



RA8000 / ESA12000 Fibre Channel  
Solutions Software V8.3 for Novell  
NetWare

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Installation Reference Guide

AA-RFB9A-TE

387376-001

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First Edition, March 1999

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## *Revision Record*

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*This Revision Record provides a concise publication history of this manual. It lists the manual revision levels, release dates, and summary of changes.*

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The following revision history lists all revisions of this publication and their effective dates. The publication part number is included in the Revision Level column, with the last entry denoting the latest revision. This publication supports StorageWorks RA8000/ESA 12000 HSG80 Subsystem for Novell NetWare.

<b><u>Revision Level</u></b>	<b><u>Date</u></b>	<b><u>Summary of Changes</u></b>
AA-RFB9A-TE (387376-001)	April 1999	Original Release



## *About This Guide*

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*This section identifies the audience of this guide and describes the contents (chapter by chapter) and structure. In addition, this section includes a list of associated documents and the conventions used in this guide.*

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This guide provides the following information:

- How to install the StorageWorks Command Console Client
- How to create your first virtual disk
- How to install the device drivers
- How to complete your configuration setup under Novell NetWare

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*[www.compaq.com](http://www.compaq.com)*

### **Intended Audience**

This guide is intended for administrators of the RA8000 Fibre Channel Subsystem. Installing the Fibre Channel Subsystem requires a general understanding of Novell NetWare servers, basic hardware installation procedures, networks, and NetWare and RAID terminology.

## Document Structure

This guide contains the following chapters:

### **Chapter 1. Installing SWCC Client and Creating Your First Virtual Disk**

This chapter contains instructions for installing the StorageWorks Command Console (SWCC) Client, a Graphical User Interface (GUI), configuring the HSG80 controller for NetWare operation, and creating your first virtual disk.

### **Chapter 2. Preparing Your Novell NetWare Host for Use with the RA8000/ESA 12000**

This chapter contains instructions for configuring your host adapter/host controller and installing the appropriate device driver on your host system.

### **Chapter 3. Configuration Guides**

This chapter contains general guidelines for configuring your host system.

### **Chapter 4. Creating Your Storage Configuration with the CLI**

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

### **Appendix A. Planning Your Storage Configuration**

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

### **Appendix B. Valid ALPA Settings**

This appendix provides a table of the valid arbitrated loop physical address (ALPA) settings available for hard addressing the fibre channel arbitrated loop.

### **Appendix C. Regulatory Compliance Notices**

This appendix describes the compliances required for the operation of your system.

## Related Documents

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

**Table 1. Related Documents**

Document Title	Order Number
<i>COMPAQ Fibre Channel Storage Hub 12 Installation Guide</i>	
<i>COMPAQ StorageWorks HSG80 Array Controller ACS Version 8.3 User Guide</i>	<i>EK-HSG80-UG</i>
<i>COMPAQ Fibre Channel Storage Hub 7 (DS-DHGGA-CA) Installation Guide</i>	<i>EK-DHGGA-UG</i>
<i>COMPAQ-Fibre Channel Host Adapter Installation Guide</i>	
<i>COMPAQ StorageWorks UltraSCSI RAID Enclosure (BA370-Series) User Guide</i>	<i>EK-BA370-UG</i>
<i>The RAIDBOOK—A Source for RAID Technology</i>	<i>RAID Advisory Board</i>
<i>COMPAQ StorageWorks HSG80 Array Controller ACS V8.3 Release Notes</i>	<i>AA-RFB8A-TE</i>

## Conventions

This guide uses the following documentation conventions:

**Table 2. Style Conventions**

Style	Meaning
<b>boldface type</b>	For emphasis and user input.
<i>italic type</i>	For emphasis, manual titles, utilities, menus, screens, and filenames.
<code>plain monospace type</code>	Screen text.

**Table 3. Nomenclature Conventure**

RAID Advisory Board Description	RAID HSG80 Solutions Usage
RAID 0	STRIPEset
RAID 1	MIRRORset
RAID 0+1	STRIPED MIRRORset
RAID 5/3	RAIDset

## Support and Services

### Who to contact in the Americas

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Information and Product Questions:	Local Sales Office / StorageWorks Hotline 1-800-786-7967
Installation Support:	Contact the COMPAQ distributor where the Storage Solution was Purchased / Local COMPAQ Sales Office.
COMPAQ Multivendor Customer Service (MCS):	
Installation	Contact the COMPAQ Customer Support Center (CSC).
Warranty	Contact the COMPAQ Customer Support Center (CSC) for warranty service after solution is installed and operating.
Remedial	Contact the COMPAQ Customer Support Center (CSC). Note: A Service Contract is recommended when the equipment is out of warranty. Contact the local COMPAQ Sales Office.
Customer Support Center (CSC)	1-800-354-9000

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### Who to contact in Europe

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Information and Product Questions:	Contact the COMPAQ distributor or reseller.
Installation Support, and Installation:	Contact the COMPAQ distributor or reseller from whom the Storage Solution was purchased.
For Warranty Service	See the Warranty Card packaged with the product.
For Remedial Service	Contact the COMPAQ distributor or reseller from whom the Storage Solution was purchased. Note: A Service Contract is recommended when the equipment is out of warranty.

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### Who to contact in Asia Pacific

For all services, contact the COMPAQ distributor or reseller from whom the equipment was purchased.

# 1

## *Installing SWCC Client and Creating Your First Virtual Disk*

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*This chapter contains instructions for installing StorageWorks Command Console (SWCC) Client, a Graphical User Interface (GUI), configuring the HSG80 RAID controller for Novell NetWare operation, and creating your first virtual disk.*

---

### **NOTE**

For more information, use the online HELP in the SWCC Storage and CLI Windows.

### **1.1 Introduction**

This chapter provides the instructions required to accomplish the following tasks:

- Installing the HSG80 Command Console software
- Launching Command Console Client
- Establishing communications with the HSG80 controller over the serial port
- Configuring the HSG80 controller for NetWare operation
- Creating your first virtual disk

#### **To create your first virtual disk, use the serial port:**

Serial Port Connection – This method is required to create your first virtual disk. This chapter shows you how to create a virtual disk over the serial port using Command Console Client software. The serial port method provides a local, direct connection to your array.

## 1.2 Installing Command Console Client

The minimum requirements to run Command Console Client are:

PC Requirements	Intel 486 processor, 66 MHz, 16-MB memory, 2 MB free disk space, and CD-ROM drive
Operating System	Microsoft Windows 95, Windows NT 3.51, or 4.0

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

### NOTE

If you are upgrading to a new version of Command Console Client, run the uninstall program and remove the old version before installing the new version.

#### To install Command Console:

1. Place the CD in the CD-ROM drive.
2. Run *File Manager* or *Windows Explorer*.
3. Move to the folder: `drive_letter:\SWCC\Client`.
4. Choose Intel client; then double-click on *Setup*.
5. Follow the instructions in the setup program to complete the installation.



### 1.3 Launching Command Console Client

To start Command Console from the Start Menu, click the HSG80 Storage Window name (Figure 1-1).

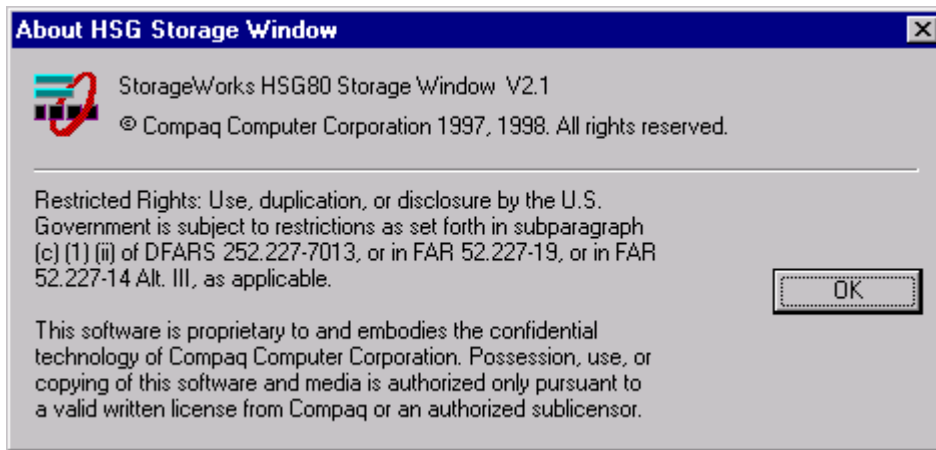
**Figure 1–1 Command Console Client’s Start Menu**



The three choices Client provides you with at startup are:

- **CLI Window:** HS-series controllers provide a feature called the Command Line Interpreter (CLI) for configuring and monitoring your storage controllers using text-based commands. With the CLI, you can connect a maintenance terminal directly to your controller and manage it using the complete set of CLI commands. You can also use a host-based, virtual terminal, such as Command Console’s CLI Window, to make the connection. See Appendix A, “Creating Your Storage Configuration with the CLI,” for details.
- **HSG80 Storage Window:** Displays the Storage Window. This choice lets you monitor and configure one storage subsystem using Client’s graphical user interface. All connection choices are provided: serial line, host interface, and network (TCP/IP).

**Figure 1–2 HSG Storage Window Display**



**NOTE**

The HSZ80 Storage Window option is not applicable to this document.

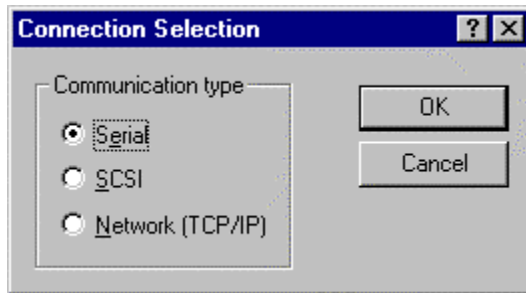
- **StorageWorks Command Console:** Displays the Navigation Window. The Navigation Window is a network navigation tool used to manage and monitor storage subsystems over a TCP/IP network. This choice lets you monitor and configure one or many storage subsystems over a network using Client’s graphical tools.

#### **1.4 Establishing a Serial Connection to the HSG80 Storage Window**

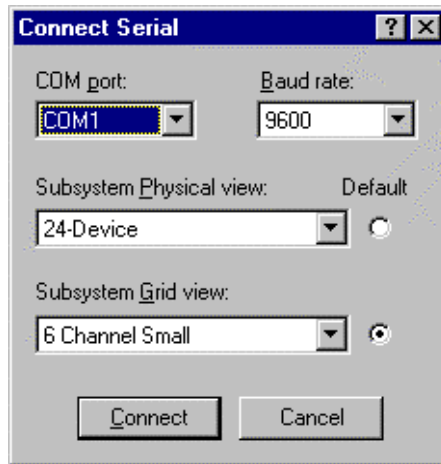
To create your first virtual disk, establish a serial cable connection from one of the PC’s COM ports to the storage subsystem’s CTR TOP or CTR BOTTOM configuration port (See Appendix A, “Creating Your Storage Configuration with the CLI”) and:

1. Click *Start* on the taskbar.
2. Click *Programs*.
3. Click *Command Console*.
4. Click *HSG80 Storage Window*.
5. When the Connection Selection dialog box displays, click the *Serial* radio button (Figure 1-3), then click *OK* to display the *Connect Serial* dialog box (Figure 1-4).

