation is to power up using controller A (the top controller in a horizontal mount and the left controller in a vertical mount).

   The power-up sequence takes approximately one minute.

2. Establish a local connection to the controller (see Appendix A, "Establishing a Local Connection").

   NOTE: If using the HSJ80 dual-redundant controllers in single-host port mode, then establish the number only on the port being used.

Configuring Controller A

1. Set the first controller to operate with a single cluster or dual clusters:

   SET THIS_CONTROLLER MULTI_CLUSTER
   or
   SET THIS_CONTROLLER NOMULTI_CLUSTER

   CAUTION: When configuring the controllers for multi-cluster operation, the port access of the controllers and the logical units must be set correctly or data loss may occur. See Chapter 1 in the *Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 Configuration Planning Guide* for additional information.

   NOTE: If using the HSJ80 Array Controller module in single-host port mode, then issue only the CLI command that specifies the port being used and ignore the other CLI command shown in the steps that follow step 2.

2. Set the maximum number of nodes in the CI cluster on each host port being used:

   SET THIS_CONTROLLER PORT_1_MAX_NODES=*n*
   SET THIS_CONTROLLER PORT_2_MAX_NODES=*n*

   where *n* is either 16 or 32. Use the smaller value that is greater than the total number of nodes in the cluster.

3. Declare a CI node number for the controller on each host port being used:

   SET THIS_CONTROLLER PORT_1_ID=*n*
   SET THIS_CONTROLLER PORT_2_ID=*n*

   where *n* is a number between 0 and (MAX_NODES-1) that is not already assigned to a node in this cluster.

4. Declare the number of host adapters on the CI cluster for each host port being used:

   SET THIS_CONTROLLER PORT_1_MAXIMUM_HOSTS=*n*
   SET THIS_CONTROLLER PORT_2_MAXIMUM_HOSTS=*n*

   where *n* is the number of host adapters.

   NOTE: Keep in mind that one CPU may have more than one host adapter. If you are going to add more adapters to the cluster in the future, you should declare the anticipated amount so you may add them without having to reconfigure the controller. The maximum number may not exceed the *MAX_NODES*-1 number set in step 2.

5. Declare an SCS node name for the controller on each host port being used:

   SET THIS_CONTROLLER PORT_1_SCS_NODENAME=*"nodename"*
   SET THIS_CONTROLLER PORT_2_SCS_NODENAME="*nodename"*

   where *nodename* is a set of alphanumeric characters identifying the controller (for example, "J801A1"). The node name may contain up to six characters; it must begin with a letter and must be enclosed in quotes.

6. Set the MSCP allocation class on each Host Port being used:

   SET THIS_CONTROLLER PORT_1_MSCP_ALLOCATION _CLASS=*n*
   SET THIS_CONTROLLER PORT_2_MSCP_ALLOCATION _CLASS=*n*

   where *n* is 0 through 255 and is a unique number within the cluster.

7. Set the TMSCP allocation class on each host port being used:

   SET THIS_CONTROLLER PORT_1_TMSCP_ALLOCATION _CLASS=*n*
   SET THIS_CONTROLLER PORT_2_TMSCP_ALLOCATION _CLASS=*n*

   where *n* is 0 through 255 and is a unique number within the cluster.

8. If 4 KB packet transfers are not desired, disable 4 KB packet transfers on each CI host port being used:

   NOTE: The use of 4 KB packet transfers are enabled as a default.

   The larger packet size normally provides an increased throughput to the host. The controller has the capability to use both 4 KB packets and smaller packets simultaneously, depending on the capabilities of each host and its adapters:

   SET THIS_CONTROLLER NOPORT_1_CI_4K_PACKET_CAPABILITY
   SET THIS_CONTROLLER NOPORT_2_CI_4K_PACKET_CAPABILITY

   NOTE: If CIXCD host adapters are installed on this cluster, each of them must have the CIXCD_4K firmware upgrade installed for this feature to work. CIPCA host adapters are already set up to use 4 KB packet transfers.

9. Deactivate all controller CI ports and their respective A and B paths:

   SET THIS_CONTROLLER NOPORT_1_PATH_A
   SET THIS_CONTROLLER NOPORT_1_PATH_B

   SET THIS_CONTROLLER NOPORT_2_PATH_A
   SET THIS_CONTROLLER NOPORT_2_PATH_B

   The ports need to be deactivated before cabling to the cluster. The desired host ports are turned on after cabling. Deactivating all ports prevents possible extraneous "broadcasting" of noise on the CI bus during the cabling process.

   NOTE: All unused ports are required to remain deactivated after cabling.

10. If adding a new cache module and external cache battery, you must also set the time on the controller by using the SET *controller* command with the TIME= switch:

    SET THIS_CONTROLLER TIME= *dd-mmm-yyyy:hh:mm:ss*

    NOTE: This step (and the next) may be bypassed if you are not adding a new cache module or battery.

11. Use the FRUTIL utility to set up the battery discharge timer:

    RUN FRUTIL

    Enter Y at the following FRUTIL message to set the battery discharge timer:

    ```
    Do you intend to replace this controller's cache battery? Y/N [N]
    ```

    FRUTIL displays a procedure, but will not issue a prompt. Ignore the procedure and press Enter.

Continue at the next section, "Configuring Controller B."

Configuring Controller B

1. Push in the program card for controller B.
2. Place both controllers in nofailover mode:

   SET NOFAILOVER

3. Place the pair of controllers into dual-redundant failover mode using the controller that contains the accurate subsystem configuration (the following example uses "this controller"):

   SET FAILOVER COPY=THIS_CONTROLLER

The new controller ("other controller") inherits the configuration file from "this controller" then restarts. Wait for both controllers to return to normal operation before continuing.

NOTE: If using the HSJ80 Array Controller module in single-host port mode, then issue only the CLI command that specifies the port being used and ignore the other CLI command shown in the steps that follow step 4.

4. Disable the port not being used in single-host port applications:

   SET THIS_CONTROLLER NOPORT_<*port number 1 or 2*>_PATH_A
   SET THIS_CONTROLLER NOPORT_<*port number 1 or 2*>_PATH_B

5. Set the maximum number of nodes in the CI cluster on each host port being used:

   SET OTHER_CONTROLLER PORT_1_MAX_NODES=*n*
   SET OTHER_CONTROLLER PORT_2_MAX_NODES=*n*

   where *n* is either 16 or 32. Use the smaller value that is greater than the total number of nodes in the cluster.

6. Declare a CI node number for the controller on each host port being used:

   SET OTHER_CONTROLLER PORT_1_ID=*n*
   SET OTHER_CONTROLLER PORT_2_ID=*n*

   where *n* is a number between 0 and (*MAX_NODES*-1) that is not already assigned to a node in this cluster.

7. Declare the number of host adapters on the CI cluster for each host port being used:

   SET OTHER_CONTROLLER PORT_1_MAXIMUM_HOSTS=*n*
   SET OTHER_CONTROLLER PORT_2_MAXIMUM_HOSTS=*n*

   where *n* is the number of host adapters.

   NOTE: Keep in mind that one CPU may have more than one host adapter. If you are going to add more adapters to the cluster in the future, you should declare the anticipated amount so you may add them without having to reconfigure the controller. The maximum number may not exceed the MAX_NODES-1 number set in step 5.

8. Declare an SCS node name for the controller on each host port being used:

   SET OTHER_CONTROLLER PORT_1_SCS_NODENAME=*"nodename"*
   SET OTHER_CONTROLLER PORT_2_SCS_NODENAME=*"nodename"*

   where *nodename* is a set of alphanumeric characters identifying the controller (for example, "J801A1"). The node name may contain up to six characters; it must begin with a letter and must be enclosed in quotes.

9. Set the MSCP allocation class on each host port being used:

   SET OTHER_CONTROLLER PORT_1_MSCP_ALLOCATION _CLASS=*n*
   SET OTHER_CONTROLLER PORT_2_MSCP_ALLOCATION _CLASS=*n*

   where *n* is 0 through 255.

10. If 4 KB packet transfers are not desired, disable 4 KB packet transfers on each CI host port being used:

    NOTE: The use of 4 KB packet transfers are enabled as a default.

    The larger packet size normally provides an increased throughput to the host. The controller has the capability to use both 4 KB packets and smaller packets simultaneously, depending on the capabilities of each host and its adapters:

    SET OTHER_CONTROLLER NOPORT_1_CI_4K_PACKET_CAPABILITY
    SET OTHER_CONTROLLER NOPORT_2_CI_4K_PACKET_CAPABILITY

    NOTE: If CIXCD host adapters are installed on this cluster, each of them must have the CIXCD_4K firmware upgrade installed for this feature to work. CIPCA host adapters are already set up to use 4 KB packet transfers.

11. Deactivate all controller CI ports and their respective A and B paths:

    SET OTHER_CONTROLLER NOPORT_1_PATH_A
    SET OTHER_CONTROLLER NOPORT_1_PATH_B

    SET OTHER_CONTROLLER NOPORT_2_PATH_A
    SET OTHER_CONTROLLER NOPORT_2_PATH_B

    The ports need to be deactivated before cabling to the cluster. The desired host ports are turned on after cabling. Deactivating all ports prevents possible extraneous "broadcasting" of noise on the CI bus during the cabling process.

12. If adding a new cache module and external cache battery, the time on the controller is set by the first controller configured.

    SET THIS_CONTROLLER TIME= *dd-mmm-yyyy:hh:mm:ss*
    or
    SET OTHER_CONTROLLER TIME= *dd-mmm-yyyy:hh:mm:ss*

    NOTE: This step (and the next) may be bypassed if not adding a new cache module or battery.

13. Upon completion, restart the controller to allow the configuration changes to take effect:

    RESTART OTHER_CONTROLLER

14. Upon completion of the RESTART *other_controller* command, enter a SHOW *this_controller* command to verify that all changes to both controllers have taken place:

    SHOW THIS_CONTROLLER

15. Set up the Subsystem Storage Configuration (see Chapter 6, "Configuring and Modifying Storagesets with the CLI").

16. Set up any optional controller commands (see Chapter 7, "Other Configuration Procedures Using the CLI").

17. Cable the Controllers to the Cluster (see Chapter 8, "Subsystem Cabling Procedures").

    NOTE: If no cabling changes are being made, ensure you turn on the host ports being used. All host ports were turned of in step 11.

18. Turn on the paths for the active ports:

    SET THIS_CONTROLLER PORT_1_PATH_A
    or
    SET THIS_CONTROLLER PORT_2_PATH_A

    SET THIS_CONTROLLER PORT_1_PATH_B
    or
    SET THIS_CONTROLLER PORT_2_PATH_B

Chapter 3

The SWCC Agent

This chapter explains how to install and configure a copy of the StorageWorks Command Console (SWCC) Agent for the HS-series of controllers on an OpenVMS host system. If you are in the process of upgrading an HSJ40 or HSJ50 subsystem to an HSJ80 and want to use the SWCC as a controller or storage configuration tool, or as both, then you must install this new version of the SWCC along with the new controller software that came with your upgrade order. The HSJ80 storage subsystem uses SWCC Agent version 2.1 as a minimum.

CAUTION: If you have an HSJ40 Array Controller subsystem, check the controller software revision level before installing the Agent. If your controller is at HSOF Version 3.2J you need to upgrade to HSOF Version 3.7J before installing the Agent. This is due to an issue with the HSOF Version 3.2J software that causes intermittent controller hangs when used with the Agent.

The StorageWorks Command Console (SWCC) HS-Series Agent (hereafter called “the Agent”) is an application that helps with configuring, operating, and monitoring storage subsystems. The Agent runs on an OpenVMS host computer as a server application. The Agent’s partner is the SWCC Client, which runs on computers using Microsoft Windows NT or Windows 2000 operating systems. The SWCC Client is a graphical user interface (GUI) that interacts with the Agent to present a user-friendly way to configure your storage subsystems.

Introduction

The Agent runs on the OpenVMS host computer. The Client (the GUI) runs on Windows NT (Version 4.0) or Windows 2000 operating systems.

Client and Agent communicate by TCP/IP network protocol, as shown in Figure 3–1. The Agent can also be used as a standalone application without the Client. In this mode of operation, referred to as "Agent Only," the Agent monitors the status of the subsystem and provides local and remote notification in the event of a failure. Local notification is by eMail. Remote notification can be made by eMail and/or SNMP messages to an SNMP Monitor. This chapter deals with installing the Agent only. Details on installing the Client are provided in the next chapter.

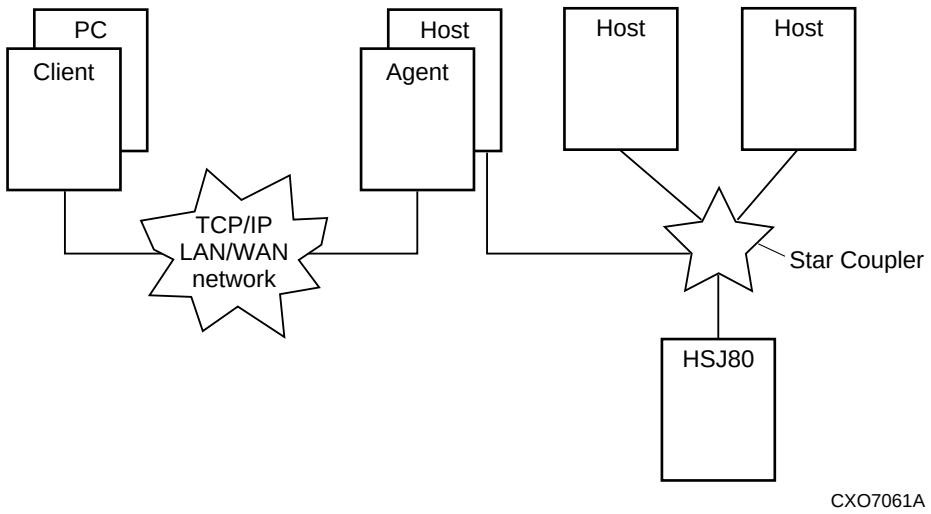


Figure 3–1. Client-Agent Connection

The Agent runs on the host storage subsystem sending notification messages to Client sessions connected to it whenever a fault occurs. You can configure the Agent to use TCP notification to the Client and SNMP notification to an SNMP-compatible monitoring application.

Minimum Requirements

Before installing the Agent you must meet the requirements in the following list:

- One of the following is required:
  - TCP/IP Services for OpenVMS (Version 4.0 or later) with FTP and Telnet utilities enabled
  - TCPWARE (Version 5.2 or later)
  - Multinet TCP/IP for OpenVMS (Version 4.0 or later)
- Your OpenVMS host resources must meet the minimum requirements specified in Table 3–1.
- The configuration procedures (Chapter 2) must be complete.
- The SWCC Client (if used) must be Version 2.1 minimum.

Table 3–1 Minimum OpenVMS Host Requirements

Host Feature	Requirement
Architecture	AlphaServer or VAX CPU with 1000 blocks free space on system disk
Operating System	OpenVMS Version 6.2-1H3 with all patches installed

Options for Running the Agent

The Agent runs as an OpenVMS process called `SWCC_AGENT`. You can use the Agent configuration program to control the execution of this process. The program offers the following options for running the Agent:

- You can choose to immediately start or stop the Agent.
- You can choose to start the Agent automatically each time the host is booted (this is the only mode available for TCPWare and Multinet).
- You can choose to start the Agent as an auxiliary service of TCP/IP Services for OpenVMS. This option is the default, and it starts the Agent on demand on any Client access.

Installing the Agent

In the following example of an installation procedure, replace the names DKB600 and DKB100:[HSAGENT] with others more suitable for your system.

CAUTION: If you have an HSJ40 Array Controller subsystem, check the controller software revision level before installing the Agent. If your controller is at HSOF Version 3.2J you need to upgrade to HSOF Version 3.7J before installing the Agent. The HSOF Version 3.2J software could cause intermittent controller hangs when used with the Agent.

1. Refer to the *Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 Release Notes* for last-minute information on the installation.
2. Insert the SWCC CD-ROM into the CD-ROM drive of the system that has access to the HSJ80 controller.

   NOTE: In this section's examples, the unit number used for the CD-ROM drive is DKB600.

3. To mount the CD-ROM, enter the following at the command prompt (replace the CD-ROM name of DKB600 with the name of your CD-ROM drive):

   $ **MOUNT/OVER=ID/MEDIA=CD DKB600:**

4. To create a local directory, enter the following at the command prompt. You will copy the installation file from the CD-ROM to this new directory (replace the name DKB100 with the name of the hard drive in the system on which you want to install the HS-Series Agent).

   $ **CREATE/DIRECTORY DKB100:[HSAGENT]**

   A directory named DKB100:[HSAGENT] has been created.

5. To set the directory, enter the following at the command prompt (replace the name DKB100 with the name of your hard drive):

   $ **SET DEFAULT DKB100:[HSAGENT]**

6. Enter the appropriate commands for the hardware and operating system type you have installed (see Table 3–2). This command copies the self-extracting file from the CD-ROM and places it into the default directory:

   NOTE: Replace the name DKB600 with the name of your CD-ROM drive and replace the name DKB100 with the name of your hard drive:

Table 3–2 OpenVMS Copy

If System Type Is	Then Enter
Alpha-based host hardware	$ COPY DKB600:[SWCC.AGENTS.VMS]SWCC230VMS.EXE DKB100:[HSAGENT]
VAX-based host hardware	$ COPY DKB600:[SWCC.AGENTS.VAX]SWCC230VAX.EXE DKB100:[HSAGENT]

7. Enter one or more of the following expressions to run the self-extracting file (replace the name `DKB100` with the name of your hard drive):

Table 3–3 OpenVMS Run

If System Type is	Then Enter
Alpha-based host hardware	$ RUN DKB100:[HSAGENT]SWCC230VMS.EXE
VAX-based host hardware	$ RUN DKB100:[HSAGENT]SWCC230VAX.EXE

8. Install the kit by entering the following at the command prompt (replace the name `DKB100` with the name of your hard drive):

   $ **PRODUCT INSTALL SWCC/SOURCE=DKB100:[HSAGENT]**

   The system responds with a message that SWCC is the product selected to install. You are asked if you want to continue.

9. Press Enter to continue. An installation verification message appears. The last line of the message is the following:

```
To configure SWCC Agent for HS* controllers:
@sys$manager:swcc_config.
$
```

10. If your cluster is running the MultiNet TCP/IP stack, the command procedure `SWCC_CONFIG.COM` will upgrade only the services of each system disk's first node. Enter the following to upgrade the services database of the other nodes that share the system disk:

    $ @MULTINET:INSTALL_DATABASES

    or

    Reboot the system, which will achieve the same result.

11. Dismount the CD-ROM. For example, enter the following at the command prompt (the example assumes that your CD-ROM drive is `DKB600`):

    $ DISMOUNT DKB600:

12. Before you can use the software, you must run the configuration program. Enter the following at the command prompt:

    $ @SYS$MANAGER:SWCC_CONFIG

    NOTE: The first time the configuration program is run, you will be shown a configuration script. While the configuration script is being run, you will need to execute the steps shown in "Configuring the Agent." You may need to execute additional steps, depending on your hardware configuration.

Configuring the Agent

1. Enter a password. It must be a text string that has 4 to 16 characters and can be entered from the client system to gain configuration access.
2. Enter the name of the client system on which you plan to install the client software. A client system is the system on which the Client software runs (you can enter more than one client system). For a client system to receive updates from the Agent, it must be on the Agent's list of client system entries.

   NOTE: Enter your most important client systems first and the client system that is infrequently connected to the network last. The software will put the client system entry that you entered first at the top of the list. The Agent first contacts the client systems that are located at the top of the list.

3. Enter client system notification options and the client system access options. For a definition of the client system notification options and the client system access options, see to Table 3–4 on page 3-14.
4. Enter the name for a subsystem and the device name used to access the subsystem (you can enter more than one subsystem). If you want to monitor and manage a subsystem, you need to enter this information. The subsystem, which consists of the controller and its array of physical devices, must be connected to the agent system.
5. Start the HS-Series Agent. The Agent runs as a process in the background. When you start the Agent, you are telling the software to start monitoring the subsystems.

   IMPORTANT: If the software detects previous configuration files, the first-time configuration script may not appear. You will have to start the Agent from the Agent Configuration menu (@sys$manager:swcc_config).

6. Go to Chapter 4 to install the SWCC Client software.

   NOTE: If you plan to use the Client software, add the names of the agent systems on which you have installed the Agent software to the Navigation Tree (*File>Add System*), which is part of the Command Console Client.

Configuration Script First Time Example

The following is a sample of the first-time configuration script, (installing the SWCC Agent):

```
$ run SWCC23VMS.EXE

UnZipSFX 5.32 of 3 November 1997, by Info-ZIP (Zip-Bugs@lists.wku.edu).
  inflating: dec-axpvms-swcc-v0203-nnn-1.pcsi
```

```
$
$
$ product install swcc /source=[]


The following product has been selected:
     DEC AXPVMS SWCC V2,3-190     Layered Product [Installed]

Do you want to continue? [YES]

Configuration phase starting ...

You will be asked to choose options, if any, for each selected product
and for any products that may be installed to satisfy software
dependency requirements.

DEC AXPVMS SWCC V2.3-190: OpenVMS SWCC Agent for HS* Controllers
[Installed]

   Copyright (c) Compaq Computer Corporation, 1997,2000

  Compaq Computer Corporation

* This product does not have any configuration options.

    This agent requires a TCP/IP service product to be installed.

    Do you want to continue? [YES]

Execution phase starting ...

The following product will be installed:

    DEC AXPVMS SWCC V2.3-190               Layered Product

Portion done: 0%...30%...40%...50%...60%...70%...80%...100%

The following product has been installed:

    DEC AXPVMS SWCC V2.3-190               Layered Product

DEC AXPVMS SWCC V2.3-190: OpenVMS SWCC Agent for HS* Controllers

    To configure SWCC Agent for HS* Controllers: @sys$manager:swcc_config

$
```

Configuration Script Text Example

The following is a sample of the configuration text:

```
 $ @sys$manager:swcc_config

SWCC-I-TCPIP, using TCP/IP Services for OpenVMS stack.

%UAF-I-MDFYMSG, user record(s) updated

       StorageWorks Command Console Agent Configuration Procedure
```

```
        This procedure helps you define the parameters required to
        run the StorageWorks Command Console VMS agent on this system.
        The Agent cannot be run until the following questions are answered.

    . . . . . . . . . . . . . . . . . . . . . . Entering Client Data ...

The client computer(s) you name will be allowed the access you specify.
Any blank entry will exit client addition and return to main menu.
NOTE: Input is case sensitive!  Match client's case in TCP/IP Services for
OpenVMS host database.
Enter the host name of the Client system : reserve


   Each client requires an access level which controls the capabilities
   a client has when communicating with the Agent server.
The possible options are:
    0 = No Access
    1 = Show Level Access Only
    2 = Storage Subsystem Configuration Capability
Enter Access Level (0, 1, 2) : 2
   The Agent server can notify a client when an error condition
   is detected.  Notification schemes available are:
    0 = No Error Notification
    1 = Notification via a TCP/IP Socket
    2 = Notification via the SNMP protocol
    3 = Notification via both TCP/IP and SNMP

Enter Error Notification Level (0, 1, 2, 3) : 1
Adding client: reserve, access level: 2, error notification: 1
Creating file SWCCGUI:CLIENT.INI.
Enter the host name of the Client system : request
   Each client requires an access level which controls the capabilities
   a client has when communicating with the Agent server.
The possible options are:
```

```
   0 = No Access
   1 = Show Level Access Only
   2 = Storage Subsystem Configuration Capability

Enter Access Level (0, 1, 2) : 2
   The Agent server can notify a client when an error condition
   is detected.  Notification schemes available are:
   0 = No Error Notification
   1 = Notification via a TCP/IP Socket
   2 = Notification via the SNMP protocol
   3 = Notification via both TCP/IP and SNMP

Enter Error Notification Level (0, 1, 2, 3) : 1
Adding client: request, access level: 2, error notification: 1
Enter the host name of the Client system :
* Done adding client data? [NO] ? y
    . . . . . . . . . . . . . . . . Entering Storage Subsystem Data ...
Any blank entry will exit storage addition and return to main menu
NOTE: Input will be converted to lower case!
Enter a name for a subsystem: hsj07
Enter the device name used to access this subsystem: hsj07
%HSCPAD-I-LOCPROGEXE, Local program executing - type ^\ to exit
HSUTIL  60J  D
FRUTIL  60J  D
CHVSN   60J  D
CLI     60J  D
CLCP    60J  D
CLONE   60J  D
CONFIG  60J  D
DILX    60J  D
DIRECT  60J  D
DSTAT   60J  D
FMU     60J  D
SWUPD   60J
```

```
VTDPY   60J  D
%HSCPAD-S-REMPGMEND, Remote program terminated - message number 1.
%HSCPAD-S-END, Control returned to node REWORD
SWCC-I-HSDJ, HSJ07 assumed to be HSD or HSJ controller.
Enter monitoring interval in seconds (0 => no monitoring): 300
Adding subsystem: hsj07, access device: !HSJ07, monitoring interval: 300
Creating file SWCCGUI:STORAGE.RAW.
Enter a name for a subsystem: hsj00
Enter the device name used to access this subsystem: hsj00
%HSCPAD-I-LOCPROGEXE, Local program executing - type ^\ to exit
HSUTIL  61J  D
FRUTIL  61J  D
CHVSN   61J  D
CLI     61J  D
CLCP    61J  D
CLONE   61J  D
CONFIG  61J  D
DILX    61J  D
DIRECT  61J  D
DSTAT   61J  D
FMU     61J  D
SWUPD   61J
VTDPY   61J  D
%HSCPAD-S-REMPGMEND, Remote program terminated - message number 1.
%HSCPAD-S-END, Control returned to node REWORD
SWCC-I-HSDJ, HSJ00 assumed to be HSD or HSJ controller.
Enter monitoring interval in seconds (0 => no monitoring): 300
Adding subsystem: hsj00, access device: !HSJ00, monitoring interval: 300
Enter a name for a subsystem:
* Done adding storage data? [NO] ? y
    . . . . . Entering SWCC Agent for HS* Controllers Password
>Enter the client access password:
> ********
    . . . . . .Enabling services
```

```
 Now enabling on this cluster...
The SWCC Agent for HS* Controllers can be enabled either as a TCP/IP
 Services for OpenVMS auxiliary service or as a detached process.
 Enabling is necessary on each cluster node you desire the agent to
 run on. Select only nodes that are attached to the storage subsystems
 you have selected to be to be monitored.
* Enable agent as a service of TCP/IP Services for OpenVMS? [YES] ?
* Immediate start of agent? [NO] ? y
Starting SWCC Agent for HS* Controllers on node REWORD
Starting the SWCC Agent for HS* Controllers...
%RUN-S-PROC_ID, identification of created process is 0000015F
SWCC Agent for HS* Controllers startup complete.
```

SWCC Agent Configuration Changes

You can change your configuration by accessing the HS-Series Agent Configuration menu. To access the Configuration menu, enter the following at the command prompt:

```
$ @SYS$MANAGER:SWCC_CONFIG
```

The following is an example of the HS-Series Agent Configuration menu:

```
SWCC Agent Configuration Menu
Agent is enabled as TCP/IP Services for OpenVMS service.
Agent is now:  active
Agent Admin Options:
1)Change Agent password
2)Agent Enable/Start
3)Agent Disable/Stop
4)Uninstall Agent
Client Options:
5)Add a Client
6)Remove a Client
7)View Clients
Storage Subsystem Options:
8)Add a subsystem
9)Remove a subsystem
10)View subsystems
E)Exit configuration procedure
```

CAUTION: After you make a change to the configuration, such as adding a client system, you must stop and then start the Agent for your changes take effect. When you stop and then start the Agent, the Storage Windows for the subsystems connected to the agent system lose their connection. To regain that connection, close and then reopen the Storage Windows connected to the agent system after you restart the Agent.

