

hp StorageWorks

Release Notes – HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.7A for Sun Solaris

Part Number: AA-RFBPL-TE

Eleventh Edition (April 2003)

Product Version: 8.7A

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 Notes content takes precedence.

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

<http://h18006.www1.hp.com/storage/index.html>



i n v e n t

© Copyright 1999-2003 Hewlett-Packard Development Company, L.P.

Hewlett-Packard Company makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

This document contains proprietary information, which is protected by copyright. No part of this document may be photocopied, reproduced, or translated into another language without the prior written consent of Hewlett-Packard. The information contained in this document is subject to change without notice.

Compaq, the Compaq logo, SANworks, StorageWorks, Tru64, and OpenVMS are trademarks of Compaq Information Technologies Group, L.P. in the U.S. and/or other countries.

Microsoft, MS-DOS, Windows, Windows NT, and Windows Server 2003 are trademarks of Microsoft Corporation in the U.S. and/or other countries.

All other product names mentioned herein may be trademarks of their respective companies.

Confidential computer software. Valid license from Compaq required for possession, use or copying. Consistent with FAR 12.211 and 12.212, Commercial Computer Software, Computer Software Documentation, and Technical Data for Commercial Items are licensed to the U.S. Government under vendor's standard commercial license.

Hewlett-Packard Company shall not be liable for technical or editorial errors or omissions contained herein. The information is provided "as is" without warranty of any kind and is subject to change without notice. The warranties for Hewlett-Packard Company products are set forth in the express limited warranty statements accompanying such products. Nothing herein should be construed as constituting an additional warranty.

Compaq service tool software, including associated documentation, is the property of and contains confidential technology of Compaq Computer Corporation or its affiliates. Service customer is hereby licensed to use the software only for activities directly relating to the delivery of, and only during the term of, the applicable services delivered by Compaq or its authorized service provider. Customer may not modify or reverse engineer, remove, or transfer the software or make the software or any resultant diagnosis or system management data available to other parties without Compaq's or its authorized service provider's consent. Upon termination of the services, customer will, at Compaq's or its service provider's option, destroy or return the software and associated documentation in its possession.

Printed in the U.S.A.

HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version
8.7A for Sun Solaris
Eleventh Edition (April 2003)
Part Number: AA-RFBPL-TE

Release Notes Contents

These Release Notes cover the following major topics:

- "Intended Audience", page 3
- "Conventions", page 4
- "Abbreviations and Acronyms", page 4
- "Release Package Contents", page 5
- "Important Notice Regarding Cache Sizes", page 6
- "Identifying ACS Revision Level", page 6
- "Patching ACS", page 7
- "Multiple Storage System Types", page 8
- "New Features", page 8
- "Modular Array Solutions", page 13
- "Hardware and Software Support", page 15
- "ACS Feature Support", page 25
- "Configuration Rules", page 30
- "SCSI-2 to SCSI-3 Migration", page 31
- "Operating Constraints", page 32
- "Saving Your Configuration", page 33
- "Avoiding Problem Situations", page 33
- "Host Operating System Notes", page 35
- "Documentation Anomalies", page 43

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 Differential
- **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 which includes:
 - *HSG80 ACS Solution Software Version 8.7 for Sun Solaris 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 8.7A for Sun Solaris Release Notes (this document)*

- HSG80 Modular Storage RAID Arrays Solution Software V8.7A for Sun Solaris CD-ROM
 - Installation and scripting utilities
 - SWCC Version 2.5 Agent and Client software
 - Device drivers

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

<http://h18006.www1.hp.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 need additional layered application software beyond this Solution Software Kit to take advantage of the added functionality of these versions. See "Layered Software Applications", page 25, for additional information on compatible layered application software.

ACS Version 8.7 is fully compatible with Version 8.7A Solution Software. In addition, Version 8.7A 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://h18000.www1.hp.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 multi-bus configurations, use the following procedure in addition to those provided with the ACS patch download:

1. Apply ACS patches to both controllers.
2. Move all units to `OTHER_CONTROLLER`, one unit at a time, using Secure Path software. Moving the units in this manner is not a requirement, but it lets the controller do less work than when moving all the units at once.
3. Reboot `THIS_CONTROLLER` during a slow time (when controllers are running at more than 50% idle). The patch takes effect once the controller is rebooted.

