



HSJ30/40 Array Controller Operating Software HSOF Version 3.4

Release Notes

This document summarizes features and characteristics of the HSJ30 and HSJ40 Array Controllers using operating software Versions 3.4, 3.3, 3.2, and 3.1 that are not covered elsewhere in the documentation. These release notes also contain instructions for installing the software and should be retained for future reference.

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Introduction

These release notes provide information for the HSJ30 and HSJ40 Array Controllers running HSOF Version 3.4. This document should be used by individuals responsible for configuring, installing, and using these controllers.

Read this entire document before upgrading the controller's software. The information in these release notes takes precedence over the information in the *HS Family of Array Controllers User's Guide*.

Topics Covered

These release notes cover the following topics:

- Hardware and software supported by HSOF Version 3.4
- Device Support—Lists of devices supported by HSOF Version 3.4
- New Items—Modifications that are new for HSOF Version 3.4
- Items from Previous Releases—Modifications to operating parameters or functions that were introduced in software versions prior to HSOF Version 3.4
- Documentation Amendments—Additions and corrections to the documentation
- HSOF software installation and upgrade instructions
- Identification of the software revision level
- Order numbers

Release Package Contents

The Version 3.4 release package consists of the following:

- A cover letter
- A PCMCIA program card containing HSOF Version 3.4 software
- *HS Family of Array Controllers User's Guide*
- *HS Family of Array Controllers Service Manual*
- License keys to enable optional features: write-back cache, disk mirroring, and RAID (each to be purchased separately)
- *HSJ30/HSJ40 Array Controller Operating Software Version 3.4 Release Notes*
- *HSJ30/HSJ40 Array Controller Operating Software (HSOF), Version 3.4 Software Product Description*

Intended Audience

This document has been prepared for Compaq customers who currently use and maintain the HSJ30 or HSJ40 array controller.

Hardware Support

HSOF Version 3.4 software supports the following revisions for your controller and associated hardware:

- HSJ30-Ax and HSJ30-Cx controller modules
- HSJ40-Ax and HSJ40-Cx controller modules
- Cache module Version 1, hardware revision A and Version 2, hardware revision A or B
- BA350-MA controller shelf
- BA350-Sx 8-bit SCSI device shelf
- BA356-Sx wide device shelf with 8-bit or 16-bit personality module (controller operates in 8-bit mode only)
- BA35x-HF power supply

Operating System Support

HSOF Version 3.4 software is supported by the following operating system versions:

- OpenVMS Alpha Versions 6.1, 6.2, 7.0, 7.1
- OpenVMS VAX™ Versions 5.5-2, 6.1, 6.2, 7.0, 7.1

Host Adapter Support

The following adapters have been tested and are supported in this release.

- CIXCD-AB
- CIXCD-AC (both for XMI-based systems)
- CIBCA-Bx (for BI-based systems)
- CIPCA (for PCI-based systems)

Device Support

HSOF Version 3.4 software supports the devices listed in Table 1 through Table 4 at the indicated minimum hardware and microcode levels.

Table 1 Supported Disk Drives

Device	Capacity in Gigabytes	Minimum Microcode Version	Minimum Hardware Version
RZ25-VA	0.43	0900	B01
RZ26-VA	1.05	T392	D02
RZ26L-VA/VW ¹	1.05	440C	A01
RZ26N-VA/VW ¹	1.05	446	A01
SWXD3-SF/WF ¹	1.05	446	A01
DS-RZ26N-VZ ¹	1.05	1003	A01
DS-RZ1BB-VW	2.10	LYJO/0656	A01
RZ28-VA/VW ¹	2.10	435E	A01
RZ28B-VA	2.10	0003	A01
RZ28D-VA/VW ¹	2.10	0008	A01
SWXD3-SG/WG ¹	2.10	0008	A01
RZ28M-VA/VW ¹	2.10	0466	A01
DS-RZ28M-VZ ¹	2.10	1003	A01
SWXD3-SH/WH ¹	2.10	0466	A01
RZ74-VA	3.57	T427B	B07
DS-RZ1CB-VW	4.1	LYJO/0656	A01
RZ29B-VA/VW ¹	4.3	0007	B01
SWXD3-SE/WE ¹	4.3	0007	C02/A01
DS-RZ1CF-VA/VW	4.3	0372/N1H1/1214	A01
DS-RZ1DB-VW	9.1	LYJO/0307	A01
DS-RZ1DF-VA/VW	9.1	0372/N1H1/1214	A01
DS-RZ40-VA	9.1	LYGO	A01
DS-RZ1DD-VA/VW	9.1	0305	A01
DS-RZ1EF-VA/VW	18.2	0372/N1H1	A01
DS-RZ1ED-VW	18.2	0305	A01

Table 1 Notes:

¹ Wide disk drives require a SWXSS-06 shelf.

All drive "VW" models require DS-SWXSS-06 wide device shelves.

NOTE

Any accidental use of the ADD TAPE command will result in conditions requiring reinitialization of the controller.

Table 2 Supported Tape Drives

Device	Capacity G= Gigabytes T=Terabytes	Minimum Microcode Version	Minimum Hardware Version	Notes
TKZ60-EC	.440	1111B01	B01	1,6
TKZ61	4.4	0611	A01	1
TKZ62	24.0	0616	A01	1,3
TKZ63	2.4	0616	A01	1,3
2T-TKZ64	144	0616	A01	1,3
TL810	480/960	1.10robot/v40drive	A01	1,2,3
TL812	960/1920G	1.2 robot /CC33 drive	A01	1,2,3,4,5
TL820	2640/5280	1d3M robot/v40	L1	1,2,3
TL822	5280/10560G	1g4F robot /CC33 drive	A01	1,2,3,4,5
TL826	3520/7040G	1g4F robot /CC33 drive	A01	1,2,3,4,5
DS-TL893	924/1848T	V2A/5A	A01	1,2,3,4,5
DS-TL894	1.68/3.36T	V1.24	A01	1,2,3,4,5
DS-TL895	3.1/6.2	230	A01	
DS-TL896	6.16/12.32T	V2A/5A	A01	1,2,3,4,5
TLZ06-VA	4	0491	A04	3
TLZ07-VA	8	04Aq	AX01	3
TLZ09-VA	4/8	V165		5
TLZ6L-VA	16	0491	A01	3,6
TLZ7L-VA	8	4BQE	A02	3,6
TLZ9L-VA	32	A020	AX01	3,6
TSZ07-AA	0.140	0309	A01	1
TZ86-VA	6	430B	A02	5
TZ87-VA	10/20G	930A	A01	3,5,6
TZ87N-VA	10/20G	930A	A01	3,4,5,6
TZ87-TA	10/20G	9514	B02	1,2,3,6
TZ87N-TA	10/20	930A	A01	1,3,5
TZ867-AE/AF	42	430B	A01	1,3,5
TZ875-NE	50/100	930A	A01	1,3,5
TZ875-NT	50/100G	930A	A01	1,3,5,6
TZ875-TA	50/100G	930A	A01	1,3,5,6
TZ875-AE/AF	50/100G	930A	A01	1,3,5
TZ877-AE/AF	70/140	930A	A01	1,3,5

Table 2 Supported Tape Drives

Device	Capacity G= Gigabytes T=Terabytes	Minimum Microcode Version	Minimum Hardware Version	Notes
TZ877-NE	70/140	930A	A01	1,3,5
TZ88N-VA/TA	20/40G	CC33	A01	3,4,5,6
TZ885-NT/NE	100/200G	CC33	A01	1,3,4,5,6
TZ887- NT/NE	140/280G	CC33	A01	1,3,4,5,6
DS-TZ89N-VW	35/70G	141F	A01	3,4,5,6,7
DS-TZ89N-TA	35/70G	141F	A01	1,3,4,5,6
DS-TL890	560/1120G	3.23 robot/V55 drive	A01	1,2,3,4,5
DS-TL891	350/700G	3.23 robot/V55 drive	A02	1,2,3,4,5
DS-TL892	350/700G	3.23 robot/V55 drive	A02	1,2,3,4,5
DS-TZS20-VW	25/50	01aj	A01	

Table 2 Notes:

1. Requires 0.2 meter SCSI-1 to SCSI-2 transition cable, Compaq internal part number 17-03831-01 for DWZZA-AA, and Compaq part number 17-04367-01 for SSB DWZZA-VA and DWZZB-VW.
2. Requires SWXA2 single-ended to differential SCSI signal converter.
3. Capacity values represent compressed data. The compression factor is device dependent based on individual device algorithms.
4. Cannot read TK50, TK70 or TZ30 formatted tapes.
5. Requires a KZPSA or PMAZC host adapter.
6. Tape device code load is supported.
7. Wide tape devices require a SWXSS-06 shelf with an 8-bit I/O module

Table 3 Supported Solid State Devices

Device	Capacity in Gigabytes	Minimum Microcode Version	Minimum Hardware Version	Notes
EZ31-VW	0.134	V064	A01	2, 3
EZ32-VW	0.268	V064	A01	2, 3
EZ51R-VA	0.10	V096	D01	1, 2, 3
EZ54R-VA	0.42	V096	A01	1, 2, 3
EZ58R-VA	0.85	V109	C01	2, 3
EZ64-VA	0.475	V064	A01	2, 3
EZ64-VW	0.475	V070	A01	2, 3
EZ69-VA	0.950	V064	A01	2, 3
EZ69-VW	0.950	V070	A01	2, 3
EZ454	.536	Y018	A01	2, 3
EZ832	3.2	Y018	A01	2, 3

Table 3 Notes:

- 1 Code load supported for these drives
- 2 Formatting supported for these drives
- 3 Do not warm-swap solid-state disk drives. Make sure power to the device shelf is turned off before removing or inserting this device.

Table 4 Supported CD-ROM Readers

Device	Capacity in Gigabytes	Minimum Microcode Version	Minimum Hardware Version
RRD42-VB/VU	0.6	1.1a	A01
RRD43-VA	0.6	0064	A02
RRD44-VA	0.6	3493	A02
RRD45-VA/VU	0.6	1645	A01
RRD46-VA	0.6	1337	A01
RRD47-VA	0.6	1206	A01
RWZ52-VA	0.6 per side	3403	A01
RWZ53-VA	2.3/2.6	1.35	AX02
RW524	19	1.37 juke box/3404 drive	A01
RW525	19	2.17 juke box / 3404 drive	A01
RW530	38	6.15 juke box / 3404 drive	A01
RW531	38	0.35 juke box / 3404 drive	A01
RW532	76	0.35 juke box / 3404 drive	A01
RW534	104	5.20 juke box / 3404 drive	A01
RW536	170	5.20 juke box / 3404 drive	A01
RW546	36.8	1.36 juke box / 1.35 drive	A01
RW551	64	1.36 juke box / 1.35 drive	A01
RW552	147	1.36 juke box / 1.35 drive	A01
RW555	294	1.36 juke box / 1.35 drive	A01
RW557	547	1.36 juke box / 1.35 drive	A01

Table 4 Notes:

Do not warm-swap CD-ROM drives. Make sure power to the device shelf is turned off before removing or inserting this device.

New Items

HSOF Version 3.4 corrects some problems that were identified after the release of HSOF Version 3.2.

Correction for TILX Incompatibility with Disks

In previous versions of HSOF software, data integrity problems could infrequently occur if the tape in-line exerciser (TILX) was run on tapes attached to a controller on which disks were also configured. This problem is corrected in HSOF Version 3.4.

NOR/DDL Errors

A small number of NOR/DDL (No Response/Dual Data Link) errors may occur during cluster transitions and other normal cluster events. However, some customers have experienced a NOR/DDL error rate higher than expected. Under certain rare conditions on the CI bus, the HSJ controller CI interface ASIC may become unable to recognize the host's acknowledgment that a packet from the controller has been received. When this condition persists on both paths, the controller closes the virtual circuit with an error log of NOR/DDL. This version of HSOF software corrects this specific problem.

Action for Repeated Reboots

Very rarely, a hardware failure might cause a controller to reboot repeatedly, preventing preferred disk devices from completing failover to the dual-redundant partner. HSOF Version 5.4 contains a modification so that if the same bugcheck repeats itself three times in a ten minute period, the controller will shutdown with no restart to permit the disk devices to failover to the working controller in a dual-redundant pair.

