StorageWorks™ Array Controller

HSZ40 Array Controller Operating Software Version 2.7 Release Notes

Order Number: EK–HSZ40–RN. H01

This document summarizes features and characteristics of the HSZ40 array controller operating software Version 2.7 that are not covered elsewhere in the documentation. These release notes also contain instructions for installing the software.

Note

This version of the HSOF Version 2.7 Release Notes includes information on the HSZ40–C*x* controller modules.

These Release Notes contain instructions for C_SWAP and HSUTIL that supersede information in the product documentation. Keep them near your StorageWorks subsystem.

Digital Equipment Corporation
Maynard, Massachusetts

March 1996

NOTE: Equipment mentioned in this document generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

Any changes or modifications made to this equipment may void the user's authority to operate the equipment.

Operation of this equipment in a residential area may cause interference, in which case, the user, at his own expense, will be required to take whatever measures required to correct the interference.

Restrictions apply to the use of the maintenance port on this series of array controllers. Failure to observe these restrictions may result in harmful interference. See *Disconnecting the Maintenance Terminal* on page 20 for details.

Warning!
This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Achtung!
Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Avertissement!
Cet appareil est un appareil de Classe A. Dans un environnement résidentiel cet appareil peut provoquer des brouillages radioélectriques. Dans ce cas, il peut être demandé à l' utilisateur de prendre les mesures appropriées.

Contents

Introduction

These release notes provide application information for the HSZ40 array controller operating software Version 2.7[1] not covered elsewhere in the documentation. This document should be used by individuals responsible for configuring, installing, and using the HSZ40 controllers.

Read this entire document before installing or upgrading the software.

Topics Covered

These release notes cover the following topics:

- Hardware and software supported by HSOF Software Version 2.7
- New features—Modifications in the software that add significant functionality to the controller
- Changes from Version 2.5—Modifications to operating parameters or functions that do not necessarily add significant functionality to the controller
- Clarifications—Explanations of controller behavior in certain situations
- Operating constraints—Limitations placed on the operation of the controller by the nature of its design
- Avoiding Problem Situations—Information to help you avoid and recover from unusual controller behavior in certain situations, under specific conditions
- Corrections and additions to the documentation
- Installation instructions
- Identification of the software revision level

Release Package Contents

The Version 2.7 release package consists of the following:

- These release notes
- A cover letter
- The *HS Family of Array Controllers User's Guide*
- A PCMCIA program card containing the HS operating software Version 2.7
- License keys to enable optional features: write-back cache, disk mirroring, and RAID (each to be purchased separately)

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[1] The OpenVMS™ SHOW CLUSTER command and the HSOF software SHOW THIS_CONTROLLER command display the version as "V27Z".

Intended Audience

This document has been prepared for Digital customers who have purchased HSZ40 array controllers and for Digital Multivendor Customer Services personnel responsible for installing and maintaining systems that include HSZ40 array controllers.

Hardware and Software Support

This section lists the hardware and software compatible with HSOF Software Version 2.7.

Hardware Support

HSOF Software Version 2.7 supports the following revisions or higher for the HSZ40 controllers and associated hardware:

- HSZ40–B*x* and HSZ40–C*x* controller modules
- Version 2 cache module, hardware revision A
- BA350–MA controller shelf
- BA350–S*x* device shelf
- BA356–S*x* wide device shelf with 8-bit I/O module
- BA35*x*–HA power supply

Operating System Support

HSOF Software Version 2.7 on HSZ-series controllers is supported by the following operating system versions, within the limitations described in the *HS Family of Array Controllers User's Guide*:

- Digital UNIX™ (formerly called DEC OSF/1™) Version 2.0 and higher. Digital highly recommends the use of Digital UNIX Version 3.2 with HSZ40 controllers.
- OpenVMS Alpha Version 6.2 and higher

Host Adapter Support

The following host adapters are supported by the Digital UNIX operating system for HSZ40–B*x* controllers:

- KZTSA (for DEC 3000™ systems)
- PMAZC (for DEC 3000 systems – requires a DWZZA signal converter)
- KZMSA (for DEC 7000™ and DEC 10000™ systems and for Digital AlphaServers 8200 and 8400 – requires a DWZZA signal converter)
- KZPSA (for Digital AlphaServers 1000/2000/2100/8200/8400)

The following host adapters are supported by the OpenVMS Alpha operating system Version 6.2 and higher for HSZ40–B*x* and HSZ40–C*x* controllers:

- KZTSA (for DEC 3000 systems)
- PMAZC (for DEC 3000 systems – requires a DWZZA signal converter)
- KZMSA (for DEC 7000 and DEC 10000 systems – requires a DWZZA signal converter)
- KZPAA (for Digital AlphaServers 1000/2000/2100 systems)

- KZPSA (for Digital AlphaServers 1000/2000/2100)

Device Support

HSOF Software Version 2.7 supports the devices listed in Table 1 through Table 4 at the indicated hardware and microcode levels or higher. New devices supported since Version 2.5 are listed in bold.

