

Compaq StorageWorks

Release Notes

HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6B for Novell NetWare

These Release Notes contain last-minute and supplemental information about the HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6B for Novell NetWare.

Be sure to read these Release Notes before installing your Enterprise/Modular Storage RAID Array. In the event of conflicting information between these Release Notes and other documents contained in this product release, the Release Note content takes precedence. Product documentation is periodically updated and available on the Compaq website:

<http://www.compaq.com/storage/index.html>

Sixth Edition (February 2002)
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HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6B for Novell NetWare

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Document Catalog

To view and access product documentation included with your StorageWorks Solution Software CD-ROM, open the `manuals.pdf` file, found on your CD-ROM. This file serves as a catalog and provides links to all manuals and documents included on your CD-ROM. Multiple document search functionality is also provided through the use of this catalog file.

NOTE: All provided documents are included in the `document` folder of your CD-ROM, should you choose to access them directly.

Release Notes (such as the document you are now reading) are not included on the CD-ROM. This is by design and allows for last minute changes that become available after documents go to press.

IMPORTANT: Please see the "Documentation Anomalies" Section, page 30, of these Release Notes for any last minute corrections or additions to the provided documentation set.

To view Portable Document Format (PDF) files, you need Adobe Acrobat Reader Version 4.05 or higher. If you do not have this program installed, you can install it from the `acrobat` folder on your CD-ROM. See the `readme.txt` file in the `acrobat` folder for more information.

To take best advantage of the multiple document search functionality, Compaq recommends that you install the Windows-based Acrobat Reader and launch it as a separate application, rather than through a browser.

NOTE: If you choose to access the `manuals.pdf` catalog file through a browser, an up-to-date Acrobat Reader plug-in is required if you wish to use search functionality. However, instances may occur where search results will not display when run from within your browser.

NOTE: Occasionally, you may have problems with mounting the catalog index when using Acrobat Readers. In order to take full advantage of the multiple document search functionality, you may need to manually mount the search index on a per session basis. The following steps outline this procedure:

1. After launching the Acrobat Reader, load the `manuals.pdf` catalog file.
2. If you see the error message, "The index associated with this document <index> is not available," click **OK** to clear the message and proceed to the next step.

If this error message does not appear, your index has been mounted correctly and this procedure does not apply.

3. From the Edit Menu, select Search > Select Indexes.
4. From the Index Selection dialogue, click the Add button.
5. Enter the path to the `index.pdx` file.

For Windows-based readers, this is typically:

```
\acrobat\index.pdx
```

6. Click **OK** to accept this selection.
7. Making sure the newly added index is selected in the Index Selection dialogue, click **OK** to exit. The catalog search function will now operate normally.

Intended Audience

This document was prepared for customers who have purchased Compaq StorageWorks Enterprise/Modular Storage RAID Array products that include Compaq StorageWorks HSG80 RAID Array Controllers. This document also serves as a reference for Compaq Customer Services personnel responsible for installing and maintaining systems that include the Compaq StorageWorks HSG80 RAID Array Controller.

Conventions

The following terms are used throughout this document:

- Unless otherwise specified, all references to controllers or array controllers imply the Compaq StorageWorks HSG80 RAID Array Controller.
- Unless otherwise specified, all references to Compaq StorageWorks Array Controller Software (ACS) Version 8.6 imply the released Compaq StorageWorks ACS Version 8.6-1 code, or subsequently patched versions of ACS Version 8.6.
- For the purpose of this document, Enterprise/Modular Storage RAID Array refers to the following Compaq StorageWorks RAID Array products:
 - RA8000 — Fibre Channel RAID Array 8000
 - ESA12000 — Enterprise Storage Array 12000 Fibre Channel
 - MA8000 — Modular Array 8000 Fibre Channel
 - EMA12000 — Enterprise Modular Array 12000 Fibre Channel
 - EMA16000 — Enterprise Modular Array 16000 Fibre Channel

Release Package Contents

This HSG80 Fibre Channel Solution Software Kit consists of the following:

- The HSG80 Solution Software documentation set:
 - *HSG80 ACS Solution Software Version 8.6 for Novell NetWare Installation and Configuration Guide*
 - *HSG80 Array Controller ACS Version 8.6 CLI Reference Guide*
 - *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide*
 - *HSG80 Array Controller ACS Version 8.6 Troubleshooting Reference Guide*
 - *Command Console Version 2.4 User Guide*

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- ❑ *Command Console Version 2.4 Release Notes*
- ❑ *StorageWorks Registration and Warranty Package*
- ❑ *HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6B for Novell NetWare Release Notes* (this document)
- **HSG80 Modular Storage RAID Arrays Solution Software V8.6B for Novell NetWare CD-ROM**

The following supporting documentation is available from the Compaq StorageWorks website:

<http://www.compaq.com/storage/index.html>

- *Heterogeneous Open SAN Design Reference Guide, Part Number: AA-RMPNC-TE*
- *Model 2100 and 2200 Ultra SCSI Controller Enclosures User Guide, Part Number: EK-SE2C8-UA. C01*
- *Model 4300 Family Ultra3 LVD Disk Enclosures User Guide, Part Number: EK-LVDU3-UA. A01*
- *Modular Array Cabinet Restrictions, Part Number EK-MACON-CA. B01*
- *Enterprise/Modular Storage RAID Array FC-AL Configurations for Novell NetWare Application Note, Part Number: EK-FCALN-AA D01*

Important Notice Regarding Cache Sizes

Due to the increased host connectivity delivered with ACS Version 8.6F, you must observe new cache size requirements. When upgrading from ACS Version 8.5 to ACS Version 8.6, cache module configurations must be upgraded from the prior minimum of 64 MB (ACS 8.5) to 128 MB in unmirrored configurations, and 256 MB in mirrored configurations, per cache module.