EMU Alarm Clarification

The environmental monitoring unit (EMU) alarm sounds for individual device failures, but does not sound for storageset failures.

Write-Back Cache (WBC) Battery Replacement

Please observe the two year posted replacement period for the write-back cache batteries as specified in the *Instructions for Write-Back Cache Battery Service Label* (FRU Insert EK-WBCIN-FI rev B01).

Updated Storageset Limits

The following limits apply to storagesets configured on single controller or dual-redundant controller configurations:

- A mirrorset can have a maximum of 6 members.

- A stripeset or RAIDset can have a maximum of 14 members.
- There can be a maximum of 20 mirrorsets and/or RAIDsets.
- There can be a maximum of 30 storage sets (RAIDsets, mirrorsets, and/or stripesets).
- There can be no more than 32 physical device members for a unit.
- Each storage set can store a maximum of 256 GB.

Support Large-Drive Formatting

This release supports formatting of larger disk devices (9GB and 18GB).

Support for up to Fourteen 18 GB Drives

The maximum storage set size has been increased to 256 GB so that this controller can support up to fourteen 18 GB drives.

New Host Mode “F” for Support of Sun Solaris Operating System

Host Function Mode “F” has been added to the list of available operating system options in support of multiple-bus failover on Sun operating systems platforms. Host Function Modes are described in the *HS Family of Array Controllers User’s Guide* under the SET THIS_CONTROLLER and SET OTHER_CONTROLLER CLI command description.

NOTE: All customers running the Sun Solaris operating system should select Host Mode “F” even if they are not using multiple-bus failover mode. Improper host operation may occur if Sun Solaris systems are connected to an array controller set to a host mode other than “F”. Select Host Mode “F” through the CLI window.

Table 5 Host Mode Function Table

Mode	Description
A	Normal (default) mode: OpenVMS® Digital UNIX® Hewlett-Packard® UNIX
B	IBM AIX®
C	HSZ15
D	Microsoft® WindowsNT®
E	Silicon Graphics IRIX®
F	Sun Solaris®

NOTE: When loading an older version of HSOF code that does not support Host Function Mode F:

- Change the host function mode to one that is supported by the older (previous) code version.
- Reboot the controller before loading the older code.

The controller goes into an “UNKNOWN” Host Mode Function state after:

- Host Function Mode “F” is the selected mode and
- The controller is rebooted with an older code version not supporting mode “F”.

Controller behavior is unpredictable at this point.

Hot Swapping Devices

When hot swapping a device, wait 90 seconds after you restore power before enabling the bus, issuing CLI commands to the controller, or allowing any activity to the controller.

Features from Previous Releases

The following list briefly describes changes that were introduced in the code version previous to HSOF Version 3.4 that are not covered in other documentation.

Battery Handling

Diagnostic testing is performed on the write-back cache batteries when the controller first initializes, and then periodically after it has become fully charged. This section clarifies battery-related topics.

Battery Handling and the CACHE_UPS Switch

If the CACHE_UPS switch is activated, the following behavior is true at all times:

- no battery checks are performed
- no battery condition is reported or messages sent
- no action is taken in the event of battery failure



CAUTION: Use of this setting without a functional uninterruptible power supply (UPS) in place may result in data loss if power is interrupted and batteries have failed.

When the CACHE_UPS switch is enabled, the controller ignores the condition of the write-back cache batteries because a UPS is assumed to be in used to maintain power to the write-back cache module in the event of a power failure. Note that HSOF software does not have the capability to monitor the remaining capacity of a UPS. There are many variables in a UPS configuration; some configurations may put data at risk if the UPS is exhausted. For example, if UPS power is lost to the entire host/storage system without warning, write-back cache data is maintained by the cache batteries only. With CACHE_UPS set, the state of the batteries is unknown and data could be at risk.

Battery Handling and Cache Policy

The settings chosen for Cache Policy (A or B) affects access to RAIDsets and mirrorsets during the initial test only, and determines the cache mode the controller uses during initial test only.

Initial test begins when the controller is turned on and continues until the battery is charged, or up to ten hours. Initial testing includes a recharge of the battery after potential discharge during shutdown. Every four minutes, the software tests the battery. Full caching operations begin when the battery is fully charged.

Cache Policy A is the default setting. Cache Policy A and B apply only to a "low" battery from initialization until either:

- the battery becomes fully charged or
- 10 hours elapse without the battery becoming fully charged (in this case, failed battery action is taken, as described in "Failed Battery Action", in these release notes.)

After a battery has become fully charged, Cache Policy A or B no longer applies, and regular periodic battery tests are performed.

The following table summarizes the effect of both cache policy settings on access to RAIDsets and mirrorsets when a battery is "low" during the initial test period.

Policy	RAID/Mirrorset access	Cache Mode
Cache Policy A	no access	write-through on individual disk units (also called JBOD)
Cache Policy B	access	write-through on RAID/mirrorsets and individual disk units

NOTE: Write-through cache mode is not a 100% guarantee of user data consistency within storagesets (RAID and mirrorsets). This is because in these storagesets, there is an inherent delay in the writing of data to the different members. If a power failure occurs between the writing of some members and others (an extremely narrow window), data on the various members will be inconsistent. Therefore, Cache Policy A (which denies access to RAIDsets /mirrorsets on controllers with low batteries) is the only 100% guarantee of user data consistency. That is why Cache Policy A enforces loss of storageset access in the event of a battery that does not pass the battery test.

NOTE: HSOF software makes every attempt to notify the user that a battery problem (not good or open circuit) has occurred by printing a message to the console and posting an error to the host errorlog. However, not all operating systems present errorlogs reliably.

Failed Battery Action

If a battery passes the initial test, cache policy no longer applies, and periodic testing begins. During periodic testing, the battery is tested every 24 hours. When a failed battery is detected during either initial or periodic testing, the following failed battery action is taken:

Dual HSJ40s (dual batteries on each cache module and partner is running and has good batteries):

- RAIDsets and mirrorsets migrate to partner under OpenVMS control without shutdown
- individual disk units accessed in write-through mode

Single HSJ40:

- no shutdown
- no RAIDset or mirrorset access permitted
- individual disk units accessed in write-through mode

Extending the Life of Your Write-Back Cache Batteries

Occasionally, circumstances require shutting down the controller and restarting it. If the correct steps for turning off the power to an HSJ40 array controller configuration with write-back cache are not followed, there is a potential for loss of data that might exist on any devices connected to them. In addition, turning off the power to the controller subsystem for any reason for longer than four days (such as a long holiday, system move, replacing a bad SCSI host cable, and so forth), turn off the write-back cache batteries to prevent them from discharging. To avoid problems when the controller restarts, always use the following procedure when shutting it down:



CAUTION: Allowing the write-back cache batteries to discharge completely, and leaving them in a discharged state for any length of time could result in permanent and irreversible degradation of the batteries.

1. Use the proper procedures for shutting down the operating system if the host system is also going to be turned off.
2. If the host is not going to be turned off, it is not necessary to shut down the host system, but use the proper operating system procedures to dismount any units that are accessed through the HSJ40 array controllers.
3. If the controller configuration contains any devices or storagesets that are write-back cache enabled, and the system is going to be turned off for an extended length of time, the batteries on the write-back cache modules drain, causing the data in the cache modules to be lost. If you have RAIDset or mirrorset units, or single devices with write-back caching turned on, set NORUN on all units.
4. When the dismount and/or the operating system shutdown procedures are complete, invoke the controller SHUTDOWN commands on the controllers.



CAUTION: Do not turn off the power to the controller subsystem until all shutdown procedures have successfully completed.

5. If you have a dual-redundant controller configuration, shut down each controller one at a time, using the following commands:

```
SHUTDOWN OTHER_CONTROLLER
```

```
SHUTDOWN THIS_CONTROLLER
```

If you have a non-redundant controller configuration, only the SHUTDOWN THIS_CONTROLLER command is necessary.

The green reset LED light stops blinking when the SHUTDOWN command is completed.

- When the controller SHUTDOWN command has successfully completed, turn off power to the controller subsystem (or just the controller shelf, if you are not shutting down the entire system, by unplugging the power supplies in the controller shelf).

Disabling the Write-Back Cache Batteries

Refer to Chapter 7 in StorageWorks Array Controllers HS Family of Array Controllers Service Manual for instructions on removing and replacing the controller module and write-back cache module.

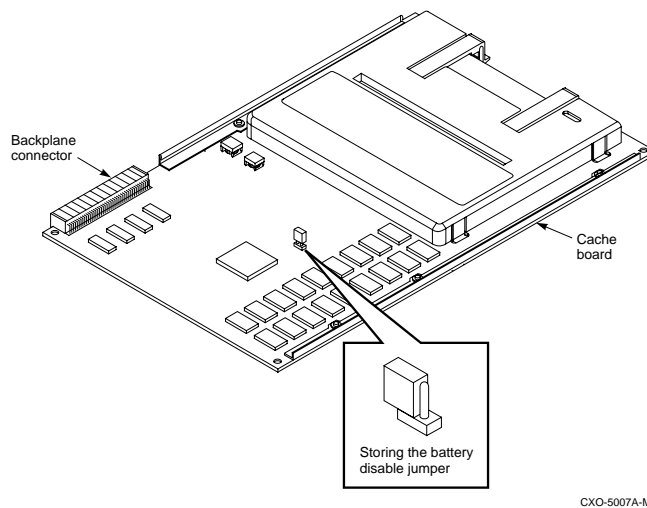


Figure 1. Location of Write-Back Cache Module Batteries

- Remove the controller module.
- Remove the write-back cache module.
- Remove the battery disable jumper and replace it so that both pins are covered. The battery is no longer powering the cache.
- Replace the write-back cache module.
- Replace the controller module.

Restarting the Controller

- Before you restore power to the subsystem, remove the controller module, and the write-back cache module. Remove the battery disable jumper and replace it so it is only covering one pin, then reassemble the unit.
- If you removed the PCMCIA card, hold down the reset button while inserting the PCMCIA card. When you release the reset button, the controller restarts.
- If you did not remove the PCMCIA card, press the reset button and the controller restarts.

Logical Device Event Reports

Under certain circumstances the Port, Target, and LUN fields contained in event reports associated with storageset logical devices, Event Log displays as well as sense data responses, will be set to 255 (decimal) instead of the Port, Target, and LUN of the first physical device in the storageset. In addition, when the Port, Target, LUN are set to 255, the Device Type is set to 0 (magnetic disk device), and the Device Product ID and Device Firmware Revision Level fields will be ASCII space filled.

SHOW on Both Controllers

Some devices, such as tape devices, may not show correctly on one controller if they are preferred to the other controller.

If the expected information is not displayed from one controller, use the SHOW command again to view the information on the other controller.

Logical Block Address Does Not Match for MEDIUM ERROR

The Logical Block Address (LBA) is a number used to identify a block on a mass storage device. The LBA that appears in the Information field of an Event Log (%EVL) display when the Sense Key field is MEDIUM ERROR does not agree with the LBA number contained in the Information field of the extended sense data that is sent to the host system. It is one less than the number in the extended sense data.

Adding RAIDsets When Battery Condition is Low

You can use the add RAIDset and add mirrorset commands, regardless of the write-back cache battery condition. However, if the cache_policy is set to A and the batteries are low, the controller does not allow access to any RAIDsets or mirrorsets. Cache_policy A requires that the cache batteries be fully charged before you can use RAIDsets or mirrorsets.

Drive-Level Event Reports

Under certain circumstances the "devtype" (device type) field contained in drive-level event reports %EVL displays as well as error logs, will contain the value 1F (hexadecimal). When "devtype" is 1F the content of the "device identification" and "device serial number" fields are undefined and should be ignored.

This is a permanent restriction.

Saving the Subsystem Configuration

The *SAVE_CONFIGURATION* switch is intended to be used to provide a means to restore nonvolatile (NVRAM) contents when a controller in a single-controller module configuration is replaced. The *SAVE_CONFIGURATION* switch cannot cross hardware revisions or software versions. *SAVE_CONFIGURATION* is not available for upgrades of firmware or hardware, and does not perform inter-platform conversions. For example, do not use *SAVE_CONFIGURATION* to upgrade from HSOF Version 3.2, or from an or from an HSJ40 to an HSD50 array controller.