4. Repeat these steps for `OTHER_CONTROLLER` by moving all units to `THIS_CONTROLLER` and rebooting `OTHER_CONTROLLER` during a slow 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 frees 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 8.7A (includes SWCC Version 2.5) and VCS Version 2.0 compatible multi-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 multi-bus software/drivers.
- HSG80 ACS Version 8.6 and HSG80 ACS Version 8.7—Use ACS Solution Software Version 8.7A (includes SWCC Version 2.5).

NOTE: Any multiple storage system configuration that includes EVA VCS Version 2.0 requires multi-bus support. See "Secure Path Software", page 24, for compatible Secure Path versions. ACS Version 8.7 compatible Secure Path versions and HBA drivers are compatible with VCS Version 2.0.

New Features

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

New Features for 8.7A

The following is the major enhancement included in the 8.7A release of the Solution Software Kit.

- **SUN Solaris 9**—Added support for Sun Solaris 9 with Secure Path V3.0B.

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 were added to control the connection table in NVRAM. When the table is locked, the host login request is rejected (unless the connection is already in the table), and the request is 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 was implemented. It 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 is 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 were 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 8.7A release:

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

- SAN Switch 2/16 (16 Ports FC, 2 Gbps)
- SAN Switch 2/8-EL (8 Ports FC Entry Level, 2 Gbps)
- SAN Switch 2/16-EL (16 Ports FC Entry Level, 2 Gbps)
- SAN Switch 2/32 (32 Ports FC, 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 Director 2/140 (140 Ports FC, 2 Gbps)
- SAN Edge Switch 2/32 (32 Ports FC, 2 Gbps)
- SAN Edge Switch 2/16 (16 Ports FC, 2 Gbps)
- SAN Edge Switch 2/24 (24 Ports FC, 2 Gbps)

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

IMPORTANT: *StorageWorks* recommends that you do not mix switch firmware versions in your SAN. The best practice is to uniformly upgrade all switches in the SAN.

Solution Software Updates

The following improvements were made to your Solution Software:

- Solution Software Version 8.7A was qualified with ACS Version 8.7 and the components defined in these Release Notes.
- Added support for SUN Solaris 9 with Secure Path V3.0B.
- Expanded 4u architecture server listings to include SunFire 3800, 4800, 4810 and 6800, and added UE10000 server to the supported platforms list in Table 6.
- Discontinued support for 4m and 4d architecture servers.
- Added support for the following HBAs (FC-SW and 4u architectures only):
 - *StorageWorks* 64-bit, 1 Gbps PCI FC HBA 3R-A3512-AA (254457-B21)
 - *StorageWorks* 64-bit, 2 Gbps PCI FC HBA 3R-A3513-AA (254456-B21)
 - *StorageWorks* 64-bit, 1Gbps Sbus FC HBA 3R-A3514-AA (254458-B21)

- Discontinued support for *StorageWorks* 267728-001 64-bit cPCI FC HBA. Superseded by *StorageWorks* 64-bit, 1 Gbps cPCI FC HBA 3R-A3512-AA (254457-B21)
- Added support for Secure Path Version 3.0B software for all but the SWSA4-SB HBA.
- The Sun Solaris required patch list has been updated. See "Required Patches", page 22, for more information.

Documentation Updates

The following documentation changes were made in order to consolidate and reduce the number of documents associated with Version 8.7A 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 Sun Solaris Application Note*, Part Number: EK-FCALH-AA. B01

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

- A new section "Abbreviations and Acronyms", page 4 was added to define abbreviations and acronyms used in these Release Notes.
- A new section "Patching ACS", page 7, was added to clarify the process used to patch ACS.
- A new section "Multiple Storage System Types", page 8, was added to address basic configuration rules used in mixing different *StorageWorks* products in the same SAN.
- New "SCSI-2 to SCSI-3 Migration", page 31, information was added to assist customers who wish to extend the interoperability of their SAN.
- The section "Layered Software Applications", page 25, was updated.
- The section "Disk Device Support", page 16, was updated.
- The "Document Catalog" section and procedures were removed because electronic copy for Solution Software documentation is available exclusively from the *StorageWorks* website.

