

# *Compaq StorageWorks*

## **Release Notes**

### **HSG60 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6 for Sun Solaris**

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*These Release Notes contain last-minute and supplemental information about the HSG60 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6 for Sun Solaris.*

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

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

Third Edition (June 2001)  
Part Number: AA-RMBNC-TE  
**Compaq Computer Corporation**

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**HSG60 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6 for Sun Solaris**

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## Document Catalog

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

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

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

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**IMPORTANT:** Please see the “Documentation Anomalies” Section of these Release Notes for any last minute corrections or additions to the provided documentation set.

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

To take best advantage of the multiple document search functionality, we highly recommended that you install the Windows based Acrobat Reader and launch it as a separate application (rather than through a browser).

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

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

1. After launching the Acrobat Reader, load the *manuals.pdf* catalog file.
2. If you see the error message “The index associated with this document <index> is not available,” click OK to clear the message and proceed to the next step.  
  
If this error message does not appear, your index has been mounted correctly and this procedure does not apply.
3. From the Edit Menu, select Search > Select Indexes.
4. From the Index Selection dialogue, click the Add button.
5. Enter the path to the *index.pdx* file.  
  
For Windows based readers, this is typically:  

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

  
For UNIX based readers, this is typically:  

```
/cdrom/<volume_id>/acrobat/index.pdx
```
6. Click OK to accept this selection.
7. Making sure the newly added index is selected in the Index Selection dialogue, click OK to exit.

The catalog search function will now operate normally.

## Intended Audience

This document was prepared for customers who have purchased Compaq StorageWorks Enterprise/Modular Storage RAID Array products that include Compaq StorageWorks HSG60 RAID Array Controller.s. This document also serves as a reference for Compaq Customer Services personnel responsible for installing and maintaining systems that include the Compaq StorageWorks HSG60 RAID Array Controller.

## Conventions

The following terminological conventions are used throughout this document:

- Unless otherwise specified, all references to controllers or array controllers should be interpreted as the Compaq StorageWorks HSG60 RAID Array Controller.
- Unless otherwise specified, all references to Compaq StorageWorks ACS Version 8.6 should be interpreted as synonymous with the released Compaq StorageWorks ACS Version 8.6-1 code.
- For the purpose of this document Enterprise/Modular Storage RAID Array refers to the following Compaq StorageWorks RAID Array products:
  - MA6000 - Modular Array 6000 Fibre Channel

## Release Package Contents

The HSG60 Fibre Channel Solution Software Kit consists of the following:

- The HSG60 Solution Software documentation set:
  - *HSG60 ACS Solution Software Version 8.6 for Sun Solaris Installation and Configuration Guide*
  - *HSG60 Array Controller ACS Version 8.6 CLI Reference Guide*
  - *HSG60 Array Controller ACS Version 8.6 Maintenance and Service Guide*
  - *HSG60 Array Controller ACS Version 8.6 Troubleshooting Reference Guide*
  - *Command Console Version 2.4 User Guide*
  - *Command Console Version 2.4 Release Notes*
  - *StorageWorks Registration and Warranty Package*
  - *HSG60 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6 for Sun Solaris Release Notes* (this document)

- HSG60 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6 for Sun Solaris CD-ROM

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

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

- *Heterogeneous Open SAN Design Reference Guide, Part Number: AA-RMPNB-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

Due to the increased host connectivity delivered with ACS Version 8.6, it is very important that users observe new cache size requirements. When upgrading from ACS Version 8.5 to ACS Version 8.6, it is critical that minimum cache module configurations be upgraded from the prior minimum of 64 MB (ACS 8.5) to 128 MB in unmirrored configurations, and 256 MB in mirrored configurations.

## Identifying ACS Software Revision Level

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

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

```
SHOW THIS_CONTROLLER
```

The resulting display lists the software revision level as follows:

```
V86L-1
```

If the ACS version is not Version 8.6L-1, contact your support provider for instructions on how to obtain the correct version.

## Using the Array Controller in a Modular Solution

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 RETMA cabinets are available in heights of 42U, 41U, 36U and 22U. The Model 2200 Ultra SCSI controller enclosure is 4U. The Model 4314 disk enclosure and the Model 4354 disk enclosure are each 3U. This combination allows for several cabinet configurations.

**NOTE:** If you wish to use an existing controller, it will require the Cache Bulkhead upgrade for installation of the controller in the Model 2200.