The controller stores the subsystem's configuration—the storagesets you configured, the switches set for each, the HSOF patches you've installed, and so on—in its nonvolatile memory. This means that, if the controller fails in a nonredundant configuration, you would have to reconfigure the subsystem from scratch. (In a dual-redundant configuration, this information is stored by both controllers, which effectively eliminates the risk of losing it.)

NOTE: Compaq recommends that the *SAVE_CONFIGURATION* switch only be used for nonredundant controller configurations. To save the configuration information for dual-redundant configurations use the *SET FAILOER COPY=* command.

If you are operating a nonredundant configuration subsystem, Compaq recommends saving the subsystem's configuration on at least one of the devices or storagesets with the following command:

```
INITIALIZE STORAGESET_NAME SAVE_CONFIGURATION
```

When initializing a device or storageset with the *SAVE_CONFIGURATION* switch, the controller copies the subsystem's configuration to the disk drives. If you use the switch for a multi-device storageset, such as a stripeset, the complete information is stored on each device in the storageset. The capacity of a device that is initialized with the *save_configuration* switch is reduced by 256KB. This capacity reduction applies to each member of a storageset.

After initializing a storageset with this switch, the controller keeps the copy up-to-date. For example, every time a new patch or storageset is added to the HSOF software, the controller re-copies the new configuration to all storagesets that were initialized with the *save_configuration* switch.

If a controller in a nonredundant-configuration fails, its replacement automatically searches the devices in the subsystem for a saved configuration. If it finds a saved configuration, it transparently loads it into nonvolatile memory and brings the subsystem online. It is unnecessary to issue an *INITIALIZE* command again after reconfiguring the devices with a new controller.

Compaq does not recommend initializing all of your storagesets with the *SAVE_CONFIGURATION* switch. Every time you change the subsystem's configuration, the controller writes the new configuration to the storagesets that you initialized with this switch. Too many write operations can adversely affect performance.

If you are upgrading from HSOF Version 3.2 to Version 3.4 in a single-controller configuration, you can refresh the *SAVE_CONFIGURATION* data on your storagesets to include the new software revision by issuing the following command:

```
SET UNIT xxx WRITE_PROTECT
```

[where xxx is any existing unit on the controller]

```
SET UNIT xxx NOWRITE_PROTECT
```

These commands, that have no net effect, serve to change the contents on nonvolatile memory, causing the updated *SAVE_CONFIGURATION* information to be automatically written to the *SAVE_CONFIG* area of all units that have been initialized with this option.

Maintenance Terminal Port Speeds

HSOF Version 3.4 software supports terminal port connections at 4800, 9600, and 19200 bits per second (bps). Connection speeds at 300, 1200, and 2400 bps are not supported.

Restrictions on Moving Storage Sets to Previous Software Versions

In HSOF Version 2.5 software, striped mirrorsets reported a different disk geometry than the same nonmirrored stripeset. This has been resolved in Versions 2.7, 3.1, and 3.2 such that striped mirrorsets initialized under these versions report a disk geometry identical to the same nonmirrored stripeset.

Due to this improvement, be aware of the following when moving stripesets to previous versions of software:

- Striped mirrorsets created under HSOF Software Versions 2.7, 3.1 or 3.2 cannot be used on previous versions; the metadata is incompatible.
- Any stripeset that is converted to a striped mirrorset using the MIRROR command under HSOF Software Versions 2.7, 3.1 or 3.2 cannot be used on previous versions. You must unmirror each of the members to return the stripeset to an earlier version.
- Any stripeset clone that is created under Versions 2.7, 3.1 or 3.2 (using the CLONE utility) cannot be used with previous software versions.
- Containers initialized with the SAVE_CONFIGURATION switch introduced in HSOF Version 2.7 cannot be used with versions prior to Version 2.7.

Striped mirrorsets created under previous software versions and used with Versions 2.7, 3.1 or 3.2 carry forward the same geometry they had under the previous version. If possible, back up all data and reinitialize the stripesets under Versions 2.7, 3.1 or 3.2 to take full advantage of geometry improvements.

Initialization Devices

Controller-attached devices can serve as initialization devices for VAX 7000 and VAX 10000 systems, provided the VAX 7000/10000 console code is at Version 4.0 or higher.

Fast Shadow Member Eviction

An MSCP flag is provided to enable rapid shadow member eviction when a device error is detected. The OpenVMS operating system can set this flag based on SYSGEN parameters in the field SHADOW_SYS_DISK. The MSCP flag is called MD.SER. When set, and an I/O encounters a device error, the I/O is returned as failed without further error recovery. The OpenVMS operating system can then evict a shadowset member, as appropriate.

Only One Switch per CLI Command Recommended

Certain CLI command switches are incompatible. To avoid problems in this area, only specify one switch per CLI command. For example, to set both WRITEBACK_CACHE and NORUN on unit D102, use the following two commands:

```
SET D102 WRITEBACK_CACHE
```

```
SET D102 NORUN
```

UNMIRROR and Device Capacity

The UNMIRROR command is valid only for devices that have a capacity equal to the capacity of the mirrorset. If a mirrorset comprises devices of different capacities, the mirrorset capacity is limited to the size of the smallest member; larger members will have unused capacity. If a member with unused capacity is the last remaining member of a mirrorset, you cannot use the UNMIRROR command to change the device back to a single-disk unit, because that change would cause a change in reported disk capacity, possibly confusing the operating system.

Unit Problems after Battery Low

An unusual combination of circumstances could cause a unit to unexpectedly become inoperative or report lost data after a write-back cache battery changes state from "low" to "good." No data has been lost. Reset the controller to correct the unit state.

CLEAR_ERRORS LOST_DATA Command

When entering the CLEAR_ERRORS LOST_DATA COMMAND for a RAIDset-based unit, always enter the command through the preferred path on the controller that owns the unit. Entering the command from the companion controller in a dual-redundant configuration does not clear the lost data.

SET NOPATH Requires Controller Reset

Shut down the controller using the SHUTDOWN THIS_CONTROLLER CLI command to restart an HSD controller after disabling the host paths with the SET THIS_CONTROLLER NOPATH COMMAND. Failure to do so could result in subsequent unexpected conditions requiring controller reinitialization. The shut down allows devices preferred to this controller to become visible on the other controller.

You do not need to reset an HSD controller after enabling paths.

RRD42 CD-ROM Reader

Mounting an RRD42 might put a message in the OpenVMS error log. In earlier versions of OpenVMS, the first four digits in Longword 19 of the controller dependent information is 02D1. New versions of OpenVMS report ASC: 209.(D1) ASCQ: 2.(02). The message indicates "Unexpected bus phase," and can be ignored safely.

OVERRIDE_ONLINE Switch

Attempting to delete tape-based units using the OVERRIDE_ONLINE switch results in conditions requiring controller reinitialization. Do not enter the OVERRIDE_ONLINE switch when deleting tape-based units.

Unable to Access Tape Drives after Power Cycle

You might not be able to access a tape drive after the power for the drive is turned off and back on. Use the `CLEAR_ERRORS UNKNOWN device-name` command to place the device in a known state.

CFMENU Constraints

CFMENU can only delete single sparesets. Delete sparesets one at a time.

Device Adds, Moves, and Changes

The controller maintains configuration maps of device types and locations and uses those maps for communicating with devices. If you add, move, or change devices while the controller is powered off and without changing the controller configuration first, the controller is not able to work with the changed devices when it returns to service.

Tape Drive Firmware Revision Upgrade

If you are not using HSUTIL to install your new tape firmware, do the following:

Before installing a new version of tape drive firmware, delete the tape drive completely from the controller configuration. You can re-add the tape drive after the firmware installation is complete.

Running CONFIG or CFMENU Utilities During Backup Operations

Do not run the CONFIG or CFMENU utilities during a tape backup operation.

Changing Host Adapter Types

If you change the host adapter and maintain the same node number, restart your controller(s).

CLONE Utility

When running the CLONE utility in a dual-redundant controller configuration, do not issue any CLI commands to devices that are involved in the clone operation.

Moving Write-Back Cache Modules

When moving a write-back cache module to a new environment (that is, different controller, different devices), it is very important that you perform a clean shut down of the controller and clear any data from the cache. Follow these steps to move a write-back cache module:

1. Shut down the controller and flush unwritten data from the cache module using the appropriate CLI command:

```
SHUTDOWN THIS_CONTROLLER  
SHUTDOWN OTHER_CONTROLLER
```


2. Wait for the shutdown command to complete and verify that the controller does not report any errors.
3. Remove the controller and cache module following the instructions in the HS Family of Array Controllers User's Guide or the HS Family of Array Controllers Service Manual.

The SHUTDOWN command flushes cache data to the devices, and you can install the module in another location without problems caused by uncleared cache data.

Set Tape Density When Adding Drive and Changing Cartridge Types

The DEFAULT_FORMAT switch allows you to specify the tape format for use by the controller for write operations to a tape drive. Also use this switch to tell the controller to allow the host to set the tape format.

Not all tape devices support all formats. The easiest way to determine what formats are supported by a specific device is to enter the SET TAPE-UNIT-NUMBER DEFAULT_FORMAT=? command. The controller displays the valid options for the unit.

NOTE: Host system software must support the density selection for the affected device for this option to operate correctly. Using the HOST_SELECTED switch for other devices may yield unpredictable results.

Compaq recommends the use of the SET TAPE-UNIT-NUMBER DEFAULT_FORMAT=HOST_SELECTED command with only TSZ07 tape drives. Set the switch to HOST_SELECTED to allow the host to set the tape format.

When first adding a tape drive to the controller configuration, set the tape density with the set tape-unit-number default_format= command before using the OpenVMS initialize command. In dual-redundant controller configurations, set the tape density from both controllers in the pair before the tape drive is mounted. Not setting the tape density might cause the tape to be written at the wrong density, or the OpenVMS initialize command to fail with an invalid format error.

Moving Drives from HSC Controllers

Software Versions 3.1 and 3.2 contain an undocumented local program, CHVSN, for viewing and changing volume serial numbers that you can use to move drives from an HSC controller to an HSJxx controller. Use this program when moving drives because the HSC controller accepts volume serial numbers of zero and duplicate serial numbers, but HSJxx controllers do not.

Run CHVSN for drives in nontransportable mode that originated on an HSC controller. If the volume serial number is zero or a duplicate of another drive's volume serial number, answer "yes" to the "Update CHVSN" question. The controller then generates a new volume serial number:

```
RUN CHVSN
Device (port target lun) [EXIT] ? 4 1 0
CHVSN: Volume Serial Number is 00000000 00000000 Update
CHVSN (Y/N) [N] ? Y
CHVSN: Volume Serial Number is 00012010 00580010
Device (port target lun) [EXIT] ? Return
CHVSN - Normal Termination
```

If you attempt to run the subsystem with zero or duplicate volume serial numbers present, two symptoms appear:

The Open VMS operating system reports “medium is offline.”

```
$ MOUNT/FOR $3$DUA324 %MOUNT-F-MEDOFLL, medium is offline
```

```
$
```

The controller SHOW UNIT command reports “MEDIA FORMAT ERROR.”

```
SHOW D324
```

MSCP unit	Uses
D324	DISK240

Switches:

- RUN
- NOWRITE_PROTECT
- READ_CACHE
- NOWRITEBACK_CACHE
- MAXIMUM_CACHED_TRANSFER_SIZE = 32

State:

- MEDIA FORMAT ERROR
- NOPREFERRED_PATH

CLI Type Ahead, Recall, And Editing

With HSOF Version 3.1 or higher, you no longer need to wait for the current command to complete before entering the next command. You can recall any of the last four commands entered, and then edit that command to save time when entering new commands.

Refer to HS Family of Array Controllers User's Guide for more information on entering CLI commands.

DILX Enhancement

The HSJ30/40 controller with HSOF Version 3.1 software has a new version Disk In-Line Exerciser (DILX) that acts on disks configured as single-device, RAIDset, stripeset, mirrorset, or striped-mirrorset units. In addition, you can choose to perform either an auto half test or an auto full test.

Support for Larger Stagesets

HSOF Version 3.1 or higher allows you to use stagesets with capacities of up to 120GB. You can configure drives of any size into stagesets, such as RAIDsets or stripesets. The maximum size of a stageset is 120GB, regardless of the size of the member drives.

