Compaq StorageWorks

Release Notes

HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6 for Linux Alpha

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

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

Release Notes Contents

These release notes include the following topics:

Document Catalog

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

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

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

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

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

To take best advantage of the multiple document search functionality, 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
   ```

6. Click OK to accept this selection.

7. Making sure the newly added index is selected in the Index Selection dialogue, click OK to exit.

The catalog search function will now operate normally.

Intended Audience

This document was prepared for customers who have purchased Compaq StorageWorks Enterprise/Modular Storage RAID Array products that include Compaq StorageWorks HSG80 RAID Array 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 HSG80 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 HSG80 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:

❏ 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

Release Package Contents

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

■ The HSG80 Solution Software documentation set:

❏ *HSG80 ACS Solution Software Version 8.6 for Linux Alpha Installation and Configuration Guide*

❏ *HSG80 Array Controller ACS Version 8.6 CLI Reference Guide*

❏ *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide*

❏ *HSG80 Array Controller ACS Version 8.6 Troubleshooting Reference Guide*

❏ *Command Console Version 2.4 User Guide*

❏ *Command Console Version 2.4 Release Notes*

- ❏ *StorageWorks Registration and Warranty Package*
- ❏ *HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6 for Linux Alpha Release Notes* (this document)

■ HSG80 Enterprise/Modular Storage RAID Array Fibre Channel Solution Software Version 8.6 for Linux Alpha 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 one of the following:

```
V86F-1
V86P-1
V86S-1
```

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

If the ACS version is Version 8.6P-1 or Version 8.6S-1, you will need additional layered application software beyond this Solution Software Kit.

ACS Version 8.6F-1 is fully compatible with Version 8.6 Solution Software.

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 84. The disk enclosures can be configured for single bus or for dual bus.

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

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
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

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

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.

SCSI Cable Options/Dual Bus Mode	Part Number
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:

❏ 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

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
127968-001	DS-RZ1FC-VW	36.4	10,000	3B02/2B07/ B020/BDC4	A01
147599-001	DS-RZ1FB-VW	36.4	7,200	N1H1/0372/ 1614/3B06	A01
188122-B22	BF01863644	18.2	15,000	3B01	A01
188120-B22	BF00963643	18.2	15,000	3B01	A01
180726-002	BD018635C4	18.2	10,000	B020	A01
180726-005	BD018735C7	18.2	10,000	B020	A01
380589-B21	DS-RZ1ED-VW	18.2	10,000	0306/1614/ 3B07/B020/ BDC4	A01
128418-B22	BD018122C9	18.2	10,000	B016	A01

Table 1 Supported Disk Drives (Continued)

Part Number	Device/Model	Capacity in Gigabytes	Spindle Speed (RPM)	Minimum Microcode Version	Minimum Hardware Version
142673-B22	BD01862376 BD01862A67	18.2	10,000	BCJE B007	A01
147598-001	DS-RZ1EA-VW	18.2	7,200	3B05	A01
380694-B21	DS-RZ1EF-VW	18.2	7,200	N1H1/ 0372	A01
388144-B22	BB01811C9C	18.2	7,200	3B05	A01
380588-B21	DS-RZ1DD-VW	9.1	10,000	0306/1614/ 3B07/B020/ BDC4	A01
328939-B22	BD009122BA	9.1	10,000	3B07	A01
142671-B22	BD00962373 BD00962A66	9.1	10,000	BCJE B007	A01
180726-001	BD009635C3	9.1	10,000	B020	A01
180726-004	BD009735C6	9.1	10,000	B020	A01
147597-001	DS-RZ1DA-VW	9.1	7,200	3B05	A01
380595-B21	DS-RZ1DF-VW	9.1	7,200	N1H1/0372/ 1614	A01
123065-B22	BB00911CA0	9.1	7,200	3B05	A01
380693-B21	DS-RZ1DB-VW	9.1	7,200	LYJ0/0307	A01
N/A	DS-RZ1CD-VW	4.3	10,000	0306	A01
N/A	DS-RZ1CB-VW	4.3	7,200	LYJ0/0656	A01
380691-B21	DS-RZ1CF-VW	4.3	7,200	N1H1/1614	A01

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 HSG80 Array Controller, ACS Version 8.6F
Platform	Alpha Servers DS10, DS20 and ES40 Series
Operating System	Linux Alpha SuSe V6.3, V7.0 Linux Alpha Redhat V6.2, V7.0
Topology	Fibre Channel Switched (FC-SW) Mode
SCSI Protocol	SCSI-3
Free Disk Space	80 MB
Adapter Compatibility	Compaq PCI FC Host Bus Adapter 167433-B21, HBA driver Version 4.28b, Firmware Version 2.01.27 Compaq PCI FC Host Bus Adapter 167432-001, HBA driver Version 4.28b, Firmware Version 1.19.16

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

Notes

Linux kernel Version 2.2.12 is the minimum required for array controllers using ACS Version 8.6 software.

Driver Installation

The driver required for successful operation of the array controller with Linux is included in the *CPQqla2x00-4.28b.rpm* RPM file. Through executing the *install_stgwks* script in the *agents/linux* directory on the Solution Software CD-ROM, you will install the driver source. The driver sources are installed into the */usr/src/linux/drivers/scsi* directory. In this directory, you will also find two README files for the *qla2100/qla2200* driver:

- **README.qla2100**, which is an overview description of the functionality of the qla2100 driver.

- **README.qla2100-addkernel**, which describes the process of building the qla2100 driver into the kernel. This file also describes the patches, which are applied during the installation process.

The latter file should be used to verify that the patches made to the various files in the */usr/src/linux/drivers/scsi* directory were applied correctly.

Host Adapter BIOS Settings

There is no difference between the settings suggested for Alpha systems or Intel systems. Alpha systems will have to use an Intel machine to set the FAST!UTIL settings, as there is no program available to set the NVRAM settings on Alpha. While the QLA2x00 HBA is a 64-bit PCI card, it will fit in a 32-bit slot if installed carefully. This was tested in a standard Compaq DeskPro EN.

Table 3 describes the correct settings to use for operating the HBA with the array controller in FC-SW Mode:

Table 3 Host Adapter BIOS Settings in FC-SW Mode

Host Adapter BIOS Settings		
Setting	**Default Value**	**Suggested Value**
Host Adapter BIOS	Disabled	Disabled
Frame Size	1024	2048
Loop Reset Delay	5 seconds	5 seconds
Adapter Hard Loop ID	Disabled	Disabled
Hard Loop ID	0	0
Advanced Host Adapter BIOS Settings		
Setting	**Default Value**	**Suggested Value**
Execution Throttle	16	16
Fast Command Posting	Enabled	Enabled
> 4 Gbyte Addressing	Disabled	Yes, if physical memory > 4 GB
LUNs per Target ID (see Note 1)	8	16
Enable LIP Reset	No	Yes
Enable LIP Full Login	Yes	Yes

Table 3 Host Adapter BIOS Settings in FC-SW Mode (Continued)

Host Adapter BIOS Settings		
Setting	Default Value	Suggested Value
Enable Target Reset	No	Yes
Login Retry Count	8	8
Port Down Retry Count	8	90
Drivers Load RISC Code	Yes	Yes
Enable Database Updates	No	No
Disable Database Load	No	No
IOCB Allocation (see Note 2)	256	8
Extended Error Logging	Disabled	Disabled

NOTE:

1. This is the maximum number of LUNs the HBA will see per controller. You can safely modify this to a lower number to correspond with the number of units you make on your storage system. A higher number will not adversely impact your operation, and give you room to add more units, although there is a maximum number of LUNs. See the documentation that came with your storage system. Example: A setting of 64 will let you see units D1-D63 on port 1 and D101-163 on port 2.

2. Setting this value too high may seriously impact the performance of your storage subsystem. Change these suggested settings at your own risk.

A key aspect of proper operation of the Compaq QLA2100/2200 Host Bus Adapter (HBA) with the array controller is properly setting up the HBA BIOS.

Compaq QLA2100//2200 Fibre Channel Host Bus Adapter BIOS provides a means of controlling HBA operation. The Host Bus Adapter BIOS is configured through the *Fast*!UTIL utility, which is invoked by pressing ALT-Q during QLA2100 BIOS initialization.

Table 4 describes the correct settings to use for operating the HBA with the array controller in FC-AL Mode:

Table 4 Host Adapter BIOS Settings in FC-AL Mode

Host Adapter BIOS Settings		
Setting	**Options**	**Suggested Value**
Host Adapter BIOS	Enabled or Disabled	Disabled
Frame Size	512, 1024, 2048	2048(*)
Loop Reset Delay	0-15 seconds	5 seconds
Adapter Hard Loop ID	Enabled or Disabled	Enabled
Hard Loop ID	0-125	125(*)
Advanced Host Adapter BIOS Settings		
Setting	**Options**	**Suggested Value**
Execution Throttle	1-256	16
Fast Command Posting	Enabled or Disabled	Enabled
> 4 Gbyte Addressing	Enabled or Disabled	Disabled
LUNs per Target ID	0,8,16,32,64,128,256	64(*)
Enable LIP Reset	Yes or No	Yes(*)
Enable LIP Full Login	Yes or No	Yes
Enable Target Reset	Yes or No	Yes(*)
Login Retry Count	0-255	8
Port Down Retry Count	0-255	8
Drivers Load RISC Code	Enabled or Disabled	Enabled
Enable Database Updates	Yes or No	No
