Compaq StorageWorks

Application Note
Enterprise/Modular Storage RAID Array
FC-AL Configurations for Novell NetWare
EK-FCALN-AA.D01

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Enterprise Network Storage Architecture (ENSA)

Compaq StorageWorks RAID Array (RA/MA8000 and ESA/EMA12000 Fibre Channel) products are the latest in fully integrated Fibre Channel RAID storage solutions. These products provide the key initial step in delivering the Compaq ENSA vision. ENSA addresses the issues that customers expect to face now and in the future. Both products address today's issues including: economical capacity growth, data protection, high availability, increased distance, multi-vendor platform support, and investment protection by serving as the base for building the ENSA vision.

Product Overview

The Enterprise/Modular Storage RAID Array Fibre Channel systems are based on a common architecture and offer customers centralized management, high availability, and exceptional performance and scalability in open systems environments. These products provide a Fibre Channel storage solution with industry leading Storage Area Network (SAN) support that uses Fibre Channel Arbitrated Loop (FC-AL) technology.

The RA/MA8000 Fibre Channel is a mid-range storage system available in a pedestal enclosure for departmental use in the office. It can also be installed in server racks for small data centers. An easy-to-deploy, flexible solution for open systems, the RA/MA8000 supports up to 2.6 TB of storage.

The ESA/EMA12000 Fibre Channel, designed for the data center, is available in three easy-to-order building blocks; each optimized for specific, high-capacity customer requirements. The ESA/EMA12000 Fibre Channel offers unprecedented levels of storage, scaling in performance and capacity as user requirements increase.

These storage systems incorporate the latest in RAID technology providing RAID levels 0, 1, 0+1, adaptive 3/5, and non-RAID disks. The Compaq implementation of RAID capability assures that data availability will be maintained despite hardware failure. Features such as read ahead cache and mirrored write back cache improve or minimize the affect on performance while preserving data availability and supporting high availability.

The Enterprise/Modular Storage RAID Array Fibre Channel platform kits contain the necessary operating system specific software and documentation needed to install, configure, and monitor your storage system. All platform kits include the StorageWorks Command Console (SWCC) for storage management operations including configuring, status inquiry and notification facilities. SWCC provides a user oriented graphical user interface (GUI) that simplifies the most complex of storage management operations.

Product Details

The Enterprise/Modular Storage RAID Array systems use the Compaq StorageWorks HSG80 RAID controller running Array Controller Software ACS V8.6. The ACS software is designed to support multiple platforms, providing features including: dual controller operation, two controller failover modes – Transparent and Multiple-Bus, mirrored write back cache, read ahead cache, RAID implementation, disk mirroring, and disk partitioning capabilities. In addition, ACS manages host interconnect and protocol services to provide data for event notification and status such as displayed by SWCC.

The HSG80 controller has two Fibre Channel host ports providing up to a total of nearly 200 MB per second of available bandwidth. Disk drives are connected to the controller through 6 UltraSCSI channels providing up to 40 MB per second per channel of available bandwidth. Servers can use multiple host bus adapters (HBAs) to multiple Enterprise/Modular Storage RAID Array systems for increased storage capacity.

The Enterprise/Modular Storage RAID Array Fibre Channel is supplied in two basic building blocks, a pedestal style cabinet and what has been termed a "rackable" model. The pedestal is a self-contained, desk height cabinet; it is available in DIGITAL Classic Top Gun Blue and in Compaq Opal. The rackable model is shipped ready to be mounted in a 19" Compaq rack or a 19" cabinet/rack using an included universal RETMA/metric mounting kit.

Enterprise/Modular Storage RAID Array Fibre Channel controllers come with 128 MB of cache. Cache options allow for 128 MB, 256 MB and 512 MB of cache in each controller. Enterprise/Modular Storage RAID Array Fibre Channel controllers come with 256 MB of cache. Cache options allow for 512 MB of cache in each controller. Cache features include read ahead and mirrored write back cache for use in optimizing performance where redundant capabilities are required for high availability system configurations. In the rare event that a storage controller fails the mirrored data is immediately available to the remaining controller for continuing operation.

