

# hp StorageWorks

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## Release Notes – HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.7 for Compaq Tru64 UNIX

Part Number: AA-RFATH-TE

Eighth Edition (August 2002)

**Product Version:** 8.7

This document contains last-minute and supplemental information about your Solution Software. In the event of conflicting information between these Release Notes and other documents contained in this product release, the Release Note content takes precedence.

For the latest version of these Release Notes and other product documentation, visit the StorageWorks website at:

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



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HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version  
8.7 for Compaq Tru64 UNIX  
Eighth Edition (August 2002)  
Part Number: AA-RFATH-TE

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## Intended Audience

This document is intended for storage administrators and StorageWorks customer service personnel, who install and maintain StorageWorks Enterprise/Modular Storage RAID Array products that include StorageWorks HSG80 RAID Array Controllers.

## Conventions

The following conventions are used throughout this document:

- Unless otherwise specified, all references to controllers or array controllers imply the StorageWorks HSG80 RAID Array Controller.
- Unless otherwise specified, all references to StorageWorks Array Controller Software Version 8.7 imply the released StorageWorks ACS Version 8.7 code, or subsequently patched versions of ACS Version 8.7.
- For the purpose of this document, Enterprise/Modular Storage RAID Array refers to the following 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

## Abbreviations and Acronyms

The following abbreviations and acronyms are used throughout this document:

- **ACS** — Array Controller Software
- **CCL** — Command Console LUN
- **CLI** — Command Line Interpreter
- **EISA** — Extended Industry Standard Architecture
- **EMU** — Environmental Monitoring Unit
- **EVA** — Enterprise Virtual Array
- **FC** — Fibre Channel
- **FC-AL** — Fibre Channel - Arbitrated Loop
- **FC-SW** — Fibre Channel - Switched
- **FRU** — Field-replaceable Unit
- **HBA** — Host Bus Adapter
- **LUN** — Logical Unit

- **LVD** — Low Voltage Differentials
- **NVRAM** — Non-volatile Memory
- **PCMCIA** — Personal Computer Memory Card Industry Association
- **PVA** — Power Verification and Addressing Assembly
- **RAID** — Redundant Array of Independent Disks
- **RETMA** — Radio Electronics Television and Manufacturing Association
- **SAN** — Storage Area Network
- **SBB** — Storage Building Block
- **SCSI** — Small Computer System Interface
- **SMART** — Self-Monitoring Analysis and Reporting Technology
- **SWCC** — StorageWorks Command Console
- **VCS** — Virtual Controller Software
- **WWID** — World Wide Identifier
- **WWN** — World Wide Name

## 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 8.7 for Compaq Tru64 UNIX Installation and Configuration Guide
  - HSG80 Array Controller ACS Version 8.7 CLI Reference Guide
  - HSG80 Array Controller ACS Version 8.7 Maintenance and Service Guide
  - HSG80 Array Controller ACS Version 8.7 Troubleshooting Reference Guide
  - Command Console Version 2.5 User Guide
  - Command Console Version 2.5 Release Notes
  - Registration and Warranty Package
  - HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.7 for Compaq Tru64 UNIX Release Notes (this document)

- HSG80 Modular Storage RAID Arrays Solution Software V8.7 for Tru64 UNIX CD-ROM
    - Installation and scripting utilities
    - SWCC Version 2.5 Agent and Client software
- NOTE:** Applicable HBA device drivers are provided with the operating system.

The following supporting documentation is available from the StorageWorks website:

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

- SAN Design Reference Guide, Part Number: AA-RMPNE-TE
- Enterprise/Modular Storage RAID Array Fibre Channel Arbitrated Loop Configurations Application Note, Part Number: AA-RS1ZA-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

## **Important Notice Regarding Cache Sizes**

For ACS Version 8.7, minimum cache size requirements are 128 MB in unmirrored configurations, and 256 MB in mirrored configurations, per cache module.

The cache size requirements for running ACS Version 8.7P or Version 8.7S remain at 512 MB.