The cache size requirements for running ACS Version 8.6P have not changed, and remain at 512 MB.

Identifying ACS Revision Level

The ACS release package you received should include a Personal Computer Memory Card Industry Association (PCMCIA) program card containing the new ACS software. Included in this section are instructions for determining the ACS version running on your RAID Array.

Once ACS is installed, you can identify the specific version of ACS by typing the following command at the Command Line Interpreter (CLI) prompt:

```
HSG80> SHOW THIS_CONTROLLER
```

The resulting display lists the software revision level as one of the following:

```
V86F-1
```

```
V86P-1
```

If the ACS version is not Version 8.6x-1 or a subsequently patched version of ACS Version 8.6, contact your support provider for instructions on how to obtain the updated version.

If the ACS version is Version 8.6P-1, you will need additional layered application software beyond this Solution Software Kit to take advantage of the added functionality of these versions.

ACS Version 8.6x-1 is fully compatible with Version 8.6 Solution Software. In addition, Version 8.6 Solution Software is backward compatible with ACS Version 8.5, which allows rolling upgrades to be performed on most operating systems. See the "Rolling Upgrades" Section, page 22, for more information.

HSG80 Device Removal and Replacement

This section provides rules for HSG80 support of Device Removal/Replacement ("Hot Swap"), defines Device Hot Swap and how to invoke Device Warm Swap.

Device Hot or Warm Swap

In all cases (Disk Device Hot Swap or Warm Swap), the disk device to be removed must be removed from any unit association and storagesets (including mirrorsets, failedsets or sparesets) prior to initiating physical removal. Use the following command options:

```
HSG80> DELETE <unit>
```

or

```
HSG80> REDUCE <storageset member>
```

NOTE: For mirrorsets or RAIDsets.

```
HSG80> DELETE <storageset>
```

or

```
HSG80> SET M1 REMOVE=DISKnnnnn
```

```
HSG80> DELETE DISKnnnnn
```

Device Hot Swap

Disk Device Hot Swap is supported only when the following conditions are met:

- The controllers are not engaged in failover or failback.
- The controllers are not running a local program, such as DILX or VTDPY.
- The controller CLI prompt is accessible (for example, another CLI command is not being processed).
- If the drive being removed or replaced is physically being moved to a new port or target location on the same controller, you must wait a minimum of 60 seconds before re-inserting the device into its new location.
- If the controller is in the process of recognizing or processing one or more hot drive insertions, the controller must be allocated enough time to do proper device discovery for both operations. The busier the controller, the longer the waiting time will be. As a rule of thumb, during the replacement of one drive at a time, waiting 60 seconds between physical removal/replacement operations is typical.

Device Warm Swap

When Disk Device Hot Swap is not applicable, Disk Device Warm Swap should be used. From a data integrity perspective, the best method of physically removing a device in a parallel bus multi-drop architecture (such as a SCSI bus) is to use the Warm Swap process. With the HSG80 family of storage systems, this involves quiescing the device bus for which the device will be removed or replaced.

This activity provides a momentary stall on that bus, while work continues on the adjacent bus. Promptly execute the removal or insertion procedure so that the internal detect “swap signal” terminates the quiesce functionality.

1. Press the appropriate port button on the Operator Control Panel (OCP) until the I/O quiesces on the bus.
2. Remove the disk device.
3. Repeat the above steps to replace a disk device.

Procedural Example

Here is an example of selecting a device in a storageset, and taking the appropriate measures to removing the physical device from the storage system.

1. Verify that disk device (diskxxxxxx) is not a member of a storageset (such as RAID 0, 1, 0+1 or 3/5) by typing:

```
HSG80> SHOW DISKxxxxxx
```

2. Verify physical location of disk drive by typing the following command:

```
HSG80> LOCATE DISKxxxxxx
```

Verify that the disk drive amber light (fault LED) flashes once per second. It is considered best practice to put a physical mark on the drive.

3. Type the following command:

```
HSG80> LOCATE CANCEL
```

Verify that the disk drive amber light turns OFF.

4. On the HSG80 controller, press the port button of the physical port containing the disk device to be removed.

Press the port button in for about 2 seconds and then release. When the action is recognized by the controller, all the port lights on the controller bulkhead will momentarily flash on for about 1 second. The port light on the controller will begin to pulse.

NOTE: Care should be taken to press the port button on the OCP for the correct port.

5. Wait for port to quiesce

Go to the side of the cabinet where you will remove the drive and wait approximately 10-15 seconds. The port is quiesced, when all the disk devices on that port show a flashing amber LED.

NOTE: If a drive on that port has the LOCATE light function enabled, the drive LED for that device will be on SOLID until the quiesce sequence is over, at which time it will begin to flash and the other devices will cease flashing.

6. Promptly pull the physical drive about one inch out, then give the drive time to spin-down (60 seconds). Complete the physical removal of the drive.

Both controllers port lights will remain on and the disk device lights will go off. Within about 20 seconds of device removal, the device activity should begin to resume on the remaining units. The period of time is load dependent.

7. Insert the replacement disk devicepart way into the slot. Verify that a minimum of 2 minutes have passed since drive removal.

8. On the HSG80 controller, press the port button of the physical port containing the removed disk device.

Press the port button for about 2 seconds, then release. When the action is recognized by the controller all the port lights on the controller bulkhead will momentarily flash for about 1 second. Then the port light on the controller will begin to pulse.

