

hp StorageWorks

Release Notes – HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.7 for Windows NT and Windows 2000

Part Number: AA-RH0QJ-TE

Ninth 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 Windows NT and Windows 2000
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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
- **MSCS** — Microsoft Cluster Server
- **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 Windows NT and Windows 2000 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 Windows NT and Windows 2000 Release Notes (this document)
- HSG80 Modular Storage RAID Arrays Solution Software V8.7 for Windows NT and Windows 2000 on Proliant & X86 Platforms 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://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 24, 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. Move all units to the `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 lull time (when controllers are running at more than 50% idle). The patch will take effect once the controller is rebooted.
4. 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. See the "Secure Path Software" Section, 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 this Version 8.7 release of the Solution Software, together with the array controller running ACS Version 8.7.

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 20, 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.
- Upgraded HBA drivers for Windows NT and Windows 2000 to Version 4-4.81a9 and Version 5-4.81a9, respectively.
- Upgraded StorageWorks DS-KGPSA-CB HBA firmware to Version 3.82a1, BIOS Version 1.60a5.
- Added support for the StorageWorks 64-bit, 2 Gbps PCI FC HBA 3R-A3515-AA (245299-B21)
- Discontinued support for StorageWorks DS-KGPSA-BC PCI FC HBA.
- Added support for Windows 2000 Service Pack 2 and Service Pack 3.
- Added support for Secure Path Version 4.0 software.
- Windows 2000 Datacenter support is not included in this release because of lengthier certification requirements for Datacenter solutions.

Upon certification, Solution Software Version 8.7 for Windows 2000 Datacenter and its associated documentation will be made available.

- The Solution Software installation program can now perform silent installations, which automates the installation process. See the *HSG80 ACS Solution Software Version 8.7 Installation and Configuration Guide* for more information.
- The Fibre Channel Software Setup included with this Solution Software Kit automatically corrects ResetTPRLO parameter by setting it to a value of 1. See the "ResetTPRLO Parameter in Windows Environments" Section, page 37, for detailed information.
- The Solution Software now provides a Component Identifier program, which gives the user a quick method for identifying storage components. See the *HSG80 ACS Solution Software Version 8.7 Installation and Configuration Guide* for more information.

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 notes:
 - *Enterprise/Modular Storage RAID Array FC-AL HA Configurations for Windows NT/Windows 2000 - Intel Application Note*, Part Number: AA-RHOSE-TE
 - *Enterprise/Modular Storage RAID Array FC-AL Configurations for Windows NT/Windows 2000 Application Note*, Part Number: AA-RHORC-TE
- The following documents have been incorporated into the *HSG80 ACS Solution Software Version 8.7 Installation and Configuration Guide*:
 - Enterprise/Modular Storage RAID Array Fibre Channel Cluster for Windows NT/Windows 2000 Installation Guide
 - Installing the Integration Patch for Compaq Insight Manager and ACS Version 8.6 or Later
- The following Datacenter documents are not included because of lengthier certification requirements for Datacenter solutions.

- HSG80 ACS Solution Software Version 8.7 for Windows 2000 Datacenter Installation and Configuration Guide
- HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.7 for Windows 2000 Datacenter Release Notes

Upon certification, Solution Software Version 8.7 for Windows 2000 Datacenter and its associated documentation will be made available.

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 24, has been updated.
- The "Disk Device Support" Section, page 17, 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.

IMPORTANT: All new Universal SCSI disk drives sold by StorageWorks come with an 8 MB EISA style partition at the start of the disk. This includes new StorageWorks SBB drives, which contain the basic universal disk drive brick internally. The EISA partition, when left on the media, is presented to a host at the storage unit level by the HSG80 storage system. Some hosts and applications may misinterpret this information. In order to resolve this potential issue, approximately 8 MB needs to be erased from the beginning of the disk. See the "Windows NT Specific Notes" Section, page 35, for details.