- The “HSG80 Device Removal and Replacement” section and procedures were moved from these Release Notes to the *HSG80 Array Controller ACS Version 8.7 Maintenance and Service Guide*.
- The “Solution Software Upgrade Procedures” section was moved from these Release Notes to the *HSG80 ACS Solution Software Version 8.7 Installation and Configuration Guide*.
- The “Installing with Automatic Mode” and “Installing with Manual Mode” sections and procedures have been moved from these Release Notes to the *HSG80 ACS Solution Software Version 8.7 Installation and Configuration Guide*.

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 |
| 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 to connect 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 | |
| | BD0186349B | | | 3B07 | |
| 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 |

Table 4: Supported Disk Drives (Continued)

| Option Part Number | Device/ Model | Capacity (GB) | Speed (RPM) | Minimum Microcode Version | Minimum Hardware Version |
|--------------------|---------------|---------------|-------------|---------------------------|--------------------------|
| 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 | 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 Ports FC, 1 Gbps) | 158222-B21 DS-DSGGB-AA | 2.6.0h |
| SAN Switch 16 (16 Ports FC, 1 Gbps) | 158223-B21 DS-DSGGB-AB | 2.6.0h |
| SAN Switch 8-EL (8 Ports FC Entry Level, 1 Gbps) | 176219-B21 DS-DSGGC-AA | 2.6.0h |
| SAN Switch 16-EL (16 Ports FC Entry Level, 1 Gbps) | 212776-B21 DS-DSGGC-AB | 2.6.0h |
| SAN Switch Integrated (32 Ports FC, 1 Gbps) | 230616-B21 DS-DSGGS-AA | 2.6.0h |
| SAN Switch Integrated 64 (64 Ports FC, 1 Gbps) | 230617-B21 DS-DSGGS-AB | 2.6.0h |
| SAN Switch 2/16 (16 Ports FC, 2 Gbps) | 240602-B21 DS-DSGGD-AA | 3.02k |
| SAN Switch 2/8-EL (8 Ports FC Entry Level, 2 Gbps) | 258707-B21 DS-DSGGD-AC | 3.02k |

Table 5: Fibre Channel Switch Support (Continued)

| | | |
|--|---------------------------|----------|
| SAN Switch 2/16-EL (16 Ports FC Entry Level, 2 Gbps) | 283056-B21 DS-DSGGD-AD | 3.02k |
| SAN Switch 2/32 (16 Ports FC, 2 Gbps) | 230616-B21 DS-DSGGS-AA | 4.0.2b |
| SAN Core Switch 2/64 (32-64s Ports FC, 2 Gbps) | 254508-B21 DS-DSGGE-AB | 4.0.2b |
| SAN Director 64 Switch (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 Switch (32-64 Ports FC, 2 Gbps) | 286809-B21 DS-DMGGD-BA | 02.00.00 |
| SAN Director 2/140 Switch (140 Ports FC, 2 Gbps) | 316093-B21 DS-DMGGD-CA | 04.01.02 |
| 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 |
| SAN Edge Switch 2/24 (24 Ports FC, 2 Gbps) | 316095-B21 DS-DMGGE-BD | 04.01.02 |