NOTE: Care should be taken to press the port button on the OCP for the correct port.

9. Wait for the port to quiesce.

Go to the side of cabinet where you removed the disk drive from and wait approximately 10-15 seconds. The port is quiesced, when ALL the disk devices on that port will have a flashing amber LED.

10. Physically push the drive completely into the shelf. Make sure there is contact with the backplane.

Within about 20 seconds of device insertion, the device activity to other storage should resume. Both controllers port lights will turn off and the disk device lights will go off if there are no disk device faults on that port.

New Features

This section briefly describes new features that are supported by this Version 8.6B release of the Solution Software, together with the array controller running ACS Version 8.6 code.

FC Switch Firmware Upgrade

The primary focus of this Solution Software update is to support the newly available FC Switch Firmware upgrade to Version 2.6. The new firmware provides the following:

- FabricWatch support, which offers switch management and monitoring features.
- Support for newer operating system versions, and higher levels of cooperation between operating systems in heterogeneous SANs.
- User-configurable resource allocation and error detection timeout values (RATOV and EDTOV, respectively), which improves synchronization across the SAN.

NOTE: Compaq recommends that you do not mix switch firmware versions in your SAN. It is considered best practice to uniformly upgrade all switches in the SAN.

Solution Software Updates

The following improvements have been added to your Solution Software:

- Added support for Novell NetWare Version 6.0 and NetWare Cluster Server Version 1.06.
- Upgraded the NetWare HBA driver to Version 2.52, which provides improved timeout values required by the switch firmware upgrade.

New Array Hardware Support

Support for the following hardware has been added:

- EMA16000 — Enterprise Modular Array 16000 Fibre Channel
- 72GB Hot-Pluggable 10K RPM, Wide Ultra3 SCSI, SCA-2, 1.0-inch Hard Drive

Documentation Updates

The following data items have been added as an enhancement to these Release Notes:

- "HSG80 Device Removal and Replacement" Section, page 7, which defines rules and procedures for Device Hot Swap and Device Warm Swap.
- "Switch Support" Section, page 17, which lists FC switches and firmware supported by this Solution Software.
- "SWCC Scalability" Section, page 19, "Multiple Agents" Section, page 19, and "Multiple Management Sessions" Section, page 20, which clarify the use and limitations of SWCC.
- "Solution Software Upgrade Procedures" Section, page 22, which help clarify the requirements for host-related storage system upgrades.

Modular Array Solutions

The modular solution consists of the array controller (single or dual configurations) installed in a Model 2200 Ultra SCSI controller enclosure and the drives installed in either a Model 4314 disk enclosure or a Model 4354 disk enclosure. The modular solutions must be mounted in RETMA cabinets. The Compaq RETMA cabinets are available in heights of 42U, 41U, 36U and 22U. The Model 2200 Ultra SCSI controller enclosure is 4U. The Model 4314 disk enclosure and the Model 4354 disk enclosure are each 3U. This combination allows for several cabinet configurations.

NOTE: If you wish to use a controller from an existing RA8000 or ESA12000 storage system, the Cache Bulkhead upgrade for installation of the controller in the Model 2200 is required.

- For information about how to install the array controller in a Model 2200 Ultra SCSI controller enclosure, see the *Model 2100 and 2200 Ultra SCSI Controller Enclosures User Guide*.
- For information about how to install drives in either a Model 4314 disk enclosure or a Model 4354 disk enclosure, see the *Model 4300 Family Ultra3 LVD Disk Enclosures User Guide*.
- For information about modular solution configurations and restrictions, see the *Modular Array Cabinet Restrictions* user document.

Disk Enclosures

The array controller firmware can now address up to 14 disks per SCSI bus. The maximum number of disks supported by an array controller (single or cooperating pair) is 84. The disk enclosures can be configured for single bus or for dual bus.

NOTE: The 43xx disk enclosures do not allow daisy chaining between shelves.

Table 1 Single Bus Mode Enclosure Options

Disk Enclosures Options/Single Bus Mode	Part Number
Model 4310R — Rack-mountable 10-drive enclosure with single bus, single power supply	174631-B21
Model 4314R — Rack-mountable 14-drive enclosure with single bus, single power supply	190209-001
Model 4314T — Tower mount 14-drive enclosure with single bus, single power supply, LCD monitor	190210-001
Second Power Supply for 4314 (Adds a redundant power supply to the 4314)	119826-B21
Single Bus I/O Module for existing 4314	190212-B21
Dual Bus I/O Module for Existing 4314 (Changes the 4314 from a single bus to a dual bus)	119829-B21

Table 2 Dual Bus Mode Enclosure Options

Disk Enclosures Options/Dual Bus Mode	Part Number
Model 4350R — Rack-mountable 10-drive enclosure with dual bus, dual power supply	174630-B21
Model 4354R — Rack-mountable 14-drive enclosure with dual bus, dual power supply	190211-001

NOTE: Use a single bus I/O module to transform a Model 4354 disk enclosure to single bus.

SCSI Cables

SCSI Cables must be ordered separately for connection of the 43xx shelves to the Model 2200 enclosure. The following SCSI cables are supported.

Table 3 SCSI Cable Options

SCSI Cable Options	Part Number
1 meter SCSI cable	168256-B21
2 meter SCSI cable	168258-B21
3 meter SCSI cable	189505-B21
5 meter SCSI cable	400983-005
10 meter SCSI cable	400983-010

Ordering Modular Storage Systems

The Modular Array/Enterprise Modular Array storage systems can be ordered one of three ways.