## **Identifying ACS Revision Level**

The ACS release package you received should include a 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 CLI prompt:

```
HSG80> SHOW THIS_CONTROLLER
```

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

V87G

V87F

V87P

V87S

If the ACS version is not Version 8.7 or a subsequently patched version of ACS Version 8.7, contact your support provider for instructions on how to obtain the updated version.

If the ACS version is Version 8.7P or Version 8.7S, you will need additional layered application software beyond this Solution Software Kit to take advantage of the added functionality of these versions. See the "Layered Software Applications" Section, page 23, for additional information on compatible layered application software.

ACS Version 8.7 is fully compatible with Version 8.7 Solution Software. In addition, Version 8.7 Solution Software is backward compatible with ACS Version 8.6, which benefits the upgrade process across your SAN.

## Patching ACS

Each ACS patch builds on the current version of ACS and all previously installed patches. ACS patches must be installed in order, from lowest to highest, when multiple patches are installed. ACS patches are available for download from the following StorageWorks website:

<http://www.compaq.com/products/storageworks/softwaredrivers/acs/index.html>

ACS patch downloads come packaged with the instructions and scripts needed to apply the patch. See the *HSG80 Array Controller ACS Version 8.7 Maintenance and Service Guide* for further information on patching ACS.

For multiple-bus configurations, use the following procedure in addition to those provided with the ACS patch download:

1. Apply ACS patches to both controllers.
2. Reboot `THIS_CONTROLLER` during a lull time (when controllers are running at more than 50% idle). The patch will take effect once the controller is rebooted.
3. Repeat these steps for the `OTHER_CONTROLLER` by moving all units to `THIS_CONTROLLER` and rebooting `OTHER_CONTROLLER` during lull time.

## ACS Patch Memory

Any installed ACS Version 8.6 (or lower) patches should be removed after an ACS Version 8.7 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
```

## Multiple Storage System Types

The extended interoperability of the heterogeneous SAN allows you to mix several types of StorageWorks storage systems. StorageWorks recommends the following configuration rules when different storage products are shared in the same SAN:

- HSG80 ACS Version 8.7 and EVA VCS Version 2.0 — Use ACS Solution Software Version 8.7 (includes SWCC Version 2.5) and VCS Version 2.0 compatible multiple-bus software/drivers.
- HSG80 ACS Version 8.6 and EVA VCS Version 2.0 — Use ACS Solution Software Version 8.6 (if SWCC Version 2.4 components are desired) and VCS Version 2.0 compatible multiple-bus software/drivers.
- HSG80 ACS Version 8.6 and HSG80 ACS Version 8.7 — Use ACS Solution Software Version 8.7 (includes SWCC Version 2.5).

**NOTE:** Any multiple storage system configuration that includes EVA VCS Version 2.0 requires multiple-bus support.

**IMPORTANT:** When mixing ACS and VCS based storage in the same environment, a special Tru64 UNIX early release patch (ERP) for OS Version 5.1x is required. This ERP is currently under development, but should be available at the time this Solution Software kit is released. Patch Kits are available at the following website:

<http://tru64unix.compaq.com/support.html>

## New Features

This section briefly describes new features and changes that are supported by this Version 8.7 release of the Solution Software, together with the array controller running ACS Version 8.7.



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## ACS Feature Enhancements

The following major enhancements are included in the ACS Version 8.7 release:

- **Host Connection Table Locking** — Host table lock and unlock commands have been added to control the connection table in NVRAM. When the table is locked, the host login request will be rejected (unless the connection is already in the table), and the request will be stored internally on a rejected hosts table.
- **Selective Management Presentation** — Selective Management Presentation extends the use of Selective Storage Presentation by providing control over which SAN Management Agent systems (if any) can perform management operations.
- **VENDOR\_ID Field** — ACS now provides a `VENDOR_ID` field at the bottom of the *Extended information* area, returned by the `SHOW THIS FULL` or `SHOW OTHER FULL` commands.
- **Linked WWIDs for Snap and Clone Units** — To better manage snap and clone unit creation, a linked WWID scheme has been implemented, which keeps the WWIDs of these units constant each time they are created. The linked WWID scheme reduces the number of system data records needed to track unit WWIDs, and enhances the stability of administrative scripts used in unit creation.
- **SMART Error Drive Eject** — In prior versions of ACS, SMART error notifications received from a device were treated as soft (recovered) errors. The notification was passed to the host and operations continued. ACS now provides a CLI switch (*smart error eject state*) that offers an alternative to this behavior.

With the new switch enabled, drives in a normalized and redundant set that report a SMART error are removed from that set. SMART errors reported by drives in a non-redundant or non-normal set continue to be treated as recovered errors. If the switch is disabled, all SMART errors are treated as recovered errors.

- **Error Threshold for Drives** — ACS now provides the ability to set limits for drive errors. Once the limit is reached, the questionable drive will be removed from any redundant set it is a member of, and put into the failed set. Errors counted are medium and recovered errors. Hardware errors are not included in this count since the drive fails immediately when a hardware error is encountered.

## CLI Command Updates

The following CLI commands and switches have been added or enhanced in ACS Version 8.7:

### Host Connection Table Locking