**Figure 1-3 Connection Selection Dialog Box**



**Figure 1–4 Connection Serial Dialog Box for Storage Window**

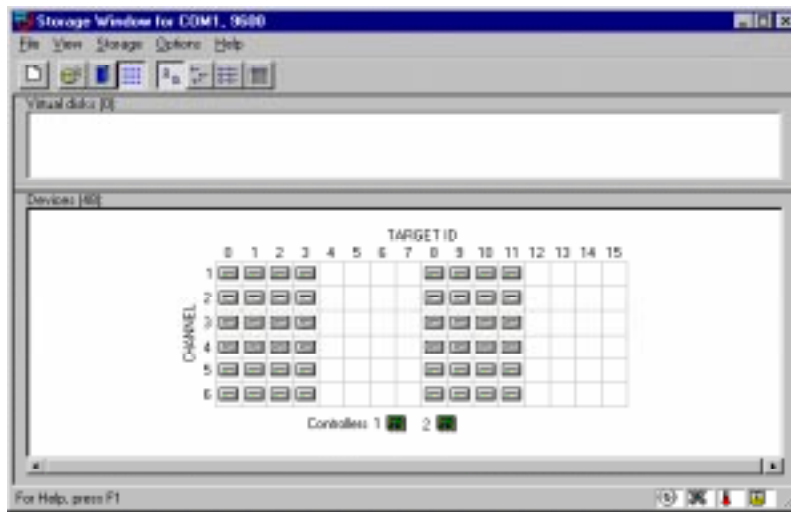


- From the drop-down menu, in the *Connect Serial* dialog box, select the PC COM port your HSG80 controller is connected to, then select the baud rate (the controller default baud rate is 9600). Click *Connect* to display the Storage Window (Figure 1-5.) You are now connected to your storage subsystem. The next step is configuring the controller.

**NOTE**

The top windowpane displays the virtual disks you create. The bottom windowpane shows the devices you have installed in the RA8000/ESA 12000 subsystem. On startup, Command Console finds installed drives and displays them in a grid by channel and SCSI ID number.

Figure 1–5 Storage Window



## 1.5 Controller Properties

### NOTE

This section discusses only one method for setting controller properties. Controller properties can also be set using the CLI, as described in Chapter 4.

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

Changes in all fields cause a controller restart and put the changes into effect. The program prompts you for confirmation before it restarts your controller.

**NOTE**

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

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

Confirm the following:

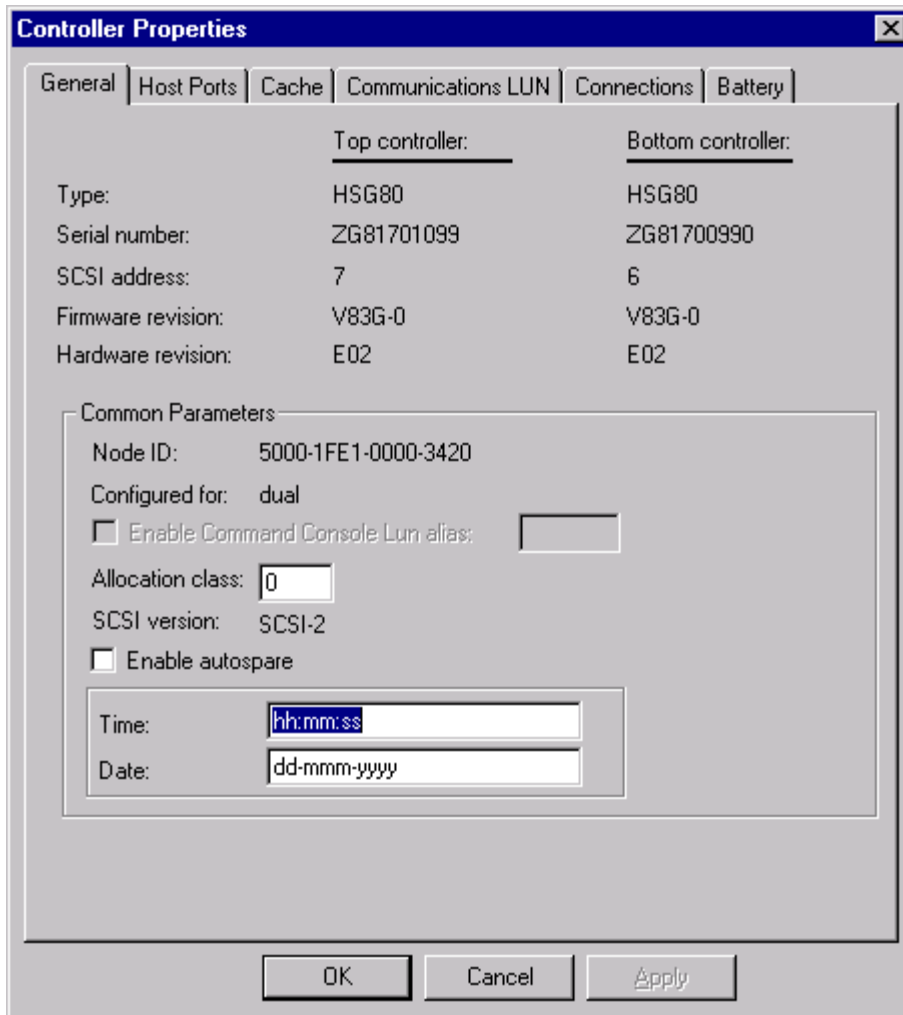
- Allocation class is 0
- SCSI modes are SCSI-2 or SCSI-3

You can also set time and date general properties.

**NOTE**

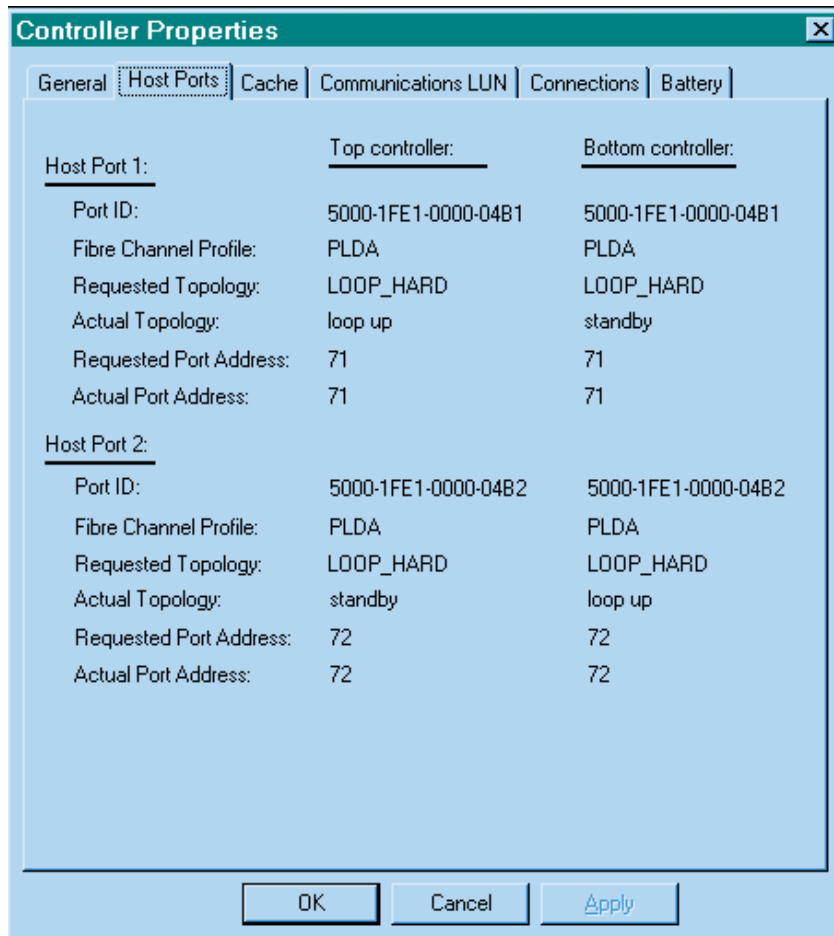
If you are choosing the SCSI-2 version, do not check the *Enable Command Console Lun alias* box. For NetWare, either SCSI-2 or SCSI-3 modes are supported. If SCSI-2 mode is chosen, the Command Console Lun is not supported. See Figure 1-6 *General Controller Properties Tab*.

Figure 1-6 General Controller Properties Tab



- Click the *Host Ports* tab to display the host port operating parameters and verify that the Requested Topology and Actual Topology settings appear as shown in Figure 1-7.

**Figure 1-7 Host Ports Controller Properties Tab**



To set the controller loop\_hard, at the CLI, type the following:

- set this port\_1\_topology=loop\_hard
- set this port\_1\_alpa=71
- set this port\_2\_topology=loop\_hard
- set this port\_2\_alpa=72

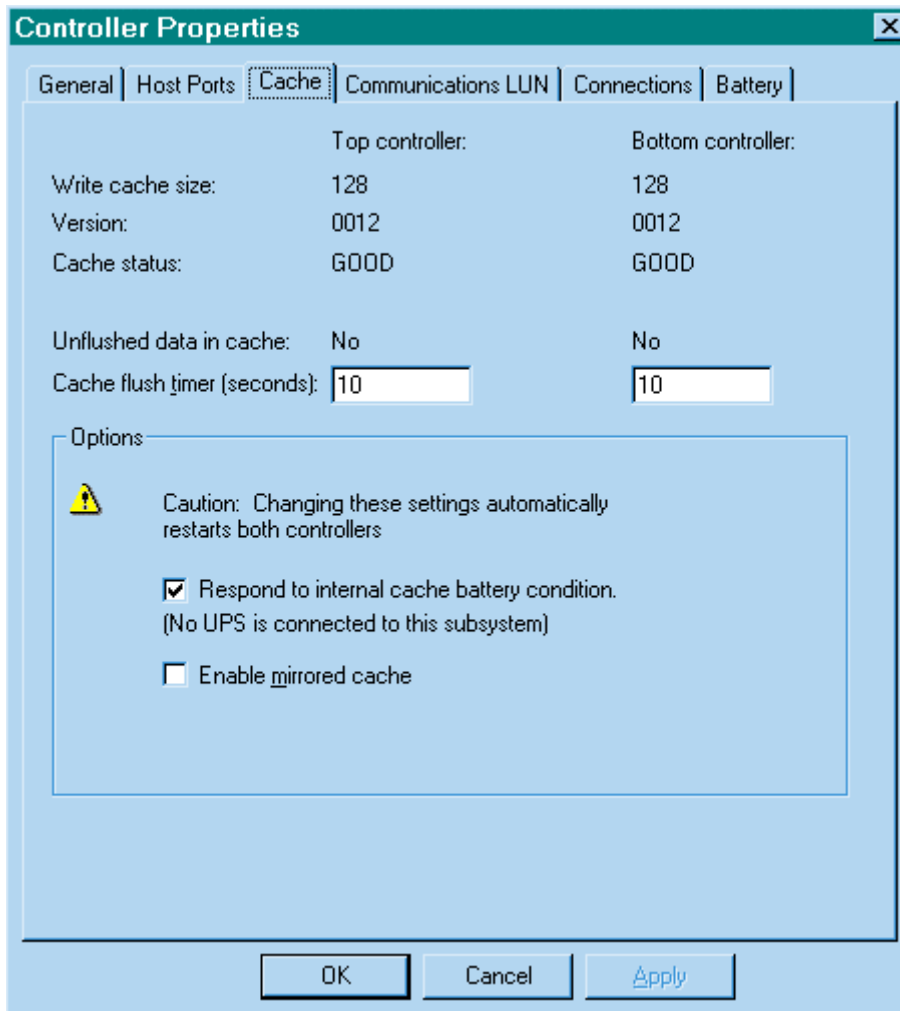


3. Click the *Cache* tab to check cache size in Figure 1-8.

Confirm the following:

- Cache flush\_time: (seconds): is 10
- Respond to internal cache battery condition is selected