- Predefined models are available that provide a set number of controller shelves and drive shelves in a Modular Storage Cabinet:
 - MA8000: One Model 2200 controller enclosure and three dual bus Model 4354 disk enclosures in a 22U Modular Storage Cabinet
 - EMA12000 D14: Three Model 2200 controller enclosures and nine dual bus Model 4354 disk enclosures in a 42U Modular Storage Cabinet
 - EMA12000 S14: One Model 2200 controller enclosure and six single bus Model 4314 disk enclosures in a 36U Modular Storage Cabinet

- ❑ EMA12000 Blue: One Model 2200 controller enclosure and three dual bus Model 4354 disk enclosures in a 41U Modular Storage Cabinet
- ❑ EMA16000 S14: Two Model 2200 controller enclosures and twelve single bus 4314 disk enclosures in a 41U Modular Storage Cabinet
- ❑ EMA16000 D14: Four Model 2200 controller enclosures with twelve dual bus 4354 disk enclosures in a 41U Modular Storage Cabinet

NOTE: The predefined models require the following options: Controllers, External Cache Batteries (ECBs), Controller firmware and drives.

- **Configure-to-Order.** Allows you to specify the number of controller shelves and drive shelves desired in a Modular Storage Cabinet.
- **Assembly onsite.** Allows you to order the components separately and install them in any supported RETMA rack or cabinet.

Hardware and Software Support

This section lists the hardware, devices and operating system versions that are compatible with this Fibre Channel Solution Software Kit.

Array Hardware Support

The following Enterprise/Modular Storage RAID Array hardware products are supported by this Fibre Channel Solution Software Kit:

- DS-SW600-AA—600-mm wide cabinet 50/60 Hz, dual-redundant controllers, bolting kit for coupling (two SW600 cabinets)
- DS-SW370-AA—RAID pedestal, five 180-watt power supplies; eight universal 50/60 Hz, 120/240V high-powered blowers; one AC input box; one enhanced EMU; one pedestal user's guide; six single-ended I/O modules
- DS-SW370-EA—RAID pedestal; five 180-watt power supplies; eight universal 50/60 Hz, 120/240V high-powered blowers; one AC input box; one enhanced EMU; one pedestal user's guide; six single-ended I/O modules; metric mounting hardware
- DS-BA370-AA—RAID rackmount enclosure; five 180-watt power supplies; eight universal 50/60 Hz, 120/240V high-powered blowers; one AC input box, six single-ended I/O modules; one pedestal user's guide; one enhanced EMU; one PVA, metric mounting hardware
- DS-BA370-MA—Maintenance Option for the SW370 and BA370 field service Option, field-replaceable unit (FRU)

- DS-BA35X-HH—180-watt, 100- to 200-V power supply; 240-V, AC factor-corrected power supply; blue color carrier
- DS-BA35X-MK—High-powered blower for the SW370 and BA370
- DS-BA35X-MP—Termination module
- DS-BA35X-BA—External cache battery shelf for SW370
- DS-BA35X-BC—Single battery in blue SBB
- DS-BA35X-BD—Double battery in blue SBB
- DS-BA35X-EB—Enhanced Environmental Monitor Unit of the SW370 and BA370
- DS-BA35X-MN—Single-ended, Ultra SCSI I/O module
- DS-BA35X-EC—Power verification and addressing module
- HS35X-BA—Single external cache battery in an SBB
- HS35X-BD—Dual external cache battery in an SBB
- DS-HSDIM-AB 64 MB Cache upgrade for HSX80
- DS-HSDIM-AC 256 MB Cache upgrade for HSX80

Disk Device Support

This Fibre Channel Solution Software Kit supports the disk devices listed in Table 4 at the indicated hardware and microcode levels.

IMPORTANT: New Universal Disk Drives (or units that are migrated from SmartArray controllers usage) being configured into storageset members need to be initially written to with DILX (a diagnostic utility on HSG storage systems). DILX only operates on units. Therefore, the new disks must be configured into a unit prior to running DILX.

Table 4 Supported Disk Drives

Part Number	Device/Model	Capacity (GB)	Spindle Speed (RPM)	Minimum Microcode Version	Minimum Hardware Version
232431-003 233806-004	BD07264546 BD0726459C	72.8	10,000	BDC7	A01
176494-B21	BC072638A2	72.8	10,000	BDC7	A01

Table 4 Supported Disk Drives (Continued)

Part Number	Device/Model	Capacity (GB)	Spindle Speed (RPM)	Minimum Microcode Version	Minimum Hardware Version
176496-B22	BD03663622 BD0366349C BD036635C5	36.4	10,000	BDC4 3B02 B020	A01 A01 A05
180726-006	BD036735C8	36.4	10,000	B020	A01
127968-001	DS-RZ1FC-VW	36.4	10,000	3B02/2B07/ B020/BDC4	A01
147599-001	DS-RZ1FB-VW	36.4	7,200	N1H1/0372/ 1614/3B06	A01
188122-B22	BF01863644	18.2	15,000	3B01	A01
188120-B22	BF00963643	18.2	15,000	3B01	A01
180726-002	BD018635C4	18.2	10,000	B020	A01
180726-005	BD018735C7	18.2	10,000	B020	A01
380589-B21	DS-RZ1ED-VW	18.2	10,000	0306/1614/ 3B07/B020/ BDC4	A01
128418-B22	BD018122C9	18.2	10,000	B016	A01
142673-B22	BD01862376 BD01862A67	18.2	10,000	BCJE B007	A01
147598-001	DS-RZ1EA-VW	18.2	7,200	3B05	A01
380694-B21	DS-RZ1EF-VW	18.2	7,200	N1H1/ 0372	A01
388144-B22	BB01811C9C	18.2	7,200	3B05	A01
380588-B21	DS-RZ1DD-VW	9.1	10,000	0306/1614/ 3B07/B020/ BDC4	A01
328939-B22	BD009122BA	9.1	10,000	3B07	A01