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) 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 | Intel and ProLiant X86 Servers |
| Operating System | Microsoft Windows NT 4.0, Service Pack 6A Microsoft Windows 2000, Service Pack 2 and Service Pack 3 Microsoft Cluster Server |

Table 6: Minimum System Requirements (Continued)

| | |
|-----------------------|--|
| Topology | Fibre Channel Switched (FC-SW) Fibre Channel Arbitrated Loop (FC-AL) |
| SCSI Protocol | SCSI-2 SCSI-3 (recommended) |
| Failover Mode | Transparent Multiple-Bus (requires Secure Path software) |
| Host Mode | WINNT |
| Disk Space | 5 MB |
| Adapter Compatibility | StorageWorks 64-bit, 1 Gbps PCI FC HBA DS-KGPSA-CB (176479-B21), HBA driver V4-4.81a9 (NT) or V5-4.81a9 (W2K), Firmware Version 3.82a1/BIOS Version 1.60a5 |
| | StorageWorks 64-bit, 2 Gbps PCI FC HBA 3R-A3515-AA (245299-B21), HBA driver V4-4.81a9 (NT) or V5-4.81a9 (W2K), Firmware Version 3.82a1/BIOS Version 1.60a5 |

Notes

- HsxDisk.sys and HszDisk.sys are required drivers for array controller configurations. The Solution Software CD-ROM that came with your kit includes the following versions of these drivers:
 - HszDisk.sys Version 4.4.0.9 for Windows NT 4.0
 - HsxDisk.sys Version 5.4.21 for Windows 2000
- HS_Service records system errors used in conjunction with remote diagnostics services provided through Proactive Services software.
- If you see a constantly blinking light on your Fibre Channel Switch, the topology setting may be set to arbitrated loop mode on your server. To correct this, remove the existing installation of the Fibre Channel Software and reinstall the desired setup.

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.

SWCC Client Installation

The SWCC Client software is installed on your host system from the StorageWorks Solution Software CD-ROM.

1. Insert the Solution Software CD-ROM into the host system. A menu appears on your screen.
2. If the program does not start automatically after inserting the CD-ROM, go to the CD-ROM drive directory and run the `launch.exe` file.

3. The installation program provides one primary option: Solution Software V8.7 for Windows NT/2000.
 - a. If you are just installing SWCC, skip the driver upgrade screen.
 - b. Select SWCC to install.
 - c. Choose “HSG80ACS85 Controller for ACS85 new” and complete the installation as prompted.

Secure Path Software

Secure Path is a high availability, multiple-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 |
|-----------------------------------|--|
| Windows NT 4.0 Service Pack 6A | Version 2.2.2 Version 3.1A Service Pack 1 |
| Windows 2000 Service Pack 2 and 3 | Version 3.1A Service Pack 1 Version 4.0 |

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

<http://www.compaq.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 1.0 | Version 8.7F/S/P |

Table 8: Layered Application Compatibility (Continued)

| | | |
|-----------------------------|--------------|--------------------|
| Virtual Replicator | Version 3.0A | Version 8.7F |
| 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

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, 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, with the following exception.

Due to a feature in the Microsoft Windows 2000 Device discovery code/Plug and Play detection code, a shutdown upgrade is required for any upgrade to EMA/MA storage systems running ACS. Rolling upgrades to adjacent ACS versions (v8.6x to v8.7x) and functionality versions (v8.7F to v8.7S) are not currently supported while Windows 2000 hosts are running.

This rolling upgrade restriction is limited to the Windows 2000 host environments only. Windows NT supports rolling upgrades between adjacent and functional versions of ACS.

Follow these steps to upgrade ACS Version 8.6 to ACS Version 8.7:

1. Perform backups of data prior to upgrading.
2. Shut down the Windows 2000 hosts.
3. Upgrade Switch firmware, if required.

For details about Fibre Channel switch support, see the "Switch Support" Section, page 20.

4. Install the PCMCIA cards containing ACS v8.7.
5. Restart the Windows 2000 hosts.
6. Update the Fibre Channel HBA driver, if required.

For details about Fibre Channel HBA support, see the "System Components" Section, page 21.