**Figure 1–8 Cache Controller Properties Tab**



4. Click the *Communications LUN* tab. (Figure 1-9)

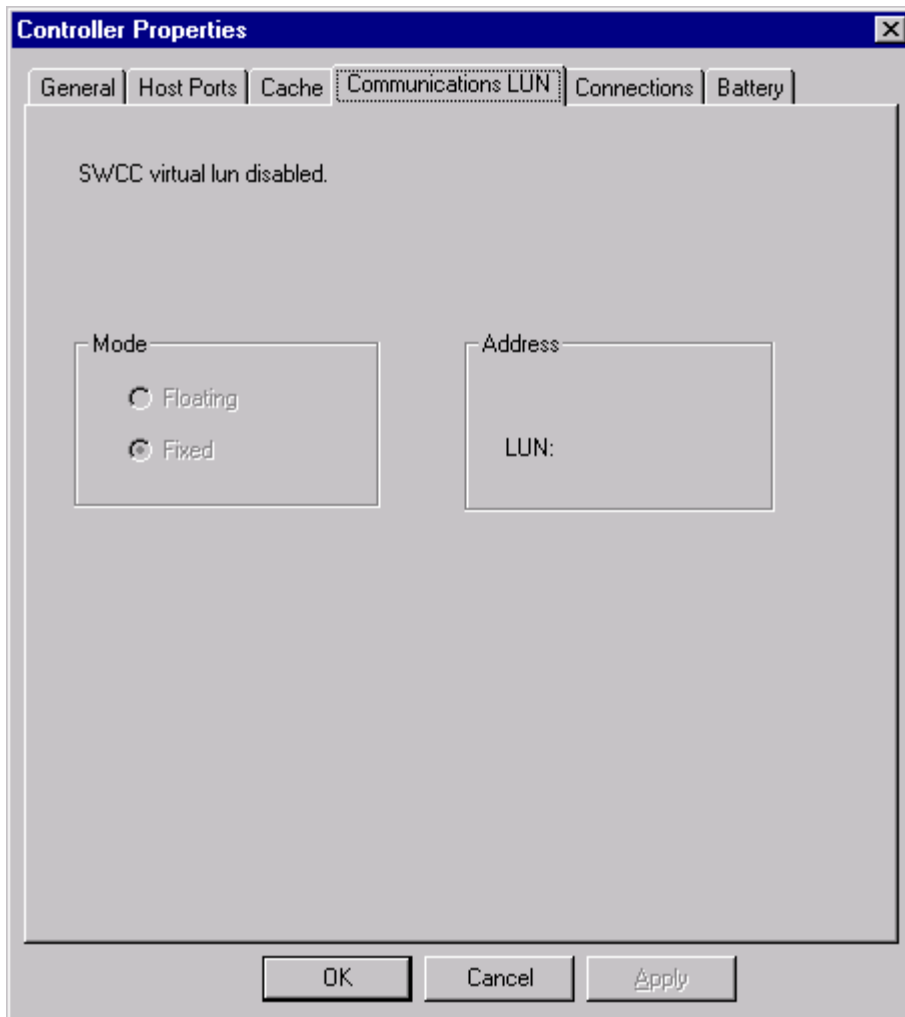
The Communications LUN is not used with NetWare if the SCSI-2 version is selected. It should be *disabled* (grayed out). If the Communications LUN is enabled, disable it using the CLI window. First close the Storage Window, and establish a CLI connection as described in Appendix A. To invoke a CLI window from the Command Console Client's START menu, select Command Console V2.1, then the CLI Window option.

The Connection Selection Window (Figure 1-3) appears. Select Serial. At the next window Select 9600 baud rate and click Connect to invoke the CLI window. Type this command to disable the Communication LUN:

```
set this_controller nocommand_console_lun
```

Close the CLI window. Return to the Windows Start Menu and select the *HSG80 Storage Window* option to re-open the storage window.

Figure 1–9 Communications LUN Controller Properties Tab

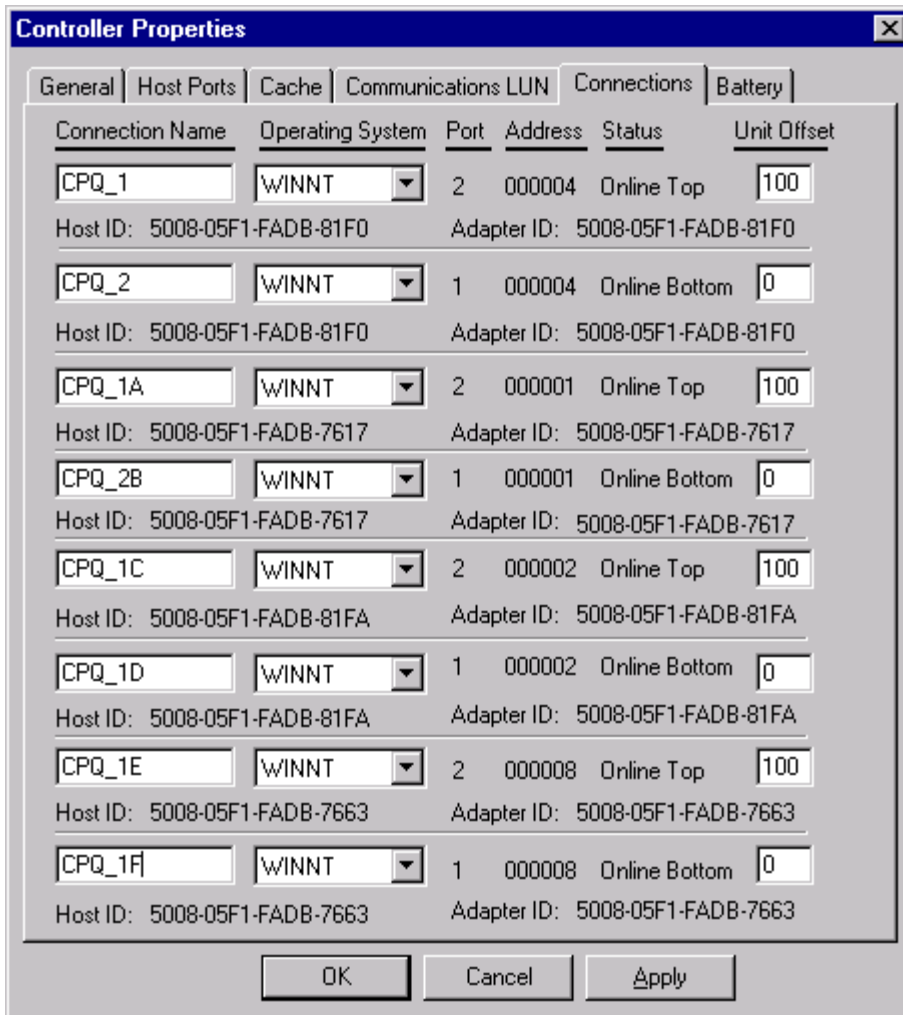


5. Click the *Connections* tab (Figure 1-10).

Confirm the following:

- Use a WINNT Operating System with Novell NetWare
- Unit Offset should be 0 for Port 1

**Figure 1–10 Connections Controller Properties Tab**

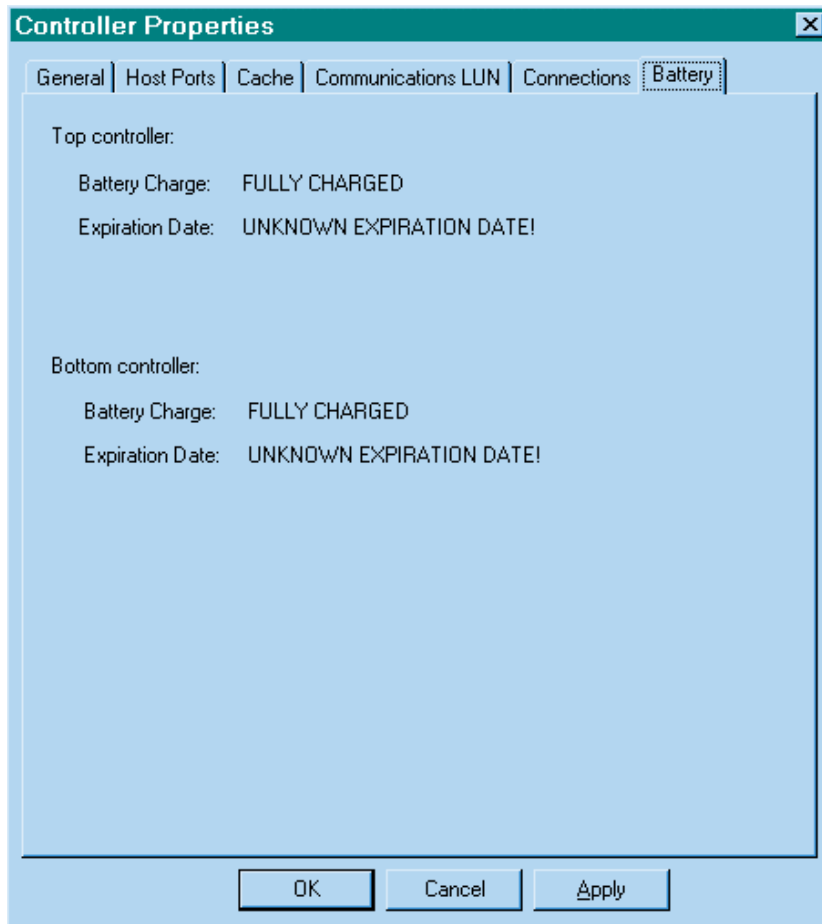


6. Click the *Battery* tab (Figure 1-11).

**NOTE**

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

**Figure 1-11 Battery Controller Properties Tab**



## 1.6 Creating Your First Virtual Disk

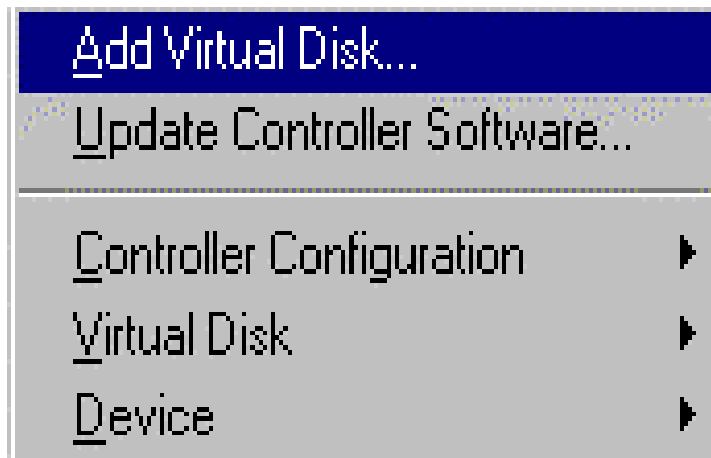
Command Console Client can create a number of different types of logical storage units, called virtual disks, on your RA8000/ESA 12000 Fibre Channel Storage Subsystem. You can create:

- 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 Command Console Client's Virtual Disk Wizard.

### Start the Wizard:

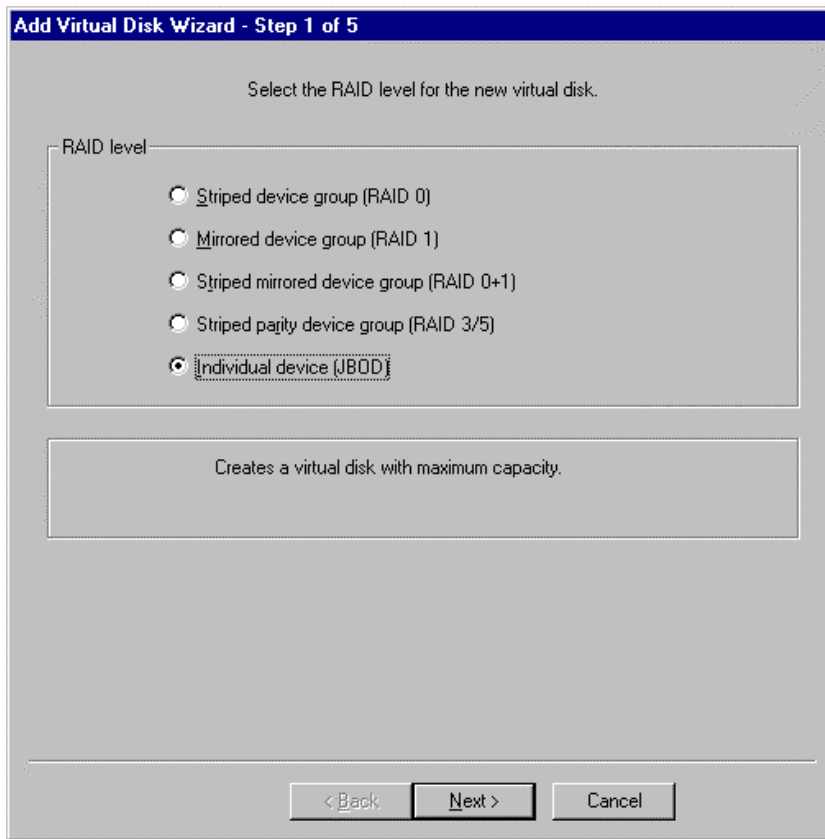
After you have established a serial connection to your RA8000/ESA 12000 Fibre Channel Subsystem and have accessed the subsystem's Storage Window, select *Add Virtual Disk* from the Storage menu to start the Virtual Disk Wizard.