The Enterprise/Modular Storage RAID Array pedestals and rackables come in both single controller and in dual controller models to enable you to select the level of high availability required for your application. A single controller model can be upgraded to a dual controller model when necessary.

High availability is supported by the use of redundancy and hot swappable components. The Enterprise/Modular Storage RAID Array disk enclosures include redundant cooling, and have five power supplies providing N+1 redundancy. Power can be upgraded to full redundancy with the addition of three more power supplies and a second power distribution unit for AC input redundancy. StorageWorks components are "hot" swappable including storage controllers when operating as a redundant pair.

You can configure and monitor the Enterprise/Modular Storage RAID Array Fibre Channel using the StorageWorks Command Console (SWCC), a client/server tool, included in the HSG80 Software Solutions Platform kit. The Client provides an easy to use graphical user interface. It can be used to monitor your storage system and notify you of events by updating a graphic display, sending electronic mail, or alerting via a pager. The Command Console Client includes applications (or Storage Windows) that communicate with the Command Console Agent software running on the host platform.

The Command Console client is available on Windows 95 and 98 and on Intel/Alpha platforms running Windows NT/2000. A Storage Window for the HSG80 controller supports the Array Controller Software (ACS) V8.6 and offers integration with Compaq's Insight Manager (CIM). Insight Manager can receive SNMP traps from the Command Console Agent and Insight Manager services can directly launch SWCC for notification or configuring operations.

General Configuration Guidelines

Fibre Channel storage technology offers more configuration flexibility than parallel SCSI storage. This application note describes typical Enterprise/Modular Storage RAID Array Fibre Channel NetWare configurations based on the configuration maximums listed. It is strongly recommended that you do 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.

Configuration Maximums

■ Five hundred meters per optical cable segment, one kilometer distance between server and storage

■ For the maximum number of Fibre Channel HBAs per server, please refer to your server documentation

■ When configuring more than one Fibre Channel HBA in a single server, each HBA must be connected to a different loop.

■ Controller Transparent Failover Mode

 ❏ Four servers on a single loop with up to two storage systems

 ❏ Up to eight servers on two loops (four servers per loop) with up to two storage systems

■ The maximum storage capacity stated (2.6 TB) assumes 36GB disks; increases in disk drive capacity will increase overall storage capacity for the same enclosure footprint.

Configuration Reference Material

The following table lists the documents that provide further information on the configuration of Enterprise/Modular Storage RAID Array Fibre Channel Storage Systems:

Table 1 Configuration Reference Material

Document Title	Order Number
Release Notes, HSG80 Array Controller Solution Software for Netware V8.6	AA–RFB8E–TE
HSG80 ACS Solution Software Version 8.6 for Netware Installation and Configuration Guide	AA-RFB9E-TE
HSG80 Array Controller ACS V8.6 CLI Reference Guide	EK-G80CL-RA.A01
HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide	EK-G80MS-SA.A01
Compaq StorageWorks Command Console V2.3 User Guide	AA–RFA2H–TE
Compaq StorageWorks Warranty Terms and Conditions	EK-HSXSW-WC.C01
RA/MA8000 and ESA12000 Fibre Channel Storage Subsystem for Novell NetWare Quick Setup	AA–RFB7A–TE
HSG80 Array Controller Illustrated Parts Map	EK-HSG80-MP or 355217-001
RA8000/ESA12000 Fibre Channel HSG80 Storage Subsystem Configuration Poster	EK–HSG80-CP or 355207-001

General Configuration Notes

■ All configurations shown in this document use dual HSG80 controllers to support transparent failover capability. Single HSG80 controller configurations are supported, but not shown in this document. These configuration guidelines also apply to single controller configurations.

■ Dual redundant controllers should be configured for Transparent Failover Mode.

■ All configuration diagrams show a front view of the storage system, Controller A is the top controller; Controller B is the bottom controller. Controller Host Port 1 is the left port; Host Port 2 is the right port.