Faster Storageset Initialization

The INITIALIZE command has been optimized in Version 3.1, and runs significantly faster than on previous versions of HSOF software. It takes less than 30 seconds to initialize a large RAIDset.

Multiple Disk Drive Formatting

You can perform a low-level format on up to seven disk drives at once with HSOF Version 3.1 software. See the "Formatting a disk using HSUTIL" section in these release notes for instructions on how to format disk drives.

Configuration Saved on Disk

A new CLI option causes the controllers to save a copy of the controller configuration (nonredundant controllers only) on one or more disk drives in the subsystem. The saved information is updated whenever the configuration of the nonredundant controller is changed. Should a nonredundant controller be replaced by another controller with no configuration, the saved configuration is restored from one of the devices to the controller.

The information saved includes the controller settings, device, storageset and unit configurations, and software patches. The section "Using SAVE_CONFIGURATION to Save the Subsystem's Configuration" further describes this feature. Note that any container initialized with the save_configuration option cannot be used on previous HSJ40 array controller HSOF software versions. See the section entitled "Replacing a Controller or Cache Module with C_SWAP" in these release notes for instructions on how to replace a failed controller.

Ability to Install New Microcode on a Tape Drive and Solid State Disk Drives

HSOF Version 3.1 software allows you to use the controller's HSUTIL program to install new microcode to the TZ89 tape drive.

HSOF Version 3.1 software also allows you to use the controller's HSUTIL program to install new microcode to solid state disk devices.

Set SCSI Speed for Devices

HSOF Version 3.1 software makes it possible for the initiator and target to negotiate a faster data rate than is supported by the cable length. HSOF Version 3.1 software has a new CLI command to set a maximum data transfer rate between the controller and any device. Possible settings are 10MHz, 5MHz, or asynchronous mode.

To set the transfer speed, use the set command as follows:

```
SET device-name TRANSFER_RATE_REQUESTED=rate
```

where, rate can be one of the following:

- ASYNCHRONOUS

- 10MHZ
- 5MHZ

The default is 10MHZ.

Refer to HS Family of Array Controllers User's Guide for more information on setting the data transfer rate according to SCSI cable lengths.

Host Tape Density Selection

You can now set the density for tape drive writes from the host operating system, and from the controller CLI.

Currently, the TSZ07 is the only tape drive for which you can set tape density from OpenVMS through the HSJ controller using Openvms init and Openvms mount. Do not use these commands to set tape density on other tape drives. Set tape density on other tape drives through programs that issue QIOs, as some customer applications do.

Inform the controller to allow the host to set tape density with the CLI command:

```
SET unit-name DEFAULT_FORMAT=HOST_SELECTED
```

When using dual-redundant controllers, tape format changes only appear on the controller that the device is mounted through. show unit only shows the updated format on the controller which has the tape online.

Disk Code Load Capability

Upload disk firmware to compatible disks in the subsystem using the HSUTIL utility. For more information, see Appendix B, "The HSUTIL Utility".

Disk Formatting Capability

Format compatible disks in the subsystem using the HSUTIL utility. For more information, see Appendix B, "The HSUTIL Utility".

This section describes the features and user interface of the HSUTIL utility. HSUTIL provides two functions:

- Device format-Enables you to perform a basic SCSI format operation on a disk device.
- Device code load-Enables you to download device firmware into supported disk devices.

Default Chunksize and Maximum Chunksize

The algorithms for calculating the default and maximum chunksize for containers changed with Version 2.7. The default chunksize is determined by the following:

- If the number of members in a container is ≤ 9 , the default chunksize is 256.
- If the number of members in a container is >9 , the default chunksize is 128.

- If the controller cache size is less than 16 MB, the default chunksize is 64, regardless of number of members.
- The maximum chunksize is figured as $2048 / (n - 1)$ where n is the number of devices in the container. You must specify the chunksize in accordance with the maximum chunk sizes found in Table 7.

Table 7 Chunk Size

RAIDset Size	Maximum Chunk Size
3 members	1024 blocks
4 members	682 blocks
5 members	512 blocks
6 members	409 blocks
10 members	227 blocks
11 members	204 blocks
12 members	186 blocks
13 members	170 blocks
14 members	157 blocks

Disk Geometries of Mirrorsets and Clones

In software Version 2.5, mirrored devices reported different geometries than unmirrored devices of the same type. This also affected the CLONE utility, such that a clone of a unit may have reported a different size to the operating system than the original unit. Software Version 2.7 resolves this issue. In Version 2.7, all mirrorsets and clones report the same disk geometry/capacity as their unmirrored equivalents.

New CLEAR_ERRORS INVALID_CACHE Functionality

A controller presents an invalid cache error during initialization if it detects a mismatch between the cache information on the controller and the cache information on the cache module. The CLEAR_ERRORS INVALID_CACHE command has new switches to tell the controller whether to use the information in the controller module or the information in the cache module.

The new syntax of the command is:

```
CLEAR_ERRORS INVALID_CACHE controller data_retention
```

In this command:

- controller identifies the controller to clear the error on either `this_controller` or `other_controller`, and
- `data_retention` specifies whether to keep the cache data and overwrite the controller information (`nodestroy_unflushed_data`) or keep the controller information and discard the cache data (`destroy_unflushed_data`).

Use the `nodestroy_unflushed_data` parameter in the following situations:

- When you have replaced the controller module
- The controller's nonvolatile memory (NVMEM) has lost its memory, possibly from an NVMEM battery failure
- You removed the cache module while there was unflushed data

For example:

```
CLEAR_ERRORS INVALID_CACHE THIS_CONTROLLER
NODESTROY_UNFLUSHED_DATA
```

Use the `destroy_unflushed_data` parameter in the following situations:

- When you have replaced the cache module
- Any other reason not listed above.

For example:

```
CLEAR_ERRORS INVALID_CACHE OTHER_CONTROLLER
DESTROY_UNFLUSHED_DATA
```

New Cache Battery Diagnostic

Software Versions 2.7, 3.1, and 3.2 check the condition of the write-back cache batteries every 24 hours. If a battery failure is detected, all RAIDsets and mirrorsets become inoperative on the controller with the failed batteries. In dual-redundant controller configurations, the RAIDsets and mirrorsets will fail over to the other controller.

Device Extended Status

HSJ controllers with software Versions 2.7, 3.1 and 3.2 transfer additional device error log information to the host when the information is made available by the device.

Static CI Credit Management

A new CLI option, `maximum_hosts`, allows HSJ controllers to calculate CI credits based on the number of host nodes, rather than on the total number of nodes. Use the following CLI command to enable this feature:

```
SET THIS_CONTROLLER MAXIMUM_HOSTS = n
```

where `n` is equal to or greater than the number of host (CPU) connections to the cluster. Note that if a single CPU has two or more adapters, you must count each adapter. This number must be smaller than the `max_nodes` number, because some cluster members (such as the HSJ controller) are not CPUs.



CAUTION: Do not add more hosts to the CI cluster without first changing the `MAXIMUM_HOSTS` parameter for all HSJ controllers on the cluster. HSJ controllers shut down if they detect more hosts on the cluster than expected.

SET FAILOVER Causes Target to Restart

The `SET_FAILOVER COPY=` command now causes the target controller to restart after the copy completes. For example, the command `CLI> SET_FAILOVER COPY=THIS_CONTROLLER` causes the "other controller" to restart after the configuration information is copied from "this controller".

The `SET_FAILOVER COPY=` command now copies license information as well as the controller configuration.

Error Log Codes

Refer to revision D01 of the HS Family of Array Controllers Service Manual for lists of error log codes.

Documentation Additions and Corrections

This section describes additions and corrections to documentation for the HSJ40 array controller including:

- *HSJ30/40 Array Controllers User's Guide*
- *HSJ30/40 Array Controllers Service Manual*
- *HSJ30/40 Array CLI Reference Manual*
- *HS Family of Array Controllers User's Guide*

AUTOSPARE Not Valid Switch on SET FAILEDSET Command

The *HSJ30/40 Array CLI Reference Manual* incorrectly identifies `AUTOSPARE` as a valid switch on the `SET FAILEDSET` command. `AUTOSPARE` is not a supported switch for the HSJ40 controller.

Replacing a Controller with C_SWAP

The procedure in *HSJ30/40 Array Controllers Service Manual* for restarting the subsystem after replacing a controller with `C_SWAP` should contain the following note:

Note: The following error message is normal. Please continue with controller configuration.

Other controller not responding - RESET signal asserted.

Please note these additional corrections:

- In the HS Family of Array Controllers User's Guide on page 5-28, the second paragraph should read, "Mirrorsets that have at least one NORMAL or NORMALIZING member other than the one being removed automatically adjust to the removal of the device."
- In the HS Family of Array Controllers User's Guide on page 6-14, the second sentence of section 6.5.5, "Changing RAIDset Characteristics," should begin, "When a RAIDset loses a member..."

CACHE_UPS

The following switches have been added to the CLI commands SET THIS_CONTROLLER and SET OTHER_CONTROLLER.

CACHE_UPS
NOCACHE_UPS (Default)

Specifies whether the controller should perform regular battery condition checks, and whether it should ignore the CACHE_POLICY setting.

Specify CACHE_UPS if your storage subsystem receives power from an uninterruptible power supply (UPS). The controller does not check the condition of the cache batteries, and ignores the CACHE_POLICY setting, meaning that RAIDsets and mirrorsets are always available, regardless of the condition of the cache batteries.

Specify NOCACHE_UPS to have the controller perform regular battery checks and follow the CACHE_POLICY setting for low batteries.

When the CACHE_UPS switch is enabled, the controller ignores the condition of the write-back cache batteries because a UPS is assumed to be in use to maintain power to the write-back cache module in the event of a power failure. Note that HSOF software does not have the capability to monitor the remaining capacity of a UPS. There are many variables in a UPS configuration; some configurations could put data at risk if the UPS is exhausted. For example, if UPS power is lost to the entire host/storage system without warning, write-back cache data is maintained by the cache batteries only.



WARNING: Use of this feature without a functional UPS could result in data loss if power is interrupted and batteries have failed.

Controller Warm Swap

The C_SWAP utility has been modified to better protect data during controller replacements. Although the procedure looks much the same, there are subtle but important changes. The section entitled "Replacing a Controller or Cache Module with C_SWAP" in these release notes contains new instructions for running C_SWAP. Follow the instructions in these release notes whenever you run C_SWAP. These instructions supersede those in your current User's Guide and Service manuals.

Fault Management Utility (FMU) Codes:

Add the following codes:

Executive Services Last Failure:

- 01192390-A processor interrupt was generated by the CACHEA Dynamic Ram controller and ArBitration engine (DRAB) with an indication that the CACHE backup battery has failed or is low (needs charging).

- 011A2390-A processor interrupt was generated by the CACHEB Dynamic Ram controller and ArBitration engine (DRAB) with an indication that the CACHE backup battery has failed or is low (needs charging).

Host Interconnect Port Service Last Failure:

42332080-Receive_main found destination address in the rcv packet does not match node address.

Last Failure Codes No Longer Used:

- 010B2380-A processor interrupt was generated by the CACHEA Dynamic Ram controller and ArBitration engine (DRAB) with an indication that the CACHE backup battery has failed or is low (needs charging).
- 010C2380-A processor interrupt was generated by the CACHEB Dynamic Ram controller and ArBitration engine (DRAB) with an indication that the CACHE backup battery has failed or is low (needs charging).

CLI Command Differences

This section describes changes to the CLI commands.

CLI Command Time Out

The time out duration for CLI commands has been extended from 10 minutes to 30 minutes. The time out is the length of time that one controller in a dual-redundant configuration waits for the other controller to complete a command.

Cache and Battery Information

The following commands now display more accurate information about the cache and battery state, even when the cache is disabled:

```
SHOW THIS_CONTROLLER
SHOW THIS_CONTROLLER FULL
SHOW OTHER_CONTROLLER
SHOW OTHER_CONTROLLER FULL
```

NORECONSTRUCT Not Allowed

The noreconstruct option for RAIDsets is no longer allowed. The valid options are RECONSTRUCT=NORMAL and RECONSTRUCT=FAST.