Table 4 Supported Disk Drives (Continued)

Part Number	Device/Model	Capacity (GB)	Spindle Speed (RPM)	Minimum Microcode Version	Minimum Hardware Version
142671-B22	BD00962373 BD00962A66	9.1	10,000	BCJE B007	A01
180726-001	BD009635C3	9.1	10,000	B020	A01
180726-004	BD009735C6	9.1	10,000	B020	A01
147597-001	DS-RZ1DA-VW	9.1	7,200	3B05	A01
380595-B21	DS-RZ1DF-VW	9.1	7,200	N1H1/0372/ 1614	A01
123065-B22	BB00911CA0	9.1	7,200	3B05	A01
380693-B21	DS-RZ1DB-VW	9.1	7,200	LYJ0/0307	A01
N/A	DS-RZ1CD-VW	4.3	10,000	0306	A01
N/A	DS-RZ1CB-VW	4.3	7,200	LYJ0/0656	A01
380691-B21	DS-RZ1CF-VW	4.3	7,200	N1H1/1614	A01

Switch Support

This Fibre Channel Solution Software Kit supports the StorageWorks Fibre Channel Switches and firmware versions listed in Table 5.

NOTE: Compaq recommends that you do not mix switch firmware versions in your SAN. It is considered best practice to uniformly upgrade all switches in the SAN.

Table 5 Fibre Channel Switch Support

Description	Part Number	Firmware Version
SAN Switch 8 (8 Port Fibre Channel)	DS-DSGGB-AA 158222-B21	2.6
SAN Switch 16 (16 Port Fibre Channel)	DS-DSGGB-AB 158223-B21	2.6

Table 5 Fibre Channel Switch Support (Continued)

SAN Switch 8-EL (8 Port Fibre Channel)	DS-DSGGC-AA 176219-B21	2.6
SAN Switch 16-EL (16 Port Fibre Channel)	DS-DSGGC-AB 212776-B21	2.6
SAN Switch Integrated 32 Port Fibre Channel	DS-DSGGS-AA 230616-B21	2.6
SAN Switch Integrated 64 Port Fibre Channel	DS-DSGGS-AB 230617-B21	2.6

For the latest versions of switch firmware, please visit the Compaq website:

<http://www.compaq.com/products/storageworks/fcsanswitch816/firmware.html>

System Components

This Fibre Channel Solution Software Kit supports the system components and operating system versions listed in Table 6.

Table 6 Minimum System Requirements

Component	Requirement
Controller Compatibility	Compaq StorageWorks HSG80 Array Controller, ACS Version 8.6F-1 (or a subsequently patched version of ACS Version 8.6F) Note: Only for the purpose of performing upgrades to the ACS firmware, this Solution Software Kit supports ACS Version 8.5. Compaq does not recommend mixing ACS versions in the same SAN.
Platform	Intel and ProLiant X86 Servers
Operating System	Novell NetWare V4.2 Novell NetWare V5.1, NetWare Cluster Server V1.01 Novell NetWare V6.0, NetWare Cluster Server V1.06
Topology	Fibre Channel Switched (FC-SW) and Arbitrated Loop (FC-AL) Modes
SCSI Protocol	SCSI-2, SCSI-3
Failover Mode	Transparent (all supported OS versions) Multiple-Bus (Netware V5.1 and V6.0 only, requires Secure Path software)

Table 6 Minimum System Requirements (Continued)

Free Disk Space	5 MB
Adapter Compatibility	Compaq 32-bit PCI FC Host Bus Adapter 223180-B21/291, HBA driver CPQFC HAM V2.52, Firmware Version N/A Compaq 64-bit PCI FC Host Bus Adapter 120186-B21/291, HBA driver CPQFC HAM V2.52, Firmware Version N/A

StorageWorks Command Console

StorageWorks Command Console (SWCC) Version 2.4 is included in this release. Version 2.4 is used to identify the SWCC suite of components. The Agent, a component of the SWCC product, is delivered at Version 4.0.

SWCC provides a graphical user interface that can be used to configure and monitor your storage system. Use of SWCC is highly recommended, but not required. The SWCC Agent is installed as part of the Solution Software Kit.

For more information on SWCC installation, see the *HSG80 ACS Solution Software Version 8.6 Installation and Configuration Guide*. For more information on SWCC Client operation, refer to *Command Console Version 2.4 User Guide* and *Command Console Version 2.4 Release Notes*.

SWCC Scalability

- The SWCC Client can monitor up to 128 host systems, each with up to 32 storage systems, for a maximum of 4096 concurrent storage connections and a total of 2.65 PB of storage.
- One Agent can support up to 32 Clients.

Multiple Agents

This Solution Software Kit contains an SWCC Agent that supports controller locking during CLI command execution, which allows support for multiple Agents. This feature is required in order to use the SANworks Management Appliance in addition to the host-based SWCC Agent. However, it is not recommended or required to use multiple Agents for any other purpose.

NOTE: As a reference, SWCC Agent Version 2.3.2, Build 79 or higher supports the locking feature. This release of Solution Software meets or exceeds this requirement.