- Each storage system can be configured using SWCC or the Command Line Interface (CLI) configured through the HSG80 controller maintenance serial port.

- All configurations use Array Controller Software, ACS V8.3 or ACS V8.6 configured for FC-AL topology.

- All configurations use short wavelength lasers and multi-mode fibre channel optical cables in each cable segment. Label both ends of each Fibre Channel cable with the same unique identification marking (number, letter, and so on.) prior to installation.

- All configurations require the Connection Name *Operating System* parameter be set to NETWARE.

- By default, the HSG80 Command Console LUN (CCL) is enabled. This must be disabled for NetWare (using the CLI, SET *controller* NOCOMMAND_CONSOLE_LUN).

- All configurations require the Arbitrated Loop Physical Address (AL_PA) to be set to hard and a unique address for each port.

   Set *controllername* port_1_topology = loop_hard

   Set *controllername* port_1_al_pa=71

   Set *controllername* port_2_topology = loop_hard

   Set *controllername* port_2_al_pa=72

   Set *connection name* operating_system=NETWARE

- Record the Fibre Channel HBA *Worldwide ID* (WWID) IEEE address shown on the back of each Fibre Channel 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 !NEWCON*nn* (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 Fibre Channel HBA WWID, rename the connection names to a name meaningful to the specific configuration i.e., 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 to each Fibre Channel HBA on the same loop. LUNs (logical units) can consist of single disks (JBOD), a storageset of multiple disks or a partition, configured for a specific RAID level of 0, 1, 0 + 1, or 3/5.

Technical Contents

This application note describes four common Enterprise/Modular Storage RAID Array Fibre Channel Novell NetWare FC-AL configurations, and provides the configuration, parts, and reference information required to support it. The presentation of this material is shown in the following table:

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Configuration Descriptions

Configuration 1- One Server, Dual Controller Transparent Failover

This two-controller configuration (Figure 1) provides dual redundant controllers configured in Transparent Failover mode. The configuration consists of an Enterprise/Modular Storage RAID Array enclosure with two HSG80 array controllers on a single loop. In normal operation Controller A provides the active path for all storagesets 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 access to up to 24 disks. An additional 48 disks can be added using two expansion enclosures. Additional servers can be added to this configuration using the existing hub.
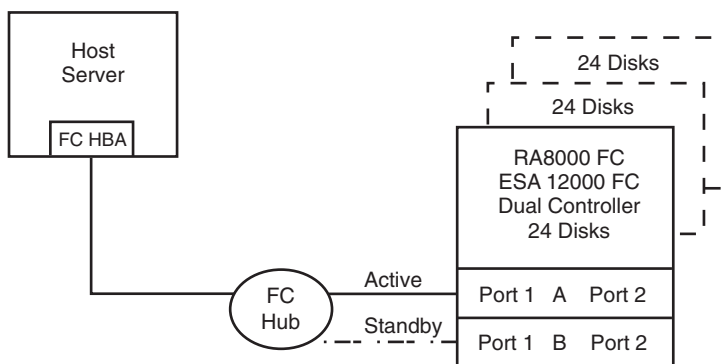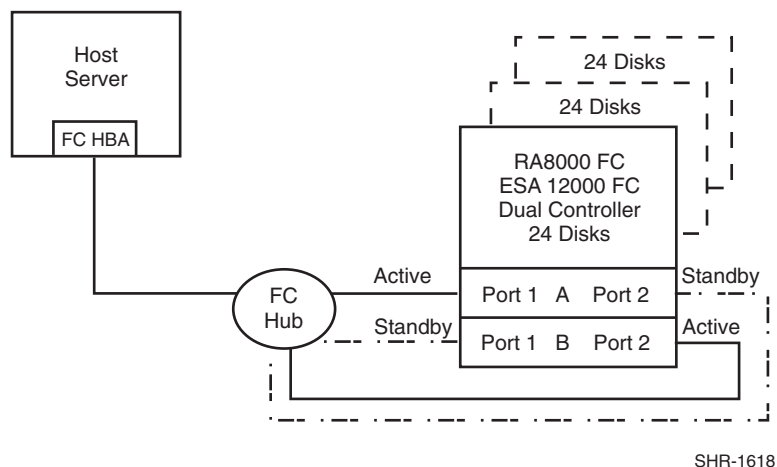