```
SET controller CONNECTIONS_LOCKED
SET controller CONNECTIONS_UNLOCKED
ADD CONNECTIONS REJECTED_HOST
```

### Selective Management Presentation

```
SET DISABLE_MANAGERS
SET ENABLE_MANAGERS
```

### Linked WWIDs for Snap and Clone Units

```
ADD SNAPSHOT_UNITS USE_PARENT_WWID
```

### SMART Error Drive Eject

```
SET controller SMART_ERROR_EJECT
```

### Error Threshold for Drives

```
CLEAR_ERRORS DRIVE_ERRORS
SET DRIVE_ERROR_THRESHOLD
SHOW DRIVE_ERROR_THRESHOLD
```

See the *HSG80 Array Controller ACS Version 8.7 CLI Reference Guide* for complete syntax details.

## FC Switch Support Updates

The following updates and changes to supported FC Switch products are included in this Solution Software Version 8.7 release:

- Support for the 8/16 Port Fibre Channel Storage Switches (DS-DSGGA-AA [380591-B21] and DS-DSGGA-AB [380578-B21]) has been discontinued because these switches are limited to four switch, two-hop maximum configurations.
- Firmware for all 1 Gbps SAN Switch products has been upgraded to v2.6.0c.
- Added support for the following FC switches, many of which provide 2 Gbps switch support:
  - SAN Switch 2/16 (16 Port FC, 2 Gbps)
  - SAN Switch 2/8-EL (8 Port FC Entry Level, 2 Gbps)
  - SAN Switch 2/16-EL (16 Port FC Entry Level, 2 Gbps)

- SAN Core Switch 2/64 (32-64 Ports FC, 2 Gbps)
- SAN Director 64 (32-64 Ports FC, 1 Gbps)
- SAN Edge Switch 32 (32 Ports FC, 1 Gbps)
- SAN Edge Switch 16 (16 Ports FC, 1 Gbps)
- SAN Director 2/64 (32-64 Ports FC, 2 Gbps)
- SAN Edge Switch 2/32 (32 Ports FC, 2 Gbps)
- SAN Edge Switch 2/16 (16 Ports FC, 2 Gbps)

See the "Switch Support" Section, page 19, for part numbers, firmware versions, and additional information.

**IMPORTANT:** StorageWorks 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:

- Solution Software Version 8.7 has been qualified with ACS Version 8.7 and the components defined in these Release Notes.
- Added 1000A and DS10L servers to the supported platforms list in Table 6.
- Upgraded DS-KGPSA-CA HBA firmware to Version dd3.82a1.
- Upgraded DS-KGPSA-DA HBA firmware to Version cd3.82a1.
- Discontinued support for StorageWorks DS-KGPSA-BC PCI FC HBA.
- Added support for Tru64 UNIX Version 4.0G.

**NOTE:** Support for Tru64 UNIX Version 4.0G was temporarily suspended in the Version 8.6B release of this Solution Software.

## Documentation Updates

The following documentation changes have been made in order to consolidate and reduce the number of documents associated with Version 8.7 Solution Software:

- New document *Enterprise/Modular Storage RAID Array Fibre Channel Arbitrated Loop Configurations Application Note* consolidates prior release, host-specific FC-AL application notes into a single, multivendor document for FC-AL configurations. This document supersedes the following application note:

- *Enterprise/Modular Storage RAID Array FC-AL Configurations for Tru64 UNIX Application Note*, Part Number: AA-RPHLA-TE
- The following document has been incorporated into the *HSG80 ACS Solution Software Version 8.7 Installation and Configuration Guide*:
  - StorageWorks Command Console Agent (Version 2.3.2) in a TruClusters Environment Application Note

The following changes have been made to the general content of these Release Notes since they were last published:

- A new "Abbreviations and Acronyms" Section has been added to define abbreviations and acronyms used in these Release Notes.
- A new "Patching ACS" Section has been added to clarify the process used to patch ACS.
- A new "Multiple Storage System Types" Section has been added to address basic configuration rules used in mixing different StorageWorks products in the same SAN.
- New "SCSI-2 to SCSI-3 Migration" information has been added to assist customers who wish to extend the interoperability of their SAN.
- The "Layered Software Applications" Section, page 23, has been updated.
- The "Disk Device Support" Section, page 16, has been updated.