New Switches for CLEAR_ERRORS INVALID_CACHE

The CLEAR_ERRORS INVALID_CACHE command has new switches to tell the controller whether to use the cache information in the controller module or the cache information in the cache module.

```
CLEAR_ERRORS INVALID_CACHE THIS_CONTROLLER NODESTROY_UNFLUSHED_DATA
CLEAR_ERRORS INVALID_CACHE OTHER_CONTROLLER NODESTROY_UNFLUSHED_DATA
CLEAR_ERRORS INVALID_CACHE THIS_CONTROLLER DESTROY_UNFLUSHED_DATA
CLEAR_ERRORS INVALID_CACHE OTHER_CONTROLLER DESTROY_UNFLUSHED_DATA
```

Customer Data Not Lost

The documentation for the following commands includes warnings that customer data may be lost. Customer data is not lost when using these commands.

```
CLEAR_ERRORS LOST_DATA
DELETE UNIT OVERRIDE_ONLINE
RESTART OTHER_CONTROLLER OVERRIDE_ONLINE
RESTART THIS_CONTROLLER OVERRIDE_ONLINE
SELFTTEST OTHER_CONTROLLER OVERRIDE_ONLINE
SELFTTEST THIS_CONTROLLER OVERRIDE_ONLINE
SHUTDOWN OTHER_CONTROLLER OVERRIDE_ONLINE
SHUTDOWN THIS_CONTROLLER OVERRIDE_ONLINE
```

New Tape Formats

The values for DEFAULT_FORMAT used with the set unit command have been expanded to include the following choices:

- host_selected
- 1600bpi_9track
- 6250bpi_9track
- tz85
- tz86
- tz87_compression
- tz87_nocompression
- dat_dds_compression
- dat_dds_nocompression
- dat_dds2_compression
- dat_dds2_nocompression
- tz88_compression
- tz88_nocompression
- 3490e_compression
- 3490e_nocompression
- 3480_compression
- 3480_nocompression
- tz89_compression
- tz89_nocompression
- ait_1_compression
- ait_1_nocompression

Valid values depend upon the specific device and the media loaded. To list valid options for a given unit or media enter the following command:

```
SET unit-number DEFAULT_FORMAT=?
```

The show unit-name full command shows the default tape format and whether the format was set from the host or from the controller CLI. There is a new entry at the end of the switches section that reads:

```
DEFAULT_FORMAT= XXX (ZZZ)
```

where xxx is one of the formats listed above, and zzz is either CLI_SELECTED or HOST_SELECTED.

Optical Disks Always Transportable

Optical read/write disks are always treated as TRANSPORTABLE in Version 2.7 (no metadata is written on them) and cannot be set TRANSPORTABLE or NOTTRANSPORTABLE. This has the following ramifications:

- The ADD OPTICAL and SET OPTICAL commands no longer accept the TRANSPORTABLE and NOTTRANSPORTABLE switches.
- The INITIALIZE optical-device command is no longer allowed.
- A unit associated with an optical disk can no longer be SET WRITEBACK or NOWRITEBACK.
- The following commands for optical devices no longer show the TRANSPORTABLE or NO TRANSPORTABLE states:

```
SHOW DEVICE FULL
```

```
SHOW OPTICAL
```

```
SHOW optical-device
```

```
SHOW unit-associated-with-optical
```

CI Credit Management

There are new options to set the static CI credit management feature.

```
SET THIS_CONTROLLER MAXIMUM_HOSTS = n
```

```
SET OTHER_CONTROLLER MAXIMUM_HOSTS = n
```

where n is a value between 1 and 31.

The SHOW THIS_CONTROLLER and SHOW OTHER_CONTROLLER commands now show the MAXIMUM_HOSTS setting at the end of the Host port section:

```
MAXIMUM_HOSTS = n
```

Add Loader Correction

The example for creating a command disk on page 7-102 in the User's Guide and page 4-22 in the Service Manual incorrectly shows the loader being added as a unit rather than the passthrough container. The correct example should be:

```
ADD TAPE TAPE320 3 2 0
```

```

ADD UNIT T322 TAPE320
ADD LOADER LDR321 3 2 1
ADD PASSTHROUGH PASS1 LDR321
ADD UNIT D332 PASS1

```

Upgrading HSOF Software

You can upgrade the HSJ40 controller software using one of the following three procedures depending on whether you are upgrading a:

- Dual-redundant controller installation configuration as a rolling upgrade (changing one program card at a time)
- Dual-redundant controller installation configuration as a shutdown upgrade (changing both program cards simultaneously)
- Single controller

During a rolling upgrade, devices on the redundant pair remain available to the host. The rolling upgrade procedure is recommended only when upgrading to an adjacent version (for example from V3.3 to V3.4.) When performing rolling upgrades, it is required that the most recent software patches, if any, be installed on both the lower and higher code versions.

During a shutdown upgrade, you are required to shut down and then restart the controllers. This procedure typically takes less than 5 minutes to accomplish. All devices on the redundant pair are dismantled prior to the upgrade. Shutdown upgrades should be used when upgrading to a non-adjacent version (for example, from V3.1 to V3.4.)



CAUTION: If JBOD disks that were initialized using the `SAVE_CONFIGURATION` option on an HSZ40 controller running HSOF Version 27Z have been moved onto your HSJ40 controller, please contact your service representative before upgrading your HSJ40 controller from HSOF Version 2.7 to HSOF Version 3.2 software.

NOTE: HSOF Version 3.4 software waits up to one minute after controller restart before presenting a CLI prompt or accepting commands. This delay does not affect unit availability to the host. The delay provides time for controller internal configuration operations to finish before user commands change the configuration. After you insert the HSOF Version 3.4 program cards and press the reset button, allow 60 seconds for the CLI prompt to appear.

Dual-Redundant Controller Rolling Upgrade

A rolling upgrade procedure is one in which the disk subsystem does not have to be shut down to upgrade the software. Using the failover capabilities of the controllers, only one controller at a time needs to be shut down, allowing the host system to have disk drive activity from the disk subsystem being upgraded. The rolling upgrade procedure is recommended only when upgrading to an adjacent version (for example from V3.3 to V3.4.) When performing rolling upgrades, it is required that the most recent software patches, if any, be installed on both the lower and higher code versions.

Use the following procedure to install the new HSOF software while maintaining connectivity to the storage devices:

1. Establish a local connection to the controller through the maintenance port of one of the controllers (“this controller”).
2. Wait for the CLI prompt, and then shut down “other controller” using the following command:

```
SHUTDOWN OTHER_CONTROLLER OVER
```



CAUTION: Before continuing, wait until the Reset button stops flashing and stays lit continuously. This indicates that unwritten data is flushed from the cache module.

3. Remove the PCMCIA program card ESD cover from “other controller”.
4. Press and hold the controller Reset button while ejecting the old program card (release the button after the card is ejected.)
5. Press and hold the Reset button while inserting the new program card in “other controller”. Release the button after the new card is inserted.

NOTE: Wait for the following to happen before continuing:

- The Reset button flashes approximately once per second.
- The maintenance terminal displays a message that finishes with:
other controller restarted

6. Read the status of “other controller” by issuing the following command:

```
SHOW OTHER_CONTROLLER
```

NOTE: When the SHOW OTHER_CONTROLLER command verifies that the other controller restarted, it is safe to continue.

7. Replace the ESD cover on “other controller” and push the locking pins to secure it.
8. Is this your first pass through this procedure:
 - Yes - move the maintenance port cable from “this controller” to “other controller” maintenance port and repeat the procedure from step 2 to replace the other program card.

NOTE: “other controller” switches with “this controller,” meaning that the controller the maintenance port cable was plugged into originally (“this controller”) becomes “other controller” for the second pass through this procedure.

- No - You have completed the procedure.

Dual-Redundant Controller Shutdown Upgrade

Shut down and restart both controllers during this upgrade; units are unavailable to the host system. Before upgrading the controller software, prepare the host system for this situation, by either dismounting units or by shutting down the system.



CAUTION: Compaq does not recommend the use of the SAVE_CONFIGURATION option for dual-redundant configurations. The following procedure requires that you change your dual-redundant configuration into two single configurations for the HSOF Version 3.2 software upgrade.

Use the following procedure to upgrade the HSOF software in a dual-redundant controller:

1. Establish a local terminal connection to one of the controllers.
2. Stop all I/O to the units in your subsystem. Do this by taking all units offline to the controller.

```
SET THIS_CONTROLLER NOPATH_A
SET THIS_CONTROLLER NOPATH_B
SET OTHER_CONTROLLER NOPATH_A
SET OTHER_CONTROLLER NOPATH_B
```

3. Enter the SET NOFAILOVER command to take this_controller and other_controller out of dual-redundant (failover) mode.

```
SET NOFAILOVER
```

4. Enter the SHUTDOWN command.

```
SHUTDOWN THIS_CONTROLLER
```



CAUTION: Failure to shut down the controller in this step might result in problems with RAIDsets and cache when the controller is reset.

Wait for the command to complete. When the controller halts, the green Reset (//) LED stops flashing and stays lit.

5. Remove the ESD shield covering the PCMCIA program card.
6. While pressing and holding this_controller's reset button, press the program card eject button to eject the program card from the controller.
7. Release the reset button.
8. Remove the program card.
9. While holding in this_controller's reset button, insert the Version 3.4 program card, pressing the card in until the eject button extends outward, then release the reset button.
10. Reinstall the ESD shield.

The controller restarts, leading to normal operations with the host systems as described in the HS Family of Array Controllers User's Guide.

11. Repeat the previous steps for the second controller, starting with step 5.
12. After completing all of the above steps on both controllers, put the controllers back into dual-redundant (failover) mode, by entering the following command:

```
SET FAILOVER COPY=CONFIGURATION-SOURCE
```

13. Allow devices to be brought online to the controller by issuing the following commands:

```
SET THIS_CONTROLLER PATH_A
```

```
SET THIS_CONTROLLER PATH_B
SET OTHER_CONTROLLER PATH_A
SET OTHER_CONTROLLER PATH_B
```

Single Controller Upgrades

You must shut down and restart the controller during this upgrade. Units are unavailable to the host system. Before upgrading the controller software, prepare the host system for this situation, either by dismounting units or by shutting down the system.

Use the following procedure to upgrade the HSOF software in a nonredundant controller:

1. Establish a local terminal connection to the controller.
2. Stop all I/O to the units in your subsystem by taking all units offline to the controller:

```
SET THIS_CONTROLLER NOPATH_A
SET THIS_CONTROLLER NOPATH_B
```

3. Enter the shutdown command:

```
SHUTDOWN THIS_CONTROLLER
```



CAUTION: Failure to shut down the controller in this step could result in problems with RAIDsets and cache when the controller is reset.

Wait for the command to complete. When the controller halts, the green Reset (//) LED stops flashing and stays lit.

4. Remove the ESD shield covering the PCMCIA program card.
5. While pressing and holding the reset button, press the program card eject button to eject the program card from the controller.
6. Release the reset button.
7. Remove the program card.
8. While holding in the controller reset button, insert the V3.4 program card, pressing the card in until the eject button extends outward, then release the reset button.
9. Reinstall the ESD shield.

The controller restarts, leading to normal operations with the host systems as described in the HS Family of Array Controllers User's Guide.

10. Allow devices to be brought online to the controller by issuing the following command:

```
SET THIS_CONTROLLER PATH_A
SET THIS_CONTROLLER PATH_B
```

Identifying Your HSOF Revision Level

You can identify HSOF Software Version 3.4 by entering the `SHOW THIS_CONTROLLER` command at the CLI prompt. The resulting display lists the software revision level as version "V34Z-x" (where x represents the number of patches associated with this version of software).

Order Numbers

The following table contains order numbers for controller options and preconfigured options.

Device	Description
HSJ30/40-BA/CA	StorageWorks HSJ30/40 Array Controller with no cache module, 6 SCSI-2 device ports
HSJ30/40-BD/CD	StorageWorks HSJ30/40 Array Controller with a 16 MB read cache module, 6 SCSI-2 device ports
HSJ30/40-BF/CF	StorageWorks HSJ30/40 Array Controller with a 32 MB read cache module, 6 SCSI-2 device ports
HSJ30/40-XD	16 MB read cache module
HSJ30/40-XF	32 MB read cache module
HSJ30/40-YX	Write-back cache option kit -- contains two onboard cache batteries, one battery bracket, one write-back cache license
QA-2YJAC-HS	HSOF Software and Documentation

Replacing or Adding an HSJ Controller or Cache Module

There are two procedures for replacing a failed controller or cache module in a dual-redundant configuration: an online controller swap method (C_SWAP) in which the surviving controller continues to process I/O, and an offline method in which you must shut down both controllers.