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Figure 1. Configuration 1

Configuration 2 - Configuration 1 with Double LUN Capacity

Use of a second controller (Controller B) as an active controller can double LUN capacity and 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 Configuration 2, shown in Figure 2. This configuration provides full controller redundancy in the event that Controller A or Controller B fails. In either failover scenario the surviving controller will transition a standby port to the active state providing access to all units to the server.

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Figure 2. Configuration 2 (Double LUN Capacity)

Configurations 1 and 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

Shared Storage

The Enterprise/Modular Storage RAID Array in a Fibre Channel Arbitrated Loop can share its storage among different servers attached to the same fibre channel hub. The configuration of the Enterprise/Modular Storage RAID Array depends on the desired application. In a cluster configuration, all storage must be accessible from each server. The Novell Cluster Server provides the controlled access to each storage unit. Non-clustered server configurations require use of the Selective Storage Presentation feature.

NetWare Cluster Services

Novell Cluster server requires that shared storage devices to be accessible from all servers in the cluster. You do not need to use the Selective Storage Presentation feature for a Novell Cluster.

NetWare Cluster Services (NCS) is the cluster software system implemented on servers to ensure high availability and manageability of critical network resources, including data (volumes), applications, server licenses, and services. It is a multinode; NDS-enabling clustering product of NetWare 5 that supports failover, failback, and migration (load balancing) of individually managed cluster resources. NCS provides important features to help you ensure and manage the availability of your network resources. These features include:

- Support for shared disk configurations or local disk configurations.

- Multinode all-active cluster. Any server in the cluster can restart resources (applications, services, IP addresses, and volumes) from a failed server in the cluster.

- Single point of administration through a Java-based ConsoleOne cluster configuration and monitoring graphical user interface.

- The ability to tailor a cluster to the specific applications and hardware infrastructure that fit your organization.

- Dynamic assignment and reassignment of server storage on an as-needed basis.

Shared Storage, No Cluster

Sharing an Enterprise/Modular Storage RAID Array with multiple servers in a non-clustered environment requires that you use Selective Storage Presentation.

Selective Storage Presentation is a feature that prevents unauthorized systems from accessing a storage device on a shared RAID array. Normally, many operating systems running on hosts "grab" all the storage they can discover. Furthermore, when these operating systems grab the storage, they tend to write their own information on the devices. This could corrupt the data.

Selective Storage Presentation with HSG80 Array Controllers provides methods for:

- Accessing control for each host connection allows: No Access, Full Access, or Selective Connection Access.

- Setting up host modes for each connection to the array. A particular host mode corresponds to a specific operating system that is tailored to the communication techniques of the operating system.

- Facilitating Fibre Channel protocols for less sophisticated operating systems by providing a LUN offset.

- The host sees a LUN at an offset from the internal LUN within the array. This is necessary because some operating systems only see LUNs in a specific range of LUN numbers.

- Host connections are made when an adapter logs into the array controller over one or more of the controller's ports. When this connection is made, the controller makes an entry in its internal connection table which is kept in each array's NonVolatile RAM (NVRAM).

- Each host connection is identified to the controller in two ways. The first, and most important method, uses the World Wide Identifier (WWID) of the adapter that has logged into the array controller, an ID that is unique to every adapter in the world. The controller uses this ID to recognize the connection as a unique connection. The second method uses the name of the connection. Each host may have more than one adapter; however, each adapter makes its own connection to the array controller, and each connection is treated separately by the controller.

For more information on setting up the Enterprise/Modular Storage RAID Array for Selective Storage Presentation, see the section on the HSG80 configuration settings.

The Enterprise/Modular Storage RAID Array can share storage with both Microsoft Windows NT/2000 and NetWare servers on the same loop, with a maximum of four servers per loop.