- The *Document Catalog* section and procedures have been removed because electronic copy for Solution Software documentation is being made available exclusively from the StorageWorks website.
- The *HSG80 Device Removal and Replacement* section and procedures have been moved from these Release Notes to the *HSG80 Array Controller ACS Version 8.7 Maintenance and Service Guide*.
- The *Solution Software Upgrade Procedures* section has been moved from these Release Notes to the *HSG80 ACS Solution Software Version 8.7 Installation and Configuration Guide*.
- The *Upgrading DS-KGPSA-BC Firmware* section and procedures have been removed since this particular HBA is no longer supported in this release.

## 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 StorageWorks 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 both 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 addresses 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 operation.

**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

**Table 1: Single Bus Mode Enclosure Options (Continued)**

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 in one of the following 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, 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:

- DS-SW600-AA—600mm 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 rack mount 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, 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.

**NOTE:** Full 14-slot drive support per channel is available on MA/EMA Series arrays only.



**Table 4: Supported Disk Drives**

Option Part Number	Device/ Model	Capacity (GB)	Speed (RPM)	Minimum Microcode Version	Minimum Hardware Version
176494-B21	BC072638A2	72.8	10,000	BDC7	A01
232432-B22	BD07264546			B209	
	BD0726459C			B008	
	BD0726536C			3B02	
232916-B22	BF03664664	36.4	15,000	3B06	A01
	BF03665223			B003	
176496-B22	BD0366349C	36.4	10,000	3B02	A01
	BD036635C5			B020	A05
	BD03663622			BDC4	A01
	BD03664545			B209	
	BD03664553			3B04	
	BD0366459B			B005	
	BD0366536B			3B02	
127968-001	DS-RZ1FC-VW	36.4	10,000	3B02/2B07/ B020/BDC4	A01
147533-001	DS-RZ1FB-VW	36.4	7,200	N1H1/0372/ 1614/3B05	A01
188122-B22	BF01863644	18.2	15,000	3B01	A01
	BF01864663			3B06	
	BF01865222			B003	
128418-B22	BD018122C9	18.2	10,000	B016	A01

**Table 4: Supported Disk Drives (Continued)**

Option Part Number	Device/ Model	Capacity (GB)	Speed (RPM)	Minimum Microcode Version	Minimum Hardware Version
142673-B22	BD01862A67	18.2	10,000	B007	A01
	BD01862376			BCJE	
	BD018635C4			B020	
	BD01864544			B209	
	BD01864552			3B04	
	BD0186459A			B008	
380589-B21	DS-RZ1ED-VW	18.2	10,000	0306/1614/ 3B07/B020/ BDC4	A01
388144-B22	BB01811C9C	18.2	7,200	3B05	A01
147598-001	DS-RZ1EA-VW	18.2	7,200	N1H1/0306/ 3B05	A01
380694-B21	DS-RZ1EF-VW	18.2	7,200	0372/N1H1	A01
188120-B22	BF00963643	9.1	15,000	3B01	A01
328939-B22	BD009122BA	9.1	10,000	3B07	A01
142671-B22	BD00962373	9.1	10,000	BCJE	A01
	BD00962A66			B007	
	BD009635C3			B020	
380588-B21	DS-RZ1DD-VW	9.1	10,000	0306/1614/ 3B07/B020	A01
123065-B22	BB00911CA0	9.1	7,200	3B05	A01
147597-001	DS-RZ1DA-VW	9.1	7,200	N1H1/3B05/ B020	A01
380595-B21	DS-RZ1DF-VW	9.1	7,200	0372/N1H1/ 1614	A01
380693-B21	DS-RZ1DB-VW	9.1	7,200	LYJ0/0307	A01

**Table 4: Supported Disk Drives (Continued)**

Option Part Number	Device/ Model	Capacity (GB)	Speed (RPM)	Minimum Microcode Version	Minimum Hardware Version
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	0372/N1H1/ 1614	A01

## Switch Support

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

**IMPORTANT:** StorageWorks 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 FC, 1 Gbps)	158222-B21 DS-DSGGB-AA	2.6.0c
SAN Switch 16 (16 Port FC, 1 Gbps)	158223-B21 DS-DSGGB-AB	2.6.0c
SAN Switch 8-EL (8 Port FC Entry Level, 1 Gbps)	176219-B21 DS-DSGGC-AA	2.6.0c
SAN Switch 16-EL (16 Port FC Entry Level, 1 Gbps)	212776-B21 DS-DSGGC-AB	2.6.0c
SAN Switch Integrated (32 Port FC, 1 Gbps)	230616-B21 DS-DSGGS-AA	2.6.0c
SAN Switch Integrated 64 (64 Port FC, 1 Gbps)	230617-B21 DS-DSGGS-AB	2.6.0c
SAN Switch 2/16 (16 Port FC, 2 Gbps)	240602-B21 DS-DSGGD-AA	3.02f