Table 1: Supported Disk Drives

Device	Capacity in Gigabytes	Minimum Microcode Version	Minimum Hardware Version
RZ25-VA	0.426	0900	B01
RZ26-VA	1.05	T392	D02
RZ26L-VA, **VW**	1.05	440C	A01
RZ26N-VA, VW	1.05	446	A01
RZ28-VA, **VW**	2.1	435E	B01
RZ28B-VA	2.1	0003	A01
RZ28D-VA, VW	2.1	0008	A01
RZ28M-VA, VW	2.1	466	A01
RZ29B-VA, **VW**	4.3	0007	B01
RZ74-VA	3.57	T427B	B07

Note: VW models require BA356 wide device shelves and an 8-bit I/O module

Table 2: Supported Tape Drives

Device	Capacity in Gigabytes	Minimum Microcode Version	Minimum Hardware Version	Comments
TZ87-VA	20 (Compressed)	930A	A01	Note 4
TZ87N-VA	20 (Compressed)	930A	A01	Notes 3, 4
TZ87-TA	20 (Compressed)	9514	B02	Notes 1, 2, 4
TZ875-NT	100 (Compressed)	930A	A01	Note 4
TZ875-TA	100 (Compressed)	930A	A01	Note 1, 4
TZ877-AE, AF	140	930A	A01	Note 4
TZ88N-VA	20/40	CC33	A01	
TZ885-NT	100/200	CC33	A01	Note 1
TZ885-TA	100/200	CC33	A01	Note 1
TZ887-AE	140/280	CC33	A01	Note 1

Note 1: Requires 0.2 meter SCSI–1 to SCSI–2 transition cable (Digital internal part number 17–03831–01).

Note 2: Requires DWZZA–AA 8-bit single-ended to 16-bit differential SCSI signal converter.

Note 3: Cannot read TK50, TK70, or TZ30 format tapes.

Note 4: Requires KZPSA or PMAZC host adapter.

Table 3: 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

Table 4: Supported Solid State Disk Drives

Device	Capacity in Gigabytes	Minimum Microcode Version	Minimum Hardware Version
EZ31-VW	0.134	V064	A01
EZ32-VW	0.268	V064	A01
EZ51R-VA	0.1069	V096	D01
EZ54R-VA	0.4277	V096	A01
EZ58R-VA	0.8553	V109	C01
EZ64-VW	0.475	V064	A01
EZ69-VW	0.950	V064	A01

Do not warm swap solid state disk devices. Make sure that the device shelf power is off when inserting or removing a solid state disk device.

New Features

The following list briefly describes new features added since Version 2.5. A new feature is defined as a modification to the software that adds significant functionality to the controller.

Support for HSZ40–C*x* Controller Module

The HSZ40–C*x* controller module is fully supported with HSOF Version 2.7. The HSZ40–C*x* is a direct replacement for the HSZ40–B*x*, and can be used in dual-redundant configurations with–B*x* modules.

You can identify the different HSZ40 controller modules by looking at the label on the front bezel. The label on an HSZ40–B*x* says "HSZ40B", and an HSZ40-C*x* says "HSZ40C". You cannot identify the different modules using the SHOW THIS_CONTROLLER or SHOW OTHER_CONTROLLER commands.

Note

The HSZ40–C*x* controller module is not supported with any version of software prior to HSOF Version 2.7.

The order numbers for HSZ40–C*x* controller options are listed in the Table 5.

Table 5: HSZ40–C*x* Controller Options

Order Number	Description
HSZ40–CA	StorageWorks Array Cntrl 6-Channel (ports); 42 SCSI–2 Disk Device support; No Cache; RAID 0, Base Firmware.
HSZ40–CD	StorageWorks Array Cntrl 6-Channel (ports); 42 SCSI–2 Disk Device support; 16 MB Read Cache; RAID 0, Base Firmware.
HSZ40–CF	StorageWorks Array Cntrl 6-Channel (ports); 42 SCSI–2 Disk Device support; 32 MB Read Cache; RAID 0, Base Firmware.
HSZ40-TL	Two HSZ40-B*x*/C*x* StorageWorks Array Controllers for 36 dual-redundant SCSI-2 and SSD disk devices; both with 32MB write-back cache, disk mirroring, RAID options, and a 20 meter cable.
HSZ40–XD	16 MB read cache module option for HSZ40–CA.
HSZ40–XF	32 MB read cache module option for HSZ40–CA.
HSZ40–XE	HSZ40 controller read cache replacement for the 16 MB read cache that comes with the HSJ40–CD option, a 32 MB read cache module; mandatory return of installed 16 MB read cache required.
HSZ40–YX	HSZ40 controller write-back cache option – this kit includes two write-back cache batteries, a battery bracket, and a write-back cache license.
QA–2YJAC–HS	SWKS HSZ40 MSC PCRM Kit.