7. Install the Fibre Channel software from the HSG80 Solution Software Kit v8.7 for Windows NT/2000.

If upgrading to a configuration that uses Secure Path software, upgrade Secure Path to a supported version. See the "Secure Path Software" Section, page 24, for supported Secure Path versions.

8. Reboot the Windows 2000 hosts.

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 storageset that has been 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.

Configuration Rules

The following list defines maximum configuration rules for the controller:

- 128 visible LUNs/200 assignable unit numbers
 - In SCSI-2 mode, the CCL is disabled, resulting in 128 visible LUNs.
 - In SCSI-3 mode, the CCL is enabled, resulting in 127 visible LUNs and one CCL.
- 1.024 TB storageset size
- 96 host connections

- 84 physical devices
- 20 RAID 3/5 storagesets
- 30 RAID 3/5 and RAID 1 storagesets (see Note)
- 45 RAID 3/5, RAID 1, and RAID 0 storagesets (see Note)

NOTE: For the previous two storageset configurations, this is a combined maximum, limited to no more than 20 RAID 3/5 storagesets.

- 8 partitions of a storageset or individual disk
- 6 physical devices per RAID 1 storageset (mirrorset)
- 14 physical devices per RAID 3/5 storageset (RAIDset)
- 24 physical devices per RAID 0 storageset (stripeset)
- 45 physical devices per RAID 0+1 storageset (striped mirrorset)

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 storagesets 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.

SAN Boot Procedures

Booting from the SAN is supported for Windows NT or Windows 2000. SAN Boot Procedures are available on the StorageWorks website.

<http://www.compaq.com/products/storageworks/san/documentation.html>

File System Limitations

Table 9 describes known limitations that certain file systems have regarding storage unit size.

Table 9: File System Storage Unit Limitation

| Disk Size | Storageset Configuration | Operating and File System |
|-----------|--------------------------|--|
| 4 GB | Any | Windows NT4.0 /Windows 2000 FAT File System |
| 16 TB | Any | Windows NT 4.0/Windows 2000 NTFS File System |

PVA Switch Setting

After installing the EMU in each cabinet, ensure that the SCSI ID number on the PVA is set according to Table 10 (BA370 Enclosures only).

Table 10: SCSI ID Number on the PVA

| Cabinet | PVA SCSI ID Setting |
|----------------------------|---------------------|
| Master enclosure | 0 |
| First expansion enclosure | 2 |
| Second expansion enclosure | 3 |

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 StorageSets

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



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

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 affect.

SWCC SCSI Connection

The SWCC Client SCSI connection can sometimes produce the following error popup when trying to connect through the CCL:

```
Error scanning subsystem. Command Execution Error: [DeviceIOControl  
Error: ]
```

Additionally, physical devices may not appear in the Select Device dropdown list. The SWCC CLI Window will terminate if the New Window icon is selected, or if New is selected from the File Menu, followed by clicking the **Cancel** button on the Connection Selection dialog box. If the connection becomes lost, restart the Client application.

Therefore, StorageWorks strongly recommends that you use the SWCC Agent to manage the storage system.

Host Operating System Notes

The following section identifies host specific operating notes.

Host Operating System Support of Multiple-Bus Failover

Multiple-bus failover is supported on the Windows NT and Windows 2000 operating system through the use of Secure Path software. See "Secure Path Software" Section, page 24, for version compatibility and restrictions.

Windows NT and Windows 2000

- Both Windows NT and Windows 2000 can run MSCS software. Refer to documents that come with Microsoft's software kits for instructions in setting up Microsoft Clusters.

- There is no Hot Plug support for FC HBAs under Windows NT 4.0 or Windows 2000 at this time. Check the StorageWorks Support web page for updates.
- Windows NT and Windows 2000 support SCSI-2 and SCSI-3 modes. Refer to the *HSG80 ACS Solution Software Version 8.7 Installation and Configuration Guide* that comes with this kit for more information.
- StorageWorks recommends that you load software directly from the Solution Software CD-ROM when installing drivers and running the Fibre Channel Setup Utility. You may experience problems on some systems if you first copy the CD-ROM contents to a disk drive and install from there.
- Windows 2000 dynamic volumes are supported in transparent failover configurations or in Secure Path Version 4.0 multiple-bus configurations.
- Cloning a Windows 2000 dynamic disk is allowed but the CLONE or original can be mounted, but not both to the same host.