SAN Switch 2/8-EL (8 Port FC Entry Level, 2 Gbps)	258707-B21 DS-DSGGD-AC	3.02f
SAN Switch 2/16-EL (16 Port FC Entry Level, 2 Gbps)	283056-B21 DS-DSGGD-AD	3.02f

**Table 5: Fibre Channel Switch Support (Continued)**

SAN Core Switch 2/64 (32-64 Ports FC, 2 Gbps)	254508-B21 DS-DSGGE-AB	4.0.0b
SAN Director 64 (32-64 Ports FC, 1 Gbps)	254512-B21 DS-DMGGD-AA	02.00.00
SAN Edge Switch 32 (32 Ports FC, 1 Gbps)	2T-M3032-AA (See Note)	02.00.00
SAN Edge Switch 16 (16 Ports FC, 1 Gbps)	2T-M3016-AA (See Note)	02.00.00
SAN Director 2/64 (32-64 Ports FC, 2 Gbps)	286809-B21 DS-DMGGD-BA	02.00.00
SAN Edge Switch 2/32 (32 Ports FC, 2 Gbps)	286810-B21 DS-DMGGE-BC	02.00.00
SAN Edge Switch 2/16 (16 Ports FC, 2 Gbps)	286811-B21 DS-DMGGE-BB	02.00.00

**NOTE:** The listed 1 Gbps SAN Edge Switches are CSS (Custom Services and Solutions) orderable only. Please contact your StorageWorks sales representative at 1-800-STORWORK for further information on these CSS components.

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

<http://www.compaq.com/products/storageworks/softwaredrivers/fcsanswitch816/index.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	StorageWorks HSG80 Array Controller, ACS Version 8.7F (or a subsequently patched version of ACS Version 8.7F) <b>Note:</b> This Solution Software is backward compatible with ACS Version 8.6, but only for the purpose of performing upgrades to the ACS firmware. StorageWorks does not recommend mixing ACS versions in the same SAN.
Platform	Alpha Servers 800, 1000A, 1200, 4000, 4100, 8200, 8400; DS10, DS10L, DS20, DS20E, ES40, ES45, GS Series
Operating System	Compaq Tru64 UNIX V4.0F, V4.0G with TruClusters V1.6 Compaq Tru64 UNIX V5.1, V5.1A with TruClusters V5.1, V5.1A

**Table 6: Minimum System Requirements (Continued)**

Topology	Fibre Channel Switched (FC-SW) Fibre Channel Arbitrated Loop (FC-AL)
SCSI Protocol	SCSI-2 (all supported OS versions) SCSI-3 (V5.1, V5.1A only, recommended)
Failover Mode	Transparent (all supported OS versions) Multiple-Bus (V5.1, V5.1A only, built into OS)
Host Mode	TRU64_UNIX
Disk Space	500 KB for the program files
Adapter Compatibility	StorageWorks 64-bit, 1 Gbps, PCI FC HBA DS-KGPSA-CA (168794-B21), HBA driver (included with OS) Version EMX 2.02, Firmware Version dd3.82a1
	StorageWorks 64-bit, 2 Gbps, PCI FC HBA DS-KGPSA-DA (261329-B21), HBA driver (included with OS) Version EMX 2.02, Firmware Version cd3.82a1 (V5.1 and V5.1A only)

**Notes**

- You can verify the KGPSA firmware version by using the `uerf` utility and looking at the last boot information. You can also find firmware version information in the `/usr/adm/messages` file.
- Patch Kit requirements for Tru64 UNIX are as follows:
  - For Tru64 UNIX Version 5.1A: Tru64 UNIX V5.1A Patch Kit 3 (BL3)
  - For Tru64 UNIX Version 5.1: Tru64 UNIX V5.1 Patch Kit 5 (BL19)
  - For Tru64 UNIX Version 4.0G: Tru64 UNIX V4.0G Patch Kit 3 (BL17)
  - For Tru64 UNIX Version 4.0F: Tru64 UNIX V4.0F Patch Kit 7 (BL18)

**IMPORTANT:** When mixing ACS and VCS based storage in the same environment, a special Tru64 UNIX early release patch (ERP) for OS Version 5.1x is required. This ERP is currently under development, but should be available at the time this Solution Software kit is released.

Patch Kits are available at the following website:

<http://tru64unix.compaq.com/support.html>

- Some ES40 systems manufactured from January through March 2001 may have a component on the CSB that might affect the operation of some 64-bit PCI HBA options. Refer to Tru64 UNIX Action Blitz #TD3004-A for details.

## StorageWorks Command Console

SWCC Version 2.5 is included in this release. Version 2.5 is used to identify the SWCC suite of components.

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 8.7 Installation and Configuration Guide*. For more information on SWCC Client operation, refer to *Command Console Version 2.5 User Guide* and *Command Console Version 2.5 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 locking feature is required in order to use the 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 77 or higher supports the locking feature. This release of Solution Software exceeds this requirement.