IOCB Allocation (see Note 2)	1-512 buffers	8(*)
Extended Error Logging	Enabled or Disabled	Disabled

NOTE: Settings in the Suggested Value column that are marked with an asterisk (*) are non-default settings.

The following list provides additional detail on the Host Adapter BIOS Settings described in Table 3 and Table 4, above:

■ **Host Adapter BIOS** - When this setting is disabled, the ROM BIOS on the QLA2100 board is not loaded into memory. For operation with the array controller, this setting should be *Disabled*.

■ **Frame Size** - This setting specifies the maximum frame length supported by the QLA2100 board. For best operation with the array controller, this option should be set to *2048*.

■ **Loop Reset Delay** - After resetting the loop, the firmware refrains from initiating any loop activity for the number of seconds specified in this setting. The default value of *5* seconds works well with the controller, allowing sufficient time for the loop to stabilize after a reset.

■ **Adapter Hard Loop ID** - This setting forces the adapter to use the Target ID specified in the Hard Loop ID setting. This setting should be *Enabled*.

■ **Hard Loop ID** - The adapter will attempt to use the value in this setting, if the Adapter Hard Loop ID is enabled. The correct setting for usage with the array controller is *125* for the first HBA in the loop, and *124, 123 and 122* for HBA number 2 through 4. Refer to the accompanying *HSG80 ACS Solution Software Version 8.6 Installation and Configuration Guide*, for more information on the mapping of SCSI Target ID's to Arbitrated Loop Physical Addresses (ALPAs).

The following list provides additional detail on the Advanced Host Adapter BIOS Settings described in Table 3 and Table 4, above:

■ **Execution Throttle** - This setting specifies the maximum number of commands executing on any one port. When a port's execution throttle value is reached, no new commands are executed until the current command finishes execution. The default value of *16* has been shown to work well with the array controller.

■ **Fast Command Posting** - This setting decreases command execution time by minimizing the number of interrupts. This setting should be *Enabled*.

■ **> 4 Gbyte Addressing** - Enable this setting if your system has more than 4 GB of physical memory.

■ **LUNs per Target ID** - This setting specifies the number of LUNs per Target ID, which will be presented by the QLA2100. This setting is critical for mapping all the LUNs that are presented by the array controller. When using both ports, the array controller will present up to 100 LUNs per Target ID and 2 Target IDs. Under normal circumstances, a setting of *64* is sufficient; this will provide support for using Unit Numbers D1-D63 on port 1, and Unit Numbers D101-D163 on port 2.

■ **Enable LIP Reset** - This setting determines the type of loop initialization process (LIP) reset that is used when the operating system initiates a SCSI bus reset. When set to *Yes*, the driver initiates a global LIP reset to clear target device reservations. When set to *No*, the driver initiates a global LIP reset with full login. This option should be set to *Yes*.

- **Enable LIP Full Login** - This setting instructs the ISP2100 chip to re-login all ports after any LIP. This should be set to *Yes*.

- **Enable Target Reset** - This setting instructs the driver to issue a Target Reset to all devices on the loop when a SCSI Bus Reset command is issued. This should be set to *Yes*.

- **Login Retry Count** - This setting specifies the number of times the software tries to log in to a device port, before issuing a port down status. This should be set to *8* retries.

- **Port Down Retry Count** - This setting specifies the number of times the software retries a command to a port returning port down status prior to aborting the command. This should be set to *8* retries.

- **Drivers Load RISC Code** - When enabled, the HBA accepts the RISC firmware from the driver. For the *qla2100* driver, set this option to *Yes*.

- **Enable Database Updates** - This setting allows the software to save the loop configuration information in Flash Memory when the system powers down. This can be left at *No*.

- **IOCB Allocation** - This setting specifies the maximum number of I/O Control Buffers allocated from the firmware's buffer pool for any one port. This setting is also used by the *qla2100* driver to set the Tagged Command Queue depth for each LUN. This setting should be set to *8 buffers*.

> IMPORTANT: Setting this value too high may have seriously adverse effects on your system's performance with a large number of LUNs.

- **Extended Error Logging** - This setting provides additional error and debug information to the operating system. This value can be left at *Disabled*, unless serious problems are occurring on your system.

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

Layered Software Applications

Compatibility with Compaq StorageWorks and SANworks layered software applications is defined in Table 5.

Table 5 Layered Application Compatibility

Application	Version	ACS Requirement
Data Replication Manager (DRM)	Version 8.6P	Version 8.6P
Enterprise Volume Manager (EVM)	Version 1.1B	Version 8.6F/S/P
Storage Resource Manager (SRM)	Version 4.01	Version 8.6F
Command Scripter	Version 1.0	Version 8.6F
Management Appliance	Version 1.0A	Version 8.6F
Storage Allocation Reporter	Version 1.0	Version 8.6F

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

Running EVM with ACS Version 8.6F affords you scripting with Clones. If you want to run Snapshots with EVM, you must be running ACS Versions 8.6S or 8.6P code.

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

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 8.6 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 84 drives behind controllers

Increased Host Connections

The maximum number of host connections has been increased from 64 to 96 for the table of known connections. A connection is unique to the node Worldwide Name (WWN), port WWN, and controller port. This table is maintained in the non-volatile memory (NVRAM) of the controller. If the table contains 96 entries, new connections cannot be added unless 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 *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide*.

> **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.

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

ACS Improvements

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

Corrections included in all variations of ACS Version 8.6:

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

Corrections included in ACS Versions 8.6S and 8.6P only:

■ Improved CLI operation while utilizing Snapshot units under high I/O.

■ Correction of issue regarding write commands to Snapshot units which caused occasional controller unavailability (i960 fault).

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

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.

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 back-up 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 snap is dissolved without having to re-merge the data.

Snapshot is enabled the instant the following CLI command is entered:

```
ADD SNAPSHOT_UNITS
```

See the *HSG80 Array Controller ACS Version 8.6 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 8.6P or ACS Version 8.6S.

> **NOTE:** Cache modules containing 512 MB of memory must be used with snapshots.

Write History Logging

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

■ when the target is inaccessible or

■ to synchronize the initiator site data during a planned failover

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

Fast-Failback - During a planned failover, if write history logging has been enabled at the target site, then when the failback is performed, the initiator site is synchronized through a process called *fast-failback*. The writes that would have gone to the initiator are logged to the association set's log unit. Only those writes since the failover are re-issued. 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 8.6 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: 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

■ 84 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

Configuring Large Storagesets

When creating large storagesets, the logical geometry presented by the array controller may be outside the limits of the operating system. When this occurs, your storageset will be reported by the operating system as having a smaller size than is correct.

If one of your storagesets is significantly smaller than you expect, it may be that the operating system is reporting the logical geometry of the storageset incorrectly. One of the more common occurrences of this phenomenon is when the cylinder count exceeds 65535, which will cause it to 'wrap around'. This problem can be easily remedied by bringing the logical geometry, as presented by the controller, within the bounds of the operating system. This is done using the ACS INITIALIZE command with the appropriate combination of the CYLINDERS, HEADS and SECTORS_PER_TRACK qualifiers.

The following example shows the steps to be taken:

1. Note the size and geometry information of the storageset using the SHOW unit-number command

   ```
   SHOW D101
   ```

   This will report the size (in blocks) and geometry of the storageset. For example:

Size:	80913640
Geometry (C/H/S):	74983 / 20 / 254

   Note that the geometry values may be rounded, so that the formula:

   ```
   cylinders x heads x sectors
   ```

may not yield the exact number for the size in blocks. When performing calculations, always ensure that the product of the above formula is no greater than the original size of the storageset in blocks (i.e., make sure that the logical geometry is no greater than the physical geometry).

2. Calculate the new values for the geometry by dividing the quantity which is too large by the same amount that is used to multiply one of the other quantities. Quite often the cylinders count is too large, and the heads count can be adjusted upward. During this process, ensure that the formula