**Create the Virtual Disk:**

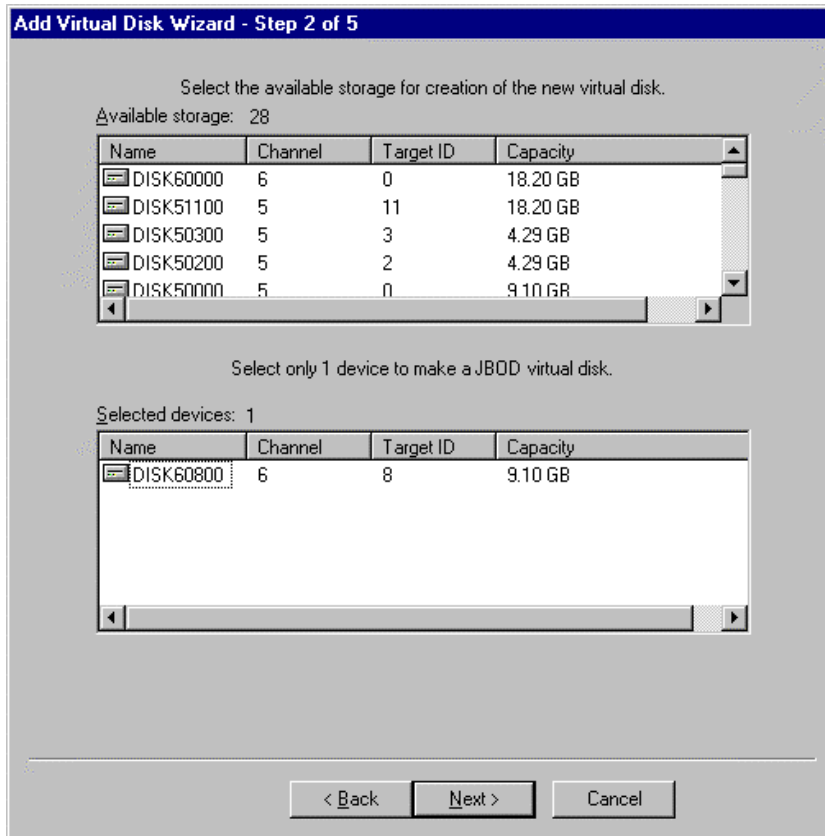
1. Click the radio button of the RAID level you want, then click *Next*.

**Figure 1–12 Add Virtual Disk Wizard - Step 1 of 5**



2. Select the devices you want to include in the virtual disk from a list of available storage devices by clicking them in the *Devices available to create a new virtual disk*: window in the dialog box. As you click them, they are listed in the *Details of selected devices*: windowpane.

Figure 1–13 Add Virtual Disk Wizard - Step 2 of 5





3. Select the capacity for the virtual disk, then click *Next*. The wizard offers the option of using only a portion of the capacity of the devices you have selected for your new virtual disk. It displays the total, available capacity of the devices you have selected in the capacity box. Enter the size of the virtual disk you want to create in the box, then click *Add*. If you want to create multiple partitions, complete all steps for this partition. Then access the wizard again, and enter the same choices to create another partitioned disk. When finished, click *Next*.

Figure 1–14 Add Virtual Disk Wizard - Step 3 of 5

**Add Virtual Disk Wizard - Step 3 of 5**

Set the capacity for the new virtual disk.

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

Selected RAID level: JBOD (individual device)

Set virtual disk capacity

Specify a capacity within this range:

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

< Back   Next >   Cancel

4. Enter the virtual disk name. Enter the maximum cache transfer blocks, then click *Next*.

**NOTE**

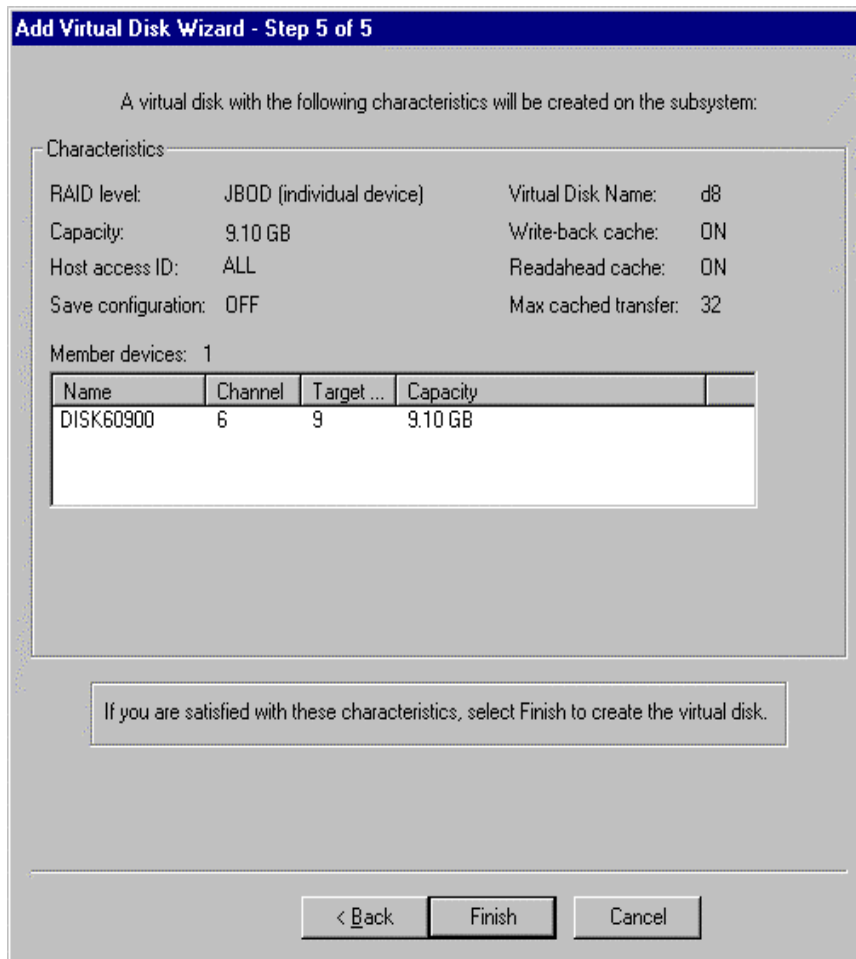
Always assign all partitions of a storageset to the same host port (do not split partitioned storagesets across host ports).

**Figure 1–15 Add Virtual Disk Wizard -Step 4 of 5**

The screenshot shows a dialog box titled "Add Virtual Disk Wizard - Step 4 of 5". The main text reads "Set the options to be used when creating this new virtual disk." Below this, there is a large text input field for "Virtual Disk Name" with a sub-label "Name (i.e..D0 - D199) :". To the right of this field is a smaller input field for "Maximum cached transfer:" with the value "32" and the unit "blocks". Below these are two checked checkboxes: "Enable writeback cache" and "Enable readahead cache". Further down, there are several dropdown menus: "Host access ID:" (set to "ALL"), "Replacement policy:", "Strip size (in blocks):", and "Reconstruction rate:". To the right of these are two more options: an unchecked checkbox "Save controller configuration to virtual disk" and a "Read source:" dropdown menu. Below the "Read source:" dropdown is a "Copy speed:" dropdown menu. At the bottom of the dialog are three buttons: "< Back", "Next >", and "Cancel".

5. The final Virtual Disk Wizard window reviews the choices you have made in steps 1 through 4. If you are satisfied with your choices, click *Finish*.

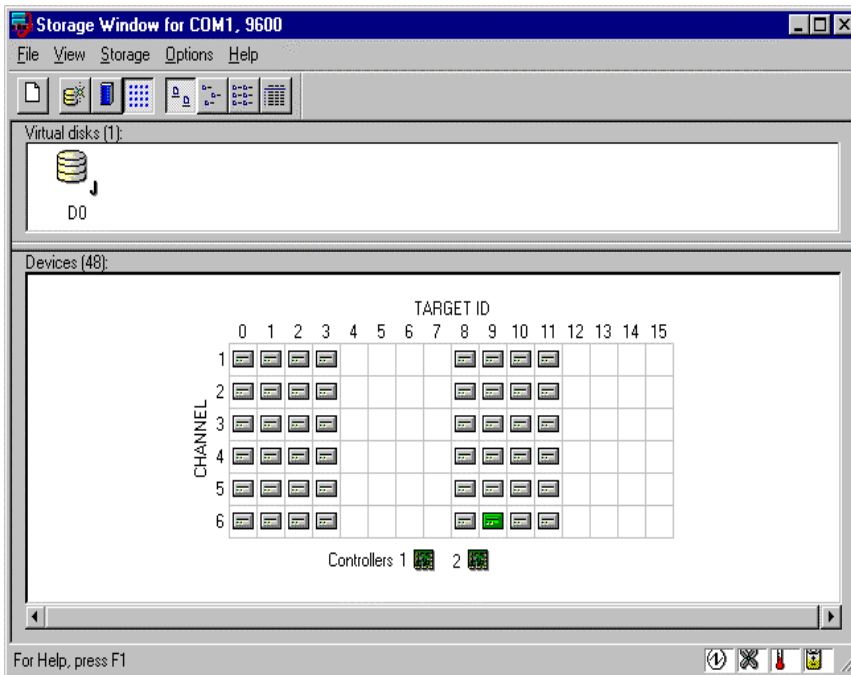
**Figure 1–16 Add Virtual Disk Wizard -Step 5 of 5**



When you click *Finish*, the storageset will start initialization.

6. You can view the virtual disks you have created by returning to the Storage Window. For additional information, see Chapter 1.4, “Establishing a Serial Connection to the HSG80 Storage Window.” Figure 1-17 displays the *Storage Window-Virtual Disk Window*.

Figure 1–17 Storage Window-Virtual Disk Window



**NOTE**

For more information, use the online HELP in the SWCC Storage and CLI windows.

# 2

## *Preparing Your Novell NetWare Host for Use with the RA8000/ESA 12000*

---

*This chapter contains instructions for configuring your host adapter/host controller and installing the appropriate device driver in your host system.*

---

### **NOTE**

To configure your RA8000 Fibre Channel subsystem for access from two hosts, perform the procedures below on both host systems.

### **2.1 Installing the Device Driver**

You can install the Novell NetWare Driver on the server from either the SmartStart CD or from the RA8000/ESA 12000 Solution Software V8.3 for the Novell NetWare CD. To perform either of these procedures, follow the installation instructions below.

### **NOTE**

Your adapter package and the RA8000/ESA 12000 Solution Software V8.3 for Novell NetWare both include the required adapter-specific software. Use only the adapters and drivers supplied, since these are tested and certified to function with the RA8000/ESA 12000 HSG80 controller.

#### **2.1.1 Installing the Novell NetWare Driver on the Server from the SmartStart CD**

1. From the NetWare 4.x console, type **Load Install** or from the NetWare 5.x console, type **Load NWconfig**.
2. Select *Product Options* from the menu and press **Enter**.
3. Select *Install a Product Not Listed* and press **Enter**.
4. Press **F3** to specify a different path.
5. Insert the Compaq SmartStart and Support Software CD-ROM V4.23 or later into the server's CD-ROM drive.

6. Execute one of the following procedures:
  - Either mount the CD-ROM as a NetWare volume and enter the path **CPQSMST423:\CPQSUPSW\NSSD** and press **Enter**. Volume name will vary pending SmartStart version.
  - Or if the DOS CD-ROM driver support is loaded, enter the path **<CD-ROM drive letter>:\CPQSUPSW\NSSD** and press **Enter**.
7. Press **Enter** to proceed past the *Welcome* screen.
8. Select *Compaq NWSA Storage Support* from the menu by scrolling cursor to it and press **F5** to mark the selection.
9. To access the main menu, press **Tab**.
10. To select *Install Selected Files*, press **Enter**.
11. After reviewing the Install Results, press **Enter**.
12. Select *To Reboot Server* and follow the instructions displayed on the screen in order to install the upgraded and/or new device drivers loaded on the server.