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://h18000.www1.hp.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) NOTE: 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 | 4u Architecture: 220, 420, 450, 3000, 3500, 4500, and UE10000 servers SunFire models: 3800, 4800, 4810, 6800, and UE15000 servers |
| Operating System | Sun Solaris 32-bit Mode: V2.6, V2.7 (Solaris 7), V2.8 (Solaris 8), V2.9 (Solaris 9) Sun Solaris 64-bit Mode: V2.7, V2.8, V2.9 Sun Clusters V2.2 Veritas Clusters V3.5 |
| Topology | Fibre Channel Switched (FC-SW) Fibre Channel Arbitrated Loop (FC-AL) |
| SCSI Protocol | SCSI-2 SCSI-3 |
| Failover Mode | Transparent Multi-Bus (requires Secure Path software) |
| Host Mode | SUN |
| Disk Space | 500 KB before any log files |
| Adapter Compatibility | StorageWorks 32-bit, 1 Gbps Sbus FC HBA (380575-001), HBA driver Version 2.5.9.03, Firmware Version 13.3.7 |
| | StorageWorks 64-bit, 1 Gbps Sbus FC HBA SWSA4-SC (123503-001), HBA driver Version 2.5.9.03, Firmware Version 13.3.7 |
| | StorageWorks 32-bit, 1 Gbps PCI FC HBA SWSA4-PC (380576-001), HBA driver Version 2.5.9.03, Firmware Version 3.0.3 (visual inspection only, not field upgradeable) |
| | StorageWorks 64-bit, 1 Gbps cPCI FC HBA 3R-A3512-AA (254457-B21), HBA driver Version 3.26, Firmware Version 2.2.1, F-Code Version 1.18.5 (FC-SW only) for Solaris 8, 9 only |
| | StorageWorks 64-bit, 2 Gbps PCI FC HBA 3R-A3513-AA (254456-B21), HBA driver Version 3.26, Firmware Version 3.1.2, F-Code Version 1.18.5 (FC-SW only) |
| | StorageWorks 64-bit, 1 Gbps Sbus FC HBA 3R-A3514-AA (254458-B21), HBA driver Version 3.26, Firmware Version 2.2.1, F-Code Version 1.18.3 (FC-SW only) |

Required Patches

This release of this Solution Software Kit was qualified with the following Sun Solaris patches installed:

IMPORTANT: Do not neglect the required patches. Your system will not function properly without them.

| Solaris Version | Patch Number | Patch Description |
|--------------------|--|---|
| 2.6 | 106226-01 105181-31 106125-08 105375-18 105356-10 105357-04 106429-02 105210-38 | format kernel patchadd Dynamic Reconfiguration Dynamic Reconfiguration Dynamic Reconfiguration kma/mm libc |
| 2.7 | 106541-16 107544-03 | kernel fsck |
| 2.7 (UE10000 only) | 107450-04 | gethostbyaddr |

| Solaris Version | Patch Number | Patch Description |
|--------------------|--|---|
| 2.8 | 108528-15 109793-07 110912-02 111293-04 110383-02 108827-10 111310-01 109279-18 109904-05 109742-04 109906-06 112396-02 108987-09 111111-03 | kernel su driver cfgadm libdevinfo libnvpair libthread libdhcagent mipagent mpathd multipathing ifconfig fgrep patchadd nawk |
| 2.8 (UE10000 only) | 110794-02 111049-02 | Dynamic Reconfiguration cvcd |
| 2.9 | 112233-03 112834-02 113277-05 | kernel scsi sd/ssd |

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, see the *Command Console Version 2.5 User Guide* and the *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: SWCC Agent Version 2.3.2, Build 79 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.

Secure Path Software

Secure Path is a high availability, multi-bus software application that supports FC-AL and 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 |
|--|----------------------------|
| Sun Solaris V2.6, V2.7, and V2.8 SWSA4-SC and SWSA4-PC HBAs | Version 2.1D, Version 3.0A |
| Sun Solaris V2.6, V2.7, and V2.8 3R-A351x-AA Series HBAs | Version 3.0A, 3.0B |
| Sun Solaris V2.9 3R-A351x-AA Series HBAs | Version 3.0B |

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

<http://h18006.www1.hp.com/products/sanworks/secure-path/index.html>

Layered Software Applications

Compatibility with *StorageWorks* layered software applications is defined in Table 8.

Table 8: 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 1.0B | 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 that 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://h18006.www1.hp.com/storage/software.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 is 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.

NOTE: Rolling upgrades are not supported on Sun Solaris when using 3R-A351x-AA HBAs.

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, Secure Path 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 having an impact on 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 since 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 in either of the following situations:

- The target is inaccessible.
- The initiator site data needs to be synchronized 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 that occurred 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 was 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 that occurred 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 storageset that was given a unit number. Another storageset 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.

The following section describes Dynamic Volume Expansion support on the Sun Solaris platform.