Support for Wide Shelves and Devices

Controllers running Version 2.7 software support the BA356 wide device shelf using the 8-bit I/O module. The controller supports both wide and narrow devices installed in a BA356 shelf, provided that they conform to shelf loading rules. The following list is a brief summary of the 8-bit/16-bit device installation rules:

- All 16-bit devices must be used in 16-bit shelves. A 16-bit shelf that is connected to an 8-bit controller must have an 8-bit I/O module installed, and all devices on that shelf operate in 8-bit mode.
- All newer 8-bit devices can be used in 16-bit shelves, as long as the 8-bit I/O module is installed in the shelf. All 8-bit devices can be used in 8-bit shelves.
- Some “older” 8-bit devices cannot be mixed with 16-bit devices in 16-bit shelves. If you are unsure about some of your devices, see page 283 of the Digital Systems and Options Catalog – April 1995 supplement.

Configuration Saved on Disk

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

To activate the feature, add the SAVE_CONFIGURATION option when you initialize any container, such as:

```
CLI> INITIALIZE DISK100 SAVE_CONFIGURATION
```

or

```
CLI> INITIALIZE RAID5 SAVE_CONFIGURATION
```

In the second example, a copy of the controller configuration is saved on every device that is a member of RAIDset RAID5. Storing the configuration uses a small amount of additional space on each device. You do not need to store the configuration on all devices in the subsystem. You can use the INITIALIZE command without the SAVE_CONFIGURATION option for any devices on which you do not want to save the configuration.

You can use the SHOW command to find out if the save configuration feature is active and which devices are being used to store the configuration. To find out if the feature is active, use SHOW THIS_CONTROLLER FULL; the display includes a line indicating status and how many devices have copies of the configuration.

```
CLI> SHOW THIS_CONTROLLER FULL

Controller:
        .
        .
        .
        Configuration backup enabled on 2 devices
```

The SHOW DISKS FULL, SHOW DEVICES FULL, and SHOW *disk-name* commands all indicate if a specific device is being used by the save configuration feature.

```
CLI> SHOW DEVICES FULL

Name          Type                          Port  Targ   Lun        Used by
--------------------------------------------------------------------------------
DISK430       disk                             4     3     0        D100
          DEC       RZ28      (C) DEC T436
        Switches:
          NOTRANSPORTABLE
        Size: 4109470 blocks
DISK530       disk                             5     3     0
          DEC       RZ28      (C) DEC D41C
        Switches:
          NOTRANSPORTABLE
        Size: 4108970 blocks
        Configuration being backed up on this container
DISK630       disk                             6     3     0
          DEC       RZ28      (C) DEC D41C
        Switches:
          NOTRANSPORTABLE
        Size: 4108970 blocks
        Configuration being backed up on this container
```

If a nonredundant controller fails, follow the steps below to replace it and restore the configuration from disk:

1. Remove the failed controller, setting the program card aside.
2. Install the replacement controller, but do not connect the host bus cable.
3. Press and hold the reset button on the new controller and insert the program card. Release the reset button to restart the controller. The controller scans the devices in the subsystem and loads the latest copy of the configuration. After loading the configuration, the controller restarts.

4. If the controller does not restart, the restore did not occur, possibly because the controller already contained some configuration information. Delete any existing controller configuration with the following CLI command:

```
CLI> SET THIS_CONTROLLER INITIAL_CONFIGURATION
```

(You cannot abbreviate this command.)

The controller halts after completing the command. Restart the controller by pressing the reset button. The controller scans the devices in the subsystem and loads the latest copy of the configuration. After loading the configuration, the controller restarts.

6. Reinstall any patches that you had installed on the previous controller.
7. Attach the host bus cable.

CAUTION

Do not change any devices when you are replacing controllers. Any devices added or removed may interfere with the controller's ability to restore the most current copy of the configuration.

(You can use the SAVE_CONFIGURATION option in dual-redundant controller configurations to provide an extra measure of redundancy, but the configuration is only restored in single-controller configurations.)

When replacing one controller in a dual-redundant configuration, use the SET FAILOVER COPY= command to copy the configuration from the existing controller to the new controller.

When replacing both controllers in a dual-redundant configuration, install just one and allow it to restore the configuration from disk. Then install the second controller and use the SET FAILOVER COPY= command to copy the configuration from the first controller to the second controller.

Note

You cannot save the controller configuration on TRANSPORTABLE devices.
A device that has been initialized with the SAVE_CONFIGURATION option cannot be used on a controller with a previous release of software. A controller with pre-2.7 software will report a media format error on the device.

Auto New Spare

To aid in replacing failed disk drives, there is now an option that you can enable in the FAILEDSET that causes replaced disk drives to be automatically placed in the SPARESET.

Once this feature is enabled, when a drive in the FAILEDSET is removed and a new drive (that does not contain any metadata) is installed in the same slot, the controller will move the drive in the configuration from the FAILEDSET to the SPARESET. It is then available for any RAIDset or mirrorset that is missing a member.