**NOTE**

The STARTUP.NCF file will automatically be updated with the appropriate driver load statements.

### **2.1.2 Installing the Novell NetWare Driver from the RA8000/ESA 12000 to the RA8000/ESA 12000 Solution Software V8.3 for the Novell NetWare CD**

1. Mount the RA8000\_V83\_NW CD as a NetWare volume.
2. Type **Load Install** from the NetWare 4.x console or type **Load NWCONFIG** from the NetWare 5.0 console.
3. Select *Driver Options* from the menu and press **Enter**.
4. Select *Configure Disk and Storage Device Drivers* from the menu and press **Enter**.
5. Select *Additional Drivers* from the menu and press **Enter**.
6. Press the **Insert** key to Install and Unlist Driver.
7. Press **F3** to specify an additional path.
8. Type the following path to the driver: **RA8000\_V83\_NW:CPQFC\**.
9. Select *CPQFC.HAM* and select *Yes* to copy the driver to the default server boot path C:\NWSERVER.
10. Select *Save the parameters and load the driver*.
11. Select *Load additional driver*.

12. Select *CPQSHD.CDM* and select *Yes* to copy the driver to the default server boot path *C:\NWSERVER*.
13. Select *Save the parameter and load the driver*.
14. Type “Scan for new devices” from the NetWare 4.0 console or type “Scan all” from the NetWare 5.0 console.
15. Type “List Devices” from the console.
16. If you have a storageset configured on the RA8000, you should see it listed as “Compaq StorageWorks FC Array Disk Idx LUNy,” where x is the ID number and y is the lun number.

**NOTE**

The *STARTUP.NCF* file will automatically be updated with the appropriate driver loaded statements.

## 2.2 Completing Your Configuration under Novell NetWare

Novell NetWare will recognize new RA8000/ESA 12000 Fibre Channel Storage subsystem devices or changes to existing configurations. You do not need to restart the NetWare server.

### 2.2.1 Configure A NetWare Volume on the Storageset for NetWare 5.0

1. From the NetWare 5.x console, type **load NWconfig**.
2. Select *Disk Options*.
3. Select *Modify disk partitions and Hot Fix*.
4. When the *Available Disk Drives* screen is displayed, select *Compaq StorageWorks FC Array Disk x Lun y*.

**NOTE**

X is a number that is created by the driver to signify the HSG80 port and Y represents the Storageset Lun number.

5. Select *Create NetWare disk partition* and press **F10**.
6. To create the NetWare partition, select *Yes*.
7. To continue to the *Available Installation Disk Options* screen, press the **Esc** key two times.
8. Select *NetWare Volume Options* from the *Available Disk Options* menu.
9. To add NetWare Volume, press the **Insert** key.
10. Select the newly created NetWare partition and press **Enter**.

11. Select *Make this segment a new volume* or *Add this segment to an existing volume*.
12. Provide a NetWare volume name in the text box and press **Enter**.
13. To save the volume name, press **F10**.
14. To exit the Volume creation menu, press **F10**, then the **Esc** key.
15. To save volume changes, select *Yes*.
16. Enter your administrator password.
17. Select *Mount all volumes* and press the **Esc** key.
18. To exit NWconfig, select *Yes*.

To delete NetWare volumes and partitions prior to deleting or reconfiguring Compaq StorageWorks virtual disks, type **NWCONFIG**.

**NOTE**

Prior to deleting or reconfiguring Compaq StorageWorks virtual disks, you must delete NetWare volumes and partitions residing on them using INSTALL.NLM or NWCONFIG.NLM.



---

*This chapter contains general guidelines for configuring your host system.*

---

### **3.1 General Configuration Guidelines**

Fibre Channel storage technology offers more configuration flexibility than parallel SCSI storage. This chapter describes typical RA8000/ESA 12000 FC configurations for Netware. This document is not intended to describe all possible configurations. For configurations not shown here, the configuration maximums listed should be used to determine the viability of the proposed configuration. It is strongly recommended that you not exceed the maximums listed.

The maximums and notes listed apply to all configurations. Additional information specific to particular configurations is provided in each configuration section.

#### **3.1.1 Configuration Maximums**

- 500 meters per optical cable segment, 1 kilometer distance between server and storage
- For single path configurations, the number of FC HBAs per server, connected to separate loops, is based on server capacity (Note: If configuring more than 1 FC HBA in the same server, each HBA must be on a different loop)
- Controller Transparent Failover Mode
- Up to 4 servers on a single loop with up to 2 storage systems - using 4 controllers with 2 active controller host ports per controller pair
- Up to 8 servers on two loops (4 servers per loop) with 1 storage system - using 2 controllers with 2 active controller host ports
- The maximum storage capacity stated (1.3 TB) assumes 18 GB disks, increases in disk drive capacity will increase overall storage capacity for the same enclosure footprint

### 3.1.2 General Configuration Notes

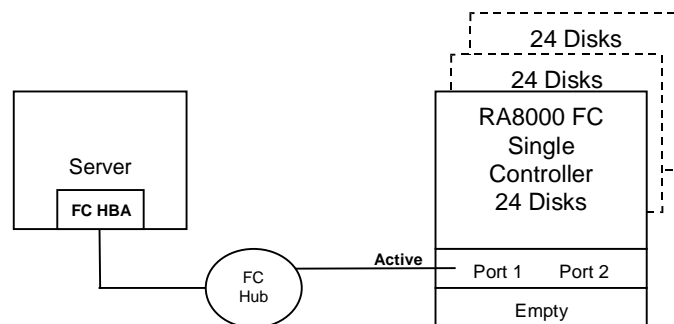
- All single controller enclosure configurations can be upgraded to dual controller configurations.
- Dual redundant controllers can be configured for Transparent Failover Mode or Multiple-Bus Failover Mode. NetWare only supports Transparent Failover Mode.
- All configuration diagrams show a front view of the storage system. Controller A is the top controller and Controller B is the bottom controller. Controller Host Port 1 is the left port and Host Port 2 is the right port.
- Each storage system can be configured using SWCC or the Command Line Interface (CLI) configured through either the HSG80 controller maintenance serial port or a TCP/IP interface.
- All configurations use ACS V8.3 (Array Controller Software) configured for FC-AL topology.
- All configurations use short wavelength lasers and multi-mode fibre channel optical cables.
- All configurations require the Arbitrated Loop Physical Address (ALPA) for each loop device be set to hard and be unique (refer to the product documentation for a list of valid addresses).
- All configurations require the Connection Name Operating System parameter set to “WINNT”.
- For configurations with more than one server on the same loop
  - ❑ Use the *Connection Name Unit Offset* value to set the range of unit numbers to be visible from each server (using the CLI, “SET *connection-name* UNIT\_OFFSET = n”).
  - ❑ Use the *Unit Connection Name* parameter to allow exclusive access to units from each server (using the CLI, “SET *unit-number* DISABLE\_ACCESS\_PATH = ALL ENABLE\_ACCESS\_PATH = *connection-name*”).
  - ❑ For single controller configurations with two active controller host ports on the same loop use the *Connection Name Unit Offset* value to set the range of unit numbers to be visible from controller Host Port 2.
- Record the FC HBA *Worldwide ID* (WWID) IEEE address shown on the back of each FC HBA prior to installing into a server.

- Use the recorded WWID to identify the connection name displayed from the CLI at the controller using the **SHOW CONNECTIONS** command.
- Rename connection names. By default new connection names are automatically added to the controller connection name table as “!NEWCONnn” (where nn is a number from 1 to 32). The controllers add a connection when a path to an adapter from each active controller host port is detected. Once you have identified each connection using the FC HBA WWID, rename the connections to a name meaningful to the specific configuration, such as `SERVER1P1`, using the CLI, “`RENAME old-name new-name`”. (Note: Connection names can be a maximum of 9 characters).
- Each active controller host port on a loop presents one SCSI Target ID with up to eight LUNs to each server (FC HBA) on the same loop. LUNs (logical units) can consist of single disks (JBOD), a storage set of multiple disks, or a partition (up to 8), configured for a specific RAID level of 0, 0 + 1, or 3/5.

### 3.2 Configuration 1 - One Server, Single Controller

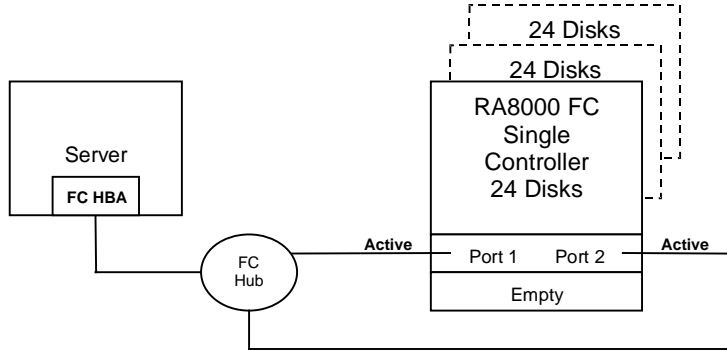
The single controller configuration is an entry-level RA8000 or ESA 12000 that can be expanded to accommodate additional storage capacity or performance needs as required (Figure 3-1). The configuration consists of an RA8000 or ESA 12000 storage enclosure with a single HSG80 array controller on a single fibre channel loop. In the initial configuration a single controller host port (Port 1) is active providing up to 8 LUNs across up to 24 disks. An additional 48 disks can be added using two expansion enclosures.

Figure 3–1 One Sever, Single Controller Configuration



LUN capacity can be doubled by the use of a third fibre channel cable connected to the second controller host port (Host Port 2, Figure 3-2), resulting in the configuration shown below.

**Figure 3-2 Single Server, Dual-port Configuration**



### 3.2.1 Configuration 1 Notes

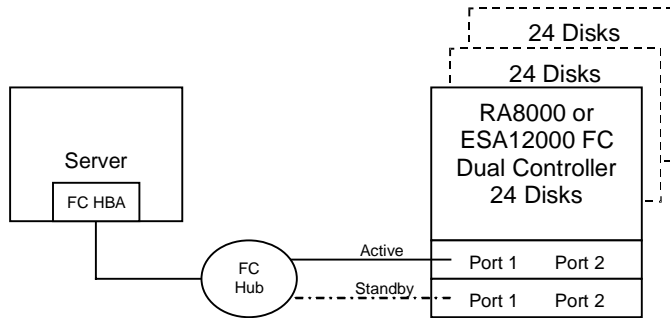
- Single Fibre Channel Loop
- This configuration consists of a single HSG80 controller so controller failover is not available
- Up to 500 meters per cable segment
- Up to 72 disks with 2 optional expansion enclosures
- Up to 8 LUNs with 1 active controller host port (first diagram). Suggested controller unit number assignment: Port 1 units D0 – D7. In this configuration, 1 logical connection is available.
- Up to 16 LUNs with 2 active controller host ports (second diagram). Suggested controller unit number assignment: Port 1 units D0 – D7, Port 2 units D100-D107. In this configuration, 2 logical connections are available.
- Use of controller Host Port 2 requires a third cable and enabling of the port through the Command Line Interface (CLI) using the following commands:
  - ❑ SET THIS PORT\_2\_TOPOLOGY = LOOP\_HARD
  - ❑ SET THIS PORT\_2\_AL\_PA = 72
- Rename the connection names, for example, SERVER1P1, SERVER1P2
- Set the connection name unit offset value for port 2:  
SERVER1P2 UNIT\_OFFSET = 100

### 3.3 Configuration 2 - One Server, Dual Controller Transparent Failover

This two-controller configuration provides dual redundant controllers configured in Transparent Failover mode (Figure 3-3). The configuration consists of an RA8000 or ESA12000 storage enclosure with two HSG80 array controllers on a single loop. In normal

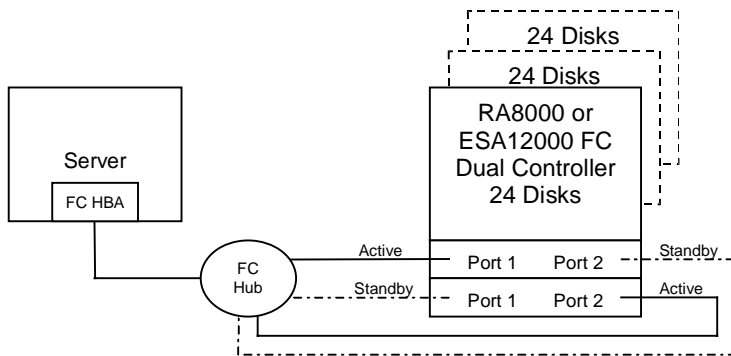
operation Controller A provides the active path for all storage sets to the server through Port 1. A second controller, Controller B, is a hot standby. Controller B will automatically become active in the event of a failure in Controller A. All units being accessed through Port 1 of Controller A will become accessible through Port 1 of Controller B. In the initial configuration a single controller host port (Port 1) is active providing up to 8 LUNs across up to 24 disks. An additional 48 disks can be added using two expansion enclosures.