Requirements:

- ACS Version 8.7
- VERITAS File System, Version 3.5

Current limitations:

- Concatsets are not supported by the SWCC client. You must use the CLI to configure concatsets.
- A concatset may have only 1 or 2 members.
- If a concatset has 2 members, both members must be of the same storageset type.
- A mirrorset cannot be used in a concatset (not as an entity or in a striped mirrorset).
- The total number of disks in a concatset cannot exceed 24. For example, if a 14-member RAIDset exists, a 10 or less member RAIDset can be concatenated with it.
- Entities added to concatsets must be initialized (have a unit or initialize storageset command done).
- Concatsets cannot be partitioned, and a partitioned storageset cannot be used in a concatset.
- Once created, the only way to delete the concatset is to delete the unit that is on top of the concatset, then delete the concatset. An entity can be inserted into a concatset, but not removed.
- When going from a build that supports concatsets to a build that does not support a concatset, a shutdown must be done.
- A CLONE cannot be done on a concatset.

The following steps should be used to expand a concatset.

NOTE: The following steps assume the user has a good understanding of the VERITAS File System software product. See the VERITAS File System documentation for more information.



CAUTION: This procedure only works with VERITAS File System Version 3.5. Do not attempt it without the VERITAS File System software, or data loss will result.

1. Assume the user has an existing RAIDset (R1) that has a VERITAS File System (vxfs) on it. The RAIDset, R1, should be a member of a concatset (assume C1).
2. Perform a complete system backup.
3. To check the size of the file system, type the following command:

```
# df -F vxfs
```

4. Stop I/O, and unmount the file system by typing the following command:

```
# umount /mnt/test
```

NOTE: Your directory name will be different.

5. Now that the unit is unmounted, you can use the following CLI command to expand the storageset:

```
HSG80> set C1 add=R2
```

This will add RAIDset R2 into the concatset consisting of R1. The size of C1 is now R1 + R2, without affecting the existing data on C1.

6. Now you must run the `format` command to update the unit's VTOC (label). Perform the following steps:
 - a. Run `format`.
 - b. Select the unit that you just expanded.
 - c. Select type to update the unit's logical geometry.
 - d. Select option 0 to auto configure the unit's logical geometry.
 - e. Select label to write the new label (with updated logical geometry) to the unit.
 - f. Exit the format program.
7. Remount the file system by typing the following command:

```
# mount -F vxfs /dev/dsk/c4t65d0s0 /mnt/test
```

NOTE: Your device name and directory will be different.

8. Now use the VERITAS `fsadm` command to expand the size of the file system.

```
# /usr/lib/fs/vxfs/fsadm -F vxfs -b 141083136 /mnt
```

NOTE: Your number of blocks will vary. The number of blocks that was detected by the `format` command in step number 6 (less diagnostic tracks) is available on the partition table.

9. The file system is now expanded. Type the following command to verify:

```
# df -F vxfs
```

Dynamic Disks

The use of SNAPSHOTs and SNAPCLONEs in HP SANs is not supported in a Windows 2000 environment if the SNAPSHOT or SNAPCLONE is presented to the same Windows 2000 host as the LUN from which the SNAPSHOT or SNAPCLONE was created. SNAPSHOTs and SNAPCLONEs are features of the HSG80 and HSV110 controller based HP Storage systems. All Dynamic disks on a system have information in their metadata about the other dynamic disks that exist on the system. When Windows is presented with 2 dynamic disks that have the same information on them, it does not have code to resolve the conflict.

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 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)

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 allows 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 needs 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 that all redundant storagesets are in normal (non-reduced) mode.

When migrating from SCSI-2 to SCSI-3, the controller checks for controller unit D0 and does not change modes until D0 (at all presented offsets) is deleted. One or more LUNs are 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 requires that the data be moved to a different LUN. It may be necessary to retrieve this data from a backup.

IMPORTANT: If multi-bus failover configurations or server clustering are employed in the environment, there may be additional considerations regarding CCL usage during SCSI migration procedures. Please see your multi-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 prevents 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 are restarted.

Using FRUTIL to Insert a New Controller

When using FRUTIL to insert a new controller in a dual-redundant controller configuration, you see a new set of instructions after the new controller was 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.

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

If the host load was 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 is 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 is not 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` command. To replace a controller and restore the configuration from a disk, you do 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 was 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 correctly removes the failed device and adds 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 StorageSets

Move only *normal* storageSets. Do not move storageSets that are *reconstructing* or were *reduced*.