Replacing a Controller or Cache Module with C_SWAP

The online (C_SWAP) method described in these release notes is valid for HSOF software Version 2.7 and higher.

To replace a controller or cache module using C_SWAP, two power supplies are required in the controller shelf in the SW500 and the SW800 cabinet.

The following sections guide you through the online method using the C_SWAP utility.

Required Parts and Tools

You must have the tools listed in Table 9 to replace a controller or cache module.

Table 9 Required Tools for Controller/Cache Replacement

Tools Required	Purpose
Maintenance terminal and cable	To shut down controllers, restart controllers, and invoke c_swap
ESD wrist strap and ESD mat	To protect all equipment against electrostatic discharge
3/32-inch Allen wrench	To loosen the controller mounting screws; to reinstall the controller
5/32-inch Allen wrench	To unlock the SW800-series cabinet
Small flat-head screwdriver	To connect the CI cable to the controller



CAUTION: Before invoking the C_SWAP utility, terminate all other running utilities and disable all other terminals.

Preparing the Subsystem Configuration (Online C_SWAP Method)

Complete the following steps to prepare your subsystem for the replacement.

1. Have the replacement modules at hand. The modules should be factory-fresh, or should have been shut down cleanly (with the SHUTDOWN command) in their last application.
2. Connect a maintenance terminal to the controller that you are not replacing.
3. If the controller to be replaced is still functioning, use the SHUTDOWN command to take it out of service. When using this command, do not specify any command switches.

```
SHUTDOWN OTHER_CONTROLLER
```



CAUTION: Failure to shut down the controller in this step could result in problems with RAIDsets and cache when the controller is reset.

4. Record the size and type of the cache module (if any) that is installed with the first controller. Ensure that the cache module for the new controller is the same size and type.
5. Start the C_SWAP program.

```
RUN C_SWAP
```

Removing the Modules (Online C_SWAP Method)

Use the following steps to remove the modules.

1. When the controller prompts you, answer the question:
Do you wish to remove other HSJ40?

2. Enter "YES"
3. Answer the question:
Will its cache module also be removed Y/N?
4. Enter "YES" if the cache module requires service or replacement.
5. Wait for the following text to be displayed at the console:
Port 1 quiesced
Port 2 quiesced
Port 3 quiesced
Port 4 quiesced
Port 5 quiesced
Port 6 quiesced
All ports quiesced
Remove the other controller (the one WITHOUT a blinking green LED) within 5 minutes.
Time remaining 4 minutes 50 seconds.

NOTE: If you are not removing the cache module, the time allowed to remove the controller will be two minutes.
6. Obtain and place the ESD wrist strap around your wrist. Ensure that the strap fits snugly around your wrist.
7. Attach or clip the other end of the ESD wrist strap to the cabinet grounding stud or a convenient cabinet grounding point (nonpainted surface).
8. Unsnap and remove the program card ESD shield on the controller you are removing (see Figure 1).
9. Remove the program card by pushing the eject button next to the card (see Figure 10, Removing and Installing the PCMCIA Card).
10. Pull the card out and save it for use in the replacement controller module.
11. Remove the CI host cable from the controller to be replaced.
12. Slide the module out of the shelf (noting which rails the module was seated in) and place it on an ESD mat (see Removing and Installing the Controller).
13. Wait for the following text to be displayed at the operating controller's console:
Port 1 restarted
Port 2 restarted
Port 3 restarted
Port 4 restarted
Port 5 restarted
Port 6 restarted

NOTE: You can remove the cache module before or after port activity has restarted.
14. If necessary, remove the cache module.

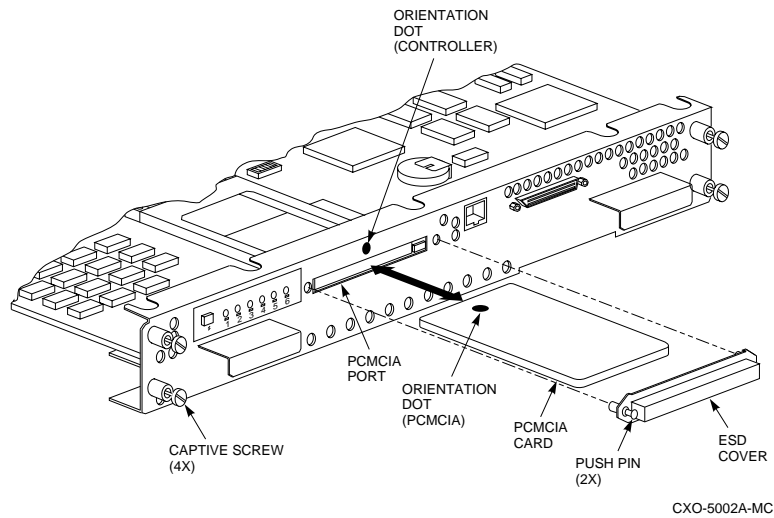


Figure 2. Removing and Installing the PCMCIA Card

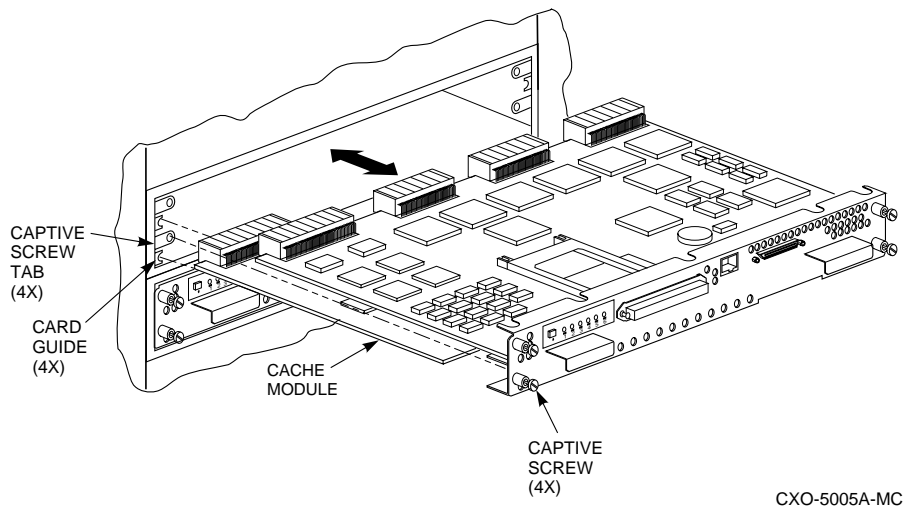


Figure 3. Removing and Installing the Controller

Installing the New Hardware (Online C_SWAP Method)

Use these steps to install the new hardware modules.

1. When the controller prompts you, answer the question:
Do you have a replacement controller available?
2. If you a replacement module ready, press "Y" for yes.
3. Answer the question:
Sequence to INSERT the other HSJ has begun.
Do you wish to INSERT the other controller Y/N?
4. Press "Y" for yes.
5. Wait for the following text to appear on the operating controller's console:
Attempting to quiesce all ports.

Port 1 quiesced
 Port 2 quiesced
 Port 3 quiesced
 Port 4 quiesced
 Port 5 quiesced
 Port 6 quiesced
 All ports quiesced.

Insert the other HSJ WITHOUT its program card, and press Return.

6. If necessary, install the cache module. Slide the module straight in along the rails and then push firmly to seat it in the backplane.
7. Install the controller module. Slide the module straight in along the rails and then push firmly to seat it in the backplane.



CAUTION: Do not overtighten the controller's front panel captive screws. Damage to the controller PC board or front panel may result.

8. Tighten the four front panel captive screws.
9. Press Return on the operating controller's console.
10. Wait for the following text to be displayed on the operating controller's console:
 - Port 1 restarted
 - Port 2 restarted
 - Port 3 restarted
 - Port 4 restarted
 - Port 5 restarted
 - Port 6 restarted
 - Controller Warm Swap terminated.
 - The configuration has two controllers
 - To restart the other HSJ40
 - 1) Enter the command RESTART OTHER_CONTROLLER
 - 2) Press and hold in the Reset (//) button while inserting the program card.
 - 3) Release Reset (//); the controller will initialize.
 - 4) Configure new controller by referring to controller's user guide

Restarting the Subsystem (Online C_SWAP Method)

Use the following steps to restart the subsystem.

1. Set the original controller to enable the new controller:

RESTART OTHER_CONTROLLER

2. Connect the maintenance terminal to the newly installed controller.
3. Press and hold the Reset (//) button on the new controller while inserting the program card from the replaced controller.
4. Release the Reset button to initialize the controller. Wait for the CLI prompt to display at the terminal. Ignore the "Controllers misconfigured" message that displays.

5. If the new controller reports an invalid cache error, enter one of the following CLI commands to clear the error:

If you have replaced the cache board, enter the following command:

```
CLEAR_ERRORS INVALID_CACHE THIS_CONTROLLER
DESTROY_UNFLUSHED_DATA
```

Otherwise enter:

```
CLEAR_ERRORS INVALID_CACHE THIS_CONTROLLER
NODESTROY_UNFLUSHED_DATA
```

6. Ensure that the new controller is not in dual-redundant mode by entering the following command on the new controller.

```
SET NOFAILOVER
```

If the controller was already in nonredundant mode, a message is displayed indicating that.

7. Enter the following command from the new controller CLI to put the controllers into dual-redundant mode:

```
SET FAILOVER COPY=OTHER_CONTROLLER
```

The new controller restarts.

8. Verify that all host information is correct.

```
SHOW THIS_CONTROLLER
```

Modify any incorrect information.

9. If any information has been changed, restart the new controller.

```
RESTART THIS_CONTROLLER
```

10. After the controller has initialized, reconnect the host cable to the new controller and tighten the captive screws.

11. Enable CI paths by entering the following CLI commands:

```
SET THIS_CONTROLLER PATH_A
SET THIS_CONTROLLER PATH_B
```

Replacing a Controller or Cache Module with the Offline Method

If you choose not to use the C-SWAP procedure to upgrade HSOF software, follow the steps in this section to replace an HSJ40 controller that has write-back cache. C_SWAP can be used on Version 2.7 and higher.

Before beginning the procedure:

- Write down the following information:
- The name and ID number for the controller you are replacing
- The configurations of all RAID, stripe and/or mirrorsets
- Which devices are part of any RAID, stripe, or mirrorset, and all unit numbers, device names, and array names

In the event that a problem occurs during this process, or a mistake is made in following these procedures, you will need this information for later manual restoration.

- You must shut down both controllers during part of this procedure, making the devices unavailable to the host operating system. Before starting this procedure, prepare your host system for all I/O associated with this controller to stop. OpenVMS shows the devices in mount verify state, and applications that use those devices stall until the controllers are back in service.
- Compaq recommends setting the mount verify time-out (MVTIMEOUT) to be at least 600 seconds (10 minutes) to allow time to complete this procedure.
- If the system uses host-based shadowsets that have members behind these controllers, increase the shadow member time-out (SHADOW_MBR_TM) to a value equal to the mount verify time-out (at least 600 seconds).
- If you do not have available a cache module which has already had its memory cleared, you will experience a five-minute delay in executing these procedures while you await the clearing of the memory on the installed cache module.

Required Parts and Tools

You must have the tools listed in Table 10 to replace a controller module.

Table 10 Required Tools for Adding Second Controller

Tools Required	Purpose
Maintenance terminal and cable	To shutdown controllers, restart controllers, and invoke c_swap
ESD wrist strap and ESD mat	To protect all equipment against electrostatic discharge
3/32-inch Allen wrench	To loosen the controller mounting screws; to reinstall the controller
5/32-inch Allen wrench	To unlock the SW800-series cabinet
Small flat-head screwdriver	To connect the CI cable to the controller

Preparing the Subsystem Configuration (Offline Method)

To replace a controller module follow these steps:

1. Have the replacement HSJ controller available. The replacement controller should be a unit direct from the factory or a unit that has been shutdown cleanly since its last application in accordance with the shutdown procedure identified in the HS Family of Array Controllers User's Guide, Revision D01, Appendix B, Page 125.