**Figure 3-3 Single Server, Dual-controller Configuration**



Controller B can be used as an active controller to increase performance, and double LUN capacity can be accomplished without sacrificing redundancy. Two fibre channel cables, one connected to Controller A Port 2, and one connected to Controller B Port 2, result in the configuration shown below. This configuration provides full controller redundancy in the event that Controller A or Controller B fails. In either failover scenarios the surviving controller will transition a standby port to the active state providing access to all units to the server (Figure 3-4).

**Figure 3–4 Single Server, Dual port Configuration**



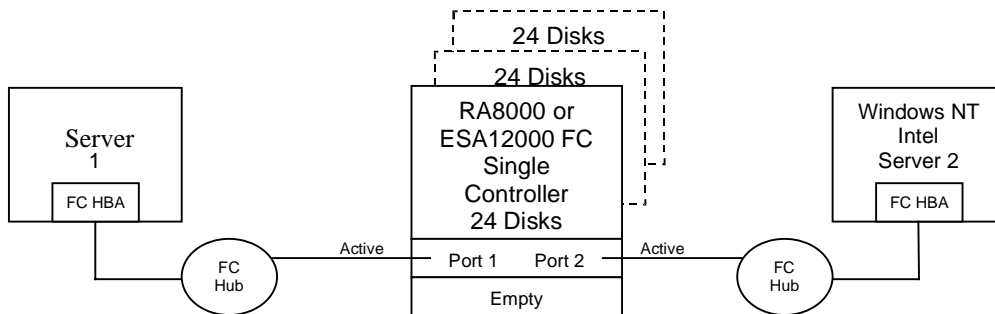
### 3.3.1 Configuration 2 Notes

- Single Fibre Channel Loop
- Dual HSG80 controllers configured in Transparent Failover Mode
- Up to 500 meters per cable segment
- Up to 72 disks with 2 optional expansion enclosures
- Up to 8 LUNs with 1 active controller host port (first diagram). Suggested controller unit number assignment: Port 1 units D0 – D7
- Up to 16 LUNs with 2 active controller host ports (second diagram). Suggested controller unit number assignment: Port 1 units D0 – D7, Port 2 units D100 – D107
- Controller Host Port 2 requires two fibre channel cables
- By default, setting the controller pair in Transparent Failover mode will automatically configure Port 1 and Port 2 of both controllers to the Active and Standby state indicated, and set the unit offset values to 0 for Port 1 and 100 for Port 2
- In this configuration, 2 logical connections are available
- Rename the connections (for example, SERVER1P1, SERVER1P2)

### 3.4 Configuration 3 – Two Servers, Single Controller, Shared Storage Enclosure

Configuration 3 uses the second controller host port to provide storage to a second separate (non-cooperating) server (Figure 3-5). The two servers share the storage enclosure in that each server has exclusive access to its own LUNs through the use of mutually exclusive LUN numbering. This configuration utilizes two separate fibre channel loops.

**Figure 3-5 Two Servers, Single-controller Configuration**



#### 3.4.1 Configuration 3 Notes

- Two fibre channel loops
- Shared storage enclosure
- This configuration consists of a single HSG80 controller so controller failover is not available
- Up to 500 meters per cable segment
- Up to 72 disks with 2 optional expansion enclosures
- Up to 16 LUNs total, 8 available to each server with 2 active controller host ports. Suggested controller unit number assignment: Server 1 Port 1 units D0 – D7, Server 2 Port 2 units D100-D107
- In this configuration, 2 logical connections are available, 1 to each server
- Utilization of controller host Port 2 requires a third cable and enabling of the port through the Command Line Interface (CLI) using the following commands:
- SET THIS PORT\_2\_TOPOLOGY = LOOP\_HARD

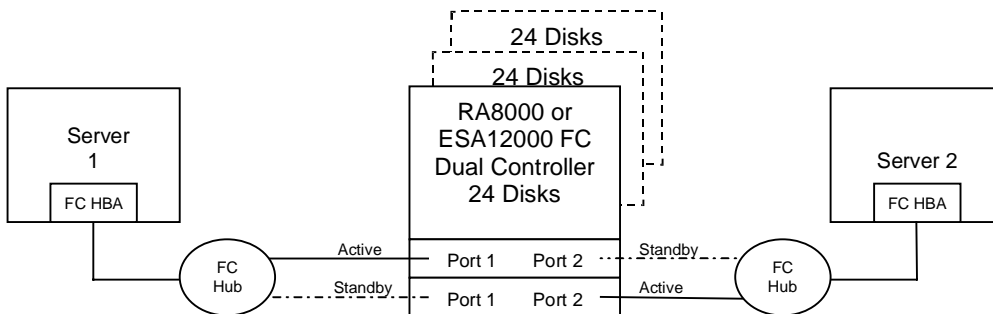
- SET THIS PORT\_2\_AL\_PA = 72
- Rename the connections, for example SERVER1P1, SERVER2P2
- Set the connection name unit offset value for port 2, SERVER2P2 UNIT\_OFFSET = 100

### 3.5 Configuration 4 – Two Servers, Dual Controller Transparent Failover, Shared Storage Enclosure

This configuration utilizes a dual controller pair to provide storage and controller redundancy to a second, separate (non-cooperating) server (Figure 3-6). The two servers share the storage enclosure in that each server has exclusive access to its own LUNs through the use of mutually exclusive LUN numbering. This configuration utilizes two separate fibre channel loops. Each server has access to its own dedicated controller. In the event of a controller failover, the surviving controller will continue to provide full access to both servers.

In normal operation Controller A provides the active path for all storage sets assigned to server 1 through Port 1. A second controller, Controller B, provides the active path for all storage sets assigned to server 2 through Port 2. Each server also has a dedicated standby port in the event that there is a controller failover.

Figure 3-6 Two Servers, Dual-controller Configuration





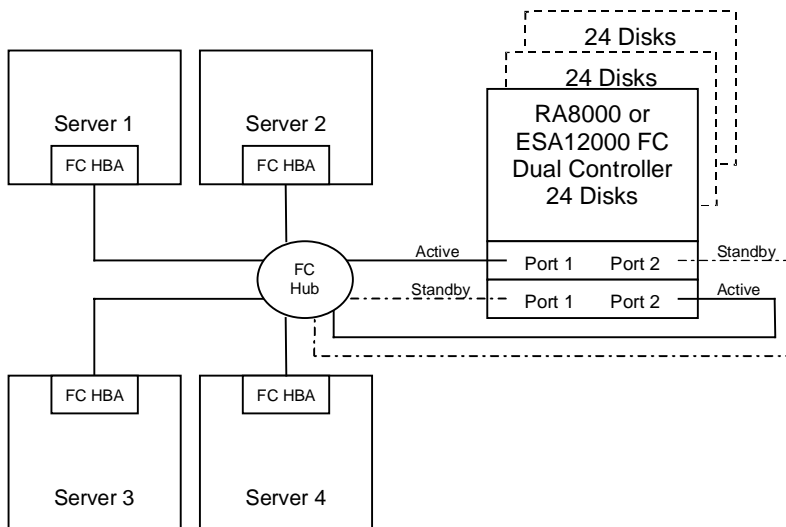
### 3.5.1 Configuration 4 Notes

- Two fibre channel loops
- Shared storage enclosure
- Dual HSG80 controllers configured in Transparent Failover Mode
- Up to 500 meters per cable segment
- Up to 72 disks with 2 optional expansion enclosures
- Up to 16 LUNs, 8 available to each server with 2 active controller host ports.  
Suggested controller unit number assignment: Server 1 Port 1 units D0 – D7, Server 2 Port 2 units D100-D107
- In this configuration, 2 logical connections are available, 1 to each server
- Rename the connections, for example SERVER1P1, SERVER2P2
- By default, setting the controller pair in Transparent Failover mode will automatically configure Port 1 and Port 2 of both controllers to the Active and Standby state indicated, and set the unit offset values to 0 for Port 1 and 100 for Port 2
- The second controller host port requires a second Server, FC host bus adapter, hub and cables

### 3.6 Configuration 5 – Up to Four Servers, Dual Controller Transparent Failover, Shared Storage Enclosure

Up to four servers share the storage enclosure in that each server has exclusive access to its own set of LUNs (Figure 3-7). This is made possible by setting explicit “host access” at the unit level and using connection name “unit offsets” to give each server an accessible range of unit numbers. Additional levels of access control are necessary for this configuration because all servers are sharing the single fibre channel loop. As with all dual controller configurations, controller failover and performance benefits are inherent.

Figure 3-7 Four Servers, Dual-controller Configuration



#### 3.6.1 Configuration 5 Notes

- Single fibre channel loop
- Shared storage enclosure
- Dual HSG80 controllers configured in Transparent Failover Mode
- Up to 500 meters per cable segment
- Up to 72 disks with 2 optional expansion enclosures
- Up to 64 LUNs total, 16 available to each server with 2 active controller host ports

- In this configuration, 8 logical connections are available, 2 to each server
- Rename the connections, for example., SERVER1P1, SERVER1P2, SERVER2P1
- Set the connection name unit offset values. By default, setting the controller pair in Transparent Failover Mode will automatically configure Port 1 and Port 2 of both controllers to the Active and Standby state indicated, and set unit offset values to 0 for Port 1 and 100 for Port 2. Use the default connection unit offset values for one of the servers and set new unit offset values for connections to the other three servers as shown below.
- Set exclusive unit access for each unit to a specific server connection name, such as for unit D0 “SET D0\_DISABLE\_ACCESS\_PATH=ALL”, then “SET D0 ENABLE\_ACCESS\_PATH=SERVER1P1”, then do the same for unit D100.

**NOTE**

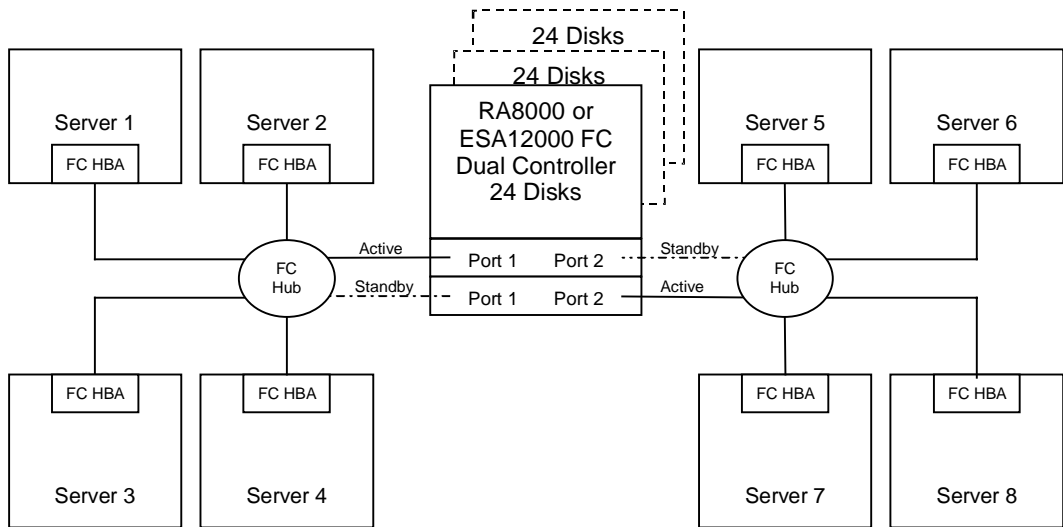
If you are using SWCC to create units, default units are enabled on all known connections.