Windows NT Specific Notes

- Fibre Channel software setup handles HszDisk and HS_Service installation. This is sometimes referred to as HSZinstall in the documentation.

IMPORTANT: Do not use the Large LUN model with Windows NT Service Pack 5 under any circumstances. Windows NT Service Pack 6A is the stated minimum for this Solution Software.
- In a situation where you are replacing a server with another and using the existing drives (storagesets) behind the array controllers, you may find drive to drive letter mapping changes. During such a system changeover, remap drives to drive letters using the Disk Administrator to restore proper access to your data.
- To delete the 8 MB EISA-type partition on new disk drives, as discussed in the "Disk Device Support" Section, page 17, create a unit and delete the partition in Disk Administrator.

Windows 2000 Specific Notes

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

- The Fibre Channel Setup Utility installs HS_Service and HsxDisk software components. These are similar to HS_Service and HszDisk in the Windows NT setup procedure.
- There are two situations where you may experience drive letter remapping. This could affect access to data by programs you may need to run. The first situation is one where you replace one server with another. The second is a situation in which you simply replace an FC HBA in one of your systems. During such a system or adapter changeover, be sure to manually remap drives to drive letters using the Disk Management. This will restore proper access to your data.
- If you replace an FC HBA in a server, you will need to reinstall the HBA driver and then rerun the Fibre Channel Setup Utility. The reason for this is that Windows 2000 may automatically reload the original driver for this adapter and reset many of the important registry settings. New connections are created on the HSG controller. Those connections should be renamed and assigned to the appropriate units.

For more information about installing the adapter, refer to the *HSG80 ACS Solution Software Version 8.7 Installation and Configuration Guide* and use the software on the Solution Software CD-ROM.

Upgrading from Windows NT 4.0 to Windows 2000

If you are upgrading from Windows NT 4.0 to Windows 2000, you must remove the software components installed by the previous version of the Fibre Channel Setup Utility. The steps are as follows:

1. Remove the software components installed from the previous Fibre Channel Setup Utility. To do this, locate the previous CD-ROM and run the utility. Follow the procedures in it to remove components. Alternately, you can use the **Add/Remove Programs** applet.
2. Upgrade from Windows NT 4.0 to Windows 2000 as instructed by Microsoft's documentation.
3. Reboot.
4. Install the HBA driver upgrade as instructed in the *HSG80 ACS Solution Software Version 8.7 Installation and Configuration Guide*.
5. Run the Fibre Channel Setup Utility to complete your installation.

ResetTPRLO Parameter in Windows Environments

All Windows SAN installations require the ResetTPRLO (Third Party Logout Extended Link Service) HBA driver parameter be set to a value of 1. When HBA driver Version x-4.53a7 or higher is installed, this parameter must be changed from the default value, which is set to 0.

For HBA driver versions above Version x-4.53a7, this value is set automatically by the Fibre Channel Software Setup included in this release of Solution Software.

For HBA driver Version x-4.53a7, this parameter must be set manually. For all Windows configurations using this driver version, verify that the ResetTPRLO HBA driver parameter is set to 1 by using the LPUTILNT utility. Use the following procedure:

1. Launch LPUTILNT and select the first HBA.
2. Select **Driver Parameters** from the Category pane.
3. Select the **Parameters** button.
4. Scroll down and double click **ResetTPRLO**.
5. Set the value to **1**
6. Select **Permanent** and **Global**.
7. Click the **Change** button.

You will need to do this for each HBA using Version x-4.53a7 drivers in the system. A Windows restart is NOT required after the registry modification when this method is used. This parameter is dynamic.

Refer to Customer Advisory OI020510_CW0x for additional information.

Registry Growth in Windows

The Windows Plug-and-Play architecture has a limitation on the number of plug-and-play device entries that can be added to the registry. Whenever devices are added or removed, or SNAPSHOTs created or deleted, entries are added to the registry by the Plug-and-Play manager, potentially causing the registry to grow beyond the allowed capacity.