See Table 3–4 for an explanation of the required configuration information.

Table 3–4 Information Needed to Configure the Agent

Term	Description
Client system	Network names for the computers on which the Client software runs.
Client system access options	The access privilege level controls the client system's level of access to the storage subsystems: ■ No Access— Allows you to use the Client software to add a system to a Navigation Tree, set up a pager, and view properties of the controller and the system. It does not allow you to use the Client to open a Storage Window ■ Show Level Access—Allows you to use the Client software to open a Storage Window, but you cannot make modifications in that window. ■ Storage Subsystem Configuration Capability—Allows you to use the Client software to make changes in a Storage Window to modify a subsystem configuration.
Password	A text string that has 4 to 16 characters. It can be entered from the client system to gain configuration access. It can be changed by accessing the Agent Configuration menu.
Client system notification options **NOTE:** For all of the client system notification options, local notification is available through an entry in the system error log file and eMail (provided that the eMail notification in PAGEMAIL.COM file has not been disabled).	■ 0 = No Error Notification—Error notification is not provided over the network. ■ 1 = Notification via a TCP/IP Socket (Transmission Control Protocol/Internet Protocol) —The Storage Window of the subsystem notifies the user of changes (required for Windows NT event logging and pager notification.) If TCP/IP is not selected, you will need to refresh the Storage Window to obtain the latest status of a subsystem. ■ 2 = Notification via the SNMP protocol (Simple Network Management Protocol)—This selection requires the use of an SNMP-monitoring program to view SNMP traps. ■ 3 = Notification via both TCP/IP and SNMP—Combination of options 1 and 2.
Subsystem name	Device name associated with subsystem name
Monitoring interval in seconds	How often the subsystem is monitored

Table 3–4 Information Needed to Configure the Agent (Continued)

Term	Description
E-mail notification	The default is for PAGEMAIL.COM to send mail to the SYSTEM account when a serious problem occurs. You can disable and configure this feature by editing the following according to the instructions in its file: SYS$MANAGER:PAGEMAIL.COM When an error is logged, the Agent executes the PAGEMAIL.COM command. You can modify this file for Agent to log errors in a log file and/or change the account to which the Agent sends messages. You can also modify for which level of errors you will be notified. The Client does not need to be running to perform these actions.
Subsystem	It is a controller and an array of physical devices.

Removing the HS-Series Agent from OpenVMS

Use the procedure that follows to remove the HS-Series Agent from the OpenVMS operating system:

NOTE: Do not uninstall the HS-Series Agent if you want to preserve configuration information. If you want to install only an upgrade, stop the HS-Series Agent, and then install the new version. Older versions are removed automatically before the update, but all configuration information is preserved.

1. Enter the following at the command prompt:

   $ @SYS$MANAGER:SWCC_CONFIG

   The Configuration menu appears.

2. To remove the Agent, Enter 4.
3. Enter Y. A display appears that informs you that the Agent has been stopped and SWCC is being disabled. You are asked if you want to continue.
4. Enter Y.

NOTE: This option does the following:

- Stops all instances of the Agent on all cluster nodes
- Deletes all Agent files, except the .PCSI file that was transferred to your host over the network when the Agent was originally installed.

Chapter 4

Installing and Removing SWCC Client

Following the installation of the StorageWorks Command Console (SWCC) Agent, you must also install HSJ80 SWCC Client. The Client must be installed on the Windows NT (version 4.0 or greater) or Windows 2000 platform that will be used as the workstation from which to conduct SWCC activities.

When you install the Command Console Client, you may also be installing Clients for other controllers (for example, the HSJ50). If you are installing the Clients with a network connection, you must also install an Agent for each system on which the SWCC is needed.

The Client allows you to monitor and manage subsystems that are in a remote location. You can configure the Client software so that it pages you when an error occurs.

Before You Begin

Refer to the `swcc ReadMe.txt` file before you begin the installation (or the *Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 Release Notes*). These documents contain any last-minute changes made to the Command Console Client and any known problems associated with this release.

An online copy of this guide is available on the CD-ROM that accompanies this software. You will need the Adobe Acrobat Reader, version 3.0 or later, to view the `.pdf` files. There are two ways to obtain the Adobe Acrobat Reader:

- From the StorageWorks Command Console CD-ROM (refer to the `swcc ReadMe.txt` file)
- From the Adobe website:

  http://www.adobe.com

Installing the Client

This section contains the instructions to install the Client on the Windows NT or Windows 2000 operating systems.

Pre-Installation Procedures

Before you install the clients, perform the following:

1. Check the software product description (SPD) that came with your PCMCIA card. This document tells you whether the Command Console supports your hardware.
2. If you are using Windows NT, verify that you are logged into an account that is a member of the administrator group.
3. Verify that your system has a static IP address.
4. The SNMP service must be installed. To verify, go to Start>Settings>Control Panel. Double-click Services and look for SNMP. If you cannot find it, you must install it using the procedure “Installing the SNMP Service” below.
5. If you have the Command Console open, exit the Command Console (File>Exit).
6. If you have Command Console Client Version 1.1b or earlier, remove the program and the asynchronous event service.
7. If any of your shortcuts point to a floppy drive, CD-ROM drive, or a removable drive, verify that the floppy or CD-ROM drives are not empty *and that the removable drive is present*.

   The installation checks the shortcuts on the desktop and in the Start menu. If you are running Windows NT, the installation checks the shortcuts of all users for that computer, even if they are not currently logged on.

Installing the SNMP Service

Perform the following procedure to install the SNMP Service:

1. Go to Start>Settings>Control Panel and double-click `Network`.

   The system displays the Network dialog box.
2. Click the `Services` tab and then click `Add`.

   The system builds a list of network services.

3. Click `SNMP Service` and then click `OK`.

   The system displays the Windows Setup box.

4. Click `Continue`.

   The system displays the Microsoft SNMP Properties box.

5. Click the `Agent` tab. Type your name in the `Contact` field and your location in the `Location` field.

6. Click the `Traps` tab. Type Public in the `Community Name` field.

7. Click `Add` and then click `Apply`.

8. Click `OK` in the SNMP Properties box.

9. Click `Close` in the Network box.

   The system displays the following message in the Network Settings Change box:

   ```
   You must shut down and restart your computer before the
   new settings take effect.

   Do you want to restart your computer now?
   ```

10. Click `Yes`.

    The system reboots.

11. After completion of the reboot, reinstall the service pack.

Installing the Client from the SWCC CD-ROM

The Command Console Client installs from a CD-ROM using a standard Windows installation routine. The program is self-extracting and stores the Command Console Client into the directory `C:\Program Files\Compaq\SWCC` by default.

NOTE: During setup, you have the option to change the disk or directory location.

The Command Console Client software is installed on your host system from the StorageWorks Command Console CD-ROM.

Execute the following procedure:

1. Go to Explorer>CD icon>SWCC folder and double-click `Setup.exe`.

   The system displays the SWCC Setup box.

2. Select all of the items listed and then click `Next`.

   The system creates the Install Shield and then displays the StorageWorks Command Console screen and the SWCC Setup box.

   NOTE: The system first installs the SWCC Command Console.

3. Click `Next`.

   The system displays the License Agreement box.

4. Read the license agreement and then click `Yes`.

   The system displays the Select Program Folder box.

5. Click `Next`.

   The system displays the Setup Status box.

6. After the Command Console installation is complete, click `Finish`.

   The system installs the other components one at a time. After all of the components are installed, the system returns you to the Explorer, which was displayed when you started.

The Command Console Client installs the Program Group *Command Console* and places client icons within the group. The Client also inserts client selections on the Start menu.

Client Choices

The four choices the Client provides you with are:

- **StorageWorks CC CLI Window**, which displays the CLI Window. The CLI window lets you monitor and configure subsystems by using text commands for the HSJ80 controller. All connection choices are provided: serial line and network (TCP/IP).
- **StorageWorks CC HSJ**, which displays communication types Serial and Network (TCP/IP); the default is Network.
- **StorageWorks CC HSJ80**, which displays the Storage Window for the HSJ80. This choice lets you monitor and configure one subsystem using Client's graphical user interface. All connection choices are provided: serial line and network (TCP/IP).
- **StorageWorks CC**, which displays the Navigation Window. The Navigation Window is a network navigation tool used to manage and monitor subsystems over a TCP/IP network. This choice lets you monitor and configure one or many subsystems over a network by using Client's graphical tools.

Asynchronous Event Service

The Asynchronous Event Service (AES) is a component of the Command Console Client. AES provides updates of the subsystems to the client system (for a client system to receive updates, it needs to be running AES).

When AES receives a new trap (message), it passes the trap to the Navigation Tree of the client system that has AES running. The Navigation Tree, in turn, passes the trap to the appropriate storage window. You can identify a new trap that as been passed to the Navigation Tree because the status of one or more of its icons will change.

AES can also send traps to pagers. To activate this function, define each pager number in the *User Profile* section of the Event Notification Window. For instructions on how to activate AES, refer to the HELP file.

> **NOTE:** Consult the Command Console HELP for the latest information on diagnosing problems that could arise when sending pages. HELP provides instructions for placing AES into a debug mode.

Running AES on Windows NT or Windows 2000

AES starts when your system is initialized. To start or stop AES:

1. Open the Services Window (Start>Settings>Control Panel>Service)
2. Highlight `AsyncEventSvc`
3. Click `Stop` (or `Start`)

To disable the automatic start of AES when your system initializes:

1. Open the Services Window (Start>Settings>Control Panel>Service)
2. Double-click `AsyncEventSvc`
3. Select `Manual`
4. Click `OK`

Removing the Command Console Client

Before you remove the Command Console Client, you must remove AES from Windows NT. This prevents the computer from sending you messages during the initialization period about a service failing to start.

1. In this step, you will stop the automatic startup of AES at the system initialization or you will remove AES from Windows NT. Follow the procedure for your operating system:

   Windows NT: Click Start>Programs>Command Prompt and go to the directory to which you installed the Command Console Client. Issue the following command at the prompt:

   ```
   AsyncEventService -remove
   ```

2. Click Start>Setting>Control Panel.
3. Double-click the `Add/Remove` programs icon in the Control Panel.

   The Add/Remove Program Properties Window appears.

4. Select `Command Console V2.2` located in the window, and then click `Add/Remove`.

   A dialog box appears with the question:
   `Are you sure you want to completely remove the selected application and all of its components?`

5. Click `Yes`

   The Command Console Client is removed.

   NOTE: The procedure described in the preceding steps did not remove device-specific Clients. You can remove a device-specific Client by using the Add/Remove program as described previously.

Online Help

After you configure this software, refer to the online Help to learn more about the product. The online Help provides further information regarding the use of the Command Console to manage your systems. Access online Help for the following:

- Features of the Command Console Client, such as the Navigation window, the Asynchronous Event Service, and pager notification. Help for these topics can be found by clicking `Help` in the Navigation Window. The Navigation Window is the window that you see when you open the Command Console Client.
- Features of the HSJ80 Client. Help for these topics can be found by clicking `Help` in the HSJ80 Storage Window.

The Navigation Tree is shown in the Navigation Window, which you will see when you click Start>Programs>Command Console>StorageWorks Command Console. Help also provides:

- Step-by-step instructions describing the use of Command Console features
- Reference information about RAID (Redundant Array of Independent Disks)
- A glossary

What's Next?

The Agent and Client for the SWCC are installed. The SWCC is now ready to be used. You may now use Chapter 5 as a guideline for the activity of configuring your subsystem storage, or go to Chapter 6 and configure the subsystem storage using CLI commands from a local terminal.

Chapter 5

Configuring the Subsystem with SWCC

If you plan to build or change a new subsystem device configuration using the Command Line Interpreter (CLI), go to Chapter 6. If you plan to configure or modify a new subsystem using the StorageWorks Command Console, use the procedure outlined in this chapter.

The SWCC HELP files contain the details of each step if you are not already familiar with them.

Starting Command Console Client

Command Console Client provides you with two choices: *HSJ80 Storage Window* and *StorageWorks Command Console*. Choosing the HSJ80 Storage Window applet allows you to connect to only one subsystem. The other choice, StorageWorks Command Console, is an applet manager that lets you connect to, monitor, and configure multiple subsystems over a TCP/IP network.

To open the HSJ80 Client, perform one of the following actions:

- Select the HSJ80 Storage Window option from the Start menu.
- Double-click the HSJ80 Storage Window icon in the Navigation Tree.

To access the HSJ80 controller over the network, the client system must be added to the Agent's list of client system entries and the HS-Series Agent process must be running. If you also want to access the HSJ80 Storage Window through the Navigation Tree, you must add the agent system to the Navigation Tree.

Selecting the HSJ80 Storage Window

Client displays the Connection Selection dialog box (Figure 5–1). This selection lets you connect locally to your subsystem over a serial line or by way of TCP/IP connection.

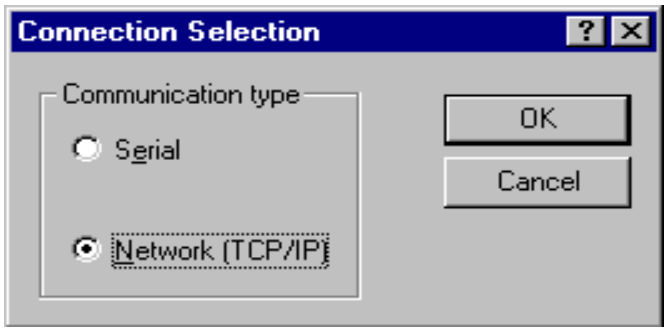


Figure 5–1. Connection Selection for Connecting to a Single Subsystem

Selecting the StorageWorks Command Console

Client displays the Navigation Window (Figure 5–2), which is used by the StorageWorks Command Console applet to monitor and configure multiple subsystems.

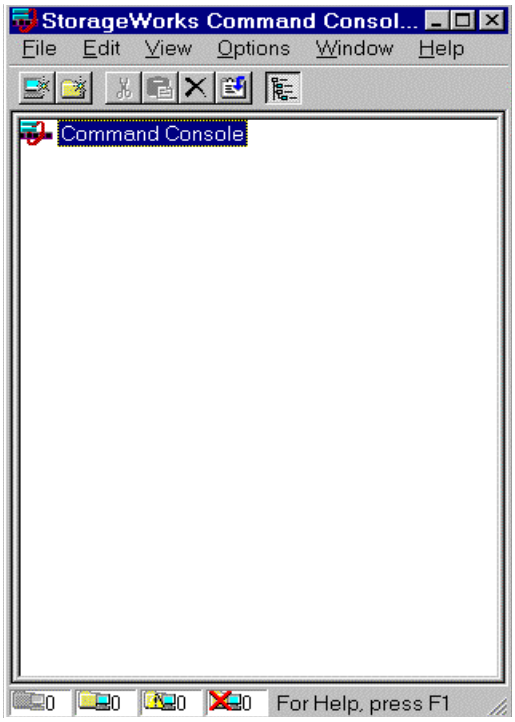


Figure 5–2. Navigation Window

Establishing a Serial Connection

The simplest connection to a subsystem is a direct cable connection from the Client host system to one of the controller serial ports.

1. Select the HSJ80 Storage Window.
2. When the Connection Selection dialog box displays, click the `Serial` radio button, then click `OK` to display the Connect Serial dialog box (Figure 5–3).
3. On the Connect Serial dialog box, from the drop-down menu, select the PC `COM port` to which your HSJ80 controller is connected.
4. Select a Baud rate, a Subsystem Physical View, and a Subsystem Grid View. Click the Connect button to display the Storage Window. When the Storage Window displays, you are connected to your subsystem.

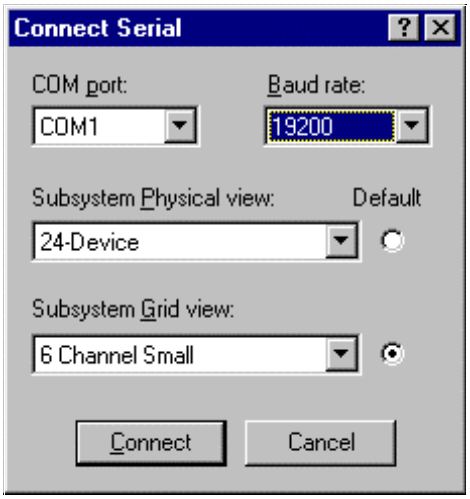


Figure 5–3. Connect Serial Dialog Box for Storage Window

Establishing a Network Connection

In order to use SWCC to manage the HSJ80 controller over a network, you must have installed the:

- HSJ80 Agent (Chapter 3)
- Command Console Client, and the HSJ80 Client (Chapter 4)

Select either *HSJ80 Storage Window* (for a single subsystem) or, if you want to configure and monitor multiple subsystems over a network, select the *StorageWorks Command Console* applet manager. Choosing StorageWorks Command Console displays the Navigation Window, which is a graphical user interface for managing subsystems over a network.

Connecting to a Single Subsystem Over the Network

Use the following procedure to use the HSJ80 Storage Window to control a single subsystem:

1. Select HSJ80 Storage Window from the Start menu.
2. When Client displays the Connection dialog box, click the `Network (TCP/IP)` radio button. Client displays the Connect Network (TCP/IP) dialog box (Figure 5–4).

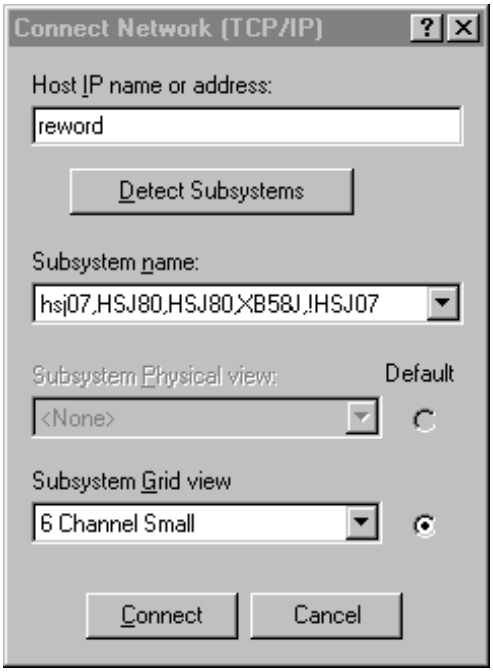


Figure 5–4. Connect Network (TCP/IP)

3. Enter the host IP name or address in the text box, then click `Detect Subsystems` (`reword` is used as the host name in this example). When Client finds the subsystem connected to reword, it displays the subsystem in the in the Storage window.
4. Select the `Subsystem name` (HSJ80 in this example), then click `Connect`. After a brief pause, Client displays the Storage Window.

NOTE: The name of the subsystem was defined during Agent installation.

Connecting to Multiple Subsystems Over the Network

Selecting *StorageWorks Command Console* from the Start menu, causes Client to display the Navigation Window (Figure 5–5). The Navigation Window is the SWCC tool used to manage and monitor many subsystems over a network.

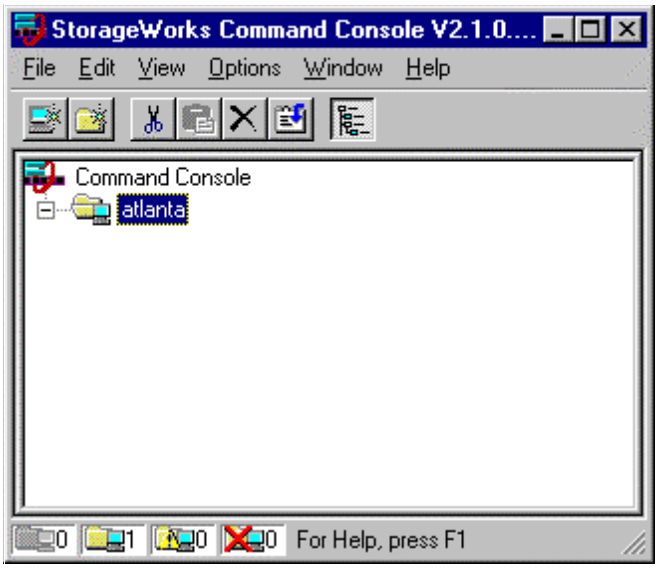


Figure 5–5. Navigation Window

Using the Navigation Window

The Navigation Window shown in Figure 5–5 has its own Menu Bar and can be moved and minimized. Sizing is accomplished by dragging on its corners and borders with the mouse. A network of HSJ80 subsystems may be established by adding systems to the Navigation Window. The host system is named a*tlarta* and the folder for atlarta is shown expanded.

Adding a System to the Network

1. From the File menu, click `Add System`
2. Enter a Domain Name Service (DNS) name or the IP address in the `Host name or TCP/IP address:` text box (Figure 5–6) and click `Apply`.

   After you click `Apply`, the Client adds an icon for *sunday* in the Navigation Window.
3. When the second Add System dialog box appears, click `Close`.

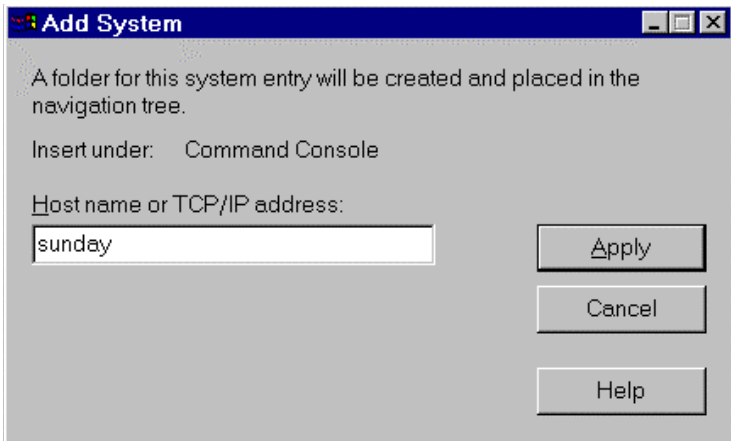


Figure 5–6. Add System Dialog Box

Deleting a Subsystem

1. In the Navigation Window, click the subsystem that you want to delete.
2. From the Edit menu, select `Delete`.

Creating and Using New General Folders

Use folders to organize your storage. Folders can be dragged and dropped within the Navigation Window. Folders can be placed only under the Command Console root or under another general folder in the Navigation Window. Folders can be used to group systems and other general folders, but they cannot be used to group controllers.