Multiple Management Sessions

IMPORTANT: Though multiple Clients can be used to monitor your storage system, Compaq recommends that only one instance of storage system management be active at a time. The Client does allow for multiple management sessions, but there are no ownership rights given to any particular session. Without a highly coordinated effort, multiple management sessions can undermine the integrity of system maintenance. This same principle applies to multiple management sessions initiated through the SANworks Management Appliance as well.

SWCC NetWare Agent

1. After adding new devices when doing a list devices with `raidcdm` loaded, you may see the following:

```
Error in getting device info
error in getting details about device
```

This is informational only.

2. After loading `steam.nlm`, the console screen displays the following:

```
Open \opt\steam\steam.log
Steamd config: Device Failover enabled
Steamd config: Bus Scanning enabled, forcing initial scan
Agent Version: 4.0
GetStgParms>> Scanning the bus for devices
```

This screen will remain open as long as `steam.nlm` is loaded and is normal. You can tab back to the NetWare console screen.

3. Do not unload `raidcdm.cdm` while `steam` is loaded.
4. If you have trouble connecting, check the `storage.ini` and `client.ini` files. The `storage.ini` is located in the `sys:\opt\steam\etc\` directory.

To recreate the `storage.ini` file:

- a. Unload `steam`.
 - b. Rename the old `storage.ini`.
 - c. Load `steam.nlm`.
5. In a shared storage configuration, install the SWCC Agent on only one of the systems accessing the Enterprise/Modular Storage RAID Array.
 6. In order to load an Agent, first create a LUN and assign an ID.

NOTE: Compaq recommends that LUN 0 not be used for this purpose.

Secure Path Software

Secure Path is a high availability, multiple-bus software application that supports FC-SW connectivity. This Fibre Channel Solution Software Kit supports the Secure Path software shown in Table 7.

Table 7 Secure Path Compatibility

Operating System	Supported Product Version
NetWare V5.1, V6.0	Version 3.0B

For more information on Secure Path software, see the product documentation that comes with the product, or visit the Compaq website:

<http://www.compaq.com/products/sanworks/secure-path/index.html>

Layered Software Applications

Compatibility with Compaq StorageWorks and SANworks layered software applications is defined in Table 8.

Table 8 Layered Application Compatibility

Application	Version	ACS Requirement
Data Replication Manager (DRM)	Version 8.6P	Version 8.6P
Management Appliance	Version 1.0A	Version 8.6F

In cases where ACS functional builds other than Version 8.6F are indicated, ensure all required components for those configurations are at the proper level prior to upgrading your ACS code.

NOTE: DRM is supported on Novell NetWare Version 5.1 and 6.0 only.

For more information on these and other Storage Management software, see the product documentation that comes with the product, or visit the following Compaq website:

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

Solution Software Upgrade Procedures

See the upgrade procedures defined in your *HSG80 ACS Solution Software Version 8.6 Installation and Configuration Guide*.

NOTE: Only for the purpose of performing upgrades to the ACS firmware, this Solution Software Kit supports ACS Version 8.5. Compaq does not recommend mixing ACS versions in the same SAN.

ACS Feature Support

Drive Support

The following drive support enhancements were added in the ACS Version 8.6 release:

- 72 GB drives in 10-slot 1.6 inch shelves and 14-slot 1.0 inch shelves
- Full 14-slot drive support per channel (MA/EMA Series arrays only)
- Maximum storageset size of 1.024 TB
- Maximum of 84 drives behind controllers

Increased Host Connections

The maximum number of host connections has been increased from 64 to 96 for the table of known connections. A connection is unique to the node Worldwide Name (WWN), port WWN, and controller port. This table is maintained in the non-volatile memory (NVRAM) of the controller. If the table contains 96 entries, new connections cannot be added unless unused entries are deleted. Otherwise, a host attempting FC login will be rejected from becoming a connection into the connection table, but not necessarily from the fabric.

Rolling Upgrades

Before initiating an ACS rolling upgrade, please refer to the "Solution Software Upgrade Procedures" Section, page 22, for alternate instructions. These procedures take precedence over controller-based rolling upgrade procedures, and are required when Solution Software is part of the upgrade path.

The ACS upgrade path has been reworked to provide more friendly and seamless operation. However, the documented process must be followed carefully to ensure a smooth transition. For more information on upgrade and downgrade procedures, refer to the *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide*.

IMPORTANT: Due to the increased host connectivity delivered with ACS Version 8.6F, you must observe new cache size requirements. When upgrading from ACS Version 8.5 to ACS Version 8.6, cache module configurations must be upgraded from the prior minimum of 64 MB (ACS 8.5) to 128 MB in unmirrored configurations, and 256 MB in mirrored configurations, per cache module.

NOTE: The cache size requirements for running ACS Version 8.6P have not changed, and remain at 512 MB.

CLI Commands

The following CLI commands have been added or enhanced in ACS Version 8.6:

```
ADD UNIT
SET UNIT
ADD PASSTHROUGH
SHOW PASSTHROUGH
DELETE PASSTHROUGH
EXIT
SET connection-name RESERVATION STYLE
SHOW ID
```

See the *HSG80 Array Controller ACS Version 8.6 CLI Reference Guide* for additional syntax details.

ACS Improvements

The following is a list of corrections included in ACS Version 8.6.

Corrections included in all variations of ACS Version 8.6:

- Excessive polling by using “show unit status” requests (with either the CLI or SWCC) caused the controller to periodically become unavailable.