Configuration 3 - Up to Four Servers, Dual Controller Transparent Failover, Clustered or Selective Storage

Configuration 3 uses a dual controller pair on a single loop to provide storage and controller redundancy for up to four separate servers. The four 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 exclusive "host access" at the unit level to give each server an access to individual storage units, or by using the cluster software. 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.
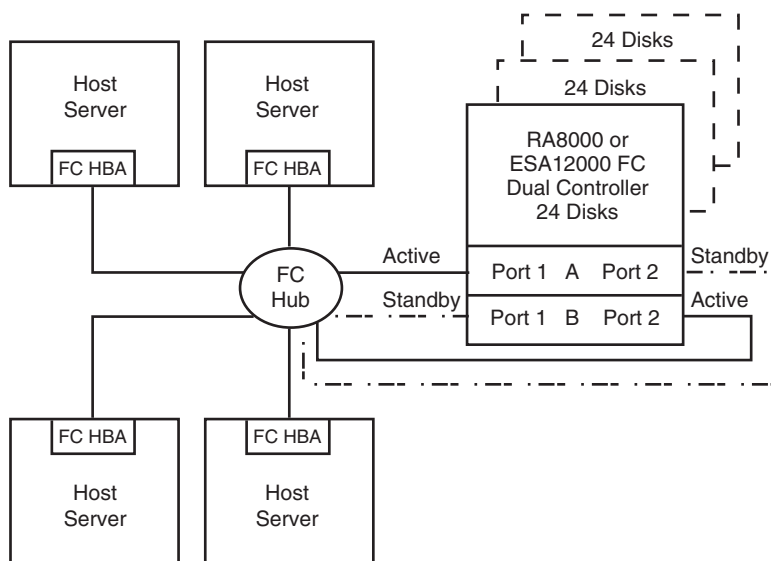
Figure 3. Configuration 3

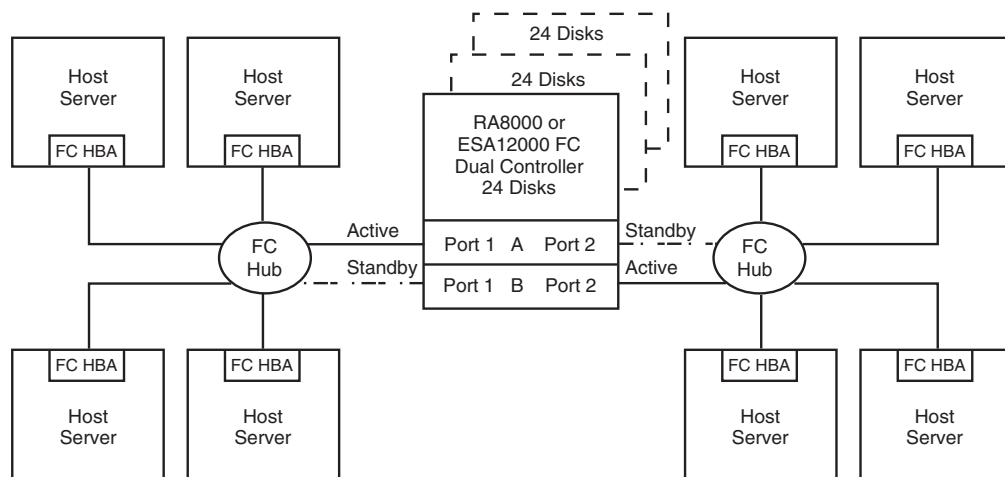> **NOTE:** Enterprise/Modular Storage RAID Array can support Windows NT/2000 and NetWare servers on the same loop

Configuration 3 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
- In this configuration, 8 logical connections are available

Configuration 4 - Up to Eight Servers, Dual Controller Transparent Failover, Clustered or Selective Storage

Configuration 4 (Figure 4) uses a dual controller pair on two fibre channel loops to provide storage and controller redundancy to two groups of up to four separate servers. 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 exclusive "host access" at the unit level to give each server an access to individual storage units, or by using the cluster software. Additional levels of access control are necessary for this configuration because each group of four servers is sharing the same loop.