The feature is disabled by default. To enable this feature, use the following CLI command:

```
CLI> SET FAILEDSET AUTOSPARE
```

To disable the feature:

```
CLI> SET FAILEDSET NOAUTOSPARE
```

You can view the current setting with the SHOW FAILEDSET command:

```
CLI> SHOW FAILEDSET

Name          Storageset                        Uses            Used by
---------------------------------------------------------------------
FAILEDSET     failedset
        Switches:
          AUTOSPARE
```

The Auto New Spare feature only operates when the newly-inserted disk drive does not contain any metadata, such as a disk drive from the factory. You can use the TRANSPORTABLE function to initialize a used device so that it no longer contains metadata by issuing the following CLI commands:

```
CLI> SET disk-name TRANSPORTABLE
CLI> INITIALIZE disk-name
```

To initialize additional disks, simply remove the first disk and replace it with another, then retype the INITIALIZE command. You do not need to reenter the ADD DISK or SET TRANSPORTABLE commands as long as you use the same PTL-location.

When the drive is moved into the spareset, some metadata is written on it (which means that it is no longer transportable). Additional metadata is written on it when it is moved from the spareset into a RAIDset or mirrorset.

HSZ40 Performance Improvement

Performance for the HSZ40 controller improved significantly with Software Version 2.7. The controller now performs over 4000 requests per second in tests with a 100% cache hit.

HSZ40 Tape Support

Tape devices and tape loaders are supported on HSZ40 controllers with Software Version 2.7. Tape devices are treated as passthrough containers, which allows the host to see the tape device as if it were connected without the controller. The controller does not directly control any aspect of the tape devices, such as tape format.

The following CLI commands show an example of adding a tape drive and a loader to a controller configuration. Note that the unit name starts with a "P" for "passthrough," rather than "T" for "tape."

```
CLI> ADD PASSTHROUGH TAPE120 1 2 0
CLI> ADD UNIT P100 TAPE120

CLI> ADD PASSTHROUGH LOADER121 1 2 1
CLI> ADD UNIT P101 LOADER121
```

The SHOW command shows tape and loader devices as "passthrough tape" and "passthrough loader:"

```
CLI> SHOW DEVICES
Name        Type              Port  Targ  Lun       Used By
------------------------------------------------------------
TAPE120     passthrough tape    1     2    0        P100
LOADER121   passthrough loader  2     1    1        P101


CLI> SHOW PASSTHROUGH FULL
Name        Type               Port Targ  Lun       Used by
-------------------------------------------------------------
TAPE120     passthrough tape     1    2    0        P100
         DEC      TZ87     (C) DEC 9719
LOADER211   passthrough loader   2    1    1        P401

         DEC      TZ Media Changer 971B


CLI> SHOW P100
    LUN                                     Uses
--------------------------------------------------------------
  P100                                      TAPE120
        State:
          ONLINE to this controller
          Not reserved
          PREFERRED_PATH = THIS_CONTROLLER


CLI> SHOW P101
    LUN                                     Uses
--------------------------------------------------------------
  P101                                      LOADER121
        State:
          ONLINE to this controller
          Not reserved
          PREFERRED_PATH = THIS_CONTROLLER
```

The CONFIG and CFMENU utilities have been enhanced to find tape devices and add them as passthrough containers named "TAPE*xxx*," where *xxx* is the port-target-LUN location of the device. Neither CONFIG nor CFMENU will add tape loaders. However, if you have already added a tape loader device using the ADD command, you can make a unit out of the device and delete it from CFMENU.

Tape and loader devices are only supported with the KZPSA and PMAZC host adapters. See the table of supported tape drives earlier in these Release Notes for a list of all tape and loaders devices supported with Software Version 2.7.

Tape data transfers greater than 64KB are not supported. Any transfer request greater than 64 KB results in a CHECK CONDITION followed by ILLEGAL REQUEST sense data.

HSZ40 CD–ROM Support

CD–ROM devices are supported on HSZ controllers attached to the Digital UNIX operating system. CD–ROM devices are presented to the host as RRD devices.

The following CLI commands show an example of adding a CD–ROM device to an HSZ controller configuration.

```
CLI> ADD CDROM CD120 1 2 0
CLI> ADD UNIT D100 CD120
```

You can use the SHOW command to view CD–ROM devices:

```
CLI> SHOW DEVICES

Name        Type             Port  Targ  Lun       Used By
------------------------------------------------------------
CDROM120    cdrom               1     2    0       D100

CLI> SHOW CD120

Name        Type             Port  Targ  Lun       Used By
------------------------------------------------------------
CDROM250    cdrom               2     5    0       D100
         DEC      RRD45    (C) DEC 1645
```

The CONFIG and CFMENU utilities have been enhanced to find CD–ROM devices and add them to the configuration.

Asynchronous Disk Drive Replacements

HSOF Software Version 2.7 supports asynchronous disk drive replacements—device removal and insertion without first quiescing the device bus. You can remove or insert devices at any time, with the following restrictions:

- Do not remove or insert devices during failover.
- Do not remove or insert devices during failback.
- Do not remove or insert devices before the CLI prompt appears during a controller initialization.
- Do not insert devices while the controller is still recognizing a device removal (indicated by flashing LEDs).
- Do not remove or insert devices while the controller is running a local program such as DILX or VTDPY.
- Wait 50 seconds after inserting one disk drive before inserting a second disk drive.