CAUTION: Ensure all storageSets are in *normal* mode prior to moving them, or data corruption occurs.

Replacing 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 reconfiguration reboot (`reboot -r`) for the newly set offsets to take effect.

Host Operating System Notes

The following section lists host-specific operating notes.

Host Operating System Support of Multi-Bus Failover

Multi-bus failover is supported on the Sun Solaris operating system through the use of Secure Path software. See "Secure Path Software", page 24, for version compatibility and restrictions.

Solution Software Uninstall in Multi-Bus Configurations

When uninstalling the Solution Software Kit (CPQfcraid) from systems configured with 3R-A351x-AA Series HBAs and Secure Path, *StorageWorks* recommends that you also uninstall all 3R-A351x-AA Series HBA drivers in use, which will allow Secure Path to correctly rediscover units.

SCSI-3 Mode

Version 8.7A Solution Software supports connections using SCSI-3 mode. A SCSI generic driver is not supplied, so the CCL LUNs are ignored. The Solaris server loses the ability to use two LUNs (D0 and D100). Any Agent connections to the storage system must be done using an active LUN, not the CCL. To avoid this, use SCSI-2 mode with the CCL disabled.

Host Function

The default operating system value for a connection is WINNT. For proper operation, please change this to SUN by using the following CLI command (example is given for the connection named !NEWCON01):

```
HSG80> SET !NEWCON01 OPERATING_SYSTEM=SUN
```

Dynamic Reconfiguration

Dynamic Reconfiguration is supported by the included HBA drivers.

A Storage System Name Cannot Use a Pipe Character

When adding a storage system, do not use the pipe character (|) in the name.

Installation Script May Not Correctly Modify the /etc/nsswitch.conf File In NIS Configurations

If you are using NIS, make sure that your services entry in /etc/nsswitch.conf looks like this:

```
services: files nis
```

This will ensure the edits made to the /etc/services file will be used.

Maximum Supported Stageset Size

With this release, Solaris can support stagesets up to 1.024 TB with the following limitations:

- You cannot enter the LUN logical geometry manually; it must be sensed by format automatically. LUNs configured manually are still limited to 256 GB. You must limit the number of sectors/track to 255 and the number of heads to 128 when the LUN is initialized. In other words, you will have to use the CLI to create and initialize LUNS to ensure that these limits are observed. Type the command:

```
initialize <container> heads = 128 sectors_per_track = 255
```

- If you are using Solaris 2.6, you must have patch # 106226-01 loaded, or format will dump core.

Per-Instance Device Configuration

By default, all instances of a driver for a particular adapter type are configured in the same mode (FC-SW or FC-AL) depending on the mode selected during driver installation.

If you must configure different adapter instances in different modes, you may select Option 20 of `config.sh` to change the mode for a specific adapter instance.

Large SAN Considerations

If you are having problems seeing LUNs, typically on a large SAN, increase the value of `scsi_probe_delay`. A value of 3000ms for a UE10000 is recommended. A greater number of storage systems may require a larger number for `scsi_probe_delay`.

To change `scsi_probe_delay` values, the following configuration files (depending on bus architecture), found in the `/kernel/drv` directory, should be edited:

```
32-bit Sbus: fca.conf
64-bit Sbus: fcaw.conf
64-bit Sbus/CPCI: qla2200.conf
32-bit PCI Bus: fca-pci.conf
64-bit PCI Bus: qla2300.conf
```

Messages on Console After Driver Initializes

You may see messages similar to the following on the console after the driver initializes:

```
/kernel/drv/fca symbol ddi_model_convert_from multiply defined
NOTICE: fca_transparent: utsname.release: 5.6
```

These messages can be safely ignored. They are removed in a future release.

Required Patches

Do not omit the required patches (see "System Components", page 20, of these Release Notes). These patches are required for proper operation of your RAID Array.

The installation program (`install_stgwks`) checks that you have the required patches loaded and notifies you if any are missing. If any patches are missing, the installation lists all required patches, not just the missing ones.