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Figure 4. Configuration 4

NOTE: Enterprise/Modular Storage RAID Array can support NT and NetWare on the same loop.
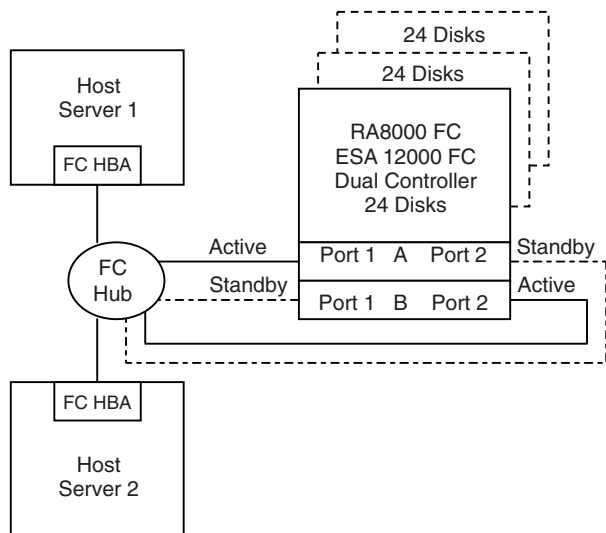
Configuration 4 Notes

- 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 64 LUNs 8 available to each server with 2 active controller host ports

- In this configuration 8 connections are available

HSG80 Configuration Settings

This section explains how to configure the HSG80 controllers of a Fibre Channel RAID Array system in a NetWare environment, including the settings required to support FC-AL shared storage (reference the basic shared storage setup, shown in Figure 5).

> **NOTE:** All commands in this section are performed via the StorageWorks Command Line Interface (CLI) utility. For further information on CLI commands, refer to the *Enterprise Storage RAID Array Fibre Channel Solution Software V8.6 for Novell NetWare Installation Reference Guide* (AA-RFB9A-TE).

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Figure 5. Basic Shared Storage Setup

HSG80 Configuration Settings Required for NetWare

NetWare requires HSG80 parameters to have the following configuration:

- Command Console LUN disabled
- Port_1_Topology = LOOP_HARD
- Port_1_AL_PA = 71
- Port_2_Topology = LOOP_HARD
- Port_2_AL_PA = 72
- Operating System=NETWARE

To view the configuration settings, from the CLI prompt, enter the following command:

    HSG80> **show this**

The following information displays:

    Controller:

        HSG80 ZG81701099 Software V83G-0, Hardware E02

        NODE_ID   = 5000-1FE1-0000-3420

        ALLOCATION_CLASS = 0

        SCSI_VERSION   = SCSI-2

Configured for dual-redundancy with ZG81700990

   In dual-redundant configuration

Device Port SCSI address 7

Time: 21-MAY-1999 14:45:05

Command Console LUN is disabled

Host PORT_1:

   Reported PORT_ID = 5000-1FE1-0000-3421

   PORT_1_PROFILE   = PLDA

   PORT_1_TOPOLOGY = LOOP_HARD (loop up)

   PORT_1_AL_PA   = 71 (71 negotiated)

Host PORT_2:

   Reported PORT_ID = 5000-1FE1-0000-3422

   PORT_2_PROFILE   = PLDA

   PORT_2_TOPOLOGY = LOOP_HARD (standby)

   PORT_2_AL_PA   = 72 (72 negotiated)

Cache:

  64 megabyte write cache, version 0012

   Cache is GOOD

   Unflushed data in cache

   CACHE_FLUSH_TIMER = DEFAULT (10 seconds)

Mirrored Cache:

   64 megabyte write cache, version 0012

   Cache is GOOD

   Unflushed data in cache

Battery:

   FULLY CHARGED

   Expires: WARNING: UNKNOWN EXPIRATION DATE!

   WARNING: AN UNKNOWN NUMBER OF DEEP DISCHARGES HAVE OCCURRED!