In the following example, the general folder *My Folder* was created and one host, *atlanta*, was placed in the folder (Figure 5–7). To add a general folder:

1. Select `New Folder` from the File menu.
2. Enter the name of the folder.

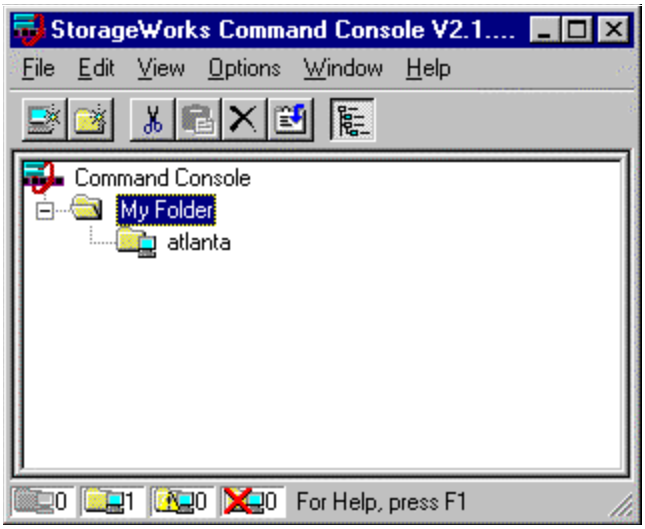


Figure 5–7. Adding a General Folder

Viewing the Hierarchy in the Navigation Window

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

Viewing and Modifying System Folder Properties

1. Right-click a system icon in the Navigation Window.
2. Click `Properties` from the shortcut menu to view the system folder properties (Figure 5–8).

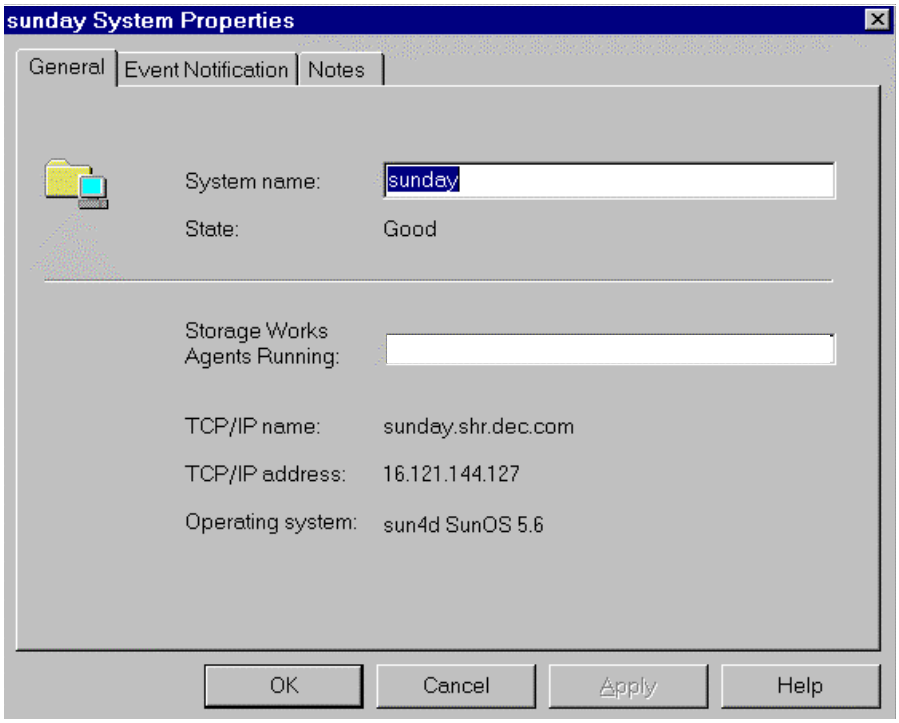


Figure 5–8. System Properties for Sunday

Opening a Storage Window

1. Connect to a subsystem.
2. In the Navigation Window, double-click a system folder.
3. Double-click the Storage Window icon (Figure 5–9) to open a Storage Window (see Figure 5–10).

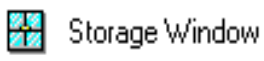


Figure 5–9. Storage Window Icon

4. To view a pictorial representation or Rack View (Figure 5–11) of your storage subsystem in the Storage Window, from the View Menu, select Device>Change View, and choose your rack configuration (Figure 5-12).

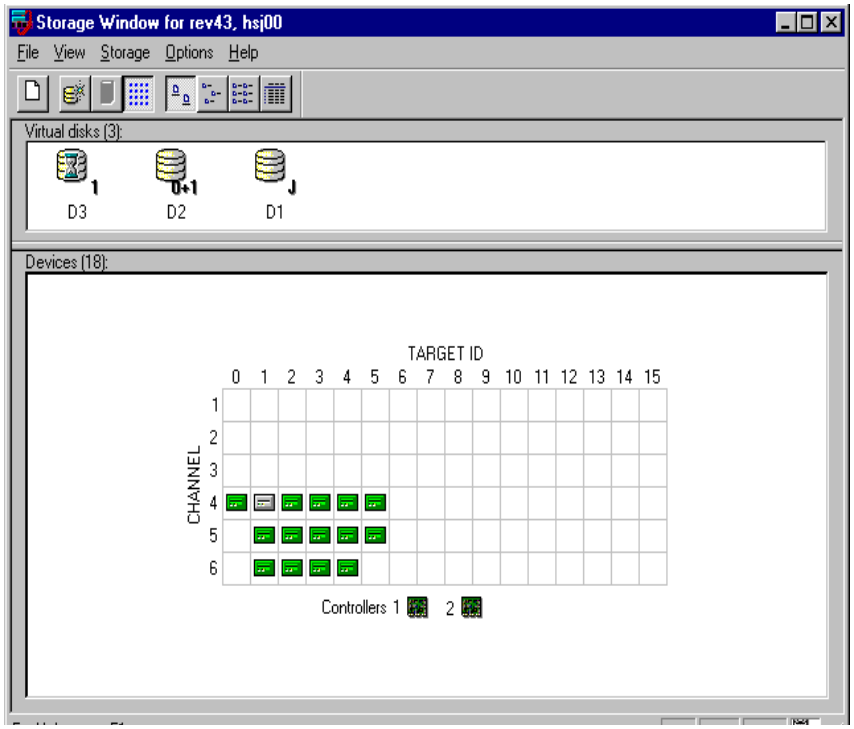


Figure 5–10. Storage Window

Figure 5–11. Storage Window Rack View

Configuring a Controller

Your controller's operating parameters are stored in property sheets. Controller property sheets are accessed by double-clicking a controller icon in the Storage Window or right-clicking the icon and selecting `Properties`. The Controller Properties window has four tabbed selections representing the four Property Sheets available. To access a Property Sheet, click its tab.

Access the controller's property sheets by double-clicking the controller icon in the Storage Window (Figure 5–10) to display its property sheets. When you double-click controller icon (Figure 5–12), the General controller properties sheet displays (Figure 5–13).

Changes to controller settings require a controller restart for the changes to take effect. The program prompts you for confirmation before it restarts your controller.

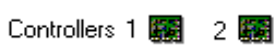


Figure 5–12. Controller Icons

The `General` tab (Figure 5–13) displays the properties of controller A and controller B, such as type, serial number, SCSI address, firmware revision, hardware revision, and common parameters.

Figure 5–13. General Controller Properties Tab

1. Click the `Host Port 1` tab (Figure 5–14) to display the operating parameters for Host Port 1.

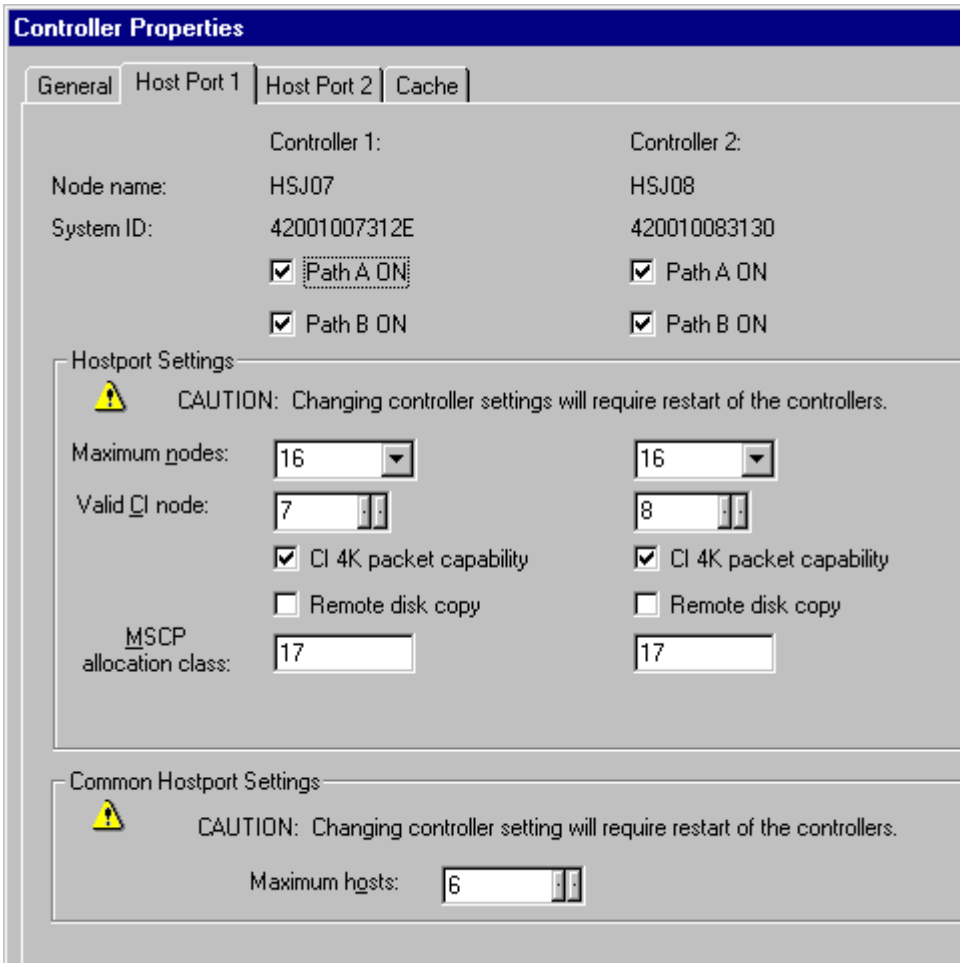


Figure 5–14. Host Port 1 Controller Properties Tab

2. Click the `Host Port 2` tab (Figure 5–15) to display the operating parameters for Host Port 2.

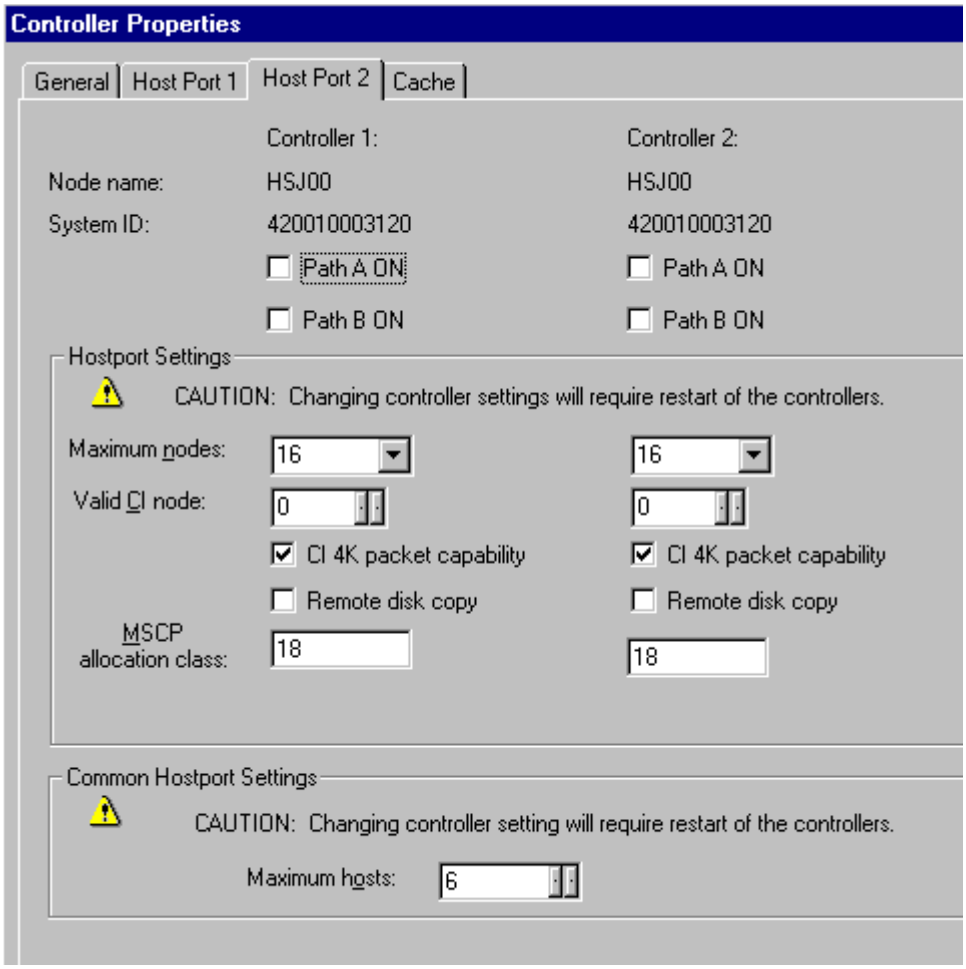


Figure 5–15. Host Port 2 Controller Properties Tab

3. Click the Cache tab to check the cache size (Figure 5–16). Confirm the following:

```
Cache flush_time: (seconds): is 10.
No UPS is connected to this subsystem.
```

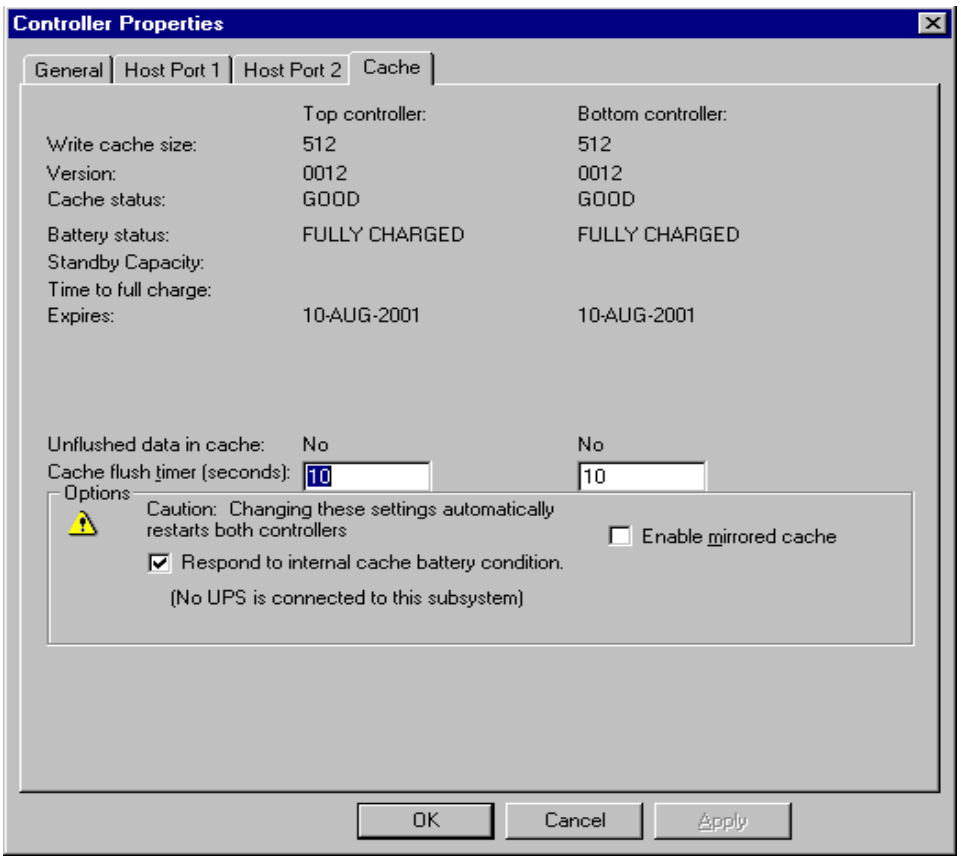


Figure 5–16. Cache Controller Properties Tab

Adding Devices

You must make your physical devices known to your controller before you can create virtual disks from them. You can also add devices online without restarting the controller.

To add a device to the subsystem configuration:

1. From the Navigation Window open a Storage Window within a desired subsystem.
2. Select a bay for the device. From the `Storage` menu and then select `Device/add`.
3. Enter the SWCC password in the Security Check dialog box that appears and click the `OK` button on the ADD Devices dialog box (Figure 5–17).

Figure 5–17. Adding Devices Dialog Box

Creating Virtual Disks

The HSJ80 Client can create a number of different types of logical storage units called virtual disks (or storageset types). You can create any of the following:

- 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 floating parity disk (RAID 3/5)

Virtual disks are created using the HSJ80 Virtual Disk Wizard.

NOTE: Many SWCC operations require an authorization password. A Security Check window appears and the user is prompted to enter a password (Figure 5–18).

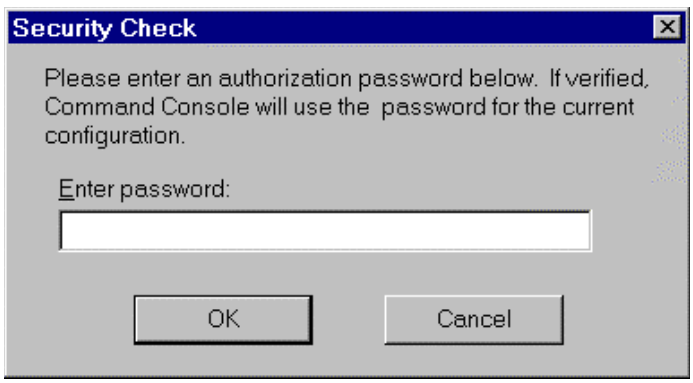


Figure 5–18. Security Check Window

Starting the Wizard

You can start the add Virtual Disk Wizard by selecting `Add Virtual Disk` from the Storage Menu in the HSJ80 Storage Window.

Selecting the RAID Level

The first step is to select the type of virtual disk you want to create. Click the radio button of the RAID level you want (Figure 5–19), then click `Next`.

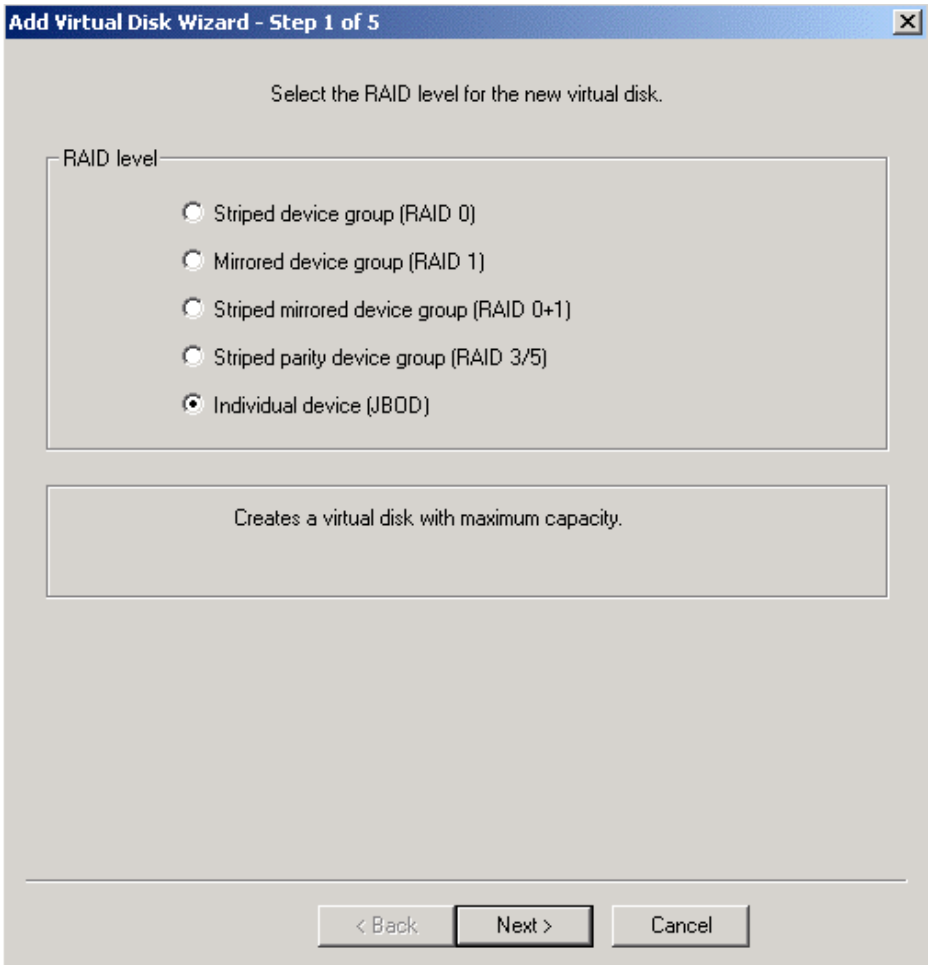


Figure 5–19. Adding Virtual Disk Wizard (Step 1 of 5)

Selecting the Device for Your Virtual Disk

Select the devices you want to include in the virtual disk by clicking them in the Available storage: window pane (Figure 5–20). As you click them, they are listed in the Selected devices: window pane. Each wizard step provides you with the information you need to successfully create a virtual disk. In this example, nine devices are made available, but you may select only one disk to make a JBOD virtual disk.

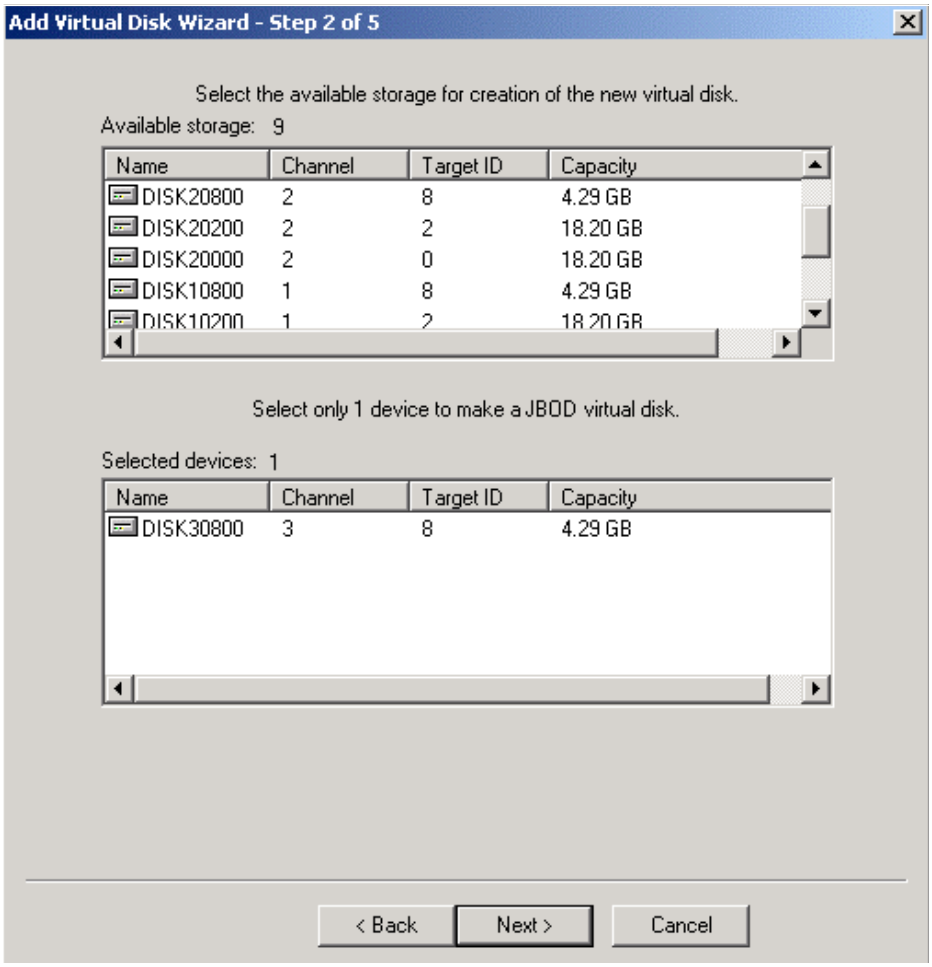


Figure 5–20. Add Virtual Disk Wizard (Step 2 of 5)

Setting the Capacity of the Virtual Disk

Set the capacity of the virtual disk in the `Capacity for virtual disk` field (Figure 5–21). The applet informs you of the minimum and maximum capacity available to you. Click `Next` to continue.