- Set each FC HBA ALPA to a unique hard address, such as HBA 1 = 01, HBA2 = 02, HBA3 = 03, HBA4 = 04.
- Suggested connection parameters and unit numbering would result in the units being distributed equally across controller host ports as follows:
- Server 1: Port 1 units D0 – D7, Port 2 units D100 – D107
- Connection name, unit offset value: SERVER1P1, 0. SERVER1P2, 100
- Server 2: Port 1 units D8 – D15, Port 2 units D108 – D115
- Connection name, unit offset value: SERVER2P1, 8. SERVER2P2 108
- Server 3: Port 1 units D16 – D23, Port 2 units D116 – D123
- Connection name, unit offset value: SERVER3P1, 16. SERVER3P2, 116
- Server 4 : Port 1 units D24 – D31, Port 2 units D124 – D131
- Connection name, unit offset value: SERVER4P1, 24. SERVER4P2, 124

### 3.7 Configuration 6 – Eight Servers, Dual Controller Transparent Failover, Shared Storage Enclosure

This configuration utilizes a dual controller pair on two fibre channel loops to provide storage and controller redundancy to two groups of four separate (non-cooperating) servers (Figure 3-8). The eight servers share the storage enclosure in that each server has exclusive access to its own set of LUNs. This is made possible by the setting of explicit “host access” at the unit level and using connection name “unit offsets” to give each server an accessible range of unit numbers. Additional levels of access control are necessary for this configuration because each group of four servers is sharing the same loop.

**Figure 3–8 Eight Servers, Dual-controller Configuration**



#### 3.7.1 Configuration 6 Notes

- Two fibre channel loops
- Shared storage enclosure
- Dual HSG80 controllers configured in Transparent Failover Mode
- Up to 500 meters per cable segment
- Up to 72 disks with 2 optional expansion enclosures
- Up to 64 LUNs, 8 available to each server with 2 active controller host ports

- In this configuration, 8 connections are available, 1 to each server.
- Rename the connections, for example SERVER1P1, SERVER2P1, SERVER5P2, etc.
- Set the connection name unit offset values. By default, setting the controller pair in Transparent Failover Mode will automatically configure Port 1 and Port 2 of both controllers to the Active and Standby state indicated, and set unit offset values to 0 for Port 1 and 100 for Port 2. Use the default connection unit offset values for one of the servers on each loop and set new unit offset values for connections to the other six servers as shown below.
- Set exclusive unit access for each unit to a specific server connection name, such as “SET D0 DISABLE\_ACCESS\_PATH=ALL” for unit D0, then “SET D0 ENABLE\_ACCESS\_PATH=SERVER1P1”, then do the same for unit D100

**NOTE**

When using SWCC to create units, by default units are enabled on all known connections.

- Suggested connection parameters and unit numbering would result in the units being distributed equally across enclosures and controller host ports as follows:
  - ❑ Server 1: Port 1 units D0 – D7  
Connection name, unit offset value: SERVER1P1, 0
  - ❑ Server 2: Port 1 units D8 – D15  
Connection name, unit offset value: SERVER2P1, 8
  - ❑ Server 3: Port 1 units D16 – D23  
Connection name, unit offset value: SERVER3P1, 16
  - ❑ Server 4 : Port 1 units D24 – D31  
Connection name, unit offset value: SERVER4P1, 24
  - ❑ Server 5: Port 2 units D100 – D107  
Connection name, unit offset value: SERVER5P2, 100

- ❑ Server 6: Port 2 units D108 – D115  
Connection name, unit offset value: SERVER6P2 108
- ❑ Server 7: Port 2 units D116 – D123  
Connection name, unit offset value: SERVER7P2, 116
- ❑ Server 8 : Port 2 units D124 – D131  
Connection name, unit offset value: SERVER8P2, 124

# 4

## *Creating Your Storage Configuration with the CLI*

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

---

### **NOTE**

To create your storage configuration using the StorageWorks Command Console, refer to Chapter 1, *Installing SWCC Client and Creating Your First Virtual Disk*.

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

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

### **4.1 Configuration Guidelines**

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

#### **4.1.1 Controller Device Configuration Guidelines**

- The enclosure has six device ports (SCSI buses). Evenly distribute disk devices across the separate six device ports. This permits parallel activities on the controller's available device ports and the attached drives.

- Avoid configuring multiple mirrorsets with the first member being on the same device port. Configure multiple mirrorsets similar to the following example:

```
ADD MIRRORSET MIRR_1 DISK10000 DISK20000
ADD MIRRORSET MIRR_2 DISK20100 DISK10100
```

#### 4.1.2 Controller Host System Configuration Guidelines

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

Each logical unit number contains the following:

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

Each HSG80 controller has two host ports, Port 1 and Port 2, as shown in the following figures. Unit numbers D0-D99 are assigned to Host Port 1, and unit numbers D100-D199 are assigned to Host Port 2. You can specify a maximum of 32 host logical units per host port, for a total of 16 host units, when access is from two SCSI hosts adapter ports.

#### NOTE

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



**Figure 4–1. Single Controller/Single Host**

<b>Controller A</b>	<b>Port 1 Active</b>	Port 2 Unused	
EMPTY			
<b>Cache A</b>		EMPTY	

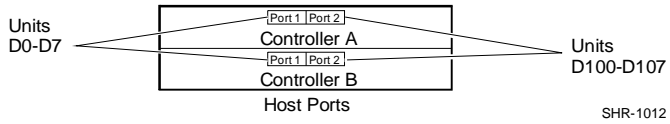
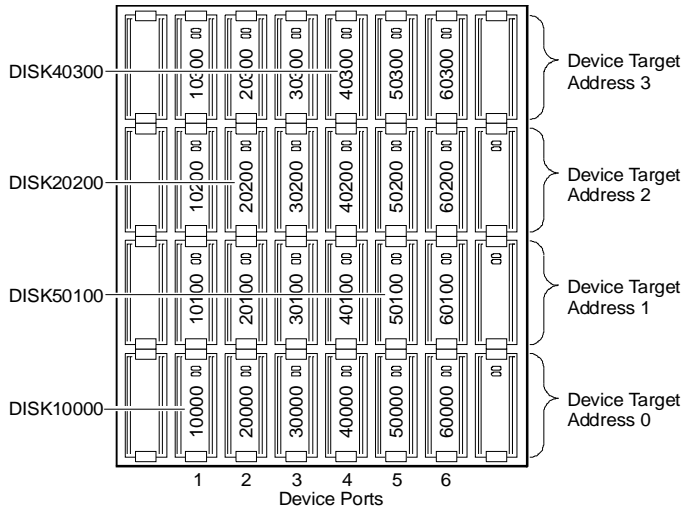
For single HSG80 controller configurations connected to a single host, configure up to 32 host logical units on Controller A - Host Port 1. Valid unit numbers are D0-D99. Controller A - Host Port 2 is unused.

**Figure 4–2. Dual Controller/Single Host**

<b>Controller A</b>	<b>Port 1 Active</b>	Port 2 Unused	
<b>Controller B</b>	Port 1 Standby	Port 2 Unused	
<b>Cache A</b>		<b>Cache B</b>	

For dual-redundant HSG80 controller configurations connected to a single host, configure up to 32 host logical units on Controller A - Host Port 1. Valid unit numbers are D0-D99. Controller B - Host Port 1 is automatically configured as a standby port for these same 32 units. Controller A - Host Port 2 and Controller B - Host Port 2 are unused.

**Figure 4-3. Mapping of Device Ports/Targets and Host Ports**



SHR-1012

## 4.2 Accessing the CLI

The Command Line Interpreter (CLI) is a command line user interface to the HSG80 controller. It provides a series of commands to configure the subsystem through the controller's firmware.

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

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

Make a serial connection to the HSG80 controller to access the CLI.

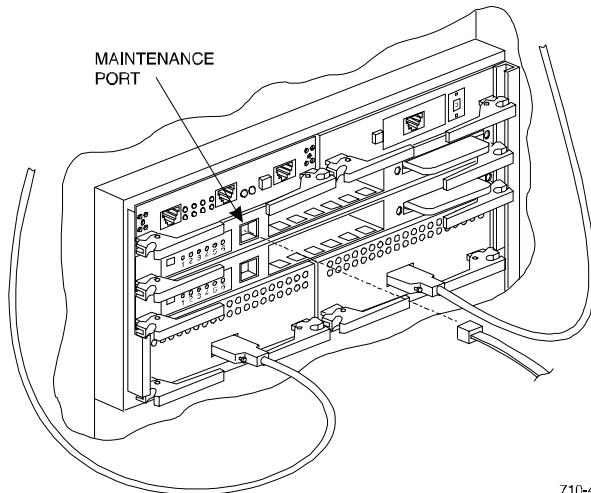
### 4.2.1 Connecting the Cable

To connect a maintenance terminal or PC to an HSG80 controller:

1. Locate the connecting cable that came with the RA8000 Fibre Channel subsystem. It has an RJ12 connector (similar to standard telephone plug) on one end and a 9-pin serial connector on the other end.
2. Plug the serial connector into the 9-pin serial port/com port 1 of the PC.
3. Plug the RJ12 connector from the PC or maintenance terminal into the maintenance port on the HSG80 controller (see Figure 4-4).

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

**Figure 4-4. Making a Serial Connection to the HSG80 Controller**



710-45

#### 4.2.2 Establishing Connection with a Host

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

1. Start a communications program on your PC.
2. Set the communications program to use the serial port that is connected to the controller.
3. Set the communications parameters to:
  - 8 bits
  - 9600 baud
  - 1-stop bit
  - No parity
4. From your communications program, issue a connect command to establish a connection with the controller, and then press the **Enter** key. You should see the CLI prompt, which looks similar to:

```
HSG80 >
```
5. To view the status of the controller, type:

```
HSG80 > SHOW THIS_CONTROLLER
```

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

```
HSG> sho this_controller
Controller:
  HSG80 ZG81000793 Software V83G-0, Hardware E01
  NODE_ID           = 5000-1FE1-0000-2370
  ALLOCATION_CLASS   = 0
  SCSI_VERSION      = SCSI-2
  Configured for dual-redundancy with ZG81000729
  In dual-redundant configuration
  Device Port SCSI address 7
  Time: 30-SEP-98 12:03:57
  Command Console LUN is disabled
Host PORT_1:
  Reported PORT_ID = 5000-1FE1-0000-2371
  PORT_1_PROFILE   = PLDA
  PORT_1_TOPOLOGY  = LOOP_SOFT (loop up)
  PORT_1_AL_PA     = 02 (negotiated)
Host PORT_2:
  Reported PORT_ID = 5000-1FE1-0000-2372
  PORT_2_PROFILE   = PLDA
  PORT_2_TOPOLOGY  = LOOP_SOFT (standby)
  PORT_2_AL_PA     = 00 (negotiated)
Cache:
  64 megabyte write cache, version 0012
  Cache is GOOD
  No Unflushed data in cache
  CACHE_FLUSH_TIMER = DEFAULT (10 seconds)
Mirrored Cache:
  64 megabyte write cache, version 0012
  Cache is GOOD
  No Unflushed data in cache
Battery:
  FULLY CHARGED
  Expires:                WARNING: UNKNOWN EXPIRATION DATE!
  NOCACHE_UPS
```

**NOTE**

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

The Communications LUN is not used with NetWare if the HSG80 is set in the SCSI-2 mode. It should be *disabled* or grayed. If the Communications LUN is enabled, disable it by typing:

```
set this_controller nocommand_console_lun
```