### Multiple Management Sessions

Though multiple Clients can be used to monitor your storage system, StorageWorks 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 Management Appliance as well.

## Layered Software Applications

Compatibility with StorageWorks layered software applications is defined in Table 7.

**Table 7: Layered Application Compatibility**

Application	Version	Supported ACS Variants
Data Replication Manager (DRM)	Version 8.7P	Version 8.7P
Enterprise Volume Manager (EVM)	Version 2.0D	Version 8.7F/S/P
Storage Resource Manager (SRM)	Version 4.0B	Version 8.7F
Command Scriptor	Version 1.0	Version 8.7F/S/P
Network View	Version 2.0B	Version 8.7F/G/S/P
Management Appliance	Version 1.0C	Version 8.7F/S/P
Storage Allocation Reporter	Version 1.0D	Version 8.7F

In cases where ACS functional builds other than Version 8.7F are required, ensure all necessary components for those configurations are at the proper level prior to upgrading your ACS code.

If you run EVM with ACS Version 8.7F, you can use scripting with CLONES. If you want to create SNAPSHOTs with EVM, you must run ACS Version 8.7S or 8.7P.

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

[http://www.compaq.com/storage/software\\_index.html](http://www.compaq.com/storage/software_index.html)

## ACS Feature Support

The following sections provide details for specific ACS features.

### Maximum Host Connections

The maximum number of host connections is 96 for the table of known connections. A connection is unique to the node WWN, port WWN, and controller port. This table is maintained in the 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

The ACS upgrade path has been reworked to provide a 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 8.7 Maintenance and Service Guide*.

ACS Version 8.7 supports both the dual-redundant controller rolling upgrade and dual-redundant controller shutdown upgrade methods. The rolling upgrade method allows the host system to continue I/O activity, with minimal impact, while each controller is upgraded. The shutdown upgrade method takes the storage devices offline for a period of time while the software is upgraded simultaneously on both controllers.

Before initiating an ACS rolling upgrade, please refer to the *HSG80 ACS Solution Software Version 8.7 Installation and Configuration Guide* for additional instructions. These procedures include consideration for Solution Software and switch firmware, as well as controller-based upgrade. Specific instructions for the Solution Software and the proper sequence for all components is included.

**NOTE:** Rolling upgrades from ACS Version 8.5 (or earlier) to ACS Version 8.7 are not supported. In these cases, a shutdown upgrade is required.

**IMPORTANT:** For ACS Version 8.7, minimum cache size requirements are 128 MB in unmirrored configurations, and 256 MB in mirrored configurations, per cache module. The cache size requirements for running ACS Version 8.7P or Version 8.7S remain at 512 MB.

## 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.

## SNAPSHOT

ACS with SNAPSHOT capability provides a quick and efficient way to make a point-in-time copy of a storage container's data. SNAPSHOT freezes a map of the container's data, which can be separated and used for backup or testing and manipulation without impacting the original data. After the SNAPSHOT, the original data can continue to be updated and utilized while the SNAPSHOT copy remains unchanged.



When the need for the duplicate copy of data has ended, a new snap of a different storage container can be made and the process repeated. SNAPSHOT eliminates much of the overhead associated with mirroring and cloning as the SNAPSHOT is dissolved without having to re-merge the data.

SNAPSHOT is enabled when the following CLI command is entered:

```
HSG80> ADD SNAPSHOT_UNITS
```

See the *HSG80 Array Controller ACS Version 8.7 CLI Reference Guide* for additional syntax details.

The SNAPSHOT unit can be presented to the host. The SNAPSHOT unit remains until it is deleted.

**NOTE:** SNAPSHOT functionality requires either ACS Version 8.7P or ACS Version 8.7S.

**IMPORTANT:** ACS SNAPSHOT capability requires 512 MB of cache memory.

## Write History Logging

Write history logging, available to users of ACS Version 8.7P, uses a log unit to log a history of write commands and data from the host on the initiator side for either of the following reasons:

- When the target is inaccessible
- 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 creates a specialized volume called a concatset (short for concatenation set) from a storage set that has been given a unit number. Another storage set can then be added to the concatset by using the `SET CONCATSET` command. See the *HSG80 Array Controller ACS Version 8.7 CLI Reference Guide* for syntax 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 storage set size
- 96 host connections
- 84 physical devices
- 20 RAID 3/5 storage sets
- 30 RAID 3/5 and RAID 1 storage sets (see Note)
- 45 RAID 3/5, RAID 1, and RAID 0 storage sets (see Note)

**NOTE:** For the previous two storage set configurations, this is a combined maximum, limited to no more than 20 RAID 3/5 storage sets.
- 8 partitions of a storage set or individual disk
- 6 physical devices per RAID 1 storage set (mirror set)
- 14 physical devices per RAID 3/5 storage set (RAID set)
- 24 physical devices per RAID 0 storage set (stripe set)
- 45 physical devices per RAID 0+1 storage set (striped mirror set)

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## SCSI-2 to SCSI-3 Migration

In order to extend interoperability within the heterogeneous SAN, StorageWorks highly recommends that customers begin migrating from SCSI-2 to SCSI-3 protocols. Moving to SCSI-3 will allow greater diversity in the operating systems and storage products (including EVA) that comprise a SAN.

All migrations from SCSI-2 to SCSI-3 should be planned during scheduled downtime. SCSI migrations require a controller restart and most likely a server restart. Data contained on CCL units will need to be moved to new units once SCSI migration is complete.



**CAUTION:** Before attempting a SCSI-2 to SCSI-3 migration, it is extremely important that all data be backed up and that units be available for remapping CCL data. In addition, ensure all redundant storage sets are in normal (non-reduced) mode.

---

When migrating from SCSI-2 to SCSI-3, the controller checks for controller unit D0 and will not change modes until D0 (at all presented offsets) is deleted. One or more LUNs will be lost after the mode change. If you are planning to move from SCSI-2 to SCSI-3, back up your data first. The data in LUN 0 (and any other offsets that map to LUN 0) that was used in SCSI-2 require that the data be moved to a different LUN. It may be necessary to retrieve this data from a backup.

**IMPORTANT:** If multiple-bus failover configurations or server clustering are employed in the environment, there may be additional considerations regarding CCL usage during SCSI migration procedures. Please refer to your multiple-bus failover or server clustering documentation prior to implementation.

In addition, there may be OS-based limitations on SCSI-3 usage to consider, particularly in down-level versions of your OS. Please review your OS documentation prior to migration.