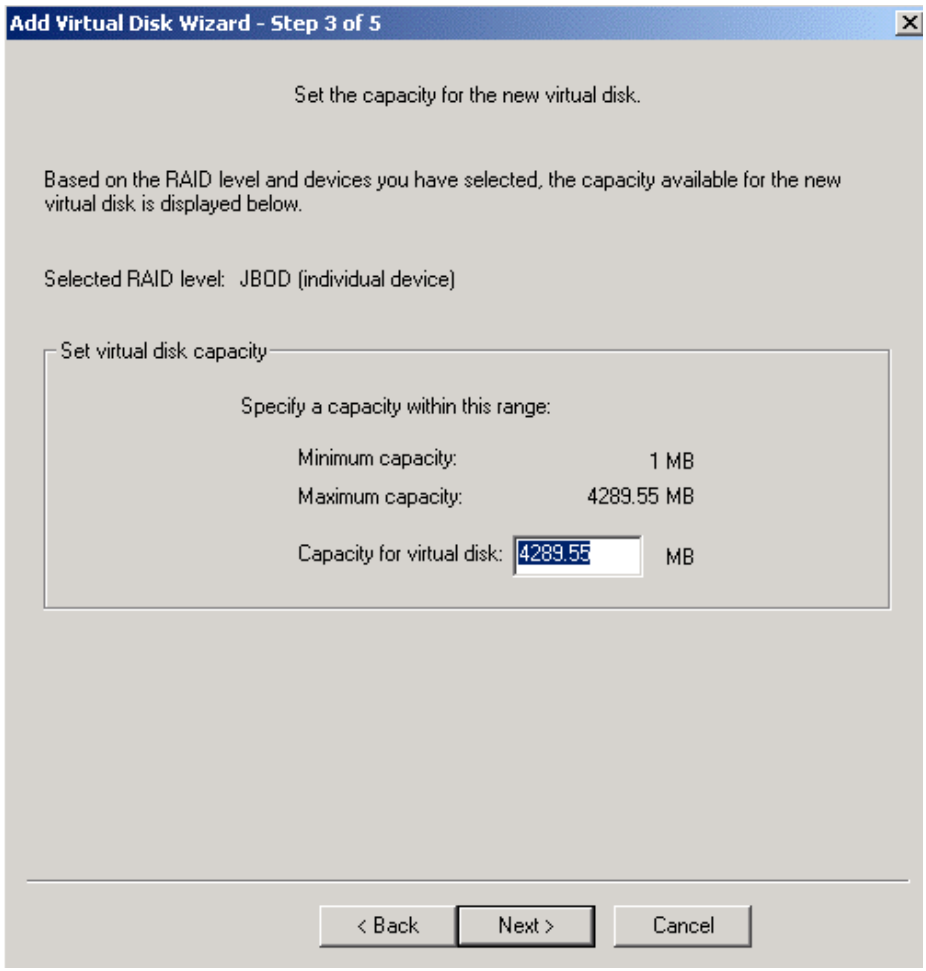


Figure 5–21. Add Virtual Disk Wizard (Step 3 of 5)

Setting the ID, Unit Number, and Operating Parameters

Specify the unit number, operating parameters, and options for the virtual disk, then click `Next`. If you want to save the controller configuration during the process of the wizard, select the `Save controller configuration to virtual disk setting` at Step 4 (Figure 5–22) of 5.

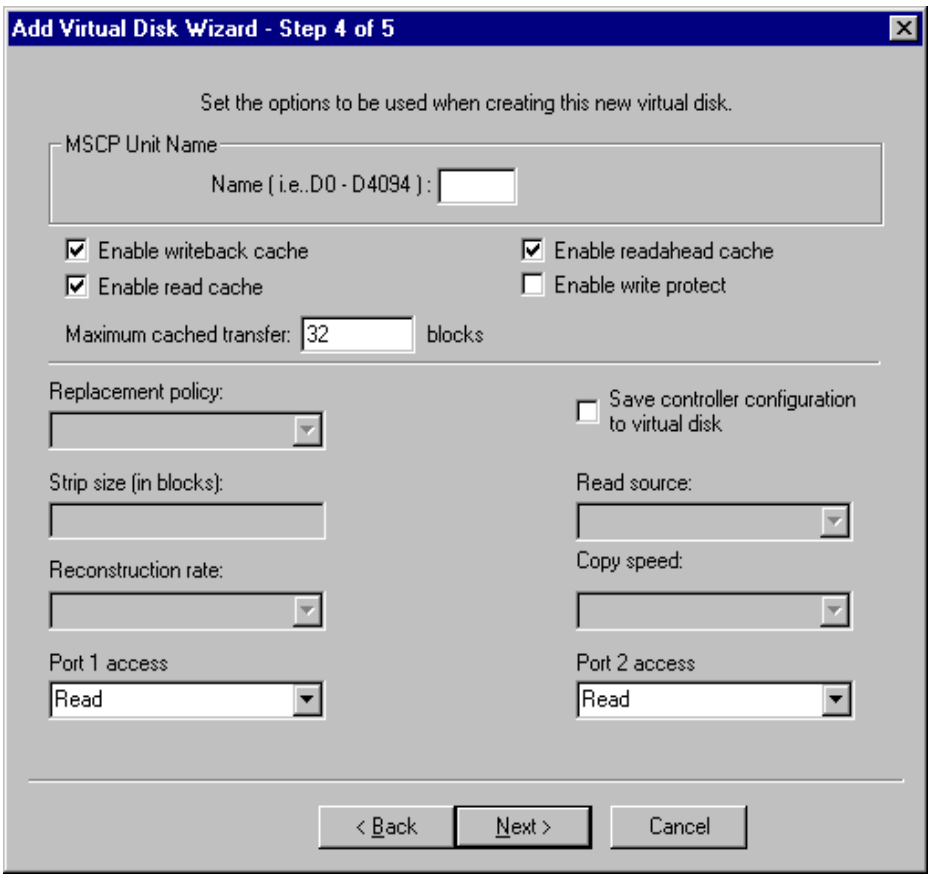


Figure 5–22. Add Virtual Disk Wizard (Step 4 of 5)

Confirming and Creating the Virtual Disks 1 and 2

The final Add Virtual Disk Wizard window Step 5 (Figure 5–23), shows the choices you have made in Steps 1 through 4. If you are satisfied with your choices, click `Finish` to start creating the virtual disks.

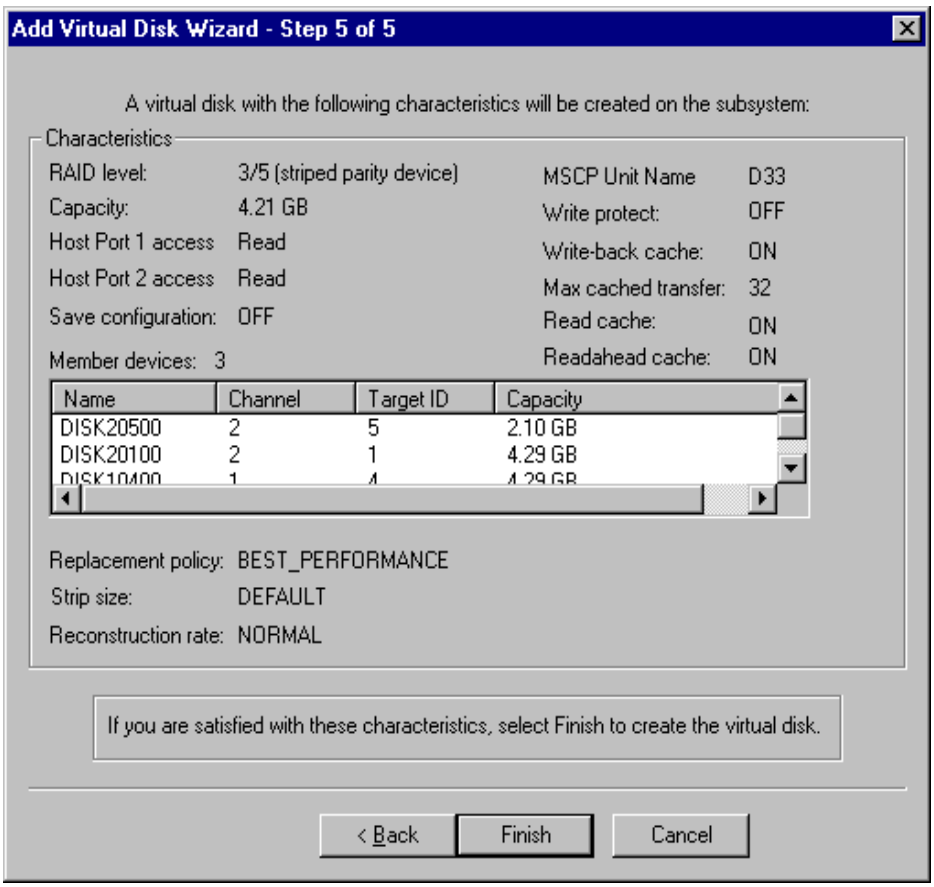


Figure 5–23. Add Virtual Disk Wizard (Step 5 of 5)

Figure 5–24 shows what the Storage Window looks like during the creation of the virtual disk. You should not use the virtual disks until they are finished building.

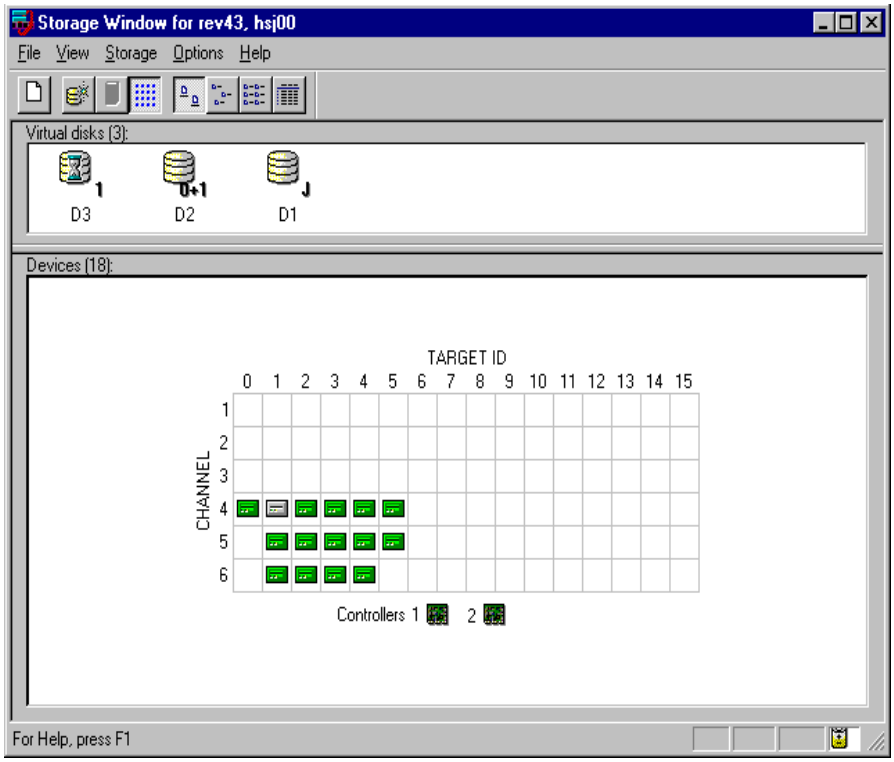


Figure 5–24. Storage Window During Creation Of Virtual Disks (D3)

Deleting Virtual Disks

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

1. Under Windows NT, use the Disk Administrator to first delete the partition. Under UNIX, make sure that any file systems that may have been mounted on the device have been unmounted and removed. If the drive was part of a logical volume, the device should also be removed from the logical volume system.
2. Click the icon of the virtual disk you want to delete.

3. On the Storage menu, select `Virtual Disk`, then `Delete`, or press the Delete key on your keyboard.
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: you can change their operating characteristics or remove their members.

CAUTION: The virtual disks in your subsystem are logical units that hold your user data. Use extreme caution when modifying the characteristics of a virtual disk. You may be putting valuable user data at risk.

Changing Virtual Disk Operating Parameters

You can change the characteristics of any of your virtual disks by accessing their property sheets.

1. Double-click the icon, or right-click and choose `Properties` of any virtual disk to access its property sheets. The first sheet displayed is the `General` tab (see Figure 5–25). This tab is informational and lists the characteristics of the virtual disk. The example given in Figure 5–25 shows the properties for the virtual disk that was created in the previous section.

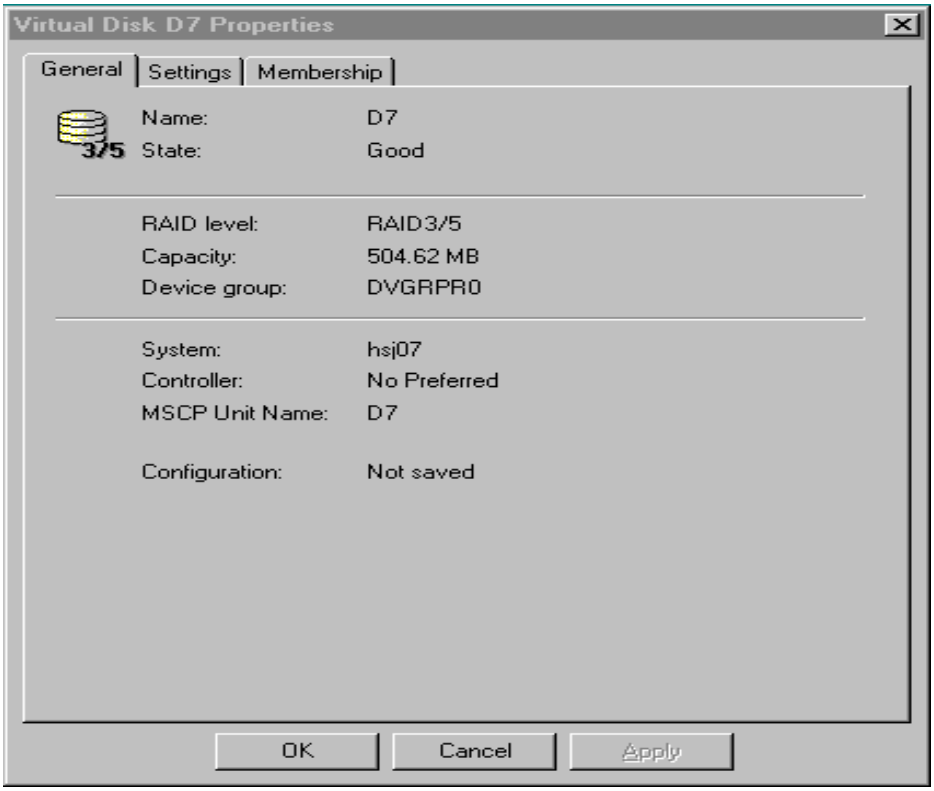


Figure 5–25. Virtual Disk Properties General Tab

2. Click the `Settings` tab to access the settings property sheet (Figure 5–26).

   You can change the chunk size, reconstruction rate, replacement policy, and maximum cached transfer blocks. You can also enable or disable writeback cache by clicking the checkbox. Click `OK` to save the changes and exit.

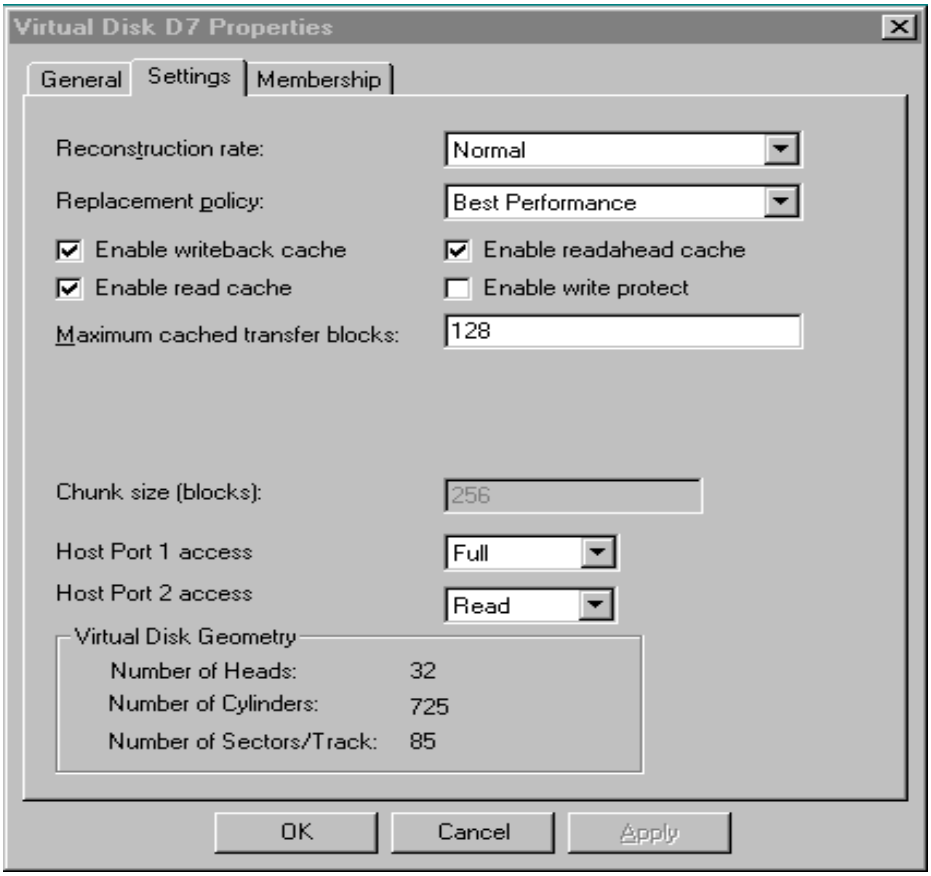


Figure 5–26. Virtual Disk Properties Settings Tab

3. Click the `Membership` tab (Figure 5–27) to display member device properties.

   In this window, you can view a device by name and its current state, channel, target, and capacity.

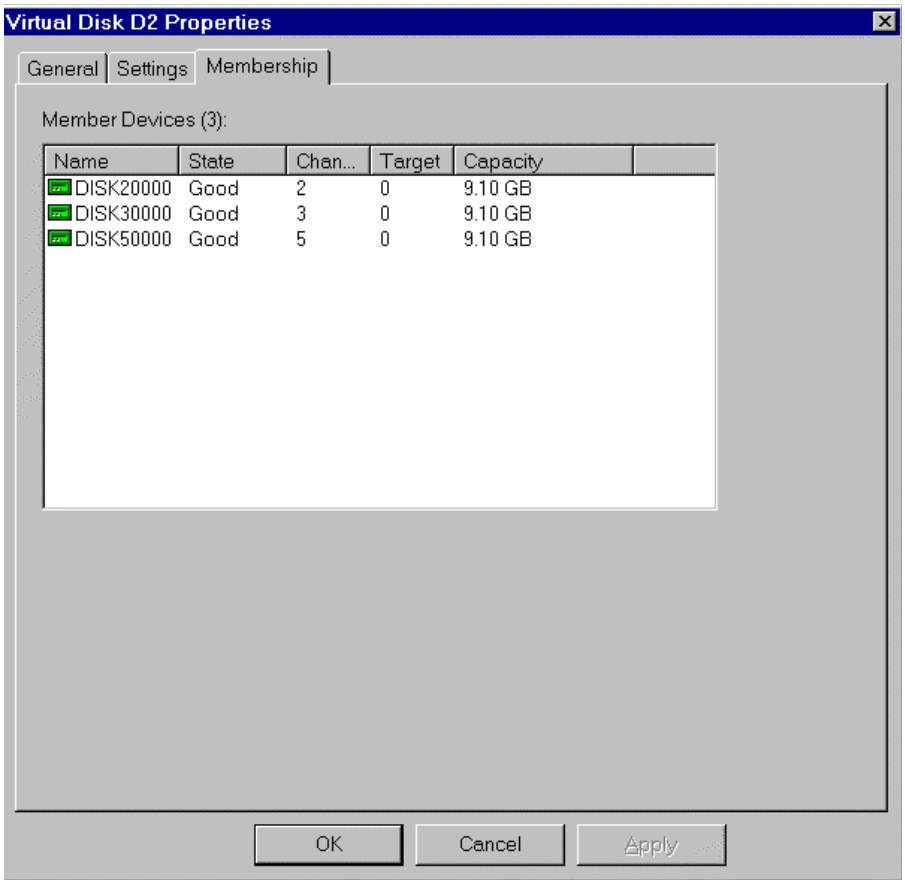


Figure 5–27. Virtual Disk Properties Membership Tab

Managing and Creating Spare Devices

Making a spare device part of a virtual disk protects the integrity of the RAID setup. This is especially true for virtual disks that have RAID requirements of two or more devices. Should one device fail, the virtual disk automatically activates the spare device as an instant replacement for the failed one.

Creating a Spare

1. Click the device in the Storage Window that you want to make a spare. (The device must be available, and it must have a capacity equal to or greater than the lowest capacity drive in the group, for an automatic failed drive replacement.)
2. From the Storage menu, choose `Device`, then choose `Make Spare`.

How a Spare Works

- If a device fails in a RAID 1, RAID 0+1, 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.
- Once the controller writes data to a spare, the spare becomes part of the same device group in which a device failed.

Clearing Failed Devices

You can easily identify a failed device in the Storage Window because its icon appears with a red X covering it. To clear the failed device, from the Storage menu select `Device`, and then select `Delete`.

Using Configuration Files

You can use a configuration file to save a particular subsystem configuration and to view or reconstruct it at a later time. You can revert to one of these saved configurations at any time. Client reads the configuration file you choose and sets up your subsystem accordingly.

Saving Configuration Settings to a File

1. From the Storage menu select `Controller Configuration`, then select `Save` (Figure 5–28).

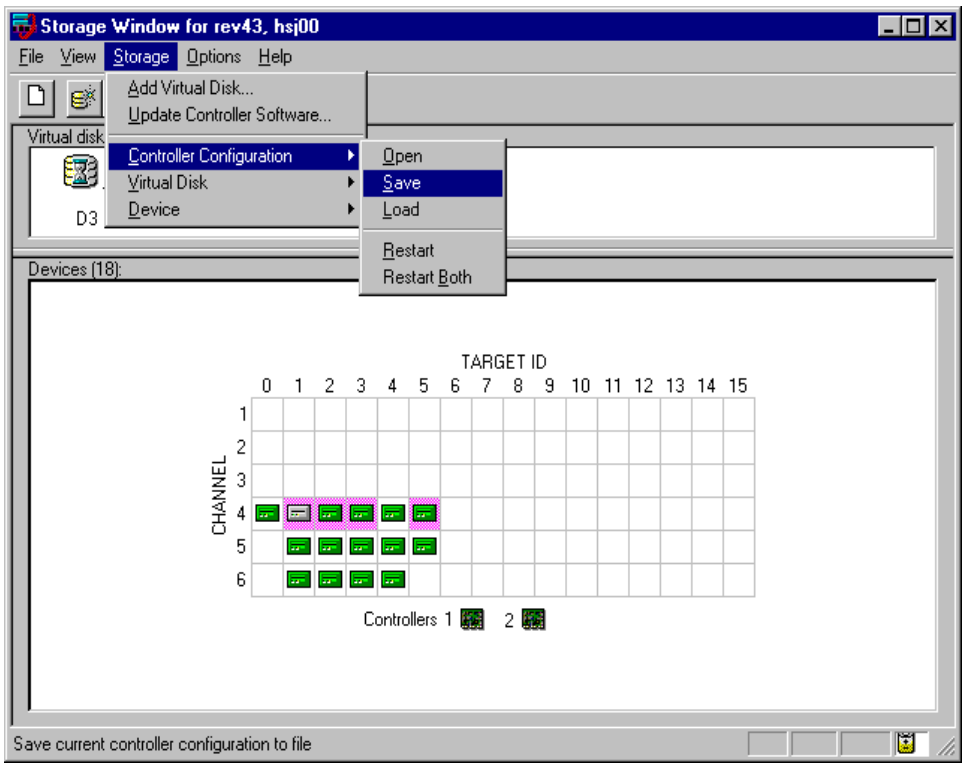


Figure 5–28. Configuration File Submenu

2. When the Save As dialog box displays, specify a file name in the File name: window (Figure 5–29), then click Save. The current configuration settings, including caches, LUNs, host port, and stripe size, are saved to a file at a location that you specify.