- 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 modular solution configurations and restrictions, see the *Modular Array Cabinet Restrictions* user document.

## Disk Enclosures

The array controller firmware can now address up to 14 disks per SCSI bus. The firmware can see seven disks on each bus allowing use of all 14 when configured for dual bus mode with the 4354 disk shelf. The maximum number of disks supported by an array controller (single or cooperating pair) is 28. The disk enclosures can be configured for single bus or for dual bus.

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

### Single Bus Mode

Disk Enclosures Options/Single Bus Mode	Part Number
Model 4310R - Rack-mountable 10-drive enclosure with single bus, single power supply	174631-B21

<b>Disk Enclosures Options/Single Bus Mode</b>	<b>Part Number</b>
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

### Dual Bus Mode

<b>Disk Enclosures Options/Dual Bus Mode</b>	<b>Part Number</b>
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

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.

<b>SCSI Cable Options/Dual Bus Mode</b>	<b>Part Number</b>
1 M SCSI Cable	168256-B21
2 M SCSI Cable	168258-B21
3 M SCSI Cable	189505-B21
5 M SCSI Cable	400983-005
10 M SCSI Cable	400983-010



## Modular Solution

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

- Predefined models are available that provide a set number of controller shelves and drive shelves in a Modular Storage Cabinet:

- MA6000: One Model 2200 controller enclosure and three dual bus Model 4354 disk enclosures in a 22U Modular Storage Cabinet

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

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

## Hardware and Software Support

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

### Array Hardware Support

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

- DS-SW600-AA—600-mm wide cabinet 50/60 Hz, dual-redundant controllers, bolting kit for coupling (two SW600 cabinets)
- DS-SW370-AA—RAID pedestal, five 180-watt power supplies; eight universal 50/60 Hz 120/240V high-powered blowers; one AC input box; one enhanced EMU; one pedestal user's guide; six single-ended I/O modules
- DS-SW370-EA—RAID pedestal; five 180-watt power supplies; eight universal 50/60 Hz 120/240V high-powered blowers; one AC input box; one enhanced EMU; one pedestal user's guide; six single-ended I/O modules; metric mounting hardware
- DS-BA370-AA—RAID rackmount enclosure; five 180-watt power supplies; eight universal 50/60 Hz 120/240V high-powered blowers; one AC input box, six single-ended I/O modules; one pedestal user's guide; one enhanced EMU; one PVA, metric mounting hardware
- DS-BA370-MA—Maintenance Option for the SW370 and BA370 field service Option, field-replaceable unit (FRU)
- DS-BA35X-HH—180-watt, 100 to 200-volt power supply, 240-volt, 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 1 at the indicated hardware and microcode levels.

**Table 1 Supported Disk Drives**

Part Number	Device/Model	Capacity in Gigabytes	Spindle Speed (RPM)	Minimum Microcode Version	Minimum Hardware Version
176494-B21	BC072638A2	72.8	10,000	BDC7	A01
176496-B22	BD03663622 BD0366349C BD036635C5	36.4	10,000	BDC4 3B02 B020	A01 A01 A05
180726-006	BD036735C8	36.4	10,000	B020	A01
188122-B22	BF01863644	18.2	15,000	3B01	A01
188120-B22	BF00963643	18.2	15,000	3B01	A01
180726-002	BD018635C4	18.2	10,000	B020	A01
180726-005	BD018735C7	18.2	10,000	B020	A01
128418-B22	BD018122C9	18.2	10,000	B016	A01
142673-B22	BD01862376 BD01862A67	18.2	10,000	BCJE B007	A01
388144-B22	BB01811C9C	18.2	7,200	3B05	A01
328939-B22	BD009122BA	9.1	10,000	3B07	A01
142671-B22	BD00962373 BD00962A66	9.1	10,000	BCJE B007	A01
180726-001	BD009635C3	9.1	10,000	B020	A01

**Table 1 Supported Disk Drives (Continued)**

Part Number	Device/Model	Capacity in Gigabytes	Spindle Speed (RPM)	Minimum Microcode Version	Minimum Hardware Version
180726-004	BD009735C6	9.1	10,000	B020	A01
123065-B22	BB00911CA0	9.1	7,200	3B05	A01

## System Components

This Fibre Channel Solution Software Kit supports the system components and operating system versions listed in Table 2.