Type the following command to list the patches already installed on your system:

```
# showrev -p
```

Minimum System Memory Requirements

Because of the increased functionality and performance of the 2.5.9.x drivers, the Sun server memory requirements have increased. A minimum of 256 MB of memory is required in the Sun server before loading the FC adapter drivers.

Maximum Supported HBAs per System Board

For Sun Enterprise machines (including E3000, E3500, E4500), the maximum number of adapters that may be installed in any sbus I/O tray is two. The maximum number of I/O trays is limited only by the system expandability.

Number of Supported LUNs

This release of *StorageWorks* Solution Software adds support for 16 LUNs per port/Target. This should be adequate for most installations.

However, the array controller and Solaris can support up to 64 LUNs per port/Target. If your environment requires more than 16 LUNs/Target, you may perform the following work-around, keeping the following items in mind:

- Make sure that all the required patches are loaded.
 - You may need to adjust the `sd_max_throttle` setting in `/etc/system`.
 - SWCC has not been tested, and is not supported with more than 32 LUNs.
 - See the `driver.conf(4)` and `sd(7D)` man pages for more information.
1. Run `config.sh` and choose Option **20**; Add/change adapters.
 2. Choose Option **4**; Modify an adapter.
 3. Select the adapter that you want to modify.
 4. Follow the instructions to modify the number of LUNs/Target.
NOTE: Do not enter more than 64.
 5. Create your LUNs on the array controller. If you are working in transparent mode, units 0–99 appear on port 1 (`al_pa=72`, `target=64`), and units 100–199 appear on port 2 (`al_pa=71`, `target=65`). If you are working in multi-bus mode, units 0-199 are visible on both ports.

6. Shut down and do a reconfigure boot (`boot -r`), and your new units should be ready for formatting.

sd_max_throttle Setting in /etc/system

Solaris defaults to a queue depth of 256 tagged commands per LUN, but it only recognizes LUN 0 on each target. The *StorageWorks* RAID Manager software adds support for 16 LUNs per target, but Solaris still allows 256 queued commands per LUN. With 32 LUNs mounted, you can have over 8000 outstanding queued requests, but the controller only supports 256 queued commands per port.

The solution is to restrict the maximum queue depth by setting `sd_max_throttle` in the `/etc/system` file. The Solution Software has already throttled the queue depth back to 32 during the installation. This works fine for most environments. If you are doing heavy I/O to 16 or more LUNs, you need to set `sd_max_throttle` even lower. Edit your `/etc/system` file, and change the `sd_max_throttle` entry in the CPQfcraid section. You must shutdown and reboot for the changes to take effect.

Set `sd_max_throttle` so that the number of active LUNs on the port times `sd_max_throttle` is less than or equal to 256 (the maximum number of queued requests for the port). For example, 16 busy LUNs on a port requires a `sd_max_throttle` setting of 16 ($256/16 = 16$).

For more information, see the *system* (4) and *sd* (7D) man pages.

Manually Specifying Logical Geometry for a Large Storageset

There are two ways to configure a LUN's logical geometry:

- **Automatic Mode:** This is the preferred method. Storagesets up to 1.024 TB can be configured this way.
- **Manual Mode:** When using manual mode, maximum values are smaller, which reduces maximum LUN size to 256 GB. If you prefer to use manual mode, it is documented below.

The Solaris `format` command is used to label and partition a storageset before a file system can be created on it. For large storagesets with a high number of large disks, the controller may specify a geometry that exceeds the parameters supported by the `format` command. The maximum values supported by Solaris (when manually configuring geometry) are:

- 32767 cylinders (including 2 alternate cylinders)
- 64 heads

- 256 sectors per track

The symptoms of exceeding these maximums will vary.

Exceeding 64 heads causes **newfs** to abort with the following error message:

```
There is no block size that can support this disk
```

Exceeding 32767 cylinders causes format to report an incorrect size (much higher or lower than the actual size of the storageset).