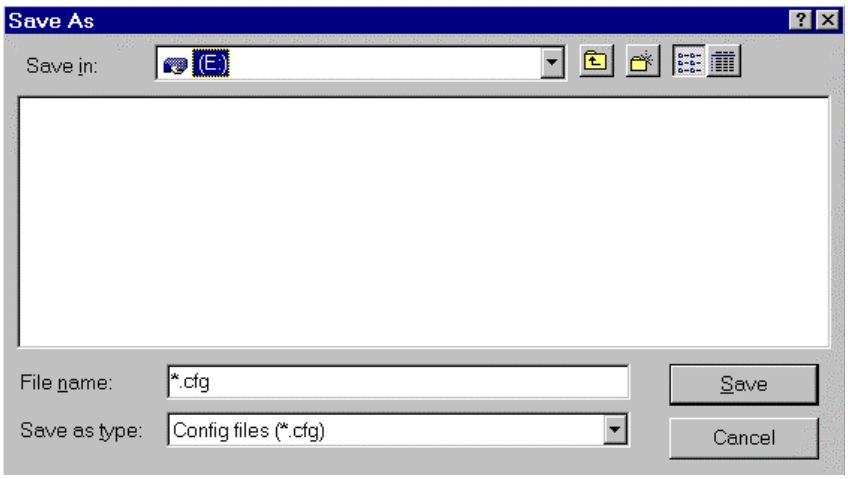


Figure 5–29. Saving to a File

NOTE: To restore the current configuration settings, all controllers must be attached to a serial connection.

Restoring Configuration Settings from a File

You can automatically restore or configure your entire subsystem from a previously saved configuration file. Client can configure your subsystem from a file only if the file corresponds to your subsystem's hardware configuration.

CAUTION: Be aware of the configuration information contained in the configuration file you choose. If you choose a file that is not compatible with the current configuration of the data on your devices, you put your data at risk.

1. Click one of the load option radio buttons.

   If you need to reconfigure a failed controller with existing virtual disks, select `Load configuration only` (see Figure 5–30). The Client recreates your virtual disks, but does not initialize them. Your data is not overwritten.

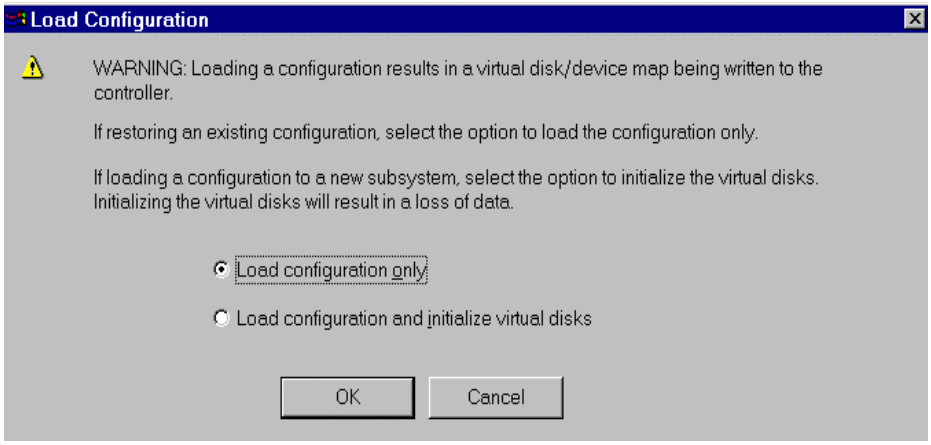


Figure 5–30. Load Configuration

CAUTION: If you are configuring a new system, select *Load configuration and initialize virtual disks*.

2. Click OK.
3. When the Open dialog box displays (Figure 5–31), specify the location (path) and file name in the text box, then click Open. The configuration settings as defined in the file, including caches, LUNs, host port, and stripe size are restored.

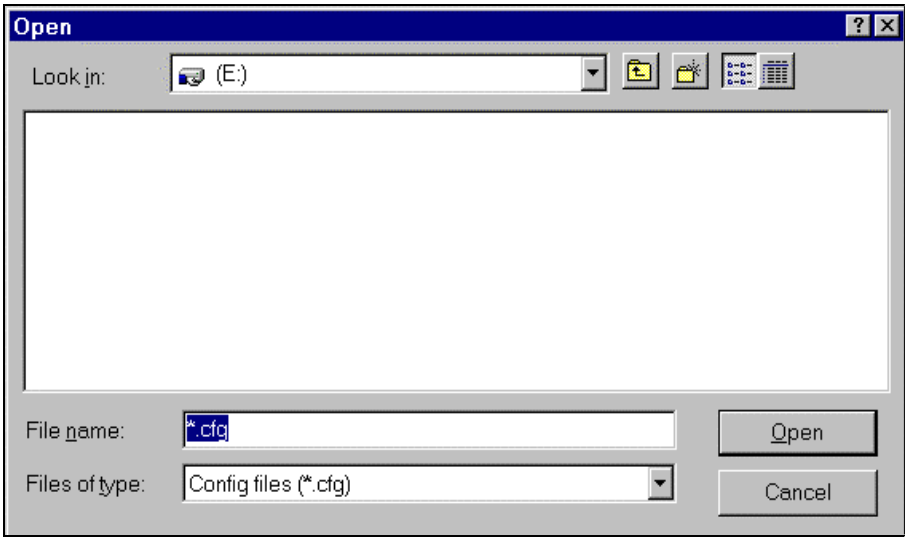


Figure 5–31. Open Dialog Box

CAUTION: You will be unable to restore the original configuration settings if the original hardware and connections have been replaced or if the original configuration settings were not saved before making the new changes.

Setting Passwords and Security Options (Network Only)

Password security prevents unauthorized users from changing or removing storage configurations. In Command Console, any operation that involves changing controller, virtual disk, or device settings requires a password. You do not need a password to view Command Console storage configurations. A password is not required when Client is connected locally to the subsystem through a serial port or host SCSI bus connection. The two security options, selectable from the Storage Window's Options menu (Figure 5–32), are: `View Only` and `Make Changes`.

Figure 5–32. Security Options Menu

Refer to the HELP files for detailed information regarding security systems.

Monitoring the Condition of Your HSJ80 Subsystem

Command Console provides two ways to monitor your subsystem: visually on the computer screen or remotely using pagers. You should familiarize yourself with the Legend of Icons (see Figure 5–33) for Command Console; they are used to show the status of virtual disks, devices, controllers, and the cache battery.

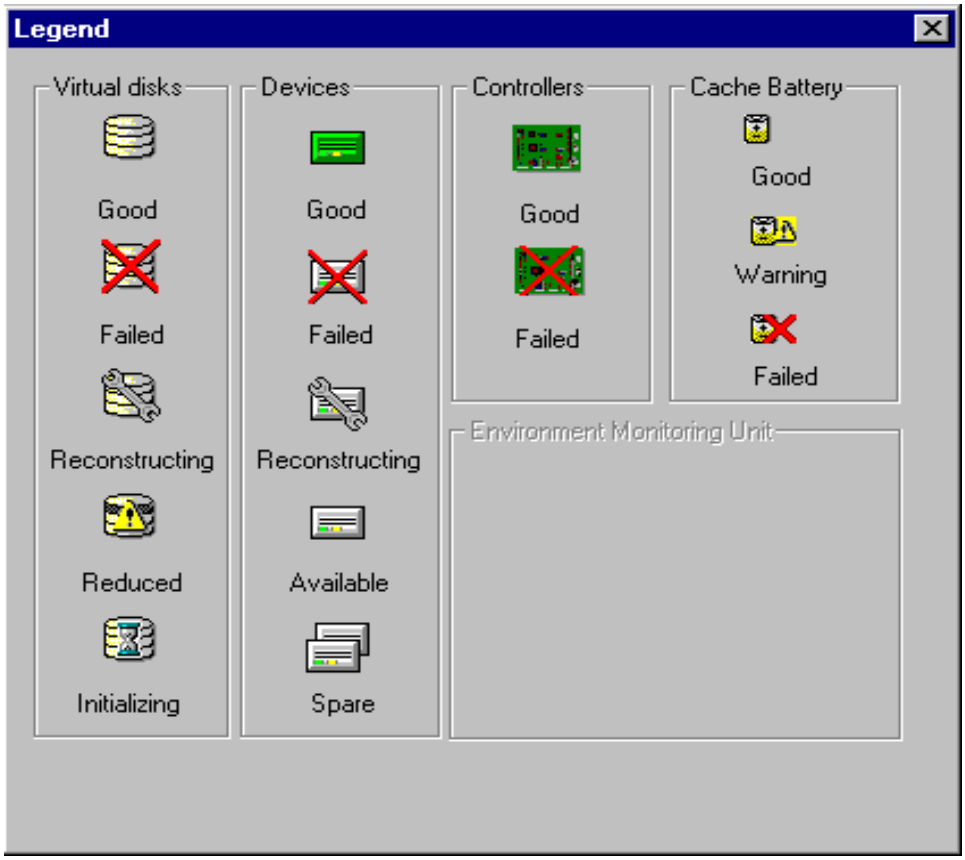


Figure 5–33. Legend of Icons for Command Console

Monitoring Visually

Icons in the Navigation Window and Storage Window show the status of host systems, subsystems, devices, and controllers. In addition, an EMU indicator in the lower-right corner summarizes the condition of the power supply, UPS, and fan.

If you are connected locally to your subsystem, you must refresh the screen manually to check system status. To refresh the screen from the Storage Window's View menu, select `Refresh`.

Navigation Window Icons

The icons in the Navigation Window show system status by modifying their shape or color. For example, if a device fails in a storage system connected to a controller on a system, the failure is indicated by the system folder. A yellow exclamation mark indicates a warning condition and a red X indicates a failure. The Navigation Window Status bar (see Figure 5–34), located in the bottom right of the window, summarizes host system connection status.

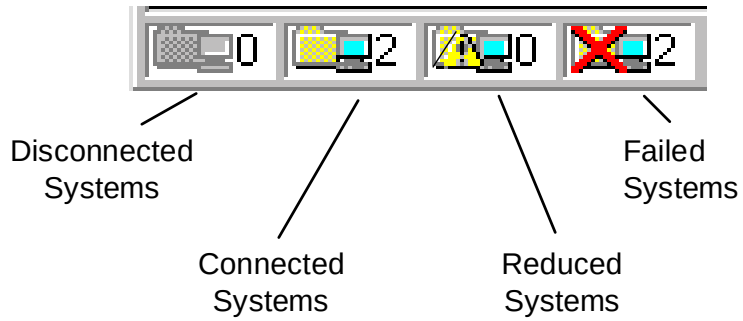


Figure 5–34. Navigation Window Status Bar

Storage Window Icons

The Storage Window provides detailed information in both physical and logical views of an individual subsystem in the Storage Window. In each view, device and virtual disk states are represented by icons. These icons provide subsystem status by modifying their shape or color. A red X through a device indicates device failure. The Storage Window Status bar (see Figure 5–35), at the present time displays only an indication of the battery status.

Figure 5–35. Storage Window Status Bar

Using Pagers to Monitor the Subsystem

Command Console monitors events on your subsystem and notifies you of critical events by pager. You can use either an alphanumeric or numeric pager. If you use an alphanumeric pager, text messages are sent to you. The message includes the host system name, subsystem name, and a text event message. For numeric pagers, you must assign numbers to your host systems and subsystems. The event message is also a four-number code, indicating a critical event.

Command Console can send messages that notify either you or a group you designate at different shift times.

The steps to setting up critical event notification by pager are:

1. Set pager preferences. This includes setting the modem COM port, pager service baud rate, and polling interval.
2. Define a user profile. This includes entering your pager number, identification number (alphanumeric pagers only), and the time period in which you want to be notified.
3. For numeric pagers only, assign pager codes. This includes assigning three-digit numbers to the host systems and subsystems you want to monitor.
4. As an option, create a group of people to notify from the user profiles you have defined.

Refer to the HELP file for detailed information on using the pager mode of operation.

Using the Command Line Interpreter (CLI) Window

The Command Line Interpreter (CLI) Window can be used to enter subsystem CLI commands in lieu of a maintenance terminal or a system host monitor. Access should be allowed to this window only to those who are familiar with the use of the CLI commands to modify and set up the subsystem configuration.

The CLI Window has a command-entry area and a command-response area below it. You can enter commands in the command-entry area, and the controller responds with the results of the entry in the response area.

Accessing the CLI Window

You may access the CLI Window from the Start menu or by double-clicking the CLI Window icon in the Navigation Tree.

- From the Start menu—Select `Command Console` then CLI Window applet.

- From the Navigation tree:

    1) In the Navigation Window, click the subsystem's host system icon to expand the tree and display the CLI Window icon.
    2) Click the CLI Window icon for your subsystem. If the program prompts you for your password, enter it and the CLI Window appears. Enter a CLI command in the command-entry area.

Chapter 6

Configuring and Modifying Storagesets with the CLI

This chapter contains procedures to configure or modify the configuration of subsystem storage. If you plan on building or modifying the subsystem configuration using CLI commands, then use the sections contained in this chapter:

- "Configuring a Stripeset" on page 6–4
- "Configuring a Mirrorset" on page 6–5
- "Configuring a RAIDset" on page 6–6
- "Configuring a Striped Mirrorset" on page 6–7
- "Configuring a Single Disk Unit" on page 6–8
- "Configuring a Partition" on page 6–9
- "Configuring a Device Loader" on page 6–11

To use the CLI, you need to connect a maintenance terminal to the controller serial maintenance port (see Appendix A), or connect to the controller by way of the Diagnostic and Utility Protocol (DUP; see Appendix B).

You must observe certain cautions when configuring storagesets in a multi-cluster environment. These cautions are described in the section that follows.

Multi-Cluster Storageset Environments

The approved cabling method for a multiple cluster subsystem configuration is described in Chapter 1 of the *Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 Configuration Planning Guide*.

CAUTION: When using this mode of operation, the port access of the controllers and the logical units must be set correctly, or data loss may occur. See the following description for additional information.

An HSJ80 Cluster Array Controller storage subsystem may be used in a multiple-cluster configuration using dual Star Couplers with both host ports on both controllers cabled in a dual-redundant configuration.

Multiple clusters, however, should be configured with caution, as data stored on a disk with one cluster may be read and written by the other cluster if not configured properly. To avoid the problems this could cause:

- Select the containers to be used with a particular cluster.
- Enter a series of CLI commands for each container in the subsystem to make them accessible by only one of the two cluster.

Use the SET *unit_number* THIS_PORT_1_ACCESS= FULL/NONE CLI command to assign specific storage units for access by only one of the two clusters. Each container in the subsystem must be set up in the manner as shown in the following example.

The following example command syntax shows containers D100 and D200 being allocated to one cluster or the other. The syntax shows the setting of the access to port 1 (attached to cluster A) to “full” on “this” controller (and “other”) for container D100. This is followed by the syntax to turn on the access to port 2 (attached to cluster B) to “full’ on “this” controller (and “other”) for container D200:

```
SET D100 THIS_PORT_1_ACCESS=FULL
SET D100 THIS_PORT_2_ACCESS=NONE
SET D100 OTHER_PORT_1_ACCESS=FULL
SET D100 OTHER_PORT_2_ACCESS=NONE

SET D200 THIS_PORT_2_ACCESS=FULL
SET D200 THIS_PORT_1_ACCESS=NONE
SET D200 OTHER_PORT_2_ACCESS=FULL
SET D200 OTHER_PORT_1_ACCESS=NONE
```

Using the syntax shown in the example, cluster A has full access to D100, while cluster B does not “see” D100. Conversely, cluster B has full access to D200, while cluster A does not “see” D200.

CONFIG Utility

The devices on the device bus can be configured either manually or by the CONFIG utility. The CONFIG utility is easier to use. This utility does not add loaders.

Invoke the CONFIG utility by using the RUN *program-name* command:

```
RUN CONFIG
```

CONFIG takes about two minutes to locate and map the configuration of a completely populated subsystem. CONFIG displays a message that indicates it is running that is similar to the following example:

```
Config Local Program Invoked
Config is building its tables and determining what devices exist on the
subsystem. Please be patient.

 add disk      DISK10000      1 0 0
 add disk      DISK10100      1 1 0
 add disk      DISK20000      2 0 0
 add disk      DISK20100      2 1 0
 add tape      TAPE30100      3 1 0
 .. . .
Config - Normal Termination
```

Configuring a Stripeset

Use the following procedure to configure a stripeset:

1. Create the stripeset by adding its name to the controller's list of storagesets and specifying the disk drives it contains by using the ADD STRIPESET *stripeset-name container-name1 container-name2 container-name n* command:

   ADD STRIPESET *STRIPESET-NAME CONTAINER-NAME1 CONTAINER-NAME2*

2. Initialize the stripeset. If you want to set any INITIALIZE switches, you must do so in this step (see the *Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 CLI Reference Manual* for details):

   INITIALIZE *STRIPESET-NAME <SWITCH NAME>*

3. Verify the stripeset configuration and switches with the SHOW *stripeset-name* command:

   SHOW *STRIPESET-NAME*

4. Assign the stripeset a unit number to make it accessible by the host or hosts.

   The following is an example showing the commands needed to create STRIPE1, a three-member stripeset:

   ```
   ADD STRIPESET STRIPE1 DISK1000 DISK2000 DISK3000
   INITIALIZE STRIPE1 CHUNKSIZE=128
   SHOW STRIPE1
   ADD UNIT D100 STRIPE1
   ```

Configuring a Mirrorset

Use the following procedure to configure a mirrorset:

1. Create the mirrorset by adding the mirrorset name to the controller's list of storagesets and specifying the disk drives it contains. As an option, you can append Mirrorset switch values. If you do not specify switch values, the default values are applied. Use the ADD MIRRORSET *mirrorset-name disk-name1 disk-name2 disk-name n* command:

   ADD MIRRORSET *MIRRORSET-NAME DISKnnnn DISKnnnn <SWITCH NAME>*

2. Initialize the mirrorset. If you want to set any INITIALIZE switches, you must do so in this step:

   INITIALIZE *MIRRORSET-NAME <SWITCH NAME>*

3. Verify the mirrorset configuration and switches by using the SHOW *mirrorset-name* command:

   SHOW *MIRRORSET-NAME*

4. Assign the mirrorset a unit number to make it accessible by the host or hosts.

   The following is an example of the commands needed to create MIRR1, a two-member mirrorset:

   ```
   ADD MIRRORSET MIRR1 DISK10000 DISK20000
   INITIALIZE MIRR1
   SHOW MIRR1
   ADD UNIT D101 MIRR1
   ```

Configuring a RAIDset

Use the following procedure to configure a RAIDset:

1. Create the RAIDset by adding its name to the controller's list of storagesets and specifying the disk drives it contains. Optionally, you can append RAIDset switch values. If you do not specify switch values, the default values are applied. Use the ADD RAIDSET *RAIDset-name container-name1 container-name2 container-name n* command:

   ADD RAIDSET *RAIDSET-NAME DISKnnnn DISKnnnn DISKnnnn <SWITCH NAME>*

2. Initialize the RAIDset. If you want to set any optional INITIALIZE switches, you must do so in this step:

   INITIALIZE *RAIDSET-NAME <SWITCH NAME>*

   NOTE: It is recommended that you allow initial reconstruct to complete before allowing I/O to the RAIDset. Not doing so may generate forced errors at the host level. To determine whether initial reconstruct has completed, enter SHOW RAIDSET *FULL*.

3. Verify the RAIDset configuration and switches by using the SHOW *raidset-name* command:

   SHOW *RAIDSET-NAME*

4. Assign the RAIDset a unit number to make it accessible by the host or hosts.

   The following is an example of the commands needed to create RAID1, a three-member RAIDset:

   ```
   ADD RAIDSET RAID1 DISK10000 DISK20000 DISK3000
   INITIALIZE RAID1
   SHOW RAID1
   ADD UNIT D101 RAID1
   ```

Configuring a Striped Mirrorset

Use the following procedure to configure a striped mirrorset:

1. Create two or more mirrorsets using the ADD MIRRORSET *mirrorset-name disk-name1 disk-name2 disk-name n* command (do not initialize):

   ADD MIRRORSET *MIRRORSET-NAME1 DISKnnnn DISKnnnn*
   ADD MIRRORSET *MIRRORSET-NAME2 DISKnnnn DISKnnnn*

2. Create a stripeset using the ADD STRIPESET *stripeset-name container-name1 container-name2 container name n* specifying the name of the stripeset and the names of the newly-created mirrorsets from step 1:

   ADD STRIPESET *STRIPESET-NAME MIRRORSET-NAME1 MIRRORSET-NAME2*

3. Initialize the stripeset. If you want to set any optional INITIALIZE switches, you must do so in this step:

   INITIALIZE *STRIPESET-NAME <SWITCH NAME>*

4. Verify the striped mirrorset configuration and switches:

   SHOW *STRIPESET-NAME*

5. Assign the striped mirrorset a unit number to make it accessible by the host or hosts.

   The following is an example of the commands needed to create a striped mirrorset with the name of Stripe1. Stripe1 is a three-member striped mirrorset made up of Mirr1, Mirr2, and Mirr3 (each of which is a two-member mirrorset):

   ```
   ADD MIRRORSET MIRR1 DISK10000 DISK20000
   ADD MIRRORSET MIRR2 DISK30000 DISK40000
   ADD MIRRORSET MIRR3 DISK50000 DISK60000
   ADD STRIPESET STRIPE1 MIRR1 MIRR2 MIRR3
   INITIALIZE STRIPE1 CHUNKSIZE=DEFAULT
   SHOW STRIPE1
   ADD UNIT D103 STRIPE1
   ```

Configuring a Single Disk Unit

Follow this procedure to set up a single disk unit in your subsystem:

1. Initialize the disk drive and set up the desired switches for the disk with the INITIALIZE *container-name SWITCH* command:

   INITIALIZE *DISKnnnn <SWITCH NAME>*

2. Assign the disk a unit number to make it accessible by the host or hosts.
3. Verify the configuration:

   SHOW DEVICE

4. The following is an example of configuring a single disk unit with the name Disk1000 and unit number 100:

   ADD DISK1000 1 0 0
   INITIALIZE DISK1000
   ADD UNIT D100 DISK1000
   SHOW DEVICE

Configuring a Partition

A single disk drive may be partitioned as well as any of the storagesets. Use one of the following two procedures to configure a partition from a single disk drive or a storageset.

Partitioning a Storageset

Follow this procedure to partition a storageset:

1. Add the storageset (and its name) to the controller's list of storagesets and specify the disk drives it contains by using the appropriate ADD command:

   ADD STORAGESET-TYPE *STORAGESET-NAME CONTAINER-NAME1 CONTAINER-NAME2*

2. Initialize the storageset. If you want to set any INITIALIZE switches, you must do so in this step:

   INITIALIZE *STORAGESET-NAME <SWITCH NAME>*

3. Create each partition in the storageset by using the CREATE_PARTITION *container-name SIZE=* command:

   CREATE_PARTITION *STORAGESET-NAME* SIZE=*n*

   where *SIZE=n* may be a percentage of the storageset that will be assigned to the partition. Enter *SIZE=LARGEST* to let the controller assign the largest free space available to the partition.

4. Verify the partition:

   SHOW *STORAGESET-NAME*

   The partition number appears in the first column, followed by the size and starting block of each partition.

5. Assign the partitioned storageset a unit number to make it accessible by the hosts.

   The following is an example of the commands needed to create a partitioned RAIDset named RAID1. RAID1 is a three-member RAIDset, partitioned into two storage units:

   ```
   ADD RAIDSET RAID1 DISK10000 DISK20000 DISK30000
   INTIALIZE RAID1
   CREATE_PARTITION RAID1 SIZE=25
   CREATE_PARTITION RAID1 SIZE=LARGEST
   SHOW RAID1
   ADD UNIT D100 RAID1 PARTITION=1
   ADD UNIT D101 RAID1 PARTITION=2
   ```

Partitioning a Single Disk Drive

Follow this procedure to partition a single disk drive:

1. Add the disk drive to the controller's list of containers by using the ADD DISK *container-name SCSI-port-location* command:

   ADD DISK *DISKnnnn PTL-LOCATION*

2. Initialize the storageset or disk drive. If you want to set any INITIALIZE switches, you must do so in this step:

   INITIALIZE *DISKnnnn <SWITCH NAME>*

3. Create each partition in the disk drive by using the CREATE_PARTITION *container-name SIZE=* command:

   CREATE_PARTITION *DISKnnnn* SIZE=*n*

   where *SIZE=n* may be a percentage of the disk drive that will be assigned to the partition. Enter *SIZE=LARGEST* to let the controller assign the largest free space available to the partition.

4. Verify the partition:

   SHOW *DISKnnnn*

   The partition number appears in the first column, followed by the size and starting block of each partition.