**Table 2 Minimum System Requirements**

Component	Requirement
Controller Compatibility	Compaq StorageWorks HSG60 Array Controller, ACS Version 8.6L
Platform	SPARC, Ultra SPARC 4m (S20 only), 4d, 4u architectures
Operating System	Sun Solaris 32-bit Mode: V2.6, V2.7, V2.8 Sun Solaris 64-bit Mode: V2.7, V2.8 Sun Clusters V2.2
Topology	Fibre Channel Switched (FC-SW) and Arbitrated Loop (FC-AL) Modes
SCSI Protocol	SCSI-2, SCSI-3
Free Disk Space	500 KB before any log files
Adapter Compatibility	Compaq 32-bit Sbus FC Host Bus Adapter SWSA4-SB, HBA driver Version 2.59, Firmware Version 13.3.7 Compaq 64-bit Sbus FC Host Bus Adapter SWSA4-SC, HBA driver Version 2.59, Firmware Version 13.3.7 Compaq 32-bit PCI FC Host Bus Adapter SWSA4-PC, HBA driver Version 2.59, Firmware Version 13.3.7

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**IMPORTANT:** For switched fabric environments, use Compaq 8-EL SAN switches (DSGGC-AA) equipped with firmware Version 2.1.9g.

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## Notes

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

Solaris Version	Patch Number	Patch Description
2.6	106226-01 105600-10 105181-19 106125-08 105375-18 105356-10 106357-04	Format lsp Kernel Patchadd Dynamic Reconfiguration Dynamic Reconfiguration Dynamic Reconfiguration
2.7	106541-08 107544-03	Kernel Fsock
2.8	N/A	N/A

## StorageWorks Command Console

StorageWorks Command Console (SWCC) Version 2.4 is included in this release. Version 2.4 is used to identify the SWCC suite of components. The Agent, a component of the SWCC product, is delivered at Version 2.3.2.

SWCC provides a graphical user interface that can be used to configure and monitor your storage subsystem. 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 Agent installation, see the *HSG60 ACS Solution Software Version 8.6 Installation and Configuration Guide*. For more information on SWCC Client installation and operation, refer to *Command Console Version 2.4 User Guide* and *Command Console Version 2.4 Release Notes*.

## Secure Path Software

Secure Path is a high availability, multiple pathing software application. The versions of Secure Path software shown in Table 3 are compatible with this Solution Software Kit.

**Table 3 Secure Path Compatibility**

Operating System	Secure Path Product Version
Sun Solaris V2.6, V2.7 and V2.8	Version 2.1C

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

[http://www.compaq.com/products/storageworks/storage\\_mgmt\\_software.html](http://www.compaq.com/products/storageworks/storage_mgmt_software.html)

## Layered Software Applications

Compatibility with Compaq StorageWorks and SANworks layered software applications is defined in Table 4.

**Table 4 Layered Application Compatibility**

Application	Version	ACS Requirement
Enterprise Volume Manager (EVM)	Version 1.1B	Version 8.6L
Storage Resource Manager (SRM)	Version 4.01	Version 8.6L
Command Scriptor	Version 1.0	Version 8.6L
Management Appliance	Version 1.0A	Version 8.6L
Storage Allocation Reporter	Version 1.0	Version 8.6L

Running EVM with ACS Version 8.6L affords you scripting with Clones.

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

[http://www.compaq.com/products/storageworks/storage\\_mgmt\\_software.html](http://www.compaq.com/products/storageworks/storage_mgmt_software.html)

## New Features

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

## ACS Version 8.6

The following new feature enhancements are provided with ACS Version 8.6:

### Drive Support

The following drive support enhancements have been added in the ACS Version 8.6L release.

- 72 GB drives in 10-slot 1.6 inch shelves
- Full 14-slot drive support per channel (MA/EMA Series arrays only)
- Storage set size increased to 1.024 TB
- Maximum of 28 drives behind controllers

### Increased Host Connections

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

### Rolling Upgrades

The ACS upgrade path has been reworked to provide more friendly and seamless operation. However, the documented process must be followed carefully to ensure a smooth transition. For more information on upgrade and downgrade procedures, refer to the *HSG60 Array Controller ACS Version 8.6 Maintenance and Service Guide*.

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**IMPORTANT:** Due to the increased host connectivity delivered with ACS Version 8.6, it is very important that users observe new cache size requirements. When upgrading from ACS Version 8.5 to ACS Version 8.6, it is critical that minimum cache module configurations be upgraded from the prior minimum of 64 MB (ACS 8.5) to 128 MB in unmirrored configurations, and 256 MB in mirrored configurations.