### 4.3 Adding Disks to the Configuration

The CONFIG utility locates and adds disks to the controller. Run the CONFIG utility whenever you add new disks to the controller. (See Chapter 1 regarding installing/adding disks in the StorageWorks enclosure.) Enter the following command to start the configuration utility. The disk numbers will correspond to the disk locations for your subsystem.

```
HSG80 > RUN CONFIG
```

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

```
CONFIG LOCAL PROGRAM INVOKED
CONFIG IS BUILDING ITS TABLES AND DETERMINING WHAT DEVICES EXIST ON
THE SUBSYSTEM. PLEASE BE PATIENT.
ADD DISK10000 1 0 0
ADD DISK10100 1 1 0
ADD DISK10200 1 2 0
ADD DISK20000 2 0 0
ADD DISK20100 2 1 0
ADD DISK20200 2 2 0
ADD DISK30000 3 0 0
ADD DISK30100 3 1 0
ADD DISK30200 3 2 0
ADD DISK40000 4 0 0
ADD DISK40100 4 1 0
ADD DISK40200 4 2 0
ADD DISK40300 4 3 0
ADD DISK50000 5 0 0
ADD DISK50100 5 1 0
ADD DISK50200 5 2 0
ADD DISK50300 5 3 0
ADD DISK60000 6 0 0
```

```
ADD DISK60100 6 1 0
ADD DISK60200 6 2 0
ADD DISK60300 6 3 0
CONFIG - NORMAL TERMINATION
```

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

#### 4.4 Creating a RAIDset

RAIDsets stripe user data over multiple drives and calculate parity information for data redundancy. Create RAIDsets to use redundant stripesets in your array. RAIDsets must have at least three members and can have as many as 14. This example creates two 3-member RAIDsets using the ADD RAIDSET command:

```
HSG80 > ADD RAIDSET DVGRPR0 DISK10000 DISK20000 DISK30000
HSG80 > ADD RAIDSET DVGRPR1 DISK40000 DISK50000 DISK60000
```

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

##### 4.4.1 Initializing a RAIDset

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

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

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

#### 4.4.2 Adding a RAIDset as a Logical Unit

To make a RAIDset available to the host computer, you must identify it as a host logical unit. For single or dual controllers on a single host, the unit numbers may range from D0 through D99 with a maximum of 32 units. For dual controllers/two hosts, the unit numbers may range from D0 through D99 for the first host and from D100 through D199 for the second host with a maximum of 32 units per host. Add units by using the ADD UNIT command:

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

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

#### 4.4.3 Setting Writeback Cache

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

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

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

#### 4.4.4 Setting Read Ahead Cache

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

```
HSG80 > SET D1 READAHEAD_CACHE
```

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

### 4.5 Creating a Stripset

Use stripsets to stripe data across multiple disks. Striping data across multiple disks increases I/O performance compared with the performance of a single disk. Stripsets must have at least 2 members and can have as many as 14. All members must be single disks. This example creates a 3-member stripset using the ADD STRIPSET command.

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

In this example, "DVGRPS0" is the name of the stripset, and it is followed by a list of the disks to be included in the stripset. The names of the stripsets are user selectable. Performance of your stripsets will be optimized if each stripset includes disks from different device ports as shown in Figure 4-5.



### 4.5.1 Initializing a Stripeset

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

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

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

### 4.5.2 Adding a Stripeset as a Logical Unit

To make a stripeset available to the host computer, you must identify it as a host logical unit. For single or dual controllers on a single host, the unit numbers may range from D0 through D99 with a maximum of 32 units. For dual controllers/two hosts, the unit numbers may range from D0 through D99 for the first host and from D100 through D199 for the second host with a maximum of 32 units per host. Add units by using the `ADD UNIT` command:

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

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

### 4.5.3 Setting Writeback Cache

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

```
HSG80 > SET D3 WRITEBACK_CACHE
```

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

## 4.6 Creating a Mirrorset

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

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

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

### 4.6.1 Initializing a Mirrorset

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

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

```
HSG80 > INITIALIZE DVGRPM0
```

### 4.6.2 Adding a Mirrorset as a Logical Unit

To make a mirrorset available to the host computer, you must identify it as a host logical unit. For single or dual controllers on a single host, the unit numbers may range from D0 through D99 with a maximum of 32 units. For dual controllers/two hosts, the unit numbers may range from D0 through D99 for the first host and from D100 through D199 for the second host with a maximum of 32 units per host. Add units by using the ADD UNIT command:

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

### 4.6.3 Setting Writeback Cache

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

```
HSG80 > SET D4 WRITEBACK_CACHE
```

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

## 4.7 Creating a Striped Mirrorset

Create a striped mirrorset to achieve high I/O performance and maximum data availability. striped mirrorsets must have at least 2 mirrorset members, and can have as many as 14. All members must be mirrorsets. To create striped mirrorsets, first create mirrorsets and then create stripesets with those mirrorsets.

### 4.7.1 Creating Mirrorsets

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

```
HSG80 > ADD MIRRORSET MIRR_0 DISK30200 DISK40200
```

```
HSG80 > ADD MIRRORSET MIRR_1 DISK50200 DISK60200
```

In these examples, MIRR\_0 and MIRR\_1 are the names of the mirrorsets. Each is followed by the list of disks to be included in it.

### 4.7.2 Striping the Mirrorsets

Striped mirrorsets must have at least 2 members, and can have as many as 14. This example uses the ADD STRIPESET command to create a 2-member stripeset with the mirrorsets just created.

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

In this example, DVGRPSM0 is the name of the striped mirrorset, and it is followed by a list of mirrorsets to include in it. The name of the stripeset is user selectable. Performance of your striped mirrorset will be optimized if each mirrorset includes disks from different device ports as shown in Figure 4-4.

### 4.7.3 Initializing the Striped Mirrorset

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

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

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

### 4.7.4 Adding a Striped Mirrorset as a Logical Unit

To make a striped mirrorset available to the host computer, you must identify it as a host logical unit. For single or dual controllers on a single host, the unit numbers may range from D0 through D99 with a maximum of 32 units. For dual controllers/two hosts, the unit numbers may range from D0 through D99 for the first host and from D100 through D199 for the second host with a maximum of 32 units per host. Add units by using the ADD UNIT command:

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

### 4.7.5 Setting Writeback Cache

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

```
HSG80 > SET D5 WRITEBACK_CACHE
```

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

## 4.8 Adding Individual Disks as Logical Units

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

### 4.8.1 Initializing Individual Disks

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

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

```
HSG80 > INITIALIZE DISK40100 CHUNKSIZE=DEFAULT
HSG80 > INITIALIZE DISK50100 CHUNKSIZE=DEFAULT
```

### 4.8.2 Adding as Logical Units

To make an individual disk available to the host computer, you must identify it as a host logical unit. For single or dual controllers on a single host, the unit numbers may range from D0 through D99 with a maximum of 32 units. For dual controllers/two hosts, the unit numbers may range from D0 through D99 for the first host and from D100 through D199 for the second host with a maximum of 32 units per host. Add units by using the ADD UNIT command:

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

## 4.9 Adding Devices to the Spareset

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

```
HSG80 > ADD SPARESET DISK60100
```

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

**NOTE**

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

#### 4.10 Saving Copies of the Configuration

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

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

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

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

```
HSG80 > INITIALIZE DISK10000 SAVE_CONFIGURATION
```

**NOTE**

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

#### 4.11 Recording your Configuration

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

First, verify the Logical Units you have configured:

```
HSG80 > SHOW UNITS
```



Next, verify the storagesets you have configured:

HSG80 > **SHOW STORAGESETS**

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

Name	StorageSet	Uses	Used by
DVGRPS0	stripeset	DISK10100 DISK20100 DISK30100	D3
DVGRPSM0	stripeset	MIRR_0 MIRR_1	D5
DVGRPM0	mirrorset	DISK10200 DISK20200	D4
MIRR_0	mirrorset	DISK30200 DISK40200	DVGRPSM0
MIRR_1	mirrorset	DISK50200 DISK60200	DVGRPSM0
DVGRPR0	raidset	DISK10000 DISK20000 DISK30000	D1
DVGRPR1	raidset	DISK40000 DISK50000 DISK60000	D2
SPARESET	spareset	DISK60100	
FAILEDSET	failedset		



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

```
HSG80 > SHOW DEVICES
```

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





## *Planning Your Storage Configuration*

---

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

---

### **A.1 Planning Your Configuration**

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

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

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

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

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

**Table A-1 Configuration Options**

Storage Method	Storageset Type	Number of Devices	Offers
RAID 3/5 A redundant-stripeset combining the optimized data transfers of RAID 3 with the striping of parity of RAID 5.	RAIDset	3 - 14	Good throughput and read bandwidth for a high request rate of small to medium transfers. High Data Availability.
RAID 0	Stripeset	2 - 14	Good performance for both read and write requests. Provides load balancing with each request requiring a single data operation. Data availability equivalent to that of an individual disk device.
RAID 1	Mirrorset	2 - 6 devices per mirrorset, up to 12 mirrorsets per RAID array	Good performance for read requests. High Data Availability.
RAID 0 + 1	Striped mirrorsets	2 - 12 mirrorsets	Performance for read requests surpassing that of an unstriped mirrorset since it can achieve load balancing. High Data Availability.
Individual Devices (JBOD)	Disk Drive	1	Provides the storage capacity and access speed of the disk used. If device fails, data is lost.

Once you select the type of storagesets to be used in your subsystem, create them using an appropriate configuration manager.

# B

## *Valid ALPA Settings*

---

*This appendix provides a table of the valid arbitrated loop physical address (ALPA) settings available for hard addressing the Fibre Channel Arbitrated Loop.*

---

### **B.1 Valid ALPA Settings**

Table B-1 lists the valid ALPA settings for hard addressing the fibre channel arbitrated loop.

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

0x01	0x02	0x04	0x08	0x0F	0x10	0x17	0x18	0x1B
0x1D	0x1E	0x1F	0x23	0x25	0x26	0x27	0x29	0x2A
0x2B	0x2C	0x2D	0x2E	0x31	0x32	0x33	0x34	0x35
0x36	0x39	0x3A	0x3C	0x43	0x45	0x46	0x47	0x49
0x4A	0x4B	0x4C	0x4D	0x4E	0x51	0x52	0x53	0x54
0x55	0x56	0x59	0x5A	0x5C	0x63	0x65	0x66	0x67
0x69	0x6A	0x6B	0x6C	0x6D	0x6E	0x71	0x72	0x73
0x74	0x75	0x76	0x79	0x7A	0x7C	0x80	0x81	0x82
0x84	0x88	0x8F	0x90	0x97	0x98	0x9B	0x9D	0x9E
0x9F	0xA3	0xA5	0xA6	0xA7	0xA9	0xAA	0xAB	0xAC
0xAD	0xAE	0xB1	0xB2	0xB3	0xB4	0xB5	0xB6	0xB9
0xBA	0xBC	0xC3	0xC5	0xC6	0xC7	0xC9	0xCA	0xCB
0xCC	0xCD	0xCE	0xD1	0xD2	0xD3	0xD4	0xD5	0xD6
0xD9	0xDA	0xDC	0xE0	0xE1	0xE2	0xE4	0xE8	0xEF





## *Regulatory Compliance Notices*

---

*This appendix describes the compliances required for the operation of your system.*

---

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the manuals, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Restrictions apply to the use of the local-connection port on this series of controllers; failure to observe these restrictions may result in harmful interference. Always disconnect this port as soon as possible after completing the setup operation. Any changes or modifications made to this equipment may void the user's authority to operate the equipment.

**Warning!**

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

**Achtung!**

Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

**Avertissement!**

Cet appareil est un appareil de Classe A. Dans un environnement résidentiel cet appareil peut provoquer des brouillages radioélectriques. Dans ce cas, il peut être demandé à l'utilisateur de prendre les mesures appropriées.

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

## **USA**

This equipment generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of FCC rules, which are designed to provide reasonable protection against such radio frequency interference. Operation of this equipment in a residential area may cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference. Any modifications to this device, unless expressly approved by the manufacturer, can void the user's authority to operate this equipment under part 15 of the FCC rules.