   NOCACHE_UPS

HSG80 Shared Storage Configuration Settings

To configure the HSG80 for shared storage, you must set:

■ StorageSet Unit Number/Port Assignment

■ Exclusive Storageset Access

The Storageset Unit Number determines the RAID controller port to which the storageset will be assigned. By default, units D0 - D99 will be located on port 1 and units D100 - D199 will be located on port 2.

Exclusive Storageset Access determines which servers can access which units. By default, all servers will be able to access all storagesets unless the exclusive access is set.

Provided below is an example that assumes that the RAID storagesets have been created, and the adapter drivers (CPQFC.HAM and CPQSHD.CDM) have been loaded, as described in the *HSG80 ACS Solution Software Version 8.6 for Novell NetWare Installation and Configuration Guide (AA-RFB9A-TE)*. In this example, units D0 and D1 (on port 1), and D100 and D101 (on port 2) have been created. Also, exclusive access has been set to enable Server 1 to access only units D0 and D100, and Server 2 to only access units D1 and D101.

After you start the server and load the drivers, connection to the RAID will be established. To show the connection, enter:

HSG80> **show connection**

The following information displays:

```
Connection     Unit
Name Operating system Controller Port Address    Status   Offset
!NEWCON1    NETWARE    OTHER    2   000001   OL other   100
    HOST_ID=5008-05F1-FADB-81F0        ADAPTER_ID=5008-05F1-FADB-81F0
!NEWCON2    NETWARE    THIS    1   000001   OL this    0
    HOST_ID=5008-05F1-FADB-81F0        ADAPTER_ID=5008-05F1-FADB-81F0
HSG80>
```

The connection information displays the WorldWide ID of each host bus adapter that resides on the loop. This number is assigned to each board and is listed on the back of the board. Record this number for each system before installing the adapter. After the adapter installation, you can rename the connection a more meaningful name. In this example the last 4 digits of the WorldWide ID on the host bus adapter in SERVER 1 is 81F0.

In this case, the !NEWCON1 (default connection name) shows the adapter ID from Server1, Port 2 as 81F0. Now rename these to something meaningful, by entering commands similar to the following:

HSG80> **rename !newcon1 SVR1_prt2**

HSG80> **rename !newcon2 SVR1_prt1**

HSG80> **show connection**

The following information displays:

```
Connection        Unit
Name Operating system Controller Port  Address   Status   Offset
SVR1_PRT2NETWARE    OTHER    2   000008   OL other    100
    HOST_ID=5008-05F1-FADB-81F0        ADAPTER_ID=5008-05F1-FADB-81F0
SVR_PRT1NETWARE    THIS    1   000008   OL this    0
    HOST_ID=5008-05F1-FADB-81F0        ADAPTER_ID=5008-05F1-FADB-81F0
```

In the next example, the last 4 digits of the world wide ID on the adapter in Server2 is 5912.

SVR2_PRT2NETWARE OTHER   2   000001   OL other   100

    HOST_ID=5008-05F1-FADB-**5912**   ADAPTER_ID=5008-05F1-FADB-**5912**

SVR2_PRT1NETWARE.THIS   1   000001   OL this   0

HOST_ID=5008-05F1-FADB-**5912**   ADAPTER_ID=5008-05F1-FADB-**5912**

To show the units you have created, enter the following command:

HSG80>**show units**

The following information displays:

D0

D1

D100

D101

To set exclusive access for a unit you must first disable access for all, by entering the following commands:

HSG80> **set d0 disable_access = all**

HSG80> set d1 disable_access = all

HSG80> set d100 disable_access = all

HSG80> set d101 disable_access = all

To enable units d0 and d100 to access only SERVER1 connection, enter the following commands:

HSG80> **set d0 enable_access = SVR1_PRT1**

HSG80> **set d100 enable_access = SVR1_PRT2**

HSG80> **show d0**

The following information displays:

```
LUN                     Uses

   -----------------------------------------------------------

   D0                      R1
      LUN ID:     6000-1FE1-0000-3420-0009-8170-1099-01AF
      NOIDENTIFIER
      Switches:
       RUN              NOWRITE_PROTECT      READ_CACHE
       READAHEAD_CACHE      WRITEBACK_CACHE
       MAXIMUM_CACHED_TRANSFER_SIZE = 32
      Access:
         SVR1_PRT1
      State:
       ONLINE to this controller
       Not reserved
   Size: 16751956 blocks
   Geometry (C/H/S): ( 7413 / 20 / 113 )
```