5. Assign the disk a unit number to make it accessible by the hosts.

   The following is an example of the commands needed to create DISK1 partitioned into three storage units:

```
ADD DISK DISK1 1 0 0
INTIALIZE DISK1
CREATE_PARTITION DISK1 SIZE=25
CREATE_PARTITION DISK1 SIZE=25
CREATE_PARTITION DISK1 SIZE=LARGEST
SHOW DISK1
ADD UNIT D100 DISK1 PARTITION=1
ADD UNIT D101 DISK1 PARTITION=2
ADD UNIT D102 DISK1 PARTITION=3
```

Configuring a Device Loader

Follow this procedure to configure a device loader:

1. Add a loader device to the controller:

   ADD LOADER *LOADER_NAME PTL_LOCATION*

2. Create a pass-through device using the created loader:

   ADD PASSTHROUGH *PASSTHROUGH_NAME LOADER_NAME*

3. Assign the pass-through device a unit number to make it accessible by the host:

   ADD UNIT *DEVICE_NAME PASSTHROUGH_NAME*

4. The following is an example of configuring device loader LOAD421 on your subsystem at port 2, target 0, LUN 0:

   ADD LOADER LOAD421 2 0 0
   ADD PASSTHROUGH PASS421 LOAD421
   ADD UNIT D100 PASS421

Configuring a Tape Drive

1. Add the tape drive to the controller's list of devices:

   ADD TAPE *TAPEDRIVE-NAME PTL-LOCATION*

2. Present the tape drive to the host by giving it a unit number the host can recognize:

   ADD UNIT *UNIT-NUMBER TAPEDRIVE-NAME*

3. Verify the configuration:

   SHOW TAPES

4. The following example shows the commands you would use to add Tape100 to your subsystem.

ADD TAPE Tape100 1 0 0
ADD UNIT T100 Tape100
SHOW TAPES

Chapter 7

Other Configuration Procedures Using the CLI

This chapter contains other configuration options for the subsystem and its devices:

- "Assigning Unit Numbers" on page 7–2
  - "Assigning a Unit Number to a Partition" on page 7–2
  - "Assigning a Unit Number to a Storageset" on page 7–2
  - "Assigning a Unit Number to a Single (JBOD) Disk" on page 7–3
- "Configuration Options" on page 7–4
  - "Changing the CLI Prompt" on page 7–4
  - "Changing the Time on the Controller" on page 7–4
  - "Set Up Cache UPS" on page 7–4
  - "Adding Disk Drives" on page 7–5
  - "Enabling and Disabling Autospare" on page 7–6
  - "Erasing Metadata" on page 7–7
  - "Deleting a Storageset" on page 7–7
  - "Changing Switches for a Storageset or Device" on page 7–8
- "Failover Mode" on page 7–10
- "Moving Containers" on page 7–10
  - "Array Controllers and Hot Pluggable Drives" on page 7–11
  - "Container Moving Procedures" on page 7–11

Assigning Unit Numbers

Each storageset, partition, or single (JBOD) disk must be assigned a unit number for the host to access. As the units are added, their properties can be specified through the use of command switches, which are described in detail under the ADD UNIT command in the *Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 CLI Reference Manual*.

The ADD UNIT command gives a storageset a logical unit number by which the hosts can access it.

Assigning a Unit Number to a Partition

Use the ADD UNIT *unit-number container-name PARTITION=* command to assign a unit number to a storageset partition:

ADD UNIT *UNIT-NUMBER STORAGESET-NAME*
PARTITION=*PARTITION-NUMBER*

The following is an example of the command syntax needed to assign partition 3 of mirrorset mirror1 to unit D300:

ADD UNIT D300 MIRROR1 PARTITION=3

Assigning a Unit Number to a Storageset

Use the ADD UNIT *unit-number container-name* command to assign a logical unit number to a storageset:

ADD UNIT *UNIT-NUMBER STORAGESET-NAME*

The following is an example of the command syntax needed to assign storageset R1 to unit D102:

ADD UNIT D102 R1

Assigning a Unit Number to a Single (JBOD) Disk

Use the ADD UNIT *unit-number container-name* command to assign a unit number to a single disk:

ADD *UNIT UNIT-NUMBER DISK-NAME*

The following is an example of the command syntax needed to assign disk 20300 to unit D4:

ADD UNIT D4 DISK20300

Assigning a Unit Number to a Tape

Use the ADD UNIT *unit-number tapedrive-name* command to assign a unit number to a single tape. For example, to assign unit number T100 to tape 100, issue the command:

ADD UNIT T100 TAPE100

Assigning a Unit Number to a Tape Loader

Use the ADD UNIT *unit-number passthrough-name* command to assign a unit number to a tape loader. For example, to assign unit number D130 to the passthrough device Pass 130, issue the command:

ADD UNIT D130 PASS130

Configuration Options

During the configuration process, there are many options to choose from. This section describes how to set up some of the more common ones.

Changing the CLI Prompt

To change the CLI prompt from the default, enter a 1-16 character new prompt string in the switch field of the SET *controller* PROMPT= *command*:

```
SET THIS_CONTROLLER PROMPT = “NEW PROMPT”
```

If you are configuring dual-redundant controllers, change the CLI prompt on the “other” controller as well:

```
SET OTHER_CONTROLLER PROMPT = “NEW PROMPT”
```

Changing the Time on the Controller

Set the time on the controller by using the SET *controller* command with the *TIME=* switch:

```
SET THIS_CONTROLLER TIME= DD-MMM-YYYY:HH:MM:SS
SET OTHER_CONTROLLER TIME= DD-MMM-YYYY:HH:MM:SS
```

Set Up Cache UPS

By default, the controller expects to use an external cache battery (ECB) as the power source backup to the cache module. You can instead choose to use an uninterruptable power supply (UPS) to provide this backup in the event of a primary power failure.

To support your subsystem with a UPS, use the SET *controller* UPS command:

```
SET THIS_CONTROLLER UPS=DATA_CENTER
or
SET THIS_CONTROLLER UPS=NODE_ONLY
or
SET THIS_CONTROLLER NOUPS
```

NOTE: The companion controller in a dual-redundant pair inherits the cache UPS setting.

Adding Disk Drives

Any factory-installed devices in your StorageWorks subsystem have already been added to the controller's list of eligible storage devices. If new drives are to be added to your subsystem, you must issue one of the CLI commands found in the following paragraphs before you can use them in any kind of storageset, single disk unit, or spareset:

- Adding One Disk Drive at a Time
- Adding Several Disk Drives at a Time
- Adding and Deleting a Disk Drive to or from the Spareset

Adding One Disk Drive at a Time

To add one new disk drive to your controller's list of eligible storage devices, use the ADD DISK *container-name SCSI-port-location* command:

ADD DISK *DISKnnnn PTL-LOCATION SWITCH_VALUE*

Adding Several Disk Drives at a Time

To add several new disk drives to your controller's list of eligible storage devices, use the RUN *program-name* command to start the CONFIG utility:

RUN CONFIG

Adding and Deleting a Disk Drive To and From the Spareset

The spareset is a collection of hot spares that are available to the controller should it need to replace a failed member of a RAIDSET or mirrorset. The following procedures describe how to add and delete a disk drive to/from the spareset.

Adding a Disk Drive—Use the following steps to add a disk drive to the spareset:

1. Add the disk drive to the controller's list of containers by using the ADD DISK *container-name SCSI-port-location* command:

   ADD DISK *DISKnnnn PTL-LOCATION*

2. Add the disk drive to the spareset list by using the ADD SPARESET *disk-name* command:

   ADD SPARESET *DISKnnnn*

   Repeat this step for each disk drive you want added to the spareset.

3. Verify the contents of the spareset:

   SHOW SPARESET

Example—The following is an example of the command syntax needed to add DISK60000 and DISK60100 to the spareset:

```
ADD SPARESET DISK60000
ADD SPARESET DISK60100
SHOW SPARESET
```

> **NOTE:** You cannot delete the spareset; it always exists whether or not it contains disk drives. You can, however, delete disks within the spareset if you need to use them elsewhere in your subsystem.

Removing a Disk Drive—To remove a disk drive from the spareset:

1. Show the contents of the spareset with the following command:

   SHOW SPARESET

2. Delete the desired disk drive by using the DELETE SPARESET *disk-name* command:

   DELETE SPARESET *DISKnnnn*

3. Verify the contents of the spareset:

   SHOW SPARESET

Example—The following is an example of the command syntax needed to remove DISK60000 from the spareset:

```
SHOW SPARESET
 Name          Storageset     Uses          Used By
-------------------------------------------------------
 SPARESET      spareset       DISK60000
                              DISK60100

DELETE SPARESET DISK60000
SHOW SPARESET
 Name          Storageset     Uses          Used By
-------------------------------------------------------
 SPARESET      spareset       DISK60100
```

Enabling and Disabling Autospare

The autospare feature allows any new disk drive that is inserted into the PTL location of a failed drive to be automatically initialized and placed into the spareset.

Enabling Autospare

To enable autospare, use the SET FAILEDSET *replacement policy* command using `autospare` as the parameter:

```
SET FAILEDSET AUTOSPARE
```

Disabling Autospare

To disable autospare, use the command:

```
SET FAILEDSET NOAUTOSPARE
```

During initialization, the *autospare* parameter of the SET FAILEDSET command checks for metadata on the new disk drive. Metadata is the information that indicates the drive belongs to, or has been used by, a known storageset. If the drive contains metadata, initialization stops.

> **NOTE:** A new disk drive will not contain metadata, but a repaired or re-used disk drive may contain metadata.

Erasing Metadata

To erase metadata from a disk drive:

1. Add the disk drive to the controller's list of eligible devices by using the ADD DISK *container-name SCSI-port-location* command:

   ADD DISK *DISKnnnn PTL-LOCATION*

2. Make the device transportable by using the SET *device-name TRANSPORTABLE* command:

   SET *DISKnnnn* TRANSPORTABLE

3. Initialize the device by using the INITIALIZE *container-name* command:

   INITIALIZE *DISKnnnn*

Deleting a Storageset

Any storageset may be deleted unless it is partitioned. If the storageset you want to delete is partitioned, you must first delete each partitioned unit before you can delete the storageset. Use the following steps to delete a storageset:

1. Show the configuration:

   SHOW STORAGESETS

2. Delete the unit number shown in the “Used by” column:

   DELETE *UNIT-NUMBER*

3. Delete the name shown in the “Name” column:

   DELETE *STORAGESET-NAME*

4. Verify the configuration:

   SHOW STORAGESETS

Example—The following example is the command syntax needed to delete Stripe1, a three-member stripeset that is made up of DISK10000, DISK20000, and DISK30000:

SHOW STORAGESETS

Name	Storageset	Uses	Used By
STRIPE1	stripeset	DISK10000	D100
		DISK20000	
		DISK30000	

```
DELETE D100
DELETE STRIPE1
SHOW STORAGESETS
```

Changing Switches for a Storageset or Device

You can optimize a storageset or device at any time by changing the switches that are associated with it. Remember to update the storageset profile when you change its switch configuration. This section describes the following:

- Displaying the Current Switches
- Changing RAIDset and Mirrorset Switches
- Changing Device Switches
- Changing Initialize Switches
- Changing Unit Switches

Displaying the Current Switches

To display the current switches for a storageset or single-disk unit, enter the following CLI command:

SHOW *STORAGESET-NAME*

or

SHOW *DEVICE-NAME*

or

SHOW *TAPE-UNIT-NUMBER*

Changing RAIDset and Mirrorset Switches

Use the SET RAIDset-name or SET mirrorset-name command to change the RAIDset or mirrorset switches associated with an existing storageset. For example, the following command changes the replacement policy for RAIDset RAID1 to *BEST_FIT*:

```
SET RAID1 POLICY=BEST_FIT
```

Changing Device Switches

Use the SET *unit-number* command to change the device switches. For example, the following command enables DISK10000 to be used in a non-StorageWorks environment:

```
SET DISK1000 TRANSPORTABLE
```

The TRANSPORTABLE switch cannot be changed for a disk if the disk is part of a higher-level container. Additionally, the disk cannot be configured as a unit if it is to be used as indicated in the preceding example.

Changing Initialize Switches

The INITIALIZE switches cannot be changed without destroying the data on the storageset or device. These switches are integral to the formatting and can only be changed by reinitializing the storageset.

CAUTION: Initializing a storageset is similar to formatting a disk drive; all data is destroyed during this procedure.

Changing Unit Switches

Use the SET *unit-number* command to change unit switches that are associated with a unit. For example, the following CLI command enables write protection for unit D100:

```
SET D100 WRITE_PROTECT
```

The general form of the SET unit-number command is:

```
SET UNIT-NUMBER SWITCH VALUE
```

For additional information on the SET *unit-number* command, see the *Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 CLI Reference Guide*.

Failover Mode

In failover mode, units can be assigned to a host in a variety of setups, including the designation of the port of the controller, either Port 1 or Port 2 or both.

The HSJ80 Array Controller has two host ports where separate hosts can then be attached to the controller through separate buses. Units can be assigned to either port, depending on their unit numbers and by setting *PORT_1_ID* and *PORT_2_ID* switch.

The configurations best suited to using the *PORT_n_ID* switch include the following:

- Separate operating systems accessing units on the same pair of HSJ80 Array Controllers
- The same operating systems (nonclustered, only) accessing units on the same pair of HSJ80 Array Controllers
- Any environment in which multiple hosts access the pair of HSJ80 Array Controllers, but where a specific host must have sole access to units

Moving Containers

You can move a container from one subsystem to another without destroying its data. You can also move a container to a new location within the same subsystem. The following sections describe the rules to be observed when moving containers:

- Array Controllers and Hot Pluggable Drives
- Container Moving Procedures

Array Controllers and Hot Pluggable Drives

Hot pluggable drives within the array controller family is also known as Asynchronous Drive Hot Swap (ADHS). “Hot pluggable” is defined as the removal or insertion of a drive without quiescing the bus. Note that disk replacement within storagesets is performed by sparing, either by using the AUTOSPARE feature, or by using manual intervention with CLI commands to delete and replace the device.

Operating Conditions Supported by ADHS

ADHS is supported on the HSJ80 with the observance of the following restrictions:

- ADHS Applies to disk drives only. Wait 90 seconds after powering on before enabling the CI bus, issuing CLI commands to the controller, and re-initiating activity to it.
- Disks may not be imported into bays configured as disks which are members of higher-level containers such as RAIDsets, mirrorsets, sparesets, and so on. AUTOSPARING is used for these types of configurations.

Operating Conditions Not Supported by ADHS

ADHS is not supported under the following operating conditions:

- During failover
- During failback
- During controller initialization/reboot (until the CLI prompt appears)
- During the running of a local program (DILX, CLCP, and so on)
- To perform a physical move of a device from one location to another (new port or target)
- To perform more than one drive removal/insertion at a time (50 seconds is required for the controller to complete the process of recognizing/processing the drive removal/insertion)

NOTE: When power cycling entire shelves during servicing, ensure all controller-based Mirror/RAID drives have not been moved to the failedset or are faulted.

Container Moving Procedures

Use the following procedure to move a container while maintaining the data it contains:

1. Show the details for the container you want to move. Use the following syntax:

   SHOW *STORAGESET-NAME*

2. Label each member with its name and PTL location.

   If you do not have a storageset map for your subsystem, you can enter the LOCATE command for each member to find its PTL location. Use the following syntax:

   LOCATE *DISKnnnn*

   To cancel the locate command, enter the following:

   LOCATE CANCEL

CAUTION: Never initialize any container or this procedure will not protect data.

3. Delete the unit-number shown in the "Used by" column of the SHOW storageset-name command. Use the following syntax:

   DELETE *UNIT-NUMBER*

4. Delete the storageset shown in the "Name" column of the SHOW storageset-name command. Use the following syntax:

   DELETE *STORAGESET-NAME*

5. Delete each disk drive—one at a time—that the storageset contained. Use the following syntax:

   DELETE *DISKnnnn*

   DELETE *DISKnnnn*

   DELETE *DISKnnnn*

6. Remove the disk drives and move them to their new PTL locations.

7. Add again each disk drive to the controller list of valid devices. Use the following syntax:

   ADD DISK *DISK-NAME PTL-LOCATION*

   ADD DISK *DISK-NAME PTL-LOCATION*

   ADD DISK *DISK-NAME PTL-LOCATION*

8. Recreate the storageset by adding its name to the controller list of valid storagesets and specifying the disk drives it contains. (Although you have to recreate the storageset from its original disks, you do not have to add them in their original order.) Use the following syntax:

   ADD *STORAGESET-NAME DISKnnnn DISKnnnn DISKnnnn*

9. Represent the storageset to the host by giving it a unit number the host can recognize. You can use the original unit number or create a new one. Use the following syntax:

   ADD UNIT *UNIT-NUMBER STORAGESET-NAME*

Example 1

The following example moves unit D100 to another rack. D100 is the RAIDset RAID99 that comprises members 20000, 30000, and 40000.

SHOW RAID99

Name	Storageset	Uses	Used by
RAID99	raidset	disk10000	D100
		disk20000	
		disk30000	

DELETE D100

DELETE RAID99

DELETE DISK10000

DELETE DISK20000

DELETE DISK30000

(...move the disk drives to their new location...)

ADD DISK DISK20000 2 0 0

ADD DISK DISK30000 3 0 0

ADD DISK DISK40000 4 0 0

ADD RAIDSET RAID99 DISK20000 DISK30000 DISK40000

ADD UNIT D100 RAID99

Example 2

The following example moves the reduced RAIDset, R3, to another rack. (R3 used to contain DISK20000, which failed before the RAIDset was moved. R3 contained DISK10000, DISK30000, and DISK40000 at the beginning of this example.)

```
DELETE D100
DELETE R3
DELETE DISK10000
DELETE DISK30000
DELETE DISK40000
(...move disk drives to their new location...)
ADD DISK DISK10000 1 0 0
ADD DISK DISK30000 3 0 0
ADD DISK DISK40000 4 0 0
ADD RAIDSET R3 DISK10000 DISK30000 DISK40000 REDUCED
ADD UNIT D100 R3
```

Chapter 8

Subsystem Cabling Procedures

Once the controller has been configured and verified that it is operational to the storage elements, you can proceed to cable the controller to the cluster. There are four supported cabling options available with the HSJ80:

- Single Controller, Single Host Port, Single Cluster
- Dual Controller, Single Host Port, Single Cluster
- Dual Controller, Dual Host Port, Single Cluster
- Dual Controller, Dual Host Port, Dual Cluster

The first two are part of the cabling alternatives that are available with the HSJ40/50 Subsystems and are described in the *Compaq StorageWorks DS-BA356-MW Controller Enclosure Upgrade/Add-On Kit Installation Guide*. The latter two cabling alternatives are new offerings that are now available with the HSJ80 and are described in this chapter.

> **NOTE:** The descriptions and illustrations shown in this section only describe the cabling from the HSJ80 to the Star Coupler. The cabling of the host bus adapter to the Star Coupler may be found in the appropriate host documentation.

Precautions

Follow the precautions described in the following paragraphs when carrying out the procedures in this chapter:

- "Electrostatic Discharge Precautions"
- "VHDCI Cable Precautions"
- "Maintenance Port Precautions"

Electrostatic Discharge Precautions

Static electricity collects on all nonconducting material, such as paper, cloth, and plastic. An electrostatic discharge (ESD) can easily damage a controller or other subsystem component even though you may not see or feel the discharge. Follow these precautions whenever you are servicing a subsystem or one of its components:

- Always use an ESD wrist strap when servicing the controller or other components in the subsystem. Make sure that the strap contacts bare skin and fits snugly, and that the strap's grounding lead is attached to a bus that is a verified earth ground.
- Before touching any circuit board or component, always touch a verifiable earth ground to discharge any static electricity that may be present in your clothing.
- Always keep circuit boards and components away from nonconducting material.
- Always keep clothing away from circuit boards and components.
- Always use antistatic bags and grounding mats for storing circuit boards or components during replacement procedures.
- Always keep the ESD cover over the program card when the card is in the controller. If you remove the card, put it in its original carrying case. Never touch the contacts or twist or bend the card while you are handling it.
- Do not touch the connector pins of a cable when it is attached to a component or host.

VHDCI Cable Precautions

Some of the cables in the subsystem (for example, the controller I/O module, cache module, and external cache battery) use very-high-density cable interconnect connectors (VHDCI). These connectors have extraordinarily small mating surfaces that can be adversely affected by dust and movement.

Use the following precautions when connecting cables that use VHDCI connectors:

- Clean the mating surfaces with a blast of clean air.
- Mate the connectors by hand, then tighten the retaining screws to 1.5 inch-pounds—approximately 1/4 additional turn after the connectors have mated.
- Test the assembly by gently pulling on the cable, which should not produce visible separation.

Maintenance Port Precautions

The maintenance port generates, uses, and radiates radio-frequency energy through cables that are connected to it. This energy may interfere with radio and television reception. Do not leave a cable connected to this port when you are not communicating with the controller.

Required Tools

You will need the following tools to service the controller, cache module, external cache battery (ECB), and the I/O module:

- A flathead screwdriver for loosening and tightening the I/O module retaining screws and the cable-retaining screws
- An antistatic wrist strap
- An antistatic mat on which to place modules during servicing
- A Storage Building Block (SBB) Extractor for removing StorageWorks building blocks. This tool is not required, but it will enable you to provide more efficient service.

Dual Controller Cabling Procedures

Select one of the following cabling configuration procedures based upon the HSJ80 subsystem order that was placed and follow the procedure outlined.

The two supported cabling options for an HSJ80 controller subsystem that utilize the dual-host port capabilities are:

- dual controller, dual host port, dual Star Couplers, single cluster
- dual controller, dual host port, dual Star Couplers, multiple clusters

Dual Controller, Dual Host Port, Single Cluster

Figure 8–1 illustrates a dual HSJ80 subsystem with the internal CI Bus cables attached. Note that both of the internal CI Bus cables are used in this configuration (both CI Host Ports are used). Use Table 8–1 as a guide to connecting the controller to the Star Coupler.

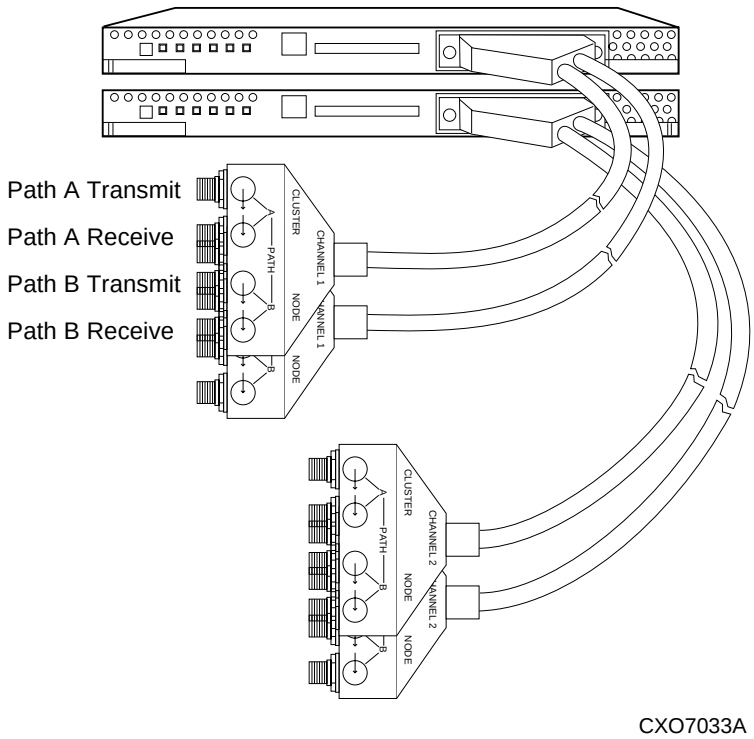


Figure 8–1. Dual HSJ80 with Internal CI Bus Cables Using Dual Host Ports

Table 8–1 Dual Controller, Dual Host Port Cabling

CI Bus Cable Channel (Port) 1	Star Coupler
Path A (Port 1) Transmit	Data Path A, Transmit (unused connector 0—31*)
Path A (Port 1) Receive	Data Path A, Receive (unused connector 0—31*)
Path B (Port 1) Transmit	Data Path B, Transmit (unused connector 0—31*)
Path B (Port 1) Receive	Data Path B, Receive (unused connector 0—31*)
CI Bus Cable Channel (Port) 2	**Star Coupler**
Path A (Port 2) Transmit	Data Path A, Transmit (unused connector 0—31*)
Path A (Port 2) Receive	Data Path A, Receive (unused connector 0—31*)
Path B (Port 2) Transmit	Data Path B, Transmit (unused connector 0—31*)
Path B (Port 2) Receive	Data Path B, Receive (unused connector 0—31*)
* when using CISCE	

To cable a dual controller, dual host port configuration:

1. Install an internal CI bus cable (17-03427-03/04) to each of the HSJ80s; tighten connector screws.
2. Dress cables in the rack to follow the I/O cables previously installed.
3. Connect the four blue external CI bus cables to the internal CI bus cable connectors on each HSJ80. Each channel connector is used to cable the Transmit /Receive and Path A/B lines to the external CI bus cables.