NOTE: Have all license keys for optional firmware available.

2. Connect a maintenance terminal to the controller you are not replacing.
3. Note which units are preferred to each controller, then prefer all units to the surviving controller.

SET unit-number PREFERRED_PATH=THIS_CONTROLLER

where unit-number is any unit preferred to the controller that is being replaced. Repeat the command for each unit that must be set to the surviving controller.

4. If the controller to be replaced is still functioning, use the SHUTDOWN command to take it out of service.

```
SHUTDOWN OTHER_CONTROLLER
```

When the controller halts, the green Reset (//) LED stops flashing and stays lit.

5. Take the operating controller out of dual-redundant (failover) mode.

```
SET NOFAILOVER
```

6. Shut down the operating controller.

```
SHUTDOWN THIS_CONTROLLER OVERRIDE_ONLINE
```

The shutdown is normally fast, but it could take up to five minutes for the controller to flush all data from cache. When the controller halts, the green Reset (//) LED stops flashing and stays lit.

Removing the Modules (Offline Method)

To remove the modules complete these steps.

1. Place an ESD wrist strap around your wrist. Ensure that the strap fits snugly.
2. Attach or clip the end of the ESD wrist strap to the cabinet grounding stud or a convenient cabinet grounding point (non-painted surface).
3. Unsnap and remove the program card ESD cover on the controller you are removing.
4. Press and hold the reset button for the controller you are removing.
5. Remove the program card on the controller by pushing the eject button next to the card. Pull the card out and save it for use in the replacement controller module.
6. Disconnect the CI Bus cable from the front of the controller you are removing.
7. Loosen the four captive retaining screws on the front bezel of the controller you are removing.
8. Remove the controller module by pulling it straight out from the shelf backplane.
9. Slide the module out of the shelf (noting which rails the module was seated in) and place it on an ESD mat.
10. Remove the write-back cache module, if present.
11. If the cache module has not failed and you do not have another module that has had the memory cleared, you must clear (discharge) the memory on the current cache module. Locate the battery disable jumper on the cache module. It should be installed on one contact pin. Place the jumper on both pins and leave it there for five minutes. Put the jumper back on one pin to keep from losing it.

Installing the New Hardware (Offline Method)

Complete these steps to install the new hardware modules.

1. Install a new cache module or reinstall the original cache module in its original position. Slide the module straight in along the rails and then push firmly to seat it in the backplane.
2. Slide the replacement controller module into the shelf without the program card installed. Slide the module straight into the shelf and then push firmly to seat it in the backplane.



CAUTION: Do not overtighten the controller's front panel captive screws. Damage to the controller PC board or front panel could result.

3. Tighten the four front panel captive screws.

Restarting the Subsystem (Offline Method)

Restart the subsystem using the following steps.

1. Press the Reset (//) button on the original controller, and wait for the CLI prompt to appear.
2. Tell the original controller to enable the new controller with the command


```
RESTART OTHER_CONTROLLER
```
3. Connect a maintenance terminal to the newly-installed controller.
4. Press and hold the Reset (//) button on the new controller while inserting the program card.
5. Release the Reset button to initialize the controller. Wait for the CLI prompt to appear at the terminal. Ignore the "Controllers misconfigured" message, that displays
6. Ensure that the new controller is not in dual-redundant mode by typing the following command:

```
SET NOFAILOVER
```

If the controller was already in non-redundant mode, a message is displayed indicating that.

7. Ensure the new controller cannot communicate with any host system yet by typing the following command:

```
SET THIS_CONTROLLER NOPATH_A
```

```
SET THIS_CONTROLLER NOPATH_B
```

The new controller must not be able to communicate with any host system because its cluster parameters are undefined.

8. Reconnect the CI Bus cable to the new controller.
9. Configure the host interconnect parameters by typing the following commands:

```
SET THIS_CONTROLLER SCS_NODENAME = (string enclosed in quotes)
```

```
SET THIS_CONTROLLER ID = (decimal value)
```

10. Type the following command from the new controller CLI to put the controllers in dual-redundant mode.


```
SET FAILOVER COPY=OTHER_CONTROLLER
```

11. Reinitialize the new controller by typing the command:

```
RESTART THIS_CONTROLLER
```

12. Turn on the host interconnect path(s) by typing the following commands:

```
SET THIS_CONTROLLER PATH_A
```

```
SET THIS_CONTROLLER PATH_B
```

13. Restore the preferred paths for each unit to their original setting using the command

```
SET unit-number PREFERRED_PATH=THIS_CONTROLLER
```

where unit-number is any unit to be serviced through the new controller. Repeat this command for each unit that you want to change.

Using C_SWAP to Add a Second HSJ Controller

You can add a second controller to a single controller configuration to create a dual-redundant configuration. There are two procedures for adding a second controller: an online method using the C_SWAP utility in which the existing controller continues to process I/O, and an offline method in which you must shut down the existing controller. The online (C_SWAP) method described in these release notes is valid for HSOF software Version 2.7 and higher.

To add a controller module using the online (C_SWAP) method, your system must have two power supplies in the controller shelf of the SW500 and SW800 cabinet. If your controller shelf has only one power supply, you must shut down the operating controller to add a second controller. Refer to the HS Family of Array Controllers User's Guide, Rev. D01, Chapter 5, or the HS Family of Array Controllers Service Manual, Rev D01, Chapter 7 for this offline method of adding a second controller.

The following steps guide you through the online method using the C_SWAP utility.

Required Parts and Tools

You must have the tools listed in Table 11 to add a second controller module.

Table 11 Tools Required for Adding a Second Controller

Tools Required	Purpose
Maintenance terminal and cable	To shutdown controllers, restart controllers, and invoke c_swap
ESD wrist strap and ESD mat	To protect all equipment against electrostatic discharge
3/32-inch Allen wrench	To loosen the controller mounting screws; to reinstall the controller
5/32-inch Allen wrench	To unlock the SW800-series cabinet
Small flat-head screwdriver	To connect the CI cable to the controller



CAUTION: Before starting the C_SWAP utility, terminate all other running utilities and disable all other terminals.

Preparing the Subsystem Configuration (Online C_SWAP Method)

Use these steps to prepare the subsystem for the second controller.

Have the new module at hand. The module should be factory-fresh or should have been shutdown cleanly (with the shutdown command) in its last application.

1. Connect a maintenance terminal to the existing controller.
2. Show the configuration of the existing controller:

SHOW THIS_CONTROLLER

The controller will display the following information:

Controller:

HSJ40 (C) DEC CX20100000 Firmware V02.7,(1) Hardware F01
 Configured for dual-redundancy with ZG03231995
 In dual-redundant configuration
 SCSI address 7
 Time: 18 DEC-1995 16:32:54

Host port:

Node name: HSJA2, valid CI node 21, 32 max nodes
 System ID 42001015F525
 Path A is on
 Path B is on
 MSCP allocation class 3
 TMSCP allocation class 3
 CI_ARBITRATION = ASYNCHRONOUS
 MAXIMUM_HOSTS = 5

Cache:

32 megabyte writeback cache, version 2
 Cache is GOOD
 Battery is good
 No unflushed data in cache
 CACHE_FLUSH TIMER = 1 (seconds)
 CACHE_POLICY = B
 Host Functionality Mode = A

3. Record the size and type of the cache module (if any) that is installed with the first controller. Ensure that the cache module for the new controller is the same size and type.
4. Start the C_SWAP program:

RUN C_SWAP

Installing the Second Controller and Cache Modules

Follow these steps to add the second controller and cache.

1. When the controller prompts you, answer the question:
Do you have a replacement HSJ readily available? [N] ? y
2. If you have a replacement module available, enter "YES."
3. Answer the question:
Sequence to INSERT the other HSJ has begun.
Do you wish to INSERT the other HSJ y/n?
4. Press "Y" for yes.
5. Wait for the following text to appear on the operating controller's console:
Attempting to quiesce all ports.
Port 1 quiesced
Port 2 quiesced
Port 3 quiesced
Port 4 quiesced
Port 5 quiesced
Port 6 quiesced
All ports quiesced.
6. Insert the other HSD controller **WITHOUT** its program card, and press Return.
7. If you are installing a new cache module, slide it straight in along the rails and then push firmly to seat it in the backplane.
8. Check the new controller to ensure that the program card is not installed. If it is installed, take the card out by removing the ESD shield and then pressing the eject button next to the card.
9. Install the controller module. Slide the module straight in along the rails and then push firmly to seat it in the backplane.
10. Tighten the four front panel captive screws.



CAUTION: Do not overtighten the controller's front panel captive screws. Damage to the controller PC board or front panel may result.

11. Press Return on the operating controller's console.
12. Wait for the following text to be displayed on the operating controller's console:
Port 1 restarted
Port 2 restarted
Port 3 restarted
Port 4 restarted
Port 5 restarted
Port 6 restarted Controller Warm Swap terminated.
The configuration has two controllers
To restart the other HSJ40
1) Enter the command RESTART OTHER_CONTROLLER
2) Press and hold in the Reset (/) button while inserting the program card.

- 3) Release Reset (/); the controller will initialize.
- 4) Configure new controller by referring to controller's user guide

Restarting the Subsystem (Online C_SWAP Method)

Restart the subsystem using these steps.

1. Set the original controller to allow the new controller to start:

```
RESTART OTHER_CONTROLLER
```

2. Connect the maintenance terminal to the newly installed controller.
3. Press and hold the Reset (/) button on the new controller while inserting the program card from the new controller.
4. Release the Reset button to initialize the controller. Wait for the CLI prompt to appear at the terminal. Ignore the "Controllers misconfigured" message, that is displayed.
5. If the new controller reports an invalid cache error, enter the following CLI command to clear the error:

```
CLEAR_ERRORS INVALID_CACHE THIS_CONTROLLER DESTROY_UNFLUSHED_DATA
```

6. Ensure that the new controller is not in dual-redundant mode by entering the following command on the new controller:

```
SET NOFAILOVER
```

If the controller was already in nonredundant mode, a message is displayed indicating that.

7. Enter the following command from the new controller CLI to put the controllers into dual-redundant mode:

```
SET FAILOVER COPY=OTHER_CONTROLLER
```

The new controller initializes.

8. Verify that all host settings are correct:

```
SHOW THIS_CONTROLLER
```

9. Modify any host information.
10. After the modifications have been made, restart the new controller:

```
RESTART THIS_CONTROLLER
```

11. After the controller has initialized, connect the CI cable to the new controller and tighten the captive screws.

12. Enable CI paths by entering the following CLI commands:

```
SET THIS_CONTROLLER PATH_A
```

```
SET THIS_CONTROLLER PATH_B
```

Appendix A

The HSUTIL Utility

This section describes the features and user interface of the HSUTIL utility. HSUTIL provides two functions:

- Device format-Enables you to perform a basic SCSI format operation on a disk device.
- Device code load-Enables you to download device firmware into supported disk devices.

The Device Format Function

The device format function enables you to perform a SCSI format operation on a disk. Once started, the HSUTIL utility performs the operation without intervention.

Device Format Special Considerations

Be aware of the following special considerations when using the HSUTIL utility to format disks:

- HSUTIL formats a single target device per session.
- HSUTIL does not format devices configured as units, stripesets, mirrorsets, RAIDsets, sparesets, or failedsets. The destination device must be an unattached device.
- If a power failure or SCSI bus reset occurs during a format operation, the device could become unusable until a successful format operation is completed. To minimize the possibility of this problem, Compaq recommends that you prevent activity to all devices on the same port as the device being formatted.
- You can use the Ctrl/C or Ctrl/Y keys to exit HSUTIL before the program begins issuing SCSI commands to perform a format. Once the program begins issuing SCSI commands, however, the exit key combinations are disabled.
- Medium formatting is accomplished with no initiator control over defect management. The destination device determines the degree of defect management to be performed.
- Special considerations for dual-redundant configurations:
 - While HSUTIL is active, do not invoke any CLI command or run any local program that might reference the target device from the other controller. Results are unpredictable.
 - Do not reinitialize either controller during a format operation. The resulting SCSI bus reset may render the target device unusable until after a successful format operation is completed.