If more than 700 entries are in the registry, the next time the system reboots for any reason, the following error message occurs before the operating system boots up:

```
"Failed to load Windows 2000 due to a file missing or corrupt in the
\WINNT\SYSTEM32\CONFIG\SYSTEM directory."
```

Please refer to the Microsoft Knowledge Base article (Q269075), which provides more information about the registry growth problem.

Large LUNs for Windows NT and Windows 2000

Enabling Large LUNs provides the ability for a Windows NT or Windows 2000 server to have access to LUNs beyond the 0-7 range, and to access more than 8 LUNs per target. The host can access unit D10 by leaving the connection offset at 0.

The maximum number of LUNs supported is 128 per storage system. If using Secure Path Version 3.1A SP1, the maximum number of LUNs is 64 per storage system. If using Secure Path Version 4.0, the maximum number of LUNs is 128 per storage system. The LUNs can be contiguous or non contiguous.

NOTE: Large LUNs are supported on Windows NT, Windows 2000 Server, and Windows 2000 Advanced Server.

Large LUN Utility for Windows

The Large LUN utility is available for download at the StorageWorks website:

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

NOTE: The Large LUN utility is provided, but unnecessary if ACS Version 8.6 or higher is running alone, or in conjunction with Secure Path software, which has built-in support.

Controller Configuration

StorageWorks recommends to set the SCSI_VERSION to SCSI-3 for maximum availability.

- Multiple-bus failover mode (with Secure Path Version 3.1A SP1) — Support for 64 LUNs per storage system (SCSI-2 mode) or 63 LUNs + 1 CCL (SCSI-3). These LUN numbers must be numbered between 0-63.
- Multiple-bus failover mode (with Secure Path Version 4.0) — Support for 128 LUNs per storage system (SCSI-2 mode) or 127 LUNs + 1 CCL (SCSI-3). These LUN numbers must be numbered between 0-199.
- Transparent failover mode — Support for 128 LUNs per storage system (SCSI-2 mode) or 127 LUNs + 1 CCL (SCSI-3). These LUN numbers can range between 0-199.

The chart below indicates which cases Large LUNs are enabled.

| | ACS Version 8.5 | | ACS Version 8.6/8.7 | |
|-----------------------------|-----------------|-------|---------------------|-------|
| | WNT | W2000 | WNT | W2000 |
| SCSI-2 LUN 0 present | Y | Y | Y | Y |
| SCSI-2 LUN 0 not present | N | N | N | Y |
| SCSI-3 LUN 0 always present | Y | Y | Y | Y |

Y = functional

N = not functional

Known Limitations

In Windows 2000, if any LUN greater than 7 is removed and a subsequent disk rescan is performed, the "Found New Hardware" wizard may ask you to finish the installation of the device that was removed. The Device Manager may show the device with a yellow warning icon on it. A reboot of the system will completely remove the device.

KGPSA Popup Message with Driver Update Utility

When running the driver update utility, you may see a popup message that says "Digital Signature Not Found." Click "yes" to continue the installation.

The digital signature for the driver is there and the driver will install correctly.

You can verify this digital signature by going to:

Control Panel -> Administrative Tools -> Computer Management ->
Device Manager -> SCSI and RAID Controllers

Right click on the Compaq KGPSA-xx, PCI-Fibre Channel HBA (with adjunct driver), select properties, select the driver tab and you can see the "Digital Signer:" section which includes "Microsoft Windows Hardware Compatibility Publ." This "Digital Signer:" section verifies that a digital signature was found for the specified driver.

Documentation Anomalies

The following are known additions and corrections to the *HSG80 ACS Solution Software Version 8.7 Installation and Configuration Guide*.

- In order to successfully perform a rolling upgrade on controllers connected to Windows 2000 hosts, a change to the “Solution Software Upgrade Procedures,” found on page 3-24, must be observed. See the "Rolling Upgrades" Section, page 25, of these Release Notes for further details.