Controller Code Load Capability

You can use the code load function of the CLCP utility to load new HSOF controller software, either through the controller front panel serial port or over the host SCSI bus. For more information, see the section on the CLCP utility in the *HS Family of Array Controllers User's Guide*.

Disk Code Load Capability

You can upload disk firmware to compatible disks in the subsystem using the HSUTIL utility. For more information, see *The HSUTIL Utility* at the end of these release notes.

Disk Formatting Capability

You can format compatible disks in the subsystem using the HSUTIL utility. For more information, see *The HSUTIL Utility* at the end of these release notes.

Changes from Version 2.5

The following list describes changes in the operation of the controller provided by the software. A change is a modification of some operating parameter or function that does not necessarily add significant functionality to the controller.

Replacing a Failed Controller

The C_SWAP utility has been modified to better protect your data during controller replacements. Although the procedure looks much the same, there are subtle but important changes. New instructions for running C_SWAP are at the end of these release notes. These instructions supersede those in the Version 2.5 documentation for some configurations. Follow the instructions in these release notes whenever you run C_SWAP.

Default Chunksize and Maximum Chunksize

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

- If the number of members in a container is less than or equal to 9, the default chunksize is 256.
- If the number of members in a container is greater than 9, the default chunksize is 128.
- If the cache module 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. Thus you *must* specify the chunksize in accordance with the following table:

RAIDset Size	Maximum Chunksize	RAIDset Size	Maximum Chunksize
3 members	1024 blocks	9 members	256 blocks
4 members	682 blocks	10 members	227 blocks
5 members	512 blocks	11 members	204 blocks
6 members	409 blocks	12 members	186 blocks
7 members	341 blocks	13 members	170 blocks
8 members	292 blocks	14 members	157 blocks

Disk Geometries of Mirrorsets and Clones

In Software Version 2.5, the MIRROR and ADD MIRRORSET commands caused the mirrored devices to report 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. This problem was the reason behind TD# 1905, *Inability to Mount Shadow Set Members/Entire Shadow*.

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 qualifiers 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
```

where

- *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:

- You have replaced the controller module
- The controller's non-volatile memory (NVMEM) has lost its memory, possibly from an NVMEM battery failure

- You removed the cache module while there was unflushed data

For example:

```
CLI> CLEAR_ERRORS INVALID_CACHE THIS_CONTROLLER NODESTROY_UNFLUSHED_DATA
```

Use the DESTROY_UNFLUSHED_DATA parameter in the following situations:

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

For example:

```
CLI> CLEAR_ERRORS INVALID_CACHE OTHER_CONTROLLER DESTROY_UNFLUSHED_DATA
```

New Cache Battery Diagnostic

Software version 2.7 checks 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 configurations, the controller with good cache batteries can be set to service the RAIDsets and mirrorsets by changing the PREFERRED_ID to include all controller target IDs, such as

```
CLI> SET THIS_CONTROLLER PREFERRED_ID=(1,2,3,4)
```

Pass SCSI Negotiated Parameters to “Standby” Controller

In dual-redundant configurations in which one controller is configured for “hot standby,” the active controller now passes all negotiated parameters to the standby controller. During failover, the standby controller can start communicating with the host without having to renegotiate the communications parameters.

SCSI Host Bus Reselect Retry

When the controller attempts to reselect the host (SCSI initiator) and the host does not respond, the controller now retries the reselection 16 times after an initial failure.

Clarifications

This section presents clarifications on controller behavior in certain situations.

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 you do not see the information that you expected from one controller, use the SHOW command again to view the information on the other controller.

LBA Does Not Match for MEDIUM ERROR

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 actually one less than the number in the extended sense data.

This problem will be fixed in a future release.

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.

Supported versions of Digital UNIX

The *HS Family of Array Controllers User's Guide* incorrectly states that HSOF Version 2.5 supports dual-redundant configurations with Digital UNIX (DEC OSF/1) Version 2.0. HSOF Versions 2.5 and greater support dual-redundant configurations with Digital UNIX Version 3.2 or higher, as stated earlier in these Release Notes.

KZPAA Host Adapter Not Supported for Digital UNIX

In the April 1995 revision E01 of these release notes, Digital erroneously stated that the KZPAA host adapter was supported by Digital UNIX with HSZ40–B*x* controllers. The KZPAA host adapter is *not* supported with HSZ40 controllers under the Digital UNIX operating system.

KZPAA Host Adapter Supported for OpenVMS Alpha

The KZPAA host adapter is supported for HSZ40–B*x*/C*x* controllers *only* under the OpenVMS Alpha operating system Version 6.2 and higher.

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.

In a future release Digital intends to properly identify the Port, Target, LUN of the first physical device in the storageset in all possible cases. In cases where it is not possible to identify the first physical device in a storageset, the intention is to set the PTL values to 255 and provide storageset specific information in the Device Product ID field to aid in identifying the logical device involved in the event.

Drive-Level Event Reports

Under certain circumstances, the Device Type field contained in %EVL drive-level event reports displays, as well as sense data responses, will contain the value 1F(hexadecimal). When the Device Type is 1F, the content of the Device Firmware Revision Level and Device Product ID fields are undefined and should be ignored.

This is a permanent condition.

Operating Constraints

This section describes the operating constraints for HSOF Software Version 2.7. An operating constraint is a limitation placed on the operation of the controller by the nature of its design. Keep these constraints in mind to avoid problems and to help you to get the maximum performance from your controller.

Limits on the Total Number of Storagesets

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

- A mirrorset can have a maximum of 6 members.
- There can be a maximum of 20 mirrorsets and/or RAIDsets.
- There can be a maximum of 30 storagesets (RAIDsets, mirrorsets, and/or stripesets).
- There can be no more than 32 physical device members total for a unit.

Only One Qualifier per CLI Command

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