To properly configure a storageset where the logical geometry exceeds these values, follow these steps:

1. Get the size of the storageset by performing a `SHOW` on the unit from the CLI on the array controller (e.g. `SHOW D100`). This results in a display with the following format:

```
LUN                                     Uses
-----
D100                                     S0

LUN ID:6000-1FE1-0000-13E0-0009-8090-0624-0147

NOIDENTIFIER
Switches:

RUN          NOWRITE_PROTECT READ_CACHE
READAHEAD_CACHE      WRITEBACK_CACHE
MAXIMUM_CACHED_TRANSFER_SIZE = 2048
Access: ALL

State: ONLINE to this controller
Not reserved
Size: 248768478 blocks
Geometry (C/H/S): ( 73601 / 20 / 169 )
```

2. Record your results. Your actual numbers vary depending on the exact size of your storageset. The values given represent the number of data cylinders (cyl), the number of heads (hd), and the number of sectors per track (sec).

NOTE: In the above example, the Solaris `format` command reports the cylinder count (cyl + alt) as 8065, giving a much smaller total block count for the above storageset.

3. Make your calculations. The goal of the calculation process is to ensure that all parameters end up in the valid ranges specified earlier in this section. Throughout the calculation, the total number of blocks should remain constant or as close to the original value without exceeding it. This is achieved by dividing one value

(e.g. cylinders) by the same amount as one of the other values (e.g. heads) is multiplied. In this example, we divide the number of cylinders and multiply the number of heads by the same value: 3. This results in the following values:

- 24533 cylinders
 - 60 heads
 - 169 sectors per track
4. At this point, allocate the alternate cylinders (2) from the total number of cylinders to get the following values:
- 24531 data cylinders
 - 2 alternate cylinders
 - 60 heads
 - 169 sectors per track

Write down the above data and proceed with the next step.

5. Using the `format` utility, reconfigure your storageset's logical geometry.
- From the **main** menu, select the storageset.
 - From the **type** menu, select **other**.
 - Enter the new number of data cylinders, heads, and sectors when prompted. Press **return**, to take the default, for **all** other questions.
 - Use the `partition` command to create the desired partition table layout.
 - Use the `label` command to write the new geometry to the storageset.

Upon completing the above process, you are now able to use the `newfs` command to create file systems on the partitions you have created.

Using the “fsck” Utility on Large Storagesets

When attempting to `fsck` a large storageset, you may get the following error:

```
Cannot alloc 115667202 bytes for aclinop
```

The actual number is irrelevant. This error means that your system does not have enough virtual memory to `fsck` a large device. This is a known problem with `fsck`.

The solution is to add swap space with the `swap -a` command. *StorageWorks* testing has shown that up to 500 MB of free memory is required to run `fsck` on a 120 GB storageset.

Booting Under Solaris

Booting under Solaris using the array controller has not been tested and is not supported.

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, but it can cause some issues under Solaris. During booting, you receive a *corrupt label - bad magic number* error because Solaris “sees” the CCL as a 320 MB read-only disk. This message is just a warning and can be ignored. You may disable the CCL if desired, but remember that it may be used by the SWCC Agent for communications with the controller. Make sure that you have configured another LUN for communication before deleting the CCL.

Setting maxcontig and rotdelay for File Systems

The overall performance of your configuration can be affected by your choice of `maxcontig` and `rotdelay` values. The `maxcontig` value specifies the maximum number of contiguous blocks that are written before inserting a rotational delay. The `rotdelay` value specifies the time (in milliseconds) of the rotational delay.

StorageWorks recommends that for optimal performance the `rotdelay` always be set to 0.

The `maxcontig` value depends somewhat on the number of units that are active in your controller configuration. In *StorageWorks* testing, values of 128 and 256 blocks have worked very well. Your exact value depends on the number of storagesets in use. If your system is reporting excessive numbers of warnings (`ddi_iopb_alloc failed` or `fca_dma_zalloc failed`) your value may be too high.

Both the `maxcontig` and `rotdelay` values can be set at the time of file system creation with `newfs` flags, or they can be modified at a later time using `tunefs`. When using `tunefs`, the file system must be unmounted. See the `newfs(1M)` and `tunefs(1M)` man pages for further details.

Driver Messages

The driver initialization message may reference Solaris Versions 2.5 and 2.6. This message is incorrect and should be ignored. See "System Components", page 20, for supported O/S levels.

Documentation Anomalies

The following are known additions and corrections to documentation or components found on the Solution Software CD-ROM.

- All references to Sparc 10 and Sparc 20 servers in the readme files are not valid since these servers are no longer supported.