For more information, see the “*What is the Command Console LUN?*” and “*Assigning Unit Numbers Depending on SCSI\_VERSION*” sections of Chapter 1 in the *HSG80 ACS Solution Software Version 8.7 Installation and Configuration Guide*.

## Operating Constraints

This section describes the operating constraints for ACS Version 8.7. 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

StorageWorks 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 8.7 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 8.7 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 8.7P 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/O is 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 8.7 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.

## Adding, Moving, and Changing Devices

The array controller maintains a configuration map of device types and locations. 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 8.7 CLI Reference Guide* for details on CLI command usage and syntax.

See the *HSG80 Array Controller ACS Version 8.7 Maintenance and Service Guide* for correct device removal and addition procedures.

## Moving Storage Sets

Move only *normal* storage sets. Do not move storage sets that are *reconstructing* or have been *reduced*.



**CAUTION:** Ensure all storage sets are in *normal* mode prior to moving them, or data corruption will occur.

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## 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 8.7 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 8.7 Maintenance and Service Guide*.

## Unit Offsets

Setting unit offsets requires a host reboot for the newly set offsets to take effect.

## Host Operating System Notes

The following section identifies host specific operating notes.

### Host Operating System Support of Multiple-Bus Failover

Compaq Tru64 UNIX Version 5.1x has multiple-bus failover support built into the operating system, which takes advantage of the array controller's ability to support multiple-bus failover. Tru64 UNIX Version 4.0x does not support multiple-bus failover.

### Booting Compaq Tru64 UNIX from the Array

Compaq Tru64 UNIX Versions 5.1 and 5.1A support booting the operating system from the RAID Array.

### Command Console LUN

The array controller can provide a dedicated communications LUN called the CCL. The CCL can simplify the installation and operation of SWCC.

Because the CCL is enabled by default:

- For Version 4.0F, Tru64 UNIX will display an `rz` device when the `file` command is executed.
- For Versions 5.1 and 5.1A, when the controller is in SCSI-3 mode, the CCL is enabled and identifies itself as a controller type. A device special file for this type (`scp`) is created in the `/dev/cport` directory.

This logical device should be left intact for future installation of SWCC.

### TruClusters Controller Devices as Member Boot Disks

Alpha System Reference Manual (SRM) console firmware Version 5.7 or later must be installed on any cluster member that boots from a disk behind an array controller. If the cluster member is using Version 5.6 firmware or earlier, the member may fail to boot, indicating "Reservation Conflict" errors.

The latest Alpha SRM console firmware can be obtained from the following website:

<http://ftp.digital.com/pub/DEC/Alpha/firmware>

**NOTE:** Boot support for Fibre Channel disk devices on nonclustered Tru64 UNIX systems is fully supported with Alpha SRM console firmware Version 5.6.