```
CLI> SET D102 WRITEBACK_CACHE
CLI> 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 is comprised of 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.

Restrictions on Moving Storagesets to Previous Software Versions

In HSOF Software Version 2.5, striped mirrorsets reported a different disk geometry than the same nonmirrored stripeset. This has been resolved in Version 2.7, such that striped mirrorsets initialized under Version 2.7 report a disk geometry identical to the same nonmirrored stripeset.

Due to this improvement in Version 2.7, you should be aware of the following when moving stripesets to previous versions of software:

- Striped mirrorsets created under HSOF Software Version 2.7 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 Version 2.7 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 Version 2.7 (using the CLONE utility) cannot be used with previous software versions.
- Any container initialized with the SAVE_CONFIGURATION option cannot be used with previous software versions.

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

Unit Problems after Battery Low

An unusual combination of circumstances may 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 on the controller that owns the unit (through the preferred path). Entering the command from the companion controller in a dual-redundant configuration will not clear the lost data. Digital expects to lift this restriction in a future HSOF software release.

CLI Response to Units Under Load

A unit that is experiencing a heavy I/O load may be slow to respond to CLI commands.

VTDPY Does Not Support Tape Devices

The VTDPY utility does not report any information on tape devices that are configured as passthrough containers on HSZ40 controllers.

CLONE and Configuration Saved On Disk

The CLONE utility does not allow cloning to a device if the source disk was initialized without the SAVE_CONFIGURATION option and the target device was initialized with the SAVE_CONFIGURATION option. To work around this situation, you can reinitialize the target disk with the NOSAVE_CONFIGURATION option.

Avoiding Problem Situations

In certain situations, you may experience unusual controller behavior. This section presents information to help you to avoid such situations and to recover from them if they occur.

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

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

CLONE

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 shutdown of the controller and clear any data from the cache. Follow these steps to move a write-back cache module:

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

   `CLI>` **`SHUTDOWN THIS_CONTROLLER`**

   or

   `CLI>` **`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.

DILX and HSUTIL

For HSZ40 controllers in dual-redundant configurations, do not change the preferred target IDs using the SET THIS_CONTROLLER PREFERRED= or the SET OTHER_CONTROLLER PREFERRED= command while running DILX or HSUTIL. These local programs do not adapt to changing target IDs while they are running.

HSZ40 and Advanced File System

The use of HSZ40 controller-based mirrorsets or RAID5 storagesets for Advfs creates high-availability disk units that can survive the failure of a single drive. Additionally, the use of redundant HSZ40 controllers reduces the risk of failure. This disk and/or controller redundancy can help to prevent file system I/O errors that could affect system availability. Optionally, the Logical Storage Manager (LSM) software layered product can be used for host-based shadowing to provide high availability, even across multiple SCSI host adapters and to multiple HSZ40 controllers.

Moving Drives from HSC Controllers

HSOF Software Version 2.7 contains an undocumented local program for viewing and changing volume serial numbers that you can use to move drives from an HSC controller to an HSZ40 controller. You must use this program when moving drives because the HSC controller accepts volume serial numbers of zero and duplicate serial numbers, but HSZ40 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:

```
CLI> 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
```

Documentation Additions and Corrections

Following are additions and corrections to the *HS Family of Array Controllers User's Guide* and *HS Family of Array Controllers Service Manual* and previous HSZ40 release notes:

Note

Both the *HS Family of Array Controllers User's Guide* and the *HS Family of Array Controllers Service Manual* were revised for the Version 2.5 software release. Much of the information contained in prior versions of these release notes, as well as new information, has been included in these revised manuals. Digital strongly recommends referring to the new revisions of these manuals for updated information.

Windows NT Support

The January 1996 version of the *HSZ40 Array Controller Operating Software Version 2.7 Release Notes* (EK–HSZ40–RN. G01) incorrectly stated that HSOF Software Version 2.7 supported systems running the Windows NT operating system. HSOF Software Version 2.7 does not support systems running Windows NT.

Disconnecting the Maintenance Terminal

The maintenance terminal port on the front bezel of the controller is meant to be used only for initial configuration and required maintenance functions. Operation of this port may cause harmful radio frequency interference. Always disconnect the terminal and cable when you have finished working with the controller.