IMPORTANT: Ensure that the internal cables are connected properly to the equivalent external CI bus cables by observing the notations on the external CI Bus cable tags. See Figure 8–2 for an example view of the completed cabling.

4. When completed, go to the section “Star Coupler” to connect the cables.

NOTE: If the Star Coupler is already cabled properly for the new installation, then the ports that were deactivated during the controller configuration process (Chapter 2, "Configuring the HSJ80 Controller") will have to be turned back on using one or more of the CLI commands listed:

```
SET THIS_CONTROLLER PORT_1_PATH_A
SET THIS_CONTROLLER PORT_1_PATH_B
SET THIS_CONTROLLER PORT_2_PATH_A
SET THIS_CONTROLLER PORT_2_PATH_B
```

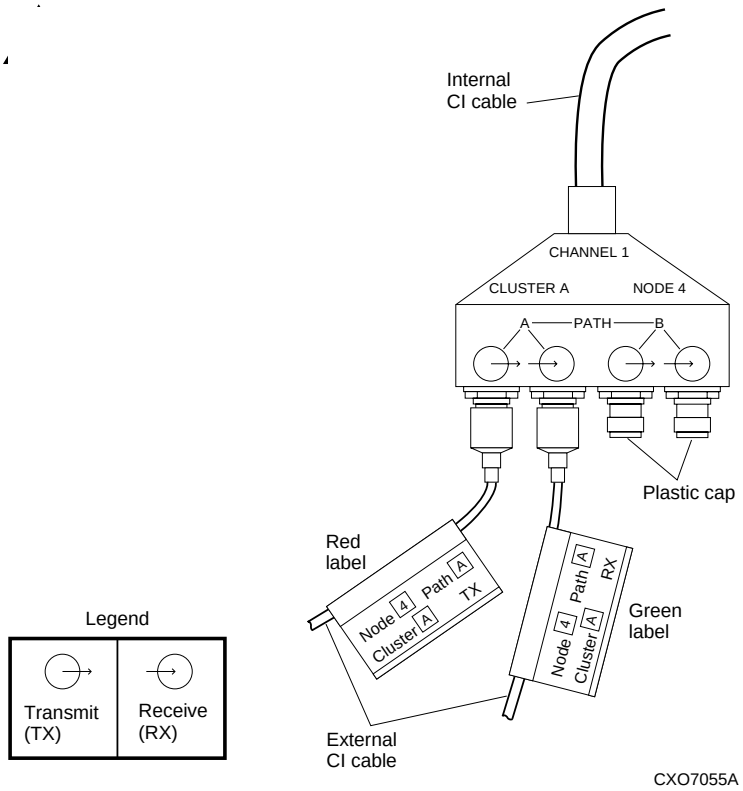


Figure 8–2. Example of CI Bus Labeling

Dual Controller, Dual Host Port, Multiple Cluster

There is no difference in the cabling of single-cluster, dual-redundant controllers to that of cabling dual-cluster, dual-redundant controller to the Star Coupler (see Table 8–1). The differences in subsystem cabling lie in the CI connections from the Star Coupler to the host bus adapters (refer to Chapter 1 in the *Compaq StorageWorks HSJ80 Array Controller ACS Version 8.5J-2 Configuration Planning Guide* for additional information). The cabling procedures are described in the appropriate host documentation.

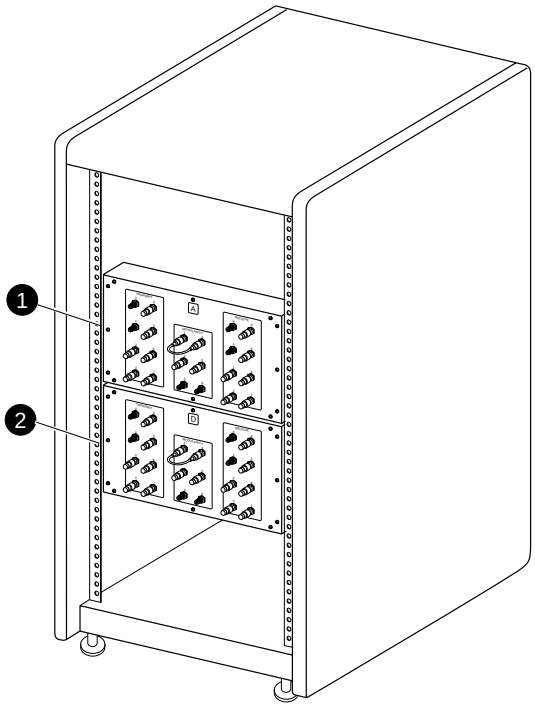
The Star Coupler

The SC008 Star Coupler is one of the basic CI bus building blocks. Physically, the coupler is a passive R-F transformer coupling connection panel. Two panels provide a central connection point for up to 8 OpenVMS cluster nodes using Path A and B. Cabling two additional panels together allows for a 16-node cluster configuration. All nodes within the cluster communicate to one another by way of the Star Coupler over the CI bus.

An example SC008 Star Coupler rack containing two coupler panels is shown in Figure 8–3. Details of the coupler panel is shown in Figure 8–4.

> **NOTE:** Any unused transmit or receive connection ports **must** have a terminator (supplied with each Star Coupler) installed to maintain the correct terminating impedance.

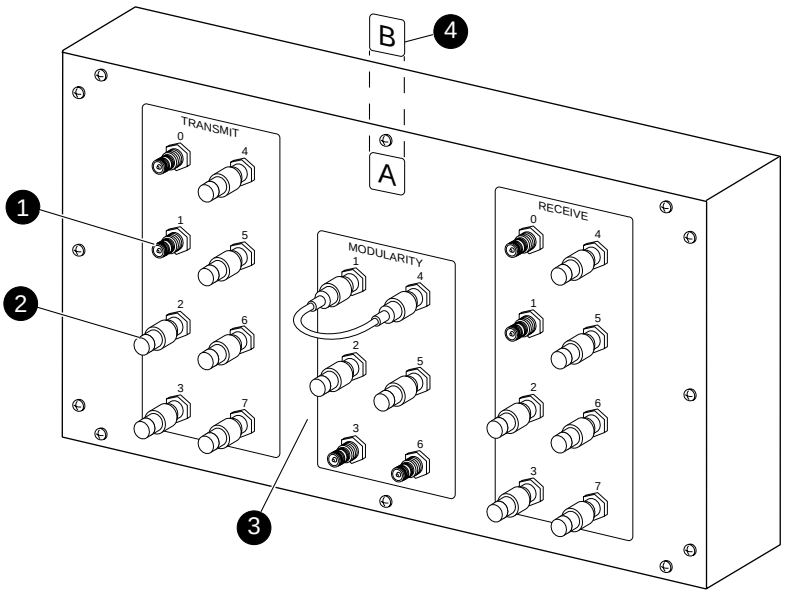
An eight-node cluster would use the two coupler connection panels (SC008-AC) as shown in Figure 8–3. Note the positions of the short modularity cables in the “Modularity” area of the coupler box (Figure 8–4).



❶ SC008 Star Coupler Connection Panel A (for Path A)

❷ SC008 Star Coupler Connection Panel B (for Path B)

Figure 8–3. SC008-AC Star Coupler Rack



❶ Unterminated Connector

❷ Terminated Connector

❸ Modularity Cables

❹ Data Path Label (A or B)

Figure 8–4. SC008 Star Coupler Connection Panel

Cabling 16-Node Clusters to the Star Coupler

To cable a 16-node cluster, two additional connection panels need to be installed (SC008-AD) into the Star Coupler rack and their respective modularity cables configured as described in the following sections.

Star Coupler Connection Panels A (Nodes 0-7 and 8-15)

1. On the panel that connects nodes 0-7, connect a modularity cable between modularity connectors 1 and 2.
2. On the panel that connects nodes 0-7, connect a modularity cable between modularity connectors 4 and 5.
3. On the panel that connects nodes 0-7, connect a modularity cable between modularity connectors 3 and modularity connector 1 on connection panel A (nodes 8-15).

4. On the panel that connects nodes 0-7, connect a modularity cable between modularity connectors 6 and modularity connector 4 on connection panel A (nodes 8-15).

Star Coupler Connection Panels B (Nodes 0-7 and 8-15)

1. On the panel that connects nodes 0-15, connect a modularity cable between modularity connectors 1 and 2.
2. On the panel that connects nodes 0-7, connect a modularity cable between modularity connectors 4 and 5.
3. On the panel that connects nodes 0-7, connect a modularity cable between modularity connectors 3 and modularity connector 1 on connection panel B (nodes 8-15).
4. On the panel that connects nodes 0-7, connect a modularity cable between modularity connectors 6 and modularity connector 4 on connection panel B (nodes 8-15).

See the *SC008 Star Coupler User Guide* (EK-SC008-UG) for additional details.

NOTE: The ports that were de-activated during the controller configuration process (Chapter 2, "Configuring the HSJ80 Controller") will have to be turned back on using one or more of the CLI commands listed:

```
SET THIS_CONTROLLER PORT_1_PATH_A
SET THIS_CONTROLLER PORT_1_PATH_B
SET THIS_CONTROLLER PORT_2_PATH_A
SET THIS_CONTROLLER PORT_2_PATH_B
```

Cabling 32-Node Clusters to the Star Coupler

To enable operation of 32-node clusters, two Computer Interconnect Star Coupler Extenders (CISCE) need to be added to the cabling of the Star Couplers. The CISCE hardware is shown in Figure 8–5 and example cabling is shown in Figure 8–6. Refer to the *CISCE Star Coupler Extender Installation and User Guide* (EK-CISCE-UG) for additional information.

Star Coupler Connection Panel A (Nodes 0-7)

1. Connect a modularity cable between modularity connector 1 and input connector 1 on the CICSE.
2. Connect a modularity cable between modularity connector 4 and output connector 1 on the CICSE.

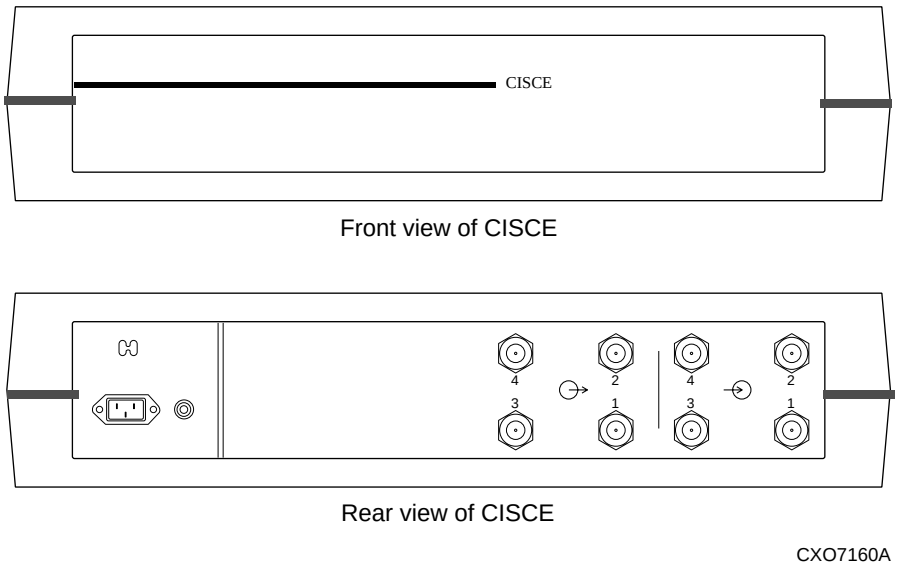


Figure 8–5. CISCE Hardware Views

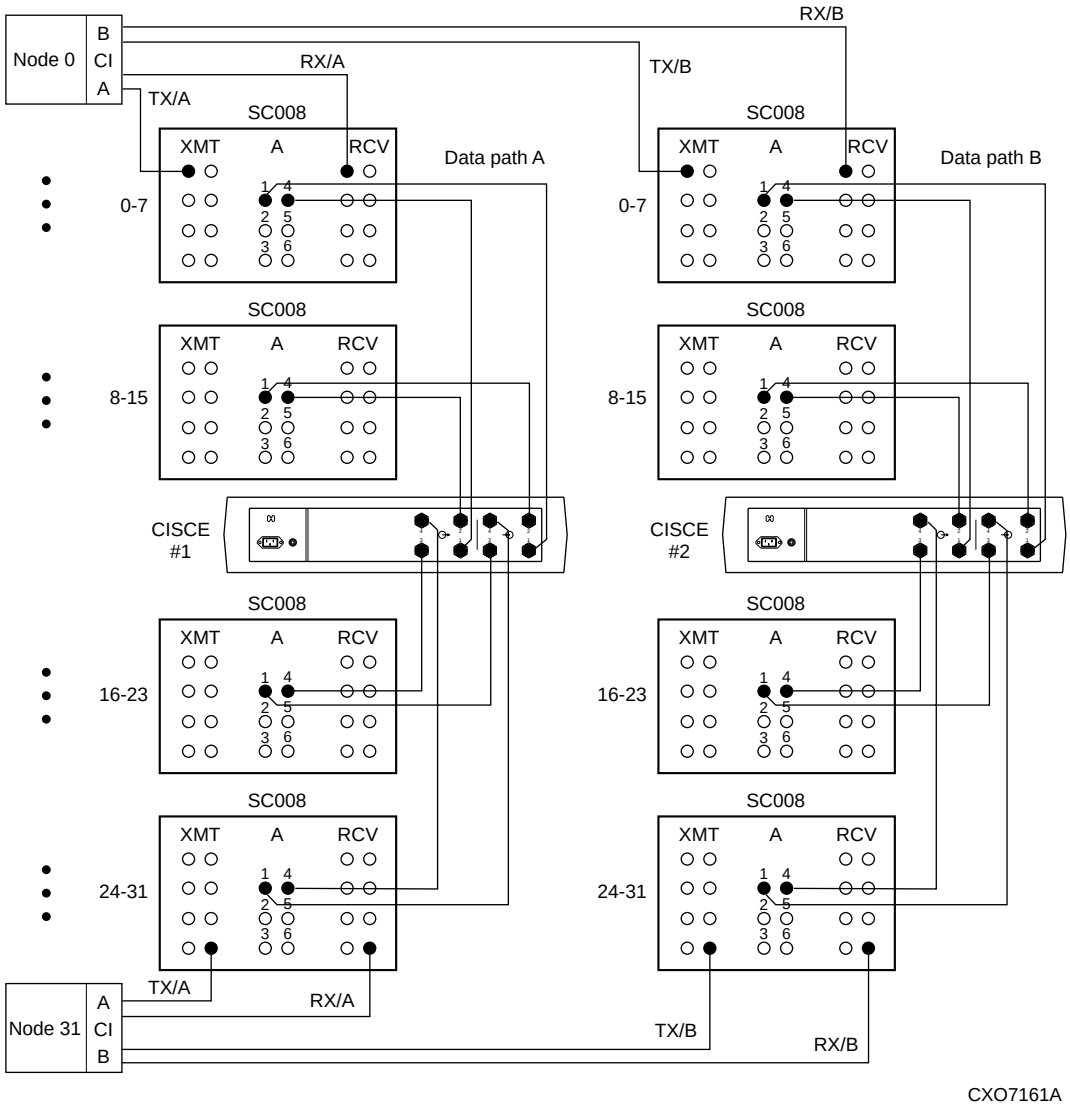


Figure 8–6. CISCE Sample Cabling for 32-Node Clusters

Star Coupler Connection Panel A (Nodes 8-15)

1. Connect a modularity cable between modularity connector 1 and input connector 2 on the CICSE.
2. Connect a modularity cable between modularity connector 4 and output connector 2 on the CICSE.

Star Coupler Connection Panel A (Nodes 16-23)

1. Connect a modularity cable between modularity connector 1 and input connector 3 on the CICSE.
2. Connect a modularity cable between modularity connector 4 and output connector 3 on the CICSE.

Star Coupler Connection Panel A (Nodes 24-31)

1. Connect a modularity cable between modularity connector 1 and input connector 4 on the CICSE.
2. Connect a modularity cable between modularity connector 4 and output connector 4 on the CICSE.

Star Coupler Connection Panel B

Cabling the Path B Star Coupler connection panels is identical to that of the previously described Path A panels. Repeat the previous steps for Path B panels using the Path A directions.

NOTE: The ports that were deactivated during the controller configuration process (Chapter 2, "Configuring the HSJ80 Controller") must be turned back on using one or more of the CLI commands listed:

```
SET THIS_CONTROLLER PORT_1_PATH_A
SET THIS_CONTROLLER PORT_1_PATH_B
SET THIS_CONTROLLER PORT_2_PATH_A
SET THIS_CONTROLLER PORT_2_PATH_B
```

Tape Cabling

Figure 8–7 through Figure 8–10 show the tape configurations and cabling for the SW500 and SW800 racks. Figure 8–11 and Figure 8–12 show the tape configurations and cabling for the Modula racks, MA8000 and EMA12000.

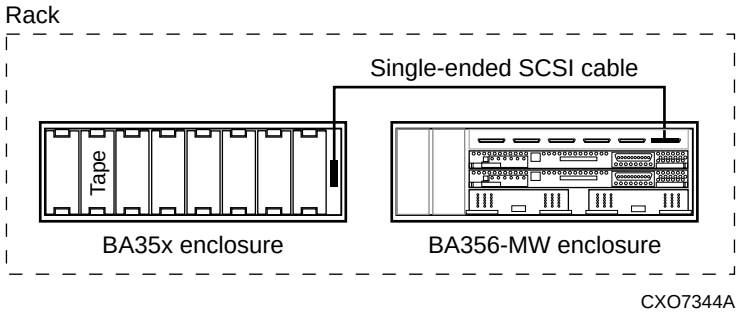


Figure 8–7. SW800 and SW500 Tape Device Cabling - Configuration 1

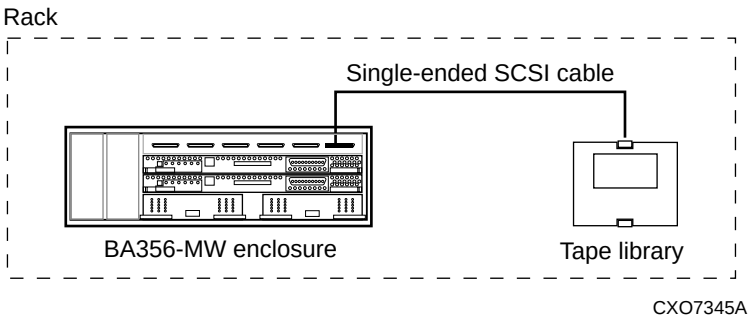


Figure 8–8. SW800 and SW500 Tape Device Cabling - Configuration 2

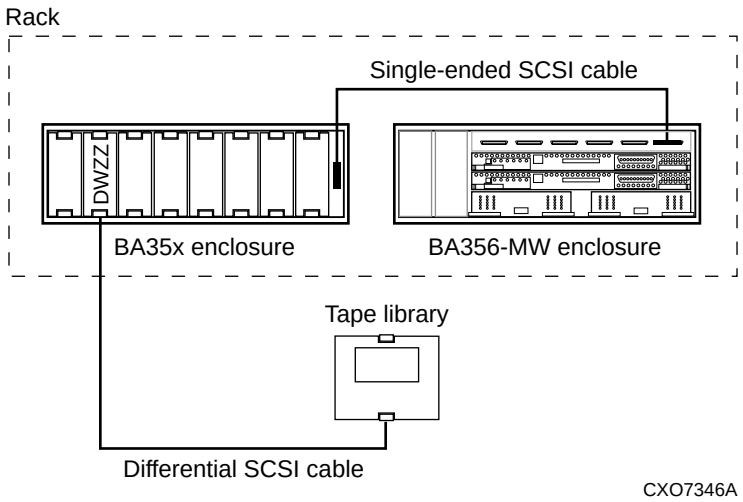


Figure 8–9. SW800 and SW500 Tape Device Cabling - Configuration 3

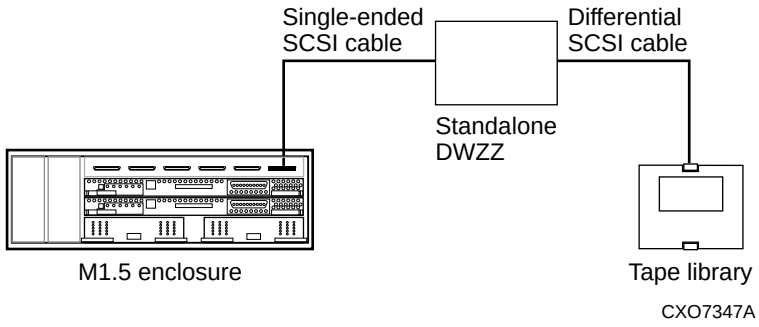


Figure 8–10. SW800 and SW500 Tape Device Cabling - Configuration 4

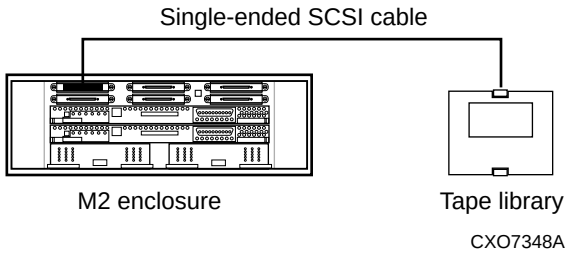


Figure 8–11. MA8000 and EMA12000 (Modula) Tape Device Cabling - Configuration 1

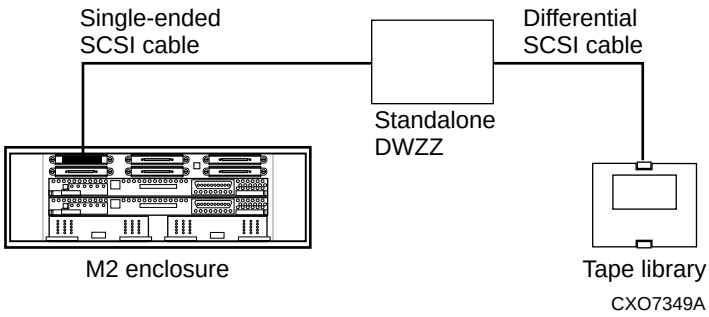


Figure 8–12. MA8000 and EMA12000 (Modula) Tape Device Cabling - Configuration 2

Tape Configuration Rules and Recommendations

The following are rules and recommendations for the support and connection of tape drives and tape libraries with the HSJ80.

1. For optimum backup and restore performance, high-performance tape drives and disk drives should *not* be connected to the same HSJ80.
2. Each port of an HSJ80 controller (and each HSJ80), for performance and redundancy reasons, should be connected to a *separate* Star Coupler (separate CI path).
3. The number of tape drive connections to an HSJ80 should be carefully managed and limited based on the bandwidth of the tape devices. For example, a dual CI ported HSJ80, with an A and B connection per CI port, and with each connection to a separate Star Coupler, should be limited to four DLT tape drives running concurrently. The four tape drives should be distributed across two different SCSI ports off of the M2200 controller enclosure/HSJ80, with each port going to the tape drive through a different SCSI extender/translator.
4. In SW500 and SW800 racks, SBB packaging of disks, tapes, optical disks, solid-state disks, and SCSI extender/translators (DWZZA devices) allows mixing of all these devices on the same SCSI device enclosure/SCSI bus and, consequently, on the same SCSI port of an HSJ80 controller. The practice of mixing tapes and disks in the same device enclosure, however, (and to the same HSJ80)) is *not* recommended for the reasons cited above.
5. In Modular Storage Systems, MA8000 and EMA12000 storage systems, the only devices supported are disk drives. However, connections to external tape drives and tape libraries can be made with the use of external table-top SCSI extenders/translators (DWZZB or DWZZC devices). The SCSI connection to the SCSI extender/translator must be made to a dedicated SCSI port of the M2200 controller enclosure/HSJ80 SCSI port. That SCSI port *cannot* also be used to connect to a disk device enclosure. The *maximum* SCSI cable length from the controller enclosure to the single-ended SCSI connection on the DWZZB or DWAAC extender/translator is 3 meters. If the DWZZB or DWZZC is a translator with differential SCSI on the other side, the differential SCSI cable length can be up to 25 meters.