Formatting a Disk Using HSUTIL

This section demonstrates the use of the HSUTIL utility to format a disk. In this example, you are formatting target disk DISK150.

1. Make a backup of any user data on the disk to be formatted.

2. If possible, prevent I/O operations to all other devices on the same device SCSI bus to reduce the possibility of a SCSI bus reset.
3. Invoke the HSUTIL utility and select the format operation by entering "1" at the prompt:

```

RUN HSUTIL
*** Available functions are:
0. EXIT
1. FORMAT
2. CODE_LOAD
Enter the number of the function you wish to perform (0:2) [2] ?1

```

The program reports the unattached units available for formatting:

```

Unattached devices on this controller include:
Device  SCSI Product ID  Current Device Rev
DISK150 RZ26L (C) DEC  T392
DISK250 RZ28 (C) DEC  441C

```

4. Select DISK150 as the device to be formatted:

```
Enter the device to format ? DISK150
```

The program displays a number of informational messages and offers you the option of exiting before the format operation begins:

```
Do you want to continue(y/n)[n] ? Y
```

The format operation begins, finishing a number of minutes later:

```

HSUTIL Started at: 13-JAN-1996 04:49:48
Format of DISK150 has successfully finished.
HSUTIL - Normal Termination at: 13-JAN-1996 05:22:33

```

DISK150 is now formatted and usable.

The Device Code Load Function

The device code load function allows you to load new firmware into supported devices. The new firmware image must be at a specific LBN on a source disk on the same controller. The source and target disks must be in the configuration on the controller from which HSUTIL is invoked. The source disk can be a raw disk device configured as a unit with no file system or label on it, or it could be a normal file system disk. The device code load process takes place in two steps.

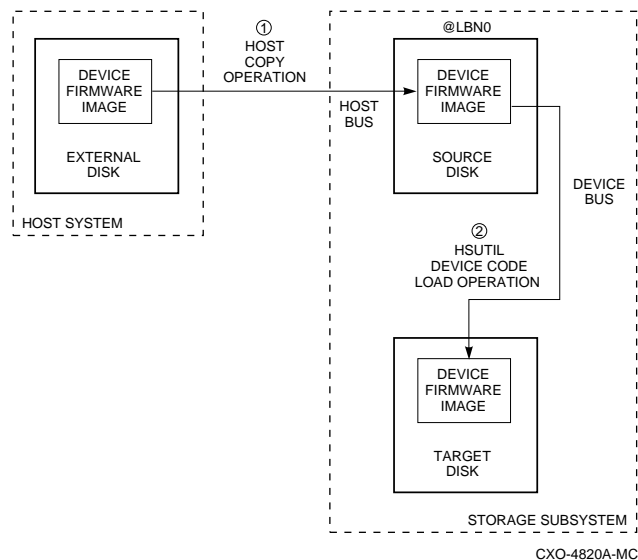


Figure 4. The Device Code Load Process

Preparing the Source Disk

Copy the new device firmware image to a source disk in the storage subsystem. You cannot load the firmware image from a location external to the controller.

The device firmware image must be located in contiguous blocks at a known logical block number (LBN) on the source disk. Prepare for the code load operation by copying the device firmware image to the source disk at a known LBN location.

One way to prepare the firmware image for downloading is to copy it to a raw source disk containing no data. A raw source disk has no label and no formatted file structure on it. Using a raw disk as the source disk puts the firmware image in contiguous blocks at a specific LBN (usually LBN 0) on the source disk.

The details of copying the firmware image to the source disk from the host disk are specific to the host operating system. Refer to the sample Host Copy Scripts below for examples of copying a firmware image in OpenVMS.

Code Loading the Target Disk

Once the firmware image is located in contiguous blocks at a known LBN on the source disk, use HSUTIL to download it into the target disk.

Sample OpenVMS Host Copy Script

If you are installing new firmware on only one device type, such as RZ29B, be sure to select the correct code for the code load, then load the code first onto a spare drive at LBN: 0. These commands show how to copy firmware for a single device type.

From an OpenVMS account you would type these commands:

```

$ MOUNT/FOREIGN $2$DUA300:
$ COPY/CONTIGUOUS NODE::LCA:[FIRMWARE.RZ2X]RZ29B_DEC_0014.LOD -
TO $2$DUA300:
$ DISMOUNT/NOUNLOAD $2$DUA300:

```

Drive \$2\$DUA300: must be installed but not mounted on a shelf visible to the controller you are going to connect to. You are now ready to update code in an RZ29B using the code starting at LBN: 0 on DUA300:.

These commands show how to copy firmware for multiple device types.

If you are updating more than one type of supported device, you can copy the code for each device to a spare disk drive or any drive that can be moved to other controllers with little interference. In this example, you can use any single mounted disk drive and would continue until you have all the software you need.

```

$ COPY/CONT NODE::LCA:[FIRMWARE.RZ2X]RZ29B_DEC_0014.LOD -
TO $2$DUA300:[000000]
$ COPY/CONT NODE::LCA:[FIRMWARE.RZ2X]RZ28P4_442C_DEC.FUP -
TO $2$DUA300:[000000]
$

```

Use the DUMP command to find the starting LBN of each firmware image:

```

$ DUMP/HEAD/BLOCK=COUNT=0 $2$DUA300:[000000]*.FUP
$ DUMP/HEAD/BLOCK=COUNT=0 $2$DUA300:[000000]*.LOD

```

The information below was edited to reduce the printout but each line is from the above dump command.

```

$2$DUA300:[000000]RZ26L_442D_DEC.FUP LBN: 8
$2$DUA300:[000000]RZ26_T392A_DEC.FUP LBN: 520
$2$DUA300:[000000]RZ28P4_442C_DEC.FUP LBN: 1036
$2$DUA300:[000000]RZ28_442D_DEC2104.FUP LBN: 1548
$2$DUA300:[000000]RZ29B_DEC_0014.LOD LBN: 2060
$ DISMOUNT/NOUNLOAD $2$DUA300:

```

Drive \$2\$DUA300: must be installed but not mounted on a shelf visible to the controller you are going to connect to. You are now ready to update code in different drives of choice with their code starting at LBN: * on DUA300: as printed out above.

Device Code Load Special Considerations

Be aware of the following special considerations when using the HSUTIL utility to download firmware to a disk device:



CAUTION: HSUTIL has been tested to perform the code load operation properly only with supported devices. Use HSUTIL to code load unsupported devices at your own risk.

- Device compatibility with firmware code loading using the SCSI Write Buffer command varies greatly from vendor to vendor. While HSUTIL does check to see if a target disk is an unsupported device, it does not prevent you from continuing the code load operation on the device. Any unsupported device could be rendered unusable until it is factory-initialized, if the code load is unsuccessful.



CAUTION: Delete all non-disk devices from the controller configuration that are on the same shelf as the target disk, and prevent bus activity to all other disks on the same shelf before downloading firmware to the target disk.

- If a power failure or SCSI bus reset occurs during a code load operation, permanent damage to the device can result. To minimize the possibility of rendering a device unusable, Compaq recommends halting activity on other devices on the same port during the code load process.
- HSUTIL processes a single target device per session.
- HSUTIL does not load code to devices configured as units, stripesets, mirrorsets, RAIDsets, sparesets, or failedsets. The destination device must be an unattached device.
- The source device must be configured as a single-device unit.
- The device firmware image must be located on the source disk in contiguous blocks at a known LBN location.
- Once HSUTIL has allocated the source disk for the code load operation, the source disk is unavailable to other subsystem operations.
- Some device firmware releases require a format operation after a code load operation to make the device usable. In this case, you must rerun HSUTIL to perform the format operation. See the release notes for your device firmware version to determine if you must format the device after code loading. If you do not have release notes, contact the device vendor to verify whether a format is required after a firmware update.
- Use the Ctrl/C or Ctrl/Y keys to exit HSUTIL before the program begins issuing SCSI commands to perform a code load. Once the program begins issuing SCSI commands, however, the exit key combinations are disabled.
- In dual-redundant configurations, shut down the controller that you are not using for the code load operation and eject the program card. Reinstall the program card to restart the controller after you have finished the code load.

Code Loading a Device Using HSUTIL

The example in this section demonstrates the use of the HSUTIL utility to download device firmware. In this case, your device's firmware release documentation specifies that it does not require a subsequent format. In the example, you are changing the firmware in device DISK150 from revision 0007 to 0014. The source disk is DISK250.

The details of copying the device firmware image from a location external to the controller to the source disk are specific to the host operating system. In this example, the firmware image is already at LBN 0 of DISK250.

1. Back up all data on the target device using your operating system's backup procedures.
2. Use the show disk command to report the available devices and the firmware level of each. In the example below, DISK150 is the target device and DISK250 (Unit D200) is the source device. Note that the firmware level of DISK150 is reported as "0007" and that it is an unattached device:

```

                SHOW DISK FULL
Name      Type  Port Targ Lun      Used by
DISK150   disk   1   5   0
          RZ29B (C) DEC    0007
DISK250   disk   2   5   0        D200
          RZ28  (C) DEC    442D
Switches:
NOTTRANSPORTABLE
Size: 8356756 blocks

```

If the target device is configured as part of a higher-level container, such as a unit, you must delete that part of the configuration. The target device must be an unattached disk drive.

3. Invoke the HSUTIL utility and select the code load function by entering option "2" at the prompt:

```

                RUN HSUTIL
*** Available functions are:
0. EXIT
1. FORMAT
2. CODE_LOAD
Enter the number of the function you wish to perform (0:2) [2] ?2

```

4. The program displays the single-device units available as source disks for code loading:

```

Single device units on this controller include:
Unit  Associated Device  SCSI Product ID
200   DISK250             RZ28

```

5. Select Unit 200 (DISK250) as the source disk:

```

Which unit is the code to be loaded FROM ? 200
Because you have previously copied the firmware image to LBN 0 on the source disk, you can accept the
default starting LBN of the device firmware image by pressing Return at the prompt:
What is the starting LBN of the code on the unit where the code is to be loaded FROM [0] ? Return

```

- Enter the disk model that is the target of the code load. Enter this information exactly as it was reported in the show command, including any spaces or special characters: (You may, however, use only as many characters as are necessary to uniquely identify the device, as shown in the following example.)

What is the SCSI PRODUCT ID of the disk that you want code load TO ? RZ29B

- The program lists all unattached disk drives of the model specified. In this example, DISK150 as the only unattached device with the desired product ID:

Unattached devices on this controller include:

Device	SCSI Product ID	Current Device Rev
DISK150	RZ29B (C) DEC	0007

- Select the target device from the list:

Which device is the code to be loaded TO ? DISK150

- The program displays a number of informational messages and offers you the option of exiting before the format operation begins:

Do you want to continue(y/n)[n] ? Y

- The program begins the device code load operation, finishing within two minutes:

Device code has been successfully downloaded to DISK150

HSUTIL - Normal Termination at: 13-JAN-1996 05:53:03

- Enter the show disk command for disk150 to verify that the device code load operation was successful. Note that the program reports a new firmware revision level, such as "0014." The device is now available for use with its new firmware.

```

                SHOW DISK150
Name      Type  Port Targ Lun      Used by
-----
DISK150  disk   1  5  0
          RZ29B (C) DEC    0014

```

Code Loading a Device Using HSUTIL (Format Required)

Some devices and some revisions of device firmware require that you format the device after installing new firmware. The Code Load portion of HSUTIL detects when a device format is required, and displays a message on the console indicating this. Follow the instructions for "Formatting a Disk" in this document. You cannot use the device until it's formatted.

Ensure data is backed up from the device before starting the code load.

Abort Codes

In the event that HSUTIL terminates before it successfully completes a format or code load operation, it reports one of the abort codes shown in Table 12.

Table 12 Abort Codes

Abort Code	Description
1	FAO returned either FAO_BAD_FORMAT or FAO_OVERFLOW
2	Bad return from TS\$READ_TERMINAL_DATA
3	TS\$READ_TERMINAL_DATA returned either an ABORTED or INVALID_BYTE_COUNT
4	User requested an abort via ^Y or ^C
5	An error occurred on a SCSI command
6	Can't find the pub, device is probably missing