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## CLI Commands

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

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

See the *HSG60 Array Controller ACS Version 8.6 CLI Reference Guide* for additional syntax details.

## ACS Improvements

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

Corrections included in all variations of ACS Version 8.6:

- Excessive polling by using “show unit status” requests (with either the CLI or SWCC) caused the controller to periodically become unavailable (Code 02DD0101).
- Excessive polling of the controller by SWCC to obtain full status information sometimes resulted in controller unavailability with an “unable to allocate large sense buckets” message.
- Correction of forced errors encountered on RAID 3/5 storage units.
- Correction of controller unavailability due to deadman timer and (LED CODE 39).
- Correction of error code in conjunction with cache hardware failure.
- Improved performance in non-mirrored 8 KB mode.
- Correction of Unit attentions being logged inappropriately to the CCL, which sometimes caused controller unavailability (Codes 02F60103 and 43130100).

## Multiple Agents Are Now Supported

This release of the Solution Software Kit contains an updated SWCC Agent, which supports locking, so multiple Agents can be supported. This feature is required to use the SAN Management Appliance in addition to the host-based Agent.



# ACS Feature Support

## 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 in both transparent and multiple-bus failover modes.

## 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 *HSG60 Array Controller ACS Version 8.6 CLI Reference Guide* for syntax details.

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

Requirements:

- ACS Version 8.6
- VERITAS File System, Version 3.3

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:** Note: the following steps assume the user has a good understanding of the VERITAS File System software product. Refer to the VERITAS File System documentation for more information.

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).

**NOTE:** This procedure only works with VERITAS File System Version 3.3. Do not attempt it without the VERITAS File System software, or data loss will result!

2. Perform a complete system backup.
3. To check the size of the file system, use the following command:

```
df -F vxfs
```

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

```
umount /mnt/test
```

**NOTE:** Your directory name will be different.

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

```
set C1 replace=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 with 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. Use the number of blocks that was detected by the format command in step number 6 (less diagnostic tracks).

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

```
df -F vxfs
```

We are developing a utility that will update the unit label without unmounting it. This will allow for truly dynamic file system expansion. Check our Website for more information on this utility.

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

## Configuration Rules

The following list defines maximum configuration rules for the controller:

- 128 visible LUNs/200 assignable unit numbers: If the Command Console LUN (CCL) is enabled, the result is 127 visible LUNs and one CCL
- 1.024 TB storage set size
- 96 host connections
- 28 physical devices
- 20 RAID 3/5 storagesets
- 30 RAID 3/5 and RAID 1 storagesets
- 45 RAID 3/5, RAID 1, and RAID 0 storagesets
- 8 partitions of a storageset or individual disk
- 6 physical devices per RAID 1 (mirrorset)
- 14 physical devices per RAID 3/5 storageset
- 24 physical devices per RAID 0 (stripeset)
- 48 physical devices per RAID 0+1 (striped mirrorset)
- 4 servers per controller port

## Operating Constraints

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

### External Cache Battery (ECB)

Compaq recommends that you replace the 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 *HSG60 Array Controller ACS Version 8.6 Maintenance and Service Guide*. This will prevent the ECB from discharging during planned power outages.

### Dual External Cache Battery (ECB) Failures

The array controller cache policy provides for proper handling of a single ECB failure as described in the *HSG60 Array Controller ACS Version 8.6 Troubleshooting Reference Guide*. For dual ECB failures, it states that no failover occurs. For this release, if a dual ECB failure is detected both controllers will be restarted.

### Using FRUTIL to Insert a New Controller

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

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

1. Press and hold the **Reset** button on the other controller.
2. 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.

## Saving Your Configuration

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

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

### Saving a Configuration to Previously Initialized Storage Sets

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

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

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

Configuration information cannot be retrieved from storage sets created on other HSx controllers (for example, HSD, HSJ, or HSZ controllers). You can only restore a configuration from a configuration saved on this or another HSG60 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 a device's type and location. This map is used to communicate with devices. If you add, move, or change a device while the array controller is powered off, without first changing the array controller configuration, the array controller is not able to communicate with the changed device when it returns to service.

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

If a device is replaced while the array controller is off, remove the device before restoring power to the array controller. Correctly remove the current device and add the new device after restoring power to the array controller.

See the *HSG60 Array Controller ACS Version 8.6 Maintenance and Service Guide* for correct device removal and addition procedures.

## Moving Storage Sets

Move only normal storage sets.

---

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

---

## Adding, Moving, and Changing Array Controllers, Cache Modules, or External Cache Battery (ECB) Storage Building Blocks (SBBs)

You can replace the array controller, cache module, or external cache battery SBB while the subsystem is shut down. However, you must enter the SHUTDOWN THIS\_CONTROLLER command before shutting the subsystem down 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 *HSG60 Array Controller ACS Version 8.6 CLI Reference Guide*. For information on maintenance and replacement of the array controller, cache module, and external cache battery, see the *HSG60 Array Controller ACS Version 8.6 Maintenance and Service Guide*.

## Host Operating System Notes

The following section identifies host specific operating notes.

## Installing with Automatic Mode

The following procedure supersedes that which is found in your *HSG60 ACS Solution Software Version 8.6 Installation and Configuration Guide*.

To install the RAID Manager software using automatic mode:

1. To start the Installation Manager, type:

```
# ./install_stgwks
```

The Installation Manager asks you if you want to use Automatic or Manual mode.

2. Enter “A” to select Automatic mode.

Installation Manager verifies that you are running a supported version of Sun Solaris and that you have the correct patches loaded. Installation Manager also installs the SMCgawk utility in the `/usr/local` directory.

If your Sun Solaris set up is supported, Installation Manager scans your system for supported adapters, and it displays a list of compatible adapter drivers.

Installation Manager prompts you to remove any old or incompatible adapter drivers.

3. Remove old and incompatible adapter drivers. Follow the on-screen prompts, always accepting the default responses.
4. Installation Manager prompts you for the package base directory. Enter the package base directory. This directory has the “steam” subdirectory, containing the RAID Manager files, created under it. The default directory is `/opt`.

- Loop mode: Each HBA is configured for LUNs 0 through 15 at targets 64 and 65 (corresponds with ALPAs 72 and 71).

- Fabric mode: You will be prompted for the SCSI targets to bind through for each HBA and the Worldwide Port Names (WWPNs) to attach to.

Installation Manager prompts you to rescan your system for supported adapter drivers.

5. If any adapter drivers were loaded in previous steps, answer “Y” to allow the Installation Manager to rescan your system for supported adapters. Since the rescan will probe every possible I/O slot for new hardware, it can take a while (up to 5 minutes) to complete on a large system. During this time, a heavily loaded system may appear to hang. This is normal.
6. Edit your `sd.conf` file. This edit can be done automatically or manually.
  - Choose “M” to manually edit your `sd.conf` file. You can choose what FC adapters and what targets will be supported. By default, LUNs 0 through 15 are configured for each target that you select.

- ❑ Choose “A” to automatically edit the `sd.conf` file. Support is added for all supported Fibre Channel adapters, using the default SCSI targets.
- ❑ Choose “Q” to exit the Installation Manager.

After all the files have been loaded and edited, Installation Manager exits.

7. After RAID Manager is loaded, you are prompted to reboot your computer.
8. Change to the top level directory, by entering the following command:  

```
# cd /
```
9. Enter the following command to shut down the computer:  

```
# /etc/shutdown -y -i0 -g0
```
10. Wait for the OK prompt to appear, then enter the following (`boot_device` is the name of your system disk):  

```
# boot boot_device -r
```
11. Wait for your computer to perform a reconfiguration boot.

**NOTE:** While your computer is booting, you may see the following message:  
WARNING:  
`/sbus@2,0/fcaw@1,0/sd@40,0 (sd32): corrupt label - wrong magic number.`

This message appeared because a LUN you configured earlier is not yet labeled.

## Installing with Manual Mode

The following procedure supersedes that which is found in your *HSG60 ACS Solution Software Version 8.6 Installation and Configuration Guide*.

To install the RAID Manager software using manual mode:

1. To start the Installation Manager, enter the following:

```
# ./install_stgws
```

Installation Manager asks you if you want to use Automatic or Manual mode. Enter “M” to select Manual mode.

- ❑ Installation Manager will verify that the computer is running a supported version of Solaris, and that it has the correct patches installed.
- ❑ Installation Manager scans your system for old or incompatible drivers and asks if you would like to remove them.



2. Installation Manager scans your system for supported adapters. When the scan is complete, Installation Manager displays a list of supported adapters installed in your system. After displaying a list of installed adapters, a menu appears listing the available packages.
3. Follow the on-screen prompts to load the correct adapter driver package for the adapters installed in your system. After the adapter driver package has successfully loaded, you are returned to the Installation Manager menu.
4. If you have multiple adapters installed in your system, select additional adapter driver packages until you have successfully loaded a driver package for each adapter you will be using.
5. If you have loaded all adapter driver packages you need, install the RAID Manager (CPQfcraid) software package and SMCgawk.
6. The default directory is /opt. This directory will have a “steam” subdirectory, containing the RAID Manager files, created under it.
7. If any adapter drivers were loaded in the previous steps, answer **Y** to allow the Installation Manager to rescan your system.
8. Edit your `sd.conf` file. This edit can be done automatically or manually.
  - Choose **“M”** to manually edit your `sd.conf` file. You can choose what FC adapters and what targets will be supported. By default, LUNs 0 through 15 are configured for each target that you select.
  - Choose **“A”** to automatically edit your `sd.conf` file. Support will be added for ALL supported FC adapters, using the default targets. These defaults are:
    - Loop mode: Each HBA is configured for LUNs 0 through 15 at targets 64 and 65 (corresponds with ALPAs 72 and 71).
    - Fabric mode: You will be prompted for the SCSI targets to bind through for each HBA, and the Worldwide Port Names (WWPNs) to attach to.
  - Choose **“Q”** to exit the Installation Manager.

After all files have been loaded and edited, Installation Manager exits. Installation Manager rescans your system for supported HBA drivers.
9. After RAID Manager is loaded, you will be prompted to reboot your computer system.
10. Change to the top level directory, by entering the following:
 

```
# cd /
```
11. To shut down the computer, enter the following:
 

```
# /etc/shutdown -y -i0 -g0
```

12. Wait for the “**OK**” console prompt, then enter the following (boot\_device is the name of your system disk):

```
boot boot_device -r
```

13. Wait for your system to perform a reconfiguration boot.

**NOTE:** During boot, you may see the following message:

**WARNING:**

```
/sbus@2,0/fcaw@1,0/sd@40,0 (sd32): corrupt label - wrong magic number.
```

This is because a LUN you configured earlier is not yet labeled.

## **SCSI-3 Mode Now Supported**

Version 8.6 Solution Software will now support connections using SCSI-3 mode. We do not supply a SCSI generic driver, so the CCL LUNs will be ignored. The Solaris server will lose the ability to use two LUNs (D0 and D100). Any Agent connections to the subsystem must be done using an active LUN, not the CCL. Compaq recommends using 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):

```
SET !NEWCON01 OPERATING_SYSTEM=SUN
```

The RAID Manager software kit name has changed from CPQhsg60 to CPQfraid.

## **SMCgawk v3.0.4 is Now Required.**

We now require GNU awk (SMCgawk package) for proper operation of the RAID Manager software. You will be prompted to install the package if the installation script does not find gawk in your search path. The source code for SMCgawk is also provided in a tar file (gawk-3.0.4.tar.gz) in the root directory of the installation CD-ROM.

## Dynamic Reconfiguration is Now Supported.

The included FC Adapter drivers (fca, fcaw, fca-PCI Version 2.5.9) now support Dynamic Reconfiguration.

## A Subsystem Name Cannot Use a Pipe Character.

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

## The 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 Storageset Size

With this release, Solaris can support storagesets 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. This means that you will have to use the CLI to create and initialize LUNS to ensure that these limits are observed. Use 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.

## Solaris 2.7 and 2.8 Support

Solaris 7 (2.7) and Solaris 8 (2.8) are supported in both 32-bit and 64-bit modes with this release.

## 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 use Option 20 of *config.sh* to change the mode for a specific adapter instance.

## Limitation on Supported sun4m Systems

The only sun4m architecture machine that is supported with this release is SPARC 20. No other sun4m machines are supported.

## Installation Problems on SPARC 20 Systems

While attempting to load the CPQfcaw driver on a SPARC 20 system, the driver may fail to attach, and the following error message will appear on the console:

```
WARNING: fca0: fca_alloc_host_data: fca_dma_zalloc failed
(IMQ_queue)
```

If this happens, you must reboot your server before attempting to load the CPQfcraid package. After your server has rebooted, and the fcaw driver has successfully loaded, you may continue with the CPQfcraid installation.

## 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 will be removed in a future release.

## Required Patches

Do not omit the required patches (they are listed in the *System Components* section of these release notes). These patches are required for proper operation of your RAID Array.

The installation program (`install_stgwks`) will check that you have the required patches loaded, and notify you if any are missing. If any patches are missing, the installation will list all required patches, not just the missing ones.

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

```
showrev -p
```

## Minimum System Memory Requirements

Due to the increased functionality and performance of the 2.5.9 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 (E3000, E3500, E4500, etc.) 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 only limited by the system expandability.

## 64-Bit Sbus Mode

By default, the 64-bit sbus adapter is configured to operate in 32-bit mode on 4m architecture machines. This ensures a trouble-free installation on all machines. If your system has 64-bit sbus slots, you can enable 64-bit sbus operation with the following steps:

1. Open the file `/etc/system` with a text editor.
2. Find the StorageWorks edits marked by, *\*Start of CPQfcaw edits*
3. Comment out the line that reads `set fcaw:force32=1`  
**NOTE:** In this file use the "\*" character for the comment.
4. Check your edit, and save the `/etc/system` file when you are finished.
5. Shut down and reboot your system.

**NOTE:** Your system must be shut down and rebooted for the changes to take effect.

## 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.
  - Refer to the *driver.conf* (4) and *sd* (7D) man pages for more information.
1. Run `config.sh` and choose Option 20; Add/change adapters.
  2. Chose Option 4; Modify and 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. Remember that units 0–99 will appear on port 1 (`al_pa=72`, `target=64`), and units 100–199 will appear on port 2 (`al_pa=71`, `target=65`).
  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 will still allow 256 queued commands per LUN. With 32 LUNs mounted, you can have over 8000 outstanding queued requests, but the controller will only support 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 will work fine for most environments. If you will be doing heavy I/O to 16 or more LUNs, you will 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 will require a `sd_max_throttle` setting of 16 ( $256/16 = 16$ ).

For more information, refer to 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: Manual configuration is described in this step. Note that the maximum values are smaller when using manual mode. This reduces the maximum LUN size to 256 GB when using manual mode. If you prefer to use this 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 will cause **newfs** to abort with the following error message:

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

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

To properly configure a storageSet whose 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 will include a line 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. Your actual numbers will 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). Write these numbers down.

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

3. 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 will 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 will now be 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. Our 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 (CCL)

The controller can provide a dedicated communications LUN (CCL). This can simplify the installation and operation of SWCC, but it can cause some issues under Solaris. During booting, you will get an error, “corrupt label - bad magic number”. This is due to the fact that Solaris “sees” the CCL as a 320 MB read-only disk. This is just a warning, and it 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.

## Timing Parameters

For better stability on certain Solaris servers, it may be helpful to adjust the timing parameters of `/kernel/drv/fca-pci.conf` by setting the following values:

```
scsi_probe_delay=1000
link_recovery_delay=1000
```

## Setting maxcontig and rotdelay for File Systems

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

Our testing has shown that for optimal performance the `rotdelay` should always be set to 0.

The `maxcontig` value is somewhat dependent on the number of units that are active in your controller configuration. In our testing, values of 128 and 256 blocks have worked very well. Your exact value will depend on the number of storage sets 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. Supported O/S levels are listed in the *System Components* section of this document.

## Documentation Anomalies

The following are known additions and corrections to the *HSG60 ACS Solution Software Version 8.6 Installation and Configuration Guide*.

- Under “Installing the Solution Software Packages,” on page 3-5, the procedures contained in the subsections “Installing with Automatic Mode” and “Installing with Manual Mode” have been rewritten for clarity. See the “Host Operating System Notes” section of these Release Notes for the updated procedures, carried under identical subsection names.
- Even page headers in Chapter 4 should read *HSG60 ACS Solution Software Version 8.6 Installation and Configuration Guide*.
- Under “Installing the Client,” on page B-2 of Appendix B, the following restriction should be observed when installing SWCC on Windows NT 4.0 Workstations:
 

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

In a SAN environment where you would need both G60 and G80 subsystems, we recommend you install both, but one at a time. This problem is not seen under Windows NT 4.0 Server.
- Under “Installing the Client,” in step 3 on page B-3 of Appendix B, select the “HSG80 Controller for ACS85 newer” menu option to properly install SWCC client.