```
cylinders x heads x sectors
```

remains constant. In this example, divide the cylinders count by 2 and multiply the heads count by 2 to get the following values:

Size:	380908560
Geometry (C/H/S):	37491 / 40 / 254

Note that the resulting size is slightly smaller.

3. Delete the unit, so that the storageset can be re-initialized:

```
DELETE D101
```

4. Initialize the storageset with the new values:

```
INITIALIZE R0 CYLINDERS=37491 HEADS=40
```

Please be sure to use the same additional qualifiers as when the storageset was first initialized.

5. Re-add the unit:

```
ADD UNIT D101 R0
```

At this point, verify that the value is correct with the SHOW command.

Upon completion of the above steps you will be able to format the storageset and create a file system on it.

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 *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide*. This will prevent the ECB from discharging during planned power outages.

Dual External Cache Battery (ECB) Failures

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

Command Console LUN Usage

In order to avoid access conflicts between the *sg* and *sd* drivers, the Access Device used for SWCC Agent communication *must not* be an *sd* device. Please ensure that the sg device used does not have an *sd* device mapped to the same LUN. The best way to verify this, is to use *scsi_info* on the *sg* device to verify that its Target ID/LUN combination has a Logical Unit Number value of 0 (zero). With the array controller operating in SCSI-3 mode, the Command Console LUNs are always mapped to Logical Unit Number 0.

Storage System CCL Mapping

In some instances, the Storage System CCL may not automatically connect during installation. If that is the case, see the "Mapping SCSI-generic Devices" section of the *HSG80 ACS Solution Software Version 8.6 Installation and Configuration Guide* to manually connect the CCL.

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.

FRUTIL Limitation

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

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

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

Saving Your Configuration

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

■ Save a configuration to a disk or storageset. 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 Storagesets

If any storageset 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 storagesets 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 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 *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide* for correct device removal and addition procedures.

Moving Storagesets

Move only normal storagesets.

> **CAUTION:** Do not move storagesets 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 *HSG80 Array Controller ACS Version 8.6 CLI Reference Guide*. For information on maintenance and replacement of the array controller, cache module, and external cache battery, see the *HSG80 Array Controller ACS Version 8.6 Maintenance and Service Guide*.

Documentation Anomalies

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

■ Under "Notes for Advanced Users and System Administrators," on page 3-8, the third bulleted item should be appended with the following:

In some instances, the Storage System CCL may not automatically connect during installation. If that is the case, see the "Mapping SCSI-generic Devices" section of this Guide to manually connect the CCL.

This addition is also documented in the "Operating Constraints" section of these Release Notes.

■ Under "Install_stgwks Example," on page 3-9, the following additional information should be added:

At the end of the installation, you may be prompted to configure the SWCC Agent. Answering **Y** will enable you to configure the Agent at that time. If you answer **N** you will need to configure your Agent at a later time using the config.sh configuration script.

■ 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.