CLI Command Differences

CLI Command Timeout

The timeout duration for CLI commands has been extended from 10 minutes to 30 minutes. The timeout is the length of time that one controller in a dual-redundant configuration will wait 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.

Controller Warm Swap

The C_SWAP utility has been modified to better protect your data during controller replacements. Although the procedure looks much the same, there are subtle but important changes. New instructions for running C_SWAP are at the end of these release notes. These instructions supersede those in the Version 2.5 documentation for some configurations. Follow the instructions in these release notes whenever you run C_SWAP.

New Qualifiers for CLEAR_ERRORS INVALID_CACHE

The CLEAR_ERRORS INVALID_CACHE command has new qualifiers 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
SELFTEST OTHER_CONTROLLER OVERRIDE_ONLINE
SELFTEST THIS_CONTROLLER OVERRIDE_ONLINE
SHUTDOWN OTHER_CONTROLLER OVERRIDE_ONLINE
SHUTDOWN THIS_CONTROLLER OVERRIDE_ONLINE
```

HSZ Tape and Loader Support

The ADD PASSTHROUGH and ADD UNIT commands have been modified to support tape drives and tape loaders as passthrough devices on HSZ controllers. To add a tape or loader device:

```
ADD PASSTHROUGH passthrough-name SCSI-location
```

To add the device as a unit:

```
ADD UNIT unit-number passthrough-name
```

Note that the *unit-number* must begin with a "P," for "passthrough." For example, to add a tape device at PTL 120:

```
CLI> ADD PASSTHROUGH TAPE120 1 2 0
CLI> ADD UNIT P101 TAPE120
```

To delete the unit and the device:

```
DELETE UNIT unit-number
DELETE passthrough-name
```

HSZ CDROM Support

An ADD CDROM command now allows you to configure and use CDROM drives on HSZ40 controllers. To add a CDROM device:

```
ADD CDROM cdrom-name SCSI-location
```

To add the device as a unit:

```
ADD UNIT unit-number cdrom-name
```

Autospare

A SET FAILEDSET command has been added to enable and disable the automatic change from FAILEDSET to SPARESET of factory-fresh disks.

```
CLI> SET FAILEDSET AUTOSPARE
CLI> SET FAILEDSET NOAUTOSPARE (Default)
```

The AUTOSPARE option setting is displayed by the SHOW FAILEDSET command.

Save Configuration

The initialize command has a new qualifier to enable and disable saving the controller configuration on disk devices.

```
INITIALIZE container-name
INITIALIZE container-name SAVE_CONFIGURATION
INITIALIZE container-name NOSAVE_CONFIGURATION (Default)
```

Restore Initial Configuration

To ensure that single controllers have no configuration information and can be used with the Configuration Saved on Disk feature, a command has been added to restore a controller to the factory default settings:

```
SET THIS_CONTROLLER INITIAL_CONFIGURATION
```

You should only use this command when you want to delete the configuration in the controller, so that the configuration information is restored from devices in the subsystem. (The devices must have been initialized under the old controller with the SAVE_CONFIGURATION qualifier.)

Do not issue this command to a single controller that has units ONLINE. To ensure that there are no units online, SET NORUN on all units before issuing the INITIAL_CONFIGURATION command. This command is not available for the OTHER_CONTROLLER.

Installation

Use the procedures described in this section to install HSOF Software Version 2.7 supplied in this kit. The procedure for upgrading your software to Version 2.7 typically takes less than 5 minutes to accomplish.

CAUTION

HSOF Software Version 2.7 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 Version 2.7 program cards and press the reset button, allow 60 seconds for the CLI prompt to appear.

Digital recommends dismounting controller-attached devices before performing the upgrade procedure. If it is not convenient to dismount the devices, perform the upgrade during a period of light I/O load.

Nonredundant Configurations

The software upgrade to Version 2.7 causes a brief interruption in service to attached devices. The operating system should automatically recover from this outage within a few seconds after the new software becomes operational and restores service.

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

1. Remove the ESD shield covering the PCMCIA program card.
2. Press the program card eject button to eject the program card from the controller.
3. Remove the program card.
4. While holding in the controller reset button, insert the new program card, pressing the card in until the eject button extends outward, then release the reset button.
5. 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*.

Dual-Redundant Configurations

In dual-redundant configurations, you must upgrade the HSOF software in both controllers simultaneously.

The software upgrade to Version 2.7 requires that both controllers be momentarily halted at the same time, causing a brief (30 to 45 second) interruption in service to attached drives. The operating system should automatically recover from this outage within a few seconds after the new software becomes operational and restores service.

Note

Perform the HSOF software upgrade at times when your subsystem I/O load is light (or zero).

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

1. Remove the ESD shields covering the PCMCIA program cards.
2. Press the program card eject buttons on both controllers simultaneously and remove both program cards.
3. Press and hold the controller reset buttons on both controllers while inserting new program cards. Be sure the eject buttons extend outward.
4. Release the reset buttons.
5. Reinstall the ESD shields.

Both controllers restart, leading to normal operations with the host systems as described in the *HS Family of Array Controllers User's Guide*.

The two controllers reinitialize concurrently and synchronize with each other. The timing of this procedure is not critical, except that you should insert and remove the program cards at approximately the same time (within an interval of a few seconds).

Identifying Your HSOF Software Revision Level

You can identify HSOF Software Version 2.7 by entering the SHOW THIS_CONTROLLER command at the CLI prompt. The resulting display lists the software revision level as version "V27Z."

The HSUTIL Utility

This section describes the features and user interface of the HSUTIL utility.

Introduction to HSUTIL

The HSUTIL utility 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 not be a part of any higher-level container.
- If a power failure or SCSI bus reset occurs during a format operation, the device may become unusable until a successful format operation is completed. To minimize the possibility of this problem, Digital 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 commands or run any local programs that might reference the target device from the other controller. Results are unpredictable.
  - Do not boot 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

Example 1 demonstrates the use of the HSUTIL utility to format a disk. In the example, you are formatting target disk DISK150.

Example 1 Device Format Operation

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:

```
CLI> 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
```

4. The program reports the unattached disk drives 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
```

5. Select DISK150 as the device to be formatted:

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

6. 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
```

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

```
HSUTIL Started at: 13-JAN-1946 04:49:48
Format of DISK150 has successfully finished.
HSUTIL - Normal Termination at: 13-JAN-1946 05:22:33
```

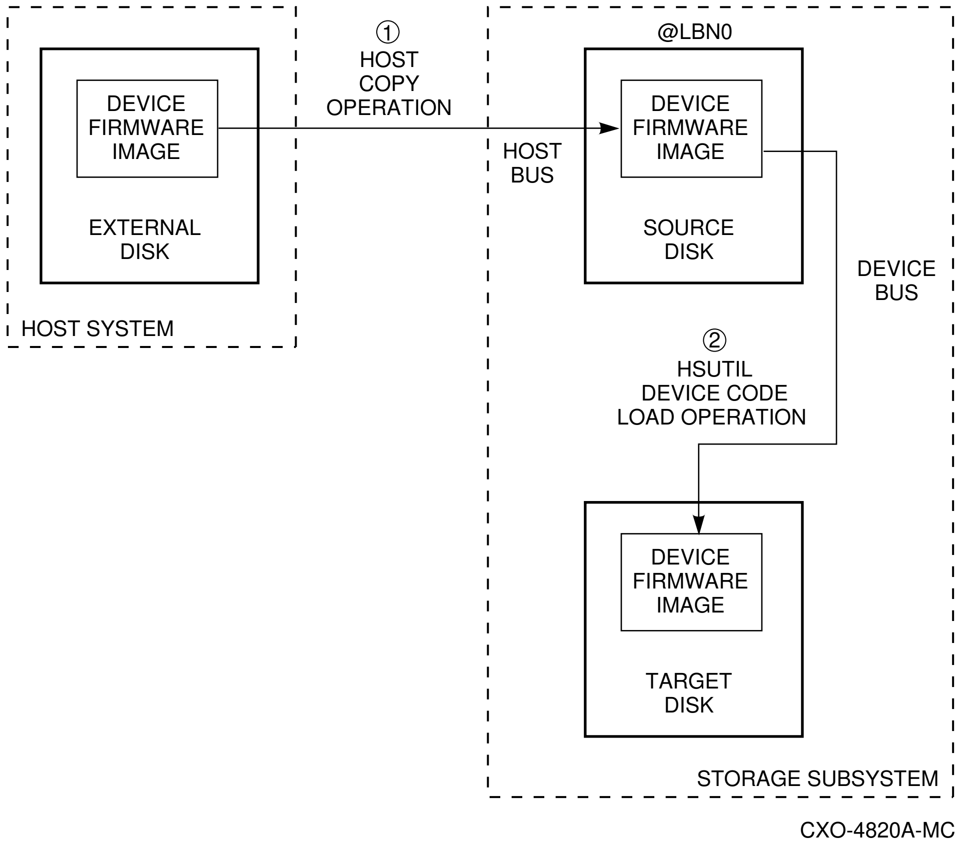
8. DISK150 is now formatted and usable.

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 logical block number (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 may be a raw disk device configured as a unit with no file system or label on it, or it may be a normal file system disk.

The device code load process takes place in two steps and is illustrated in Figure 1.

Figure 1: The Device Code Load Process



Preparing the Source Disk—You must 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 LBN on the source disk. You must 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, as illustrated in Figure 1. 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 Digital UNIX and OpenVMS.

Code Loading the Target Disk—Once the firmware image is located in contiguous blocks at a known LBN on the source disk, you can use HSUTIL to download it into the target disk.

Sample UNIX Host Copy Script

The details of copying the firmware image to the source disk from the host disk are specific to the host operating system. Following is a sample script, for use under the Digital UNIX™ operating system:

```
# disklabel -z /dev/rrza40c
# dd if=rz28_