Enter the following command to display unit D100.

```
HSG80> show d100
```

The following information displays:

```
LUN                     Uses

   -----------------------------------------------------------

   D100                    R2
      LUN ID:     6000-1FE1-0000-3420-0009-8170-1099-01B3
      NOIDENTIFIER
      Switches:
       RUN              NOWRITE_PROTECT      READ_CACHE
       READAHEAD_CACHE      WRITEBACK_CACHE
       MAXIMUM_CACHED_TRANSFER_SIZE = 32
      Access:
         SVR1_PRT2
      State:
       ONLINE to the other controller
      Size: 16751956 blocks
      Geometry (C/H/S): ( 7413 / 20 / 113 )
   HSG80>
```

From the console of NetWare SERVER1, scan for new devices as shown below, or reboot the server, and the LUNs display.

> SERVER1:**scan for new devices**

To see the new devices, enter:

> SERVER1:**list devices**

The following information displays:

> 0x0001: [V502-A0-D0:1] Compaq StorageWorks RA8000 Disk ID 0 LUN 0
>
> 0x0002: [V502-A0-D1:5] Compaq StorageWorks RA8000 Disk ID 1 LUN 0
>
> 0x0004: [V025-A1-D1:0] COMPAQ CRD-S88P rev:0.91
>
> 0x000A: [V500-A2-D0:0] Compaq 53C875 Slot 0 ID 0 COMPAQ WDE4360S

Continue this process until all units have been assigned as needed.

> HSG80> **set d1 enable_access = SVR2_PRT1**
>
> HSG80> set d101 enable_access = SVR2_PRT2
>
> HSG80> show d1

The following information displays:

> LUN   Uses
>
> --
>
> D1   R3
>
>   LUN ID: 6000-1FE1-0000-3420-0009-8170-1099-01B7
>
>   NOIDENTIFIER
>
>   Switches:
>
>   RUN   NOWRITE_PROTECT   READ_CACHE
>
>   READAHEAD_CACHE   WRITEBACK_CACHE
>
>   MAXIMUM_CACHED_TRANSFER_SIZE = 32
>
>   Access:
>
>   SVR2_PRT1
>
>   State:
>
>   ONLINE to this controller
>
>   Not reserved
>
>   Size: 35529666 blocks
>
>   Geometry (C/H/S): (10512 / 20 / 169)

HSG80> **show d101**

The following information displays:

```
LUN                       Uses

---------------------------------------------------------------

D101                      R4

    LUN ID:    6000-1FE1-0000-3420-0009-8170-1099-01BB

    NOIDENTIFIER

    Switches:

      RUN              NOWRITE_PROTECT      READ_CACHE

      READAHEAD_CACHE      WRITEBACK_CACHE

      MAXIMUM_CACHED_TRANSFER_SIZE = 32

    Access:

      SVR2_PRT2

    State:

      ONLINE to the other controller

    Size: 35529666 blocks

    Geometry (C/H/S): ( 10512 / 20 / 169 )

HSG80>
```

From NetWare SERVER2, scan for new devices as shown below, or reboot the server, and the LUNs display:

SERVER2:**scan for new devices**

To see the new devices, enter the following command:

SERVER2:**list devices**

The following information displays:

```
0x0001: [V502-A0-D0:1] Compaq StorageWorks RA8000 Disk ID 0 LUN 1

0x0002: [V502-A0-D1:5] Compaq StorageWorks RA8000 Disk ID 1 LUN 1

0x0004: [V025-A1-D1:0] COMPAQ CRD-S88P rev:0.91

0x000A: [V500-A2-D0:0] Compaq 53C875 Slot 0 ID 0 COMPAQ WDE4360S
```