- Excessive polling of the controller by SWCC to obtain full status information sometimes resulted in controller unavailability with an “unable to allocate large sense buckets” message.
- Correction of forced errors encountered on RAID 3/5 storage units.
- Correction of controller unavailability due to deadman timer and (LED CODE 39).
- Correction of error code in conjunction with cache hardware failure.
- Improved performance in non-mirrored 8 KB mode.
- Correction of Unit attentions being logged inappropriately to the CCL, which sometimes caused controller unavailability.

Corrections included in ACS Version 8.6P only:

- Correction of rare Secure Path issue with associated units behavior on the controller.

Disk Partitioning

ACS allows partitioning of disk drives or storagesets for improved device management. A partition appears to the operating system as a single virtual disk. Up to eight partitions may be created per storageset or disk drive. Disk partitioning is supported under all failover modes supported by your operating system.

Write History Logging

Write history logging, available to users of ACS Version 8.6P, uses a log unit to log a history of write commands and data from the host on the initiator side:

- When the target is inaccessible or
- To synchronize the initiator site data during a planned failover

Mini-merge — If the target becomes inaccessible, the writes that would have gone to the target are logged to the association set’s assigned log unit. An inaccessible target in this context refers to both links or target controllers shutting down. When the target becomes accessible, a full copy is not necessary. Only those host writes while the links were down are reissued. This is referred to as a *mini-merge*. If a full copy was in progress at the time of the disconnect, write history logging is not initiated and the full copy is restarted when the target is accessible again.

Fast-Failback — During a planned failover, if write history logging has been enabled at the target site, then when the failback is performed, the initiator site is synchronized through a process called *fast-failback*. The writes that would have gone to the initiator are logged to the association set's log unit. Only those writes since the failover are reissued. A full copy is not necessary.

Dynamic Volume Expansion

Dynamic Volume Expansion is not supported on NetWare. However, NetWare provides its own dynamic volume expansion features. Please refer to your NetWare documentation for details.

Configuration Rules

The following list defines maximum configuration rules for the controller:

- 128 visible LUNs/200 assignable unit numbers
 - In SCSI-2 mode, if the CCL is enabled, the result is 127 visible LUNs and one CCL.
 - In SCSI-3 mode, if the CCL is enabled, the result is 126 visible LUNs and two CCLs.
- 1.024 TB storageset size
- 96 host connections
- 84 physical devices
- 20 RAID 3/5 storagesets
- 30 RAID 3/5 and RAID 1 storagesets
 - NOTE:** This is a combined maximum, limited to no more than 20 RAID 3/5 storagesets.
- 45 RAID 3/5, RAID 1, and RAID 0 storagesets
 - NOTE:** This is a combined maximum, limited to no more than 20 RAID 3/5 storagesets.
- 8 partitions of a storageset or individual disk
- 6 physical devices per RAID 1 storageset (mirrorset)
- 14 physical devices per RAID 3/5 storageset (RAIDset)
- 24 physical devices per RAID 0 storageset (stripeset)
- 45 physical devices per RAID 0+1 storageset (striped mirrorset)

Operating Constraints

This section describes the operating constraints for ACS Version 8.6. An operating constraint is a limitation placed on the operation of the controller. Other constraints on host adapters or other system components may also apply. Keep these constraints in mind to avoid problems and to help achieve the maximum performance from your controller. See the documentation that came with your host server for more details.

External Cache Battery

Compaq recommends that you replace the External Cache Battery (ECB) every two years to prevent battery failure.

If you are shutting down your controller for longer than one day, complete the additional steps in “Shutting Down the Subsystem” in the *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide*. This will prevent the ECB from discharging during planned power outages.

Dual External Cache Battery Failures

The array controller cache policy provides for proper handling of a single ECB failure as described in the *HSG80 Array Controller ACS Version 8.6 Troubleshooting Reference Guide*. For dual ECB failures, it states that no failover occurs. For this release, if a dual ECB failure is detected both controllers will be restarted.

Using FRUTIL to Insert a New Controller

When using FRUTIL to insert a new controller in a dual-redundant controller configuration, you will see a new set of instructions after the new controller has been inserted:

If the other controller did not restart, follow these steps:

1. Press and hold the **Reset** button on the other controller.
2. Remove and re-insert the program card for the other controller.
3. Release the **Reset** button.

NOTE: Whenever you are running FRUTIL you must quiesce all I/O.

FRUTIL Limitation

This limitation applies to users of ACS Version 8.6P with DRM only.

NOTE: FRUTIL cannot be run in remote copy set environments on the target side specifically when I/O is in progress.

If the host load has been stopped, you can run FRUTIL on the initiator or target. If the host load is not quiesced and FRUTIL is run while remote copy I/Os are running, the normalization process will reset.

Saving Your Configuration

When enabled, the `SAVE_CONFIGURATION` function allows you to do the following (supported on single controller configurations only):

- Save a configuration to a disk or storage set. The configuration may be retrieved later and downloaded onto a replacement controller.
- Retain code patches to the ACS software.

Saving a Configuration to Previously Initialized Storage Sets

If any storage set within the configuration was previously initialized with the `INITIALIZE` container-name `SAVE_CONFIGURATION` command to save your configuration to disk, it will not be necessary to reconfigure your devices with a new controller.

`SAVE_CONFIGURATION` also retains code patch information to the software. This option is supported on single controller configurations only.

ACS Version 8.6 saves any installed software patches on disks initialized with the `SAVE_CONFIGURATION` option. To replace a controller and restore the configuration from a disk, you will not have to reinstall any software patches.

Configuration information cannot be retrieved from storage sets created on other HSx controllers (for example, HSD, HSJ, or HSZ controllers). You can only restore a configuration from a configuration saved on this or another HSG80 array controller.