Some reasons why these recommendations are made:

1. Streaming tape drives must have data supplied to (written to) or taken from (read from) at a minimum rate to keep them streaming. If they fall out of streaming mode, the performance can be quite a bit less than the rated performance. Here are some examples of the data rates required to keep some of the higher capacity, higher performance tape drives (that are supported by the HSJ80) streaming:

Part Number	Description	Transfer Rates
TZ89N	35/70GB DLT	8-10 MB/sec in compressed mode 5 MB/sec in native mode
TZ88N	20/40GB DLT	3 MB/sec in compressed mode 1.5 MB/sec in native mode
DS-AIT35	35/70GB AIT	6-9 MB/sec in compressed mode 3 MB/sec in native mode
DS-TZS20	25/50GB AIT	6-9 MB/sec in compressed mode 3 MB/sec in native mode

2. In a backup or restore operation, even if the disks and tapes are connected to the same controller, the data must pass from the source device (say disk) through the controller to the host computer, then back to the controller and out to the target device (say tape). If one controller is used for both devices, twice the data throughput capability is required for the path to and from the host system. A CI interface path has a bandwidth of 8.5 MB/second burst-rate and is not fast enough to maintain backup and restore operations through the same CI path through one controller.
3. Backup or restore performance is often limited by the file organization on the disks. Reading files may involve random read operations of the disks, and the disks may not be able to retrieve data fast enough to maintain the streaming rates of the tape drives. Consequently, the HSJ80 managing the disks shout not also be burdened with managing the tapes.

Appendix A

Establishing a Local Connection

In the process of configuring or modifying the configuration of your controller, you must be able to communicate with your controller either through a local connection or through a remote connection:

- Use a local connection using the maintenance terminal and the maintenance port cable to configure the controller for the first time.
- Use a remote connection, the SWCC CLI window, or a local connection for all subsequent configuration tasks.

Serial Maintenance Port

The serial maintenance port on the front of the HSJ80 (see Figure A–1) provides a convenient place to connect a maintenance terminal to the controller so that configuration and troubleshooting tasks may be accomplished. This port accepts a standard RS-232 jack from any EIA-423 compatible terminal (or a PC with a terminal-emulation program). The maintenance port supports serial communications with default values of 9600 baud using 8 data bits, 1 stop bit, and no parity.

CAUTION: The local-connection port described in this book generates, uses, and can radiate radio-frequency energy through cables that are connected to it. This energy may interfere with radio and television reception. Do not leave any cables connected to it when you are not communicating with the controller.

Installation Procedures

Use the following procedures to establish a local connection for setting the controller's initial configuration. Turn off the terminal and connect the required cables to the controller maintenance port as shown in Figure A–1.

NOTE: The cable that is currently being shipped (17-04074-04; shown in Figure A–1), does not support a direct connection to a terminal and to some desktop or laptop PCs. If a connection is needed that is not supported by the shipped cable, then the parts shown in Table A–1 will need to be ordered.

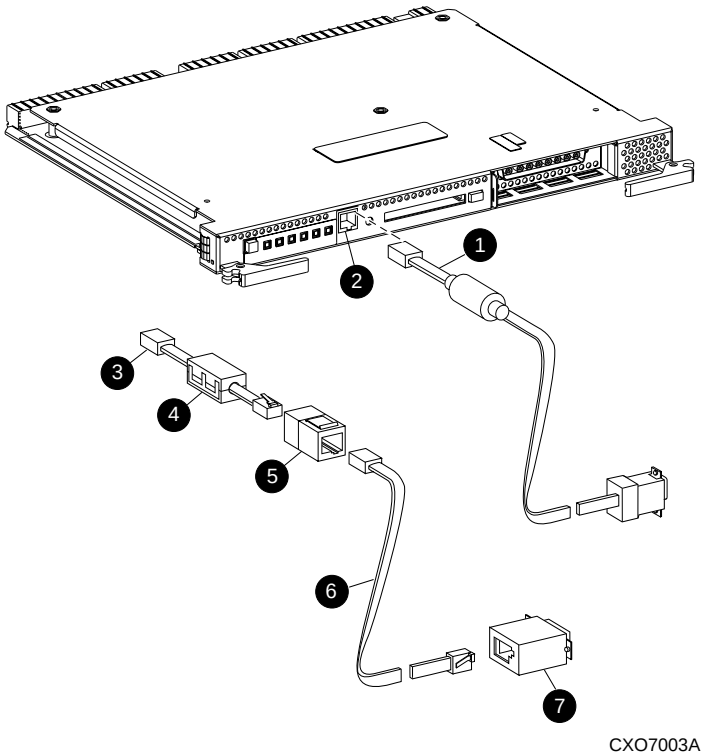


Figure A–1. Terminal to Maintenance Port Connection

Table A–1 Controller Maintenance Port Cables

	Description	Used On	Part No.
1	Standard Maintenance Cable (BC16E-xx)	PC	17-04074-01
2	Controller Maintenance Port	N/A	N/A
	Alternate Maintenance Port Cable Components		
3	BC16E-xx Cable Assy	PC, SUN, or HP800	17-04074-01
4	Ferrite bead	PC, SUN, or HP800	16-25105-14
5	RJ-11 Adapter	PC, SUN, or HP800	12-43346-01
6	RJ-11 Extension Cable	PC, SUN, or HP800	17-03511-01
7	PC Serial Port Adapter:		
	9 pin D-sub to 25 pin SKT D-sub	PC	12-45238-01
	9 pin D-sub to 25 pin D-sub	Sun	12-45238-02
	9 pin D-sub to 25 pin D-sub, mod	HP800	12-45238-03

1. Use Table A–2 to choose the cabling method based upon whether the local connection is a PC or a maintenance terminal:

Table A–2 PC/Maintenance Terminal Selection

If	Then	And
Maintenance Terminal	1) Plug one end of a DECconnect Office Cable (BC16E–XX) into the controller local connection port. 2) Place the Ferrite Bead on the BC16E. 3) Plug the other end into the RJ–11 adapter (12–43346–01). 4) Use the RJ–11 extension (17–03511–04) to connect the adapter to the maintenance terminal.	Go to step 2.
PC	1) Plug one end of the Maintenance Port Cable (17-04074-04) into the terminal. 2) Plug the appropriate 9-pin serial port adapter into the back of the PC into one of the COMM ports.	Go to step 2.

2. Turn on the terminal (or PC).
3. Configure the terminal (or PC) for 9600 baud, 8 data bits, 1 stop bit, and no parity.
4. Press the Enter or Return key. A copyright notice and the CLI prompt appear, indicating that a local connection has been made with the controller.
5. Optional Step: Configure the controller to a baud rate of 19200:

   ```
   SET THIS_CONTROLLER TERMINAL SPEED=19200
   SET OTHER_CONTROLLER TERMINAL SPEED=19200
   ```

6. Optional Step (to be completed if step 5 is also completed): Configure the terminal (or PC) to a baud rate of 19200.

NOTE: Terminal Port connections at baud rates of 1800, 9600, and 19200 are supported by ACS V8.5J-2. Terminal port connections of 300, 1200, and 2400 are not supported.

Appendix B

Establishing a Remote Connection

In the process of configuring or modifying the configuration of your controller, you must be able to communicate with your controller either through a local connection or through a remote connection:

- Use a local connection using the maintenance terminal and the maintenance port cable to configure the controller for the first time.
- Use a remote connection, the SWCC CLI Window, or the local connection for all subsequent configuration tasks.

The following sections describe how to establish the remote connection using the Diagnostic and Utilities Protocol (DUP).

Using DUP

To establish a connection using DUP, you must first install the FY driver, and then start the DUP terminal. Each is described in the following sections.

Installing the FY Driver

You will need to install the FY Driver before starting a DUP terminal. Use the appropriate procedure to install this from an Alpha or VAX-based host:

VAX-Based Hosts

1. Access the SYSGEN utility by entering:

   $ SYSGEN :== $SYSGEN

2. Specify an FY connection that does not use an adapter:

   SYSGEN> CONNECT FYA0 /NOADAPTER

3. Exit from SYSGEN:

   SYSGEN> EXIT

Alpha-Based Hosts

1. Access the SYSMAN utility by entering:

   $ SYSMAN :==$SYSMAN

2. Specify an FY connection that does not use an adapter:

   SYSMAN>IO CONNECT FYA0 /DRIVER=SYS$FYDRIVER /NOADAPTER

3. Exit from SYSMAN:

   SYSMAN> EXIT

Starting a DUP Terminal

1. Obtain DIAGNOSE privileges.
2. Start the DUP connection by entering the following command at the DCL prompt:

   $ SET HOST/DUP/SERVER=MSCP$DUP/TASK=CLI <*NODENAME*>

   A copyright notice and CLI prompt appear, indicating that you have established a remote connection to the controller.

3. Use the/LOG qualifier to create a log file of your sessions:

   ```
   $ SET HOST/DUP/SERVER=MSCP$DUP/TASK=CLI/LOG=LOG.INFO
   ```

   If you want to run a local program (such as DILX) without going into the CLI, substitute the name of the program after the /TASK qualifier:

   ```
   $ SET HOST/DUP/SERVER=MSCP$DUP/TASK=DILX/LOG=LOG.INFO
   ```

Glossary

This glossary defines terms pertaining to the HSJ80 Array Controller.

ACS — *See* array controller software.

adapter — A device that converts the protocol and hardware interface of one bus type to another without changing the function of the bus. OpenVMS clusters use host bus adapters to communicate on the CI bus with the other subsystems.

array controller — *See* controller.

array controller software (ACS) — Software that is contained on a removable PCMCIA program card that provides the operating system for the array controller.

autospare — A controller feature that automatically replaces a failed disk drive. Autospare aids the controller in automatically replacing failed disk drives. You can enable the AUTOSPARE switch for the failedset, causing physically replaced disk drives to be automatically placed into the spareset. Also called *autonewspare*.

bad block — A data block that contains a physical defect.

bad block replacement (BBR) — A replacement routine that substitutes defect-free disk blocks for those found to have defects. This process takes place in the controller and is transparent to the host.

BBR — *See* bad block replacement.

block	A stream of data stored on disk or tape media and transferred and error-checked as a unit. In a disk drive, a block is also called a *sector* (the smallest collection of consecutive bytes addressable on a disk drive). In integrated storage elements, a block contains 512 bytes of data, error codes, flags, and the block address header.
cache memory	A portion of high-speed memory used as an intermediary between a data user and a larger amount of storage. Cache improves performance by placing the most frequently used data in the highest performance memory.
chunk	A block of data written by the host. *See also* block
chunk size	The number of data blocks, assigned by a system administrator, written to the primary RAIDset or stripeset member before the remaining data blocks are written to the next RAIDset or stripeset member.
CI bus	Computer Interconnect bus. This bus connects the nodes in a clustered subsystem through a star coupler. The CI bus uses two serial paths, each with a data transfer rate of 70 Mb/s (8.75 MB/s). *See also* adapter, cluster, MSCP, node, and Star Coupler.
CLCP	Acronym for code-load code-patch utility.
CLI	*See* command line interpreter.
cluster	A collection of nodes (controller, adapters, host CPUs, etc.) that are connected by a star coupler and use the CI bus to communicate. *See also* MSCP, Star Coupler, CI Bus, nodes, and adapter.
command line interpreter (CLI)	The configuration interface that operates the controller software.
configuration file	A file that contains a representation of the controller and storage configuration.
container	1. Any entity (a physical device or a group of physical devices) that is capable of storing data. 2. A virtual internal controller structure representing either a single disk or a group of disk drives linked as a storageset (stripesets and mirrorsets are examples of storageset containers the controller uses to create units).

controller A hardware device that uses software to facilitate communications between a host and one or more storage devices organized in an array. The HS-series StorageWorks family of controllers are all array controllers.

copying A state in which data to be copied to the mirrorset is inconsistent with other members of the mirrorset. *See also* normalizing.

copying member Any member that joins the mirrorset after the mirrorset is created, is regarded as a copying member. Once all the data from the normal member (or members) is copied to a normalizing or copying member, the copying member then becomes a normal member. *See also* normalizing member.

data striping The process of segmenting logically sequential data, such as a single file, so that segments can be written to multiple physical devices (usually disk drives) in a round-robin fashion. This technique is useful if the processor is capable of reading or writing data faster than a single disk can supply or accept the data. While data is being transferred from the first disk, the second disk can locate the next segment.

device *See* node and peripheral device.

DILX Disk Inline Exerciser. A diagnostic that tests the data transfer capabilities of disk drives in a way that simulates a high level of user activity.

dirty data The write-back cached data that has not been written to storage media, even though the host operation processing the data has completed.

dual-redundant configuration A storage subsystem configuration consisting of two active controllers operating as a single controller. If one controller fails, the other assumes control of the failing controller's devices. *See also* failover, failback.

ECB External Cache Battery. The unit that supplies backup power to the cache module in the event the primary power source fails or is interrupted.

external cache battery *See* ECB.

failback The process of restoring data access to the newly-restored controller in a dual-redundant controller configuration. *See also* failover, and dual-redundant configuration.

failedset A group of disk drives that has been removed from RAIDsets due to a failure or a manual removal. Disk drives in the failedset are considered defective and should be tested and repaired before being placed back into the spareset.

failover The process that takes place when one controller in a dual-redundant configuration assumes the workload of a failed companion controller. Failover continues until the failed controller is repaired or replaced. *See also* failback and dual-redundant configuration.

flush The act of writing dirty data from cache to a storage media. *See also* dirty data.

FMU Acronym for Fault Management Utility.

forced errors A data bit indicating that a corresponding logical data block contains unrecoverable data.

host The computer or computers to which a storage subsystem is attached.

hot disks Disks containing multiple hot spots. Hot disks occur when the workload is poorly distributed across storage devices, which prevents optimum subsystem performance. *See also* hot spots.

hot spots A portion of a disk drive frequently accessed by the host. Because the data being accessed is concentrated in one area, rather than spread across an array of disks providing parallel access, I/O performance is significantly reduced. *See also* hot disks.

INIT Abbreviation for initialize.

initiator A SCSI device that requests an I/O process to be performed by another SCSI device—the SCSI target. The controller is the initiator on the device bus.

JBOD Acronym for *Just a Bunch Of Disks*. A group of single-device logical units not configured into any other container type.

LBN Logical Block Number.

local connection A connection to the subsystem using either the controller's serial maintenance port or from the host terminal. A local connection enables you to connect to one subsystem controller to perform maintenance tasks.

local terminal A terminal plugged into the EIA-423 maintenance port located on the front bezel of the controller. *See also* maintenance terminal, local connection.

logical block number *See* LBN.

logical unit A physical or virtual device addressable through a target ID number. LUNs use their target's bus connection to communicate on the SCSI bus.

logical unit number (LUN) A value that identifies a specific logical unit belonging to a SCSI target ID number. A number associated with a physical device unit during a task's I/O operations. Each task in the system must establish its own correspondence between logical unit numbers and physical devices.

maintenance terminal An EIA-423-compatible terminal used with the controller. This terminal identifies the controller, enables host paths, enters configuration information, and checks the controller's status. The maintenance terminal is not required for normal operations. *See also* local terminal, local connection.

member A container that is a storage element in a RAID array.

metadata The data written to a disk for the purposes of controller administration. Metadata improves error detection and media defect-management for the disk drive. It also supports storageset configuration and partitioning. Non-transportable disks also contain metadata to indicate they are uniquely configured for StorageWorks environments. Metadata can be thought of as "data about data." *See also* transportable, nontransportable

mirrored write-back caching A method of caching data that maintains two copies of the cached data. The copy is available if either cache module fails.

mirroring The act of creating an exact copy or image of data.

mirrorset *See* RAID level 1.

MSCP Mass Storage Control Protocol. MSCP is the protocol by which blocks of information are transferred between the host and the HSJ80 controller on the CI Bus. *See also* CI Bus, Star Coupler.

network A data communication, a configuration in which two or more terminals or devices are connected to enable information transfer.

node 1. In OpenVMS CI Bus systems, a node is one of the connection points to the star coupler. The external CI Bus cable that goes from the star coupler to a host bus adapter represents one node. A dual-redundant controller pair using dual-host port capability connected to one host would add up to six nodes. 2. In data communications, the point at which one or more functional units connect transmission lines.

nominal membership The desired number of mirrorset members when the mirrorset is fully populated with active devices. If a member is removed from a mirrorset, the actual number of members may fall below the nominal membership.

nonredundant controller configuration 1. A single controller configuration. 2. A controller configuration that does not include a second controller.

non-transportable A term applied to a storage device that has metadata specifying that the device may be used only within StorageWorks subsystems. *See also* transportable.

normal member A mirrorset member that, block-for-block, contains the same data as other normal members within the mirrorset. Read requests from the host are always satisfied by normal members.

normalizing Normalizing is a state in which, block-for-block, data written by the host to a mirrorset member is consistent with the data on other normal and normalizing members. The normalizing state exists only after a mirrorset is initialized. Therefore, no customer data is on the mirrorset.

normalizing member A mirrorset member whose contents is the same as all other normal and normalizing members for data that has been written since the mirrorset was created or lost cache data was cleared. A normalizing member is created by a normal member when either all of the normal members fail or all of the normal members are removed from the mirrorset. *See also* copying member.

NVM Acronym for Non-Volatile Memory. A type of memory where the contents survive power loss. Also known as NVMEM. The HSJ80 controller uses NVM to store the subsystem configuration.

OCP Acronym for Operator Control Panel. The control or indicator panel associated with a device. The HSJ80 OCP is on the front of the controller and contains the RESET and Port Quiesce buttons.

other controller The controller in a dual-redundant pair that is not connected to the controller serving your current CLI session with a local terminal. *See also* this controller and local terminal.

parity RAID *See* RAIDset.

partition A logical division of a container, represented to the host as a logical unit.

PCMCIA Acronym for Personal Computer Memory Card Industry Association. An international association that promotes a common standard for PC card-based peripherals to be plugged into notebook computers. A PCMCIA card is about the size of a credit card. It is used in the HSJ80 to load the controller software. *See also* program card, ACS.

port 1. A logical channel in a communications system. 2. The hardware and software used to connect a host controller to a communications bus, such as a SCSI bus or serial bus. With respect to the controller, the port is: 3. The logical route for data in and out of a controller that can contain one or more channels, all of which contain the same type of data. 4. The hardware and software that connects a controller to a SCSI device.

program card The PCMCIA card containing the controller's operating software. *See also* PCMCIA.

PTL Acronym for Port-Target-LUN. The controller's method of locating a device on the controller device bus.

RAID Redundant Array of Independent Disks. RAID represents multiple levels of storage access developed to improve performance or availability or both.

RAID level 0 A RAID storageset that stripes data across an array of disk drives. A single logical disk spans multiple physical disks, allowing parallel data processing for increased I/O performance. While the performance characteristics of RAID level 0 are excellent, this RAID level is the only one that does not provide redundancy. Raid level 0 storagesets are sometimes referred to as *stripesets.*

RAID level 0+1 A RAID storageset that stripes data across an array of disks (RAID level 0) and mirrors the striped data (RAID level 1) to provide high I/O performance and high availability. Raid level 0+1 storagesets are sometimes referred to as *striped mirrorsets*.

RAID level 1 A RAID storageset of two or more physical disks that maintains a complete and independent copy of the entire virtual disk's data. This type of storageset has the advantage of being highly reliable and extremely tolerant of device failure. Raid level 1 storagesets are sometimes referred to as *mirrorsets*.

RAID level 3 A RAID storageset that transfers data in a parallel manner, across the array's disk drives, one byte at a time, causing individual blocks of data to be spread over several disks serving as one enormous virtual disk. A separate, redundant check-disk for the entire array stores parity on a dedicated disk drive within the storageset. *See also* RAID level 5.

RAID level 3/5 A specially-developed RAID storageset that stripes data and parity across three or more members in a disk array. A RAIDset combines the best characteristics of RAID level 3 and RAID level 5. A RAIDset is the best choice for most applications with small to medium I/O requests, unless the application is write intensive. A RAIDset is sometimes called *parity RAID*. Raid level 3/5 storagesets are sometimes referred to as *RAIDsets*.

RAID level 5 A RAID storageset that, unlike RAID level 3, stores the parity information across all of the disk drives within the storageset. *See also* RAID level 3.

RAIDset *See* RAID level 3/5.

read caching A cache management method used to decrease the subsystem response time to a read request by allowing the controller to satisfy the request from the cache memory rather than from the disk drives.

read-ahead caching A caching technique for improving performance of synchronous sequential reads by prefetching data from disk.

reconstruction The process of regenerating the contents of a failed member's data. The reconstruction process writes the data to a spareset disk and then incorporates the spareset disk into the mirrorset, striped mirrorset, or RAIDset from which the failed member came. *See also* regeneration.

reduced A term that indicates that a mirrorset or RAIDset is missing one member because the member has failed or has been physically removed.

redundancy The provision of multiple, interchangeable components to perform a single function in order to cope with failures and errors. A RAIDset is considered to be redundant when user data is recorded directly to one member and all of the other members include associated parity information.

regeneration 1. The process of calculating missing data from redundant data. 2. The process of recreating a portion of the data from a failing or failed drive using the data and parity information from the other members within the storageset. The regeneration of an entire RAIDset member is called reconstruction. *See also* reconstruction.

replacement policy The policy specified by a switch with the SET FAILEDSET command indicating whether a failed disk from a mirrorset or RAIDset is to be automatically replaced with a disk from the spareset. The two switch choices are *AUTOSPARE* and *NOAUTOSPARE*.

request rate The rate at which requests are arriving at a servicing entity.

SCSI Acronym for Small Computer System Interface. 1. An American National Standards Institute (ANSI) interface standard defining the physical and electrical parameters of a parallel I/O bus that connects initiators to devices. 2. A processor-independent standard protocol for system-level interfacing between a computer and intelligent devices, including hard drives, floppy disks, CD-ROMs, printers, scanners, and others.

SCSI device 1. A host-computer adapter, a peripheral controller, or an intelligent peripheral that can be attached to the SCSI bus. 2. Any physical unit that can communicate on a SCSI bus.

SCSI device ID number A bit-significant representation of the SCSI address referring to one of the signal lines, numbered 0 through 7 for an 8-bit bus, or 0 through 15 for a 16-bit bus.

SCSI ID number The representation of the SCSI address that refers to one of the signal lines numbered 0 through 15.

star coupler The physical hub of the CI cluster subsystem cabling. The star coupler is a set of connection panels contained within a rack containing cable connections and transformers through which the nodes of a cluster connect to one another through the CI bus. *See also* CI bus, MSCP.

storage array An integrated set of storage devices.

storage unit The general term that refers to storagesets, single-disk units, and all other storage devices that are installed in a subsystem and accessed by the host. A storage unit can be any entity that is capable of storing data, whether it is a physical device or a group of physical devices.

storageset 1. A group of devices configured with RAID techniques to operate as a single container. 2. Any collection of containers, such as stripesets, mirrorsets, striped mirrorsets, JBODs, and RAIDsets.

stripe The data divided into blocks and written across two or more member disks in an array.

stripe size The stripe capacity as determined by *n*–1 times the chunksize, where *n* is the number of RAIDset members.

striped mirrorset *See* RAID level 0+1.

stripeset *See* RAID level 0.

striping The technique used to divide data into segments, also called chunks. The segments are striped, or distributed, across members of the stripeset. This technique helps to distribute hot spots across the array of physical devices. Each stripeset member receives an equal share of the I/O request load, improving performance.

surviving controller The controller in a dual-redundant configuration pair that serves its companion's devices when the companion controller fails.

this controller The controller that is serving a current CLI session through a local or remote terminal. *See also* other controller.

transportable A term applied to a storage device that may be used in types of storage subsystems other than StorageWorks subsystems.

unit A container made accessible to a host. A unit may be created from a single disk drive or tape drive. A unit may also be created from a more complex container such as a RAIDset. The controller supports a maximum of eight units on each target.

unwritten cached data Sometimes called *unflushed data*. *See* dirty data.

UPS Acronym for Uninterruptable Power Supply. A battery-powered power supply guaranteed to provide power to an electrical device in the event of an interruption to the primary power supply. UPSs are usually rated by the amount of voltage supplied and the length of time the voltage is supplied.

virtual terminal A software path from an operator terminal on the host to the controller's CLI interface; sometimes called a *host console*. The path can be established through the host port on the controller or via the maintenance port through an intermediary host.

VTDPY Acronym for the Virtual Terminal Display utility.

write hole The period of time in a RAID level 1 or RAID level 5 write operation when an opportunity emerges for undetectable RAIDset data corruption. Write holes occur under conditions, such as power outages, where the writing of multiple members can be abruptly interrupted. A battery backed-up cache design eliminates the write hole because data is preserved in cache and unsuccessful write operations can be retried.

write-back caching A cache management method that decreases the subsystem response time to write requests by allowing the controller to declare the write operation complete as soon as the data reaches its cache memory. The controller performs the operation of writing the data to the disk drives at a later time.

write-through cache A cache management technique for retaining host write-requests in read cache. When the host requests a write operation, the controller writes data directly to the storage device. This technique allows the controller to complete some read requests from the cache, greatly improving the response time to retrieve data. The operation is complete only after the data to be written is received by the target storage-device.

This cache management method may update, invalidate, or delete data from the cache memory accordingly, to ensure that the cache contains the most current data.

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