Avoiding Problem Situations

Under certain conditions, you may experience unusual array controller behavior. This section presents information to help you avoid such situations and to recover from them if they occur.

ACS Patch Memory

Any installed ACS Version 8.5 (or lower) patches should be removed after an ACS Version 8.6 installation since they are no longer applicable. This will free up HSG80 patch memory for future ACS patches.

To check or remove ACS patches, run the “Code Load and Code Patch” Utility by typing the following command:

```
HSG80> RUN CLCP
```

Adding, Moving, and Changing Devices

The array controller maintains a configuration map of a device’s type and location. This map is used to communicate with devices. If you add, move, or change a device while the array controller is powered off, without first changing the array controller configuration, the array controller is not able to communicate with the changed device when it returns to service.

If a device is removed by mistake while the array controller is off, delete all containers associated with the removed device after power has been restored to the array controller.

If a device is replaced while the array controller is off, install the replacement device before restoring power to the array controller. Once power is restored, use the `DELETE DISK CLI` command to remove the disk from the configuration. Then use the `ADD DISK CLI` command to add the new device. This will correctly remove the failed device and add the new device after restoring power to the array controller.

See the *HSG80 Array Controller ACS Version 8.6 CLI Reference Guide* for details on CLI command usage and syntax.

See the *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide* for correct device removal and addition procedures.

Moving Storage Sets

Move only normal storage sets.

IMPORTANT: Do not move storage sets that are reconstructing or have been reduced, or data corruption will result.

Adding, Moving, and Changing Array Controllers, Cache Modules, or External Cache Battery Storage Building Blocks

You can replace the array controller, cache module, or External Cache Battery (ECB) Storage Building Block (SBB) while the storage system is shut down. However, you must enter the `SHUTDOWN THIS_CONTROLLER` command prior to shutting down the storage system in order to make configuration changes. If two array controllers are configured in a dual-redundant configuration, you must first enter the `SHUTDOWN OTHER_CONTROLLER` command.

These commands instruct the array controllers to flush all unwritten data from the cache modules and discontinue all I/O activity. For more information regarding the `SHUTDOWN` controller command, see the *HSG80 Array Controller ACS Version 8.6 CLI Reference Guide*. For information on maintenance and replacement of the array controller, cache module, and external cache battery, see the *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide*.

Establishing an SWCC SCSI Connection

For SWCC to connect to an array, a LUN must be configured using CLI commands. Compaq recommends that LUN 0 or LUN 100 not be used. In certain instances, if LUN 0 is used, LUNs with IDs greater than D50 or D150 will not be recognized.

NOTE: In transparent failure mode, LUN D100 should not be used.

Host Operating System Notes

The following section identifies host specific operating notes.

Host Operating System Support of Multiple-Bus Failover

Multiple-bus failover is supported on the Novell Netware operating system through the use of SANworks Secure Path software. See "Secure Path Software" Section, page 21, for version compatibility and restrictions.

Virtual Disk Wizard in Multiple-Bus Failover Mode

In Step 4 of the *Add Virtual Disk Wizard*, the default value for *host access* is “none.” You must change this value to one of the host names provided; otherwise, the virtual disk you have just added will be inaccessible.

Mounting a CLONE

Before mounting a CLONE, make sure you move it to another system. Having two identical NetWare Volume Names on the same system can cause problems.

Cluster Configurations

If using an array in a cluster configuration, leave 5 MB free on one array for cluster configuration information.

SCSI-2 Configurations

Do not use LUN 0 with Novell NetWare in multiple-bus. failover mode. Do not use LUN 0 or LUN 100 with Novell NetWare in transparent failover mode

SCSI-3 Mode

SCSI-3 Mode is now supported under NetWare.

NSS Partitions

NSS partition creation is supported by this Solution Software under NetWare.

Documentation Anomalies

The following are known additions and corrections to the *HSG80 ACS Solution Software Version 8.6 Installation and Configuration Guide*.

- The “Configuration Rules” on page 2-3, under “Planning Storage,” are incomplete. See the “Configuration Rules” Section, page 25, of these Release Notes for a full and updated rule set.

- Under “Installing and Configuring the Agent,” on page 4-5, the following errors should be noted.
 - ❑ In step 6, the listed message, “ENTER MESSAGE-SCREEN PRINT” is incorrect. The message should state, “No servers could be found.”
 - ❑ In step 9, the installation program adds two lines to the `AUTOEXEC.NCF` file, rather than the `SYS:ETC\SERVICES` file. In addition, the two lines that are added should read:

```
load raidcdm
load steam
```
 - ❑ Steps 1 through 9 are duplicated within this section. This procedure need only be followed once.
- Under “Configuring the Agent,” on page 4-6, in step 1, the correct syntax to enter at the menu screen is:

```
load HSG80CFG
```
- Chapter 6, “Verifying Storage Configuration from the Host,” is not applicable to NetWare systems.
- Under “Installing the Client,” on page B-2 of Appendix B, the following restriction should be observed when installing SWCC on Windows NT 4.0 Workstations:

If you select all of the applets during installation, the installation will fail on the HSG60 applet and again on one of the HSG80 applets. The workaround is to install all of the applets you want except for the HSG60 applet and the HSG80 ACS 8.5 applet. You can then return to the setup program and install the one that you need.

In a SAN environment where you would need both HSG60 and HSG80 storage systems, Compaq recommends you install both, but one at a time. This problem is not seen under Windows NT 4.0 Server.
- Under “Installing the Client,” in step 3 on page B-3 of Appendix B, select the “HSG80 Controller for ACS85 newer” menu option to properly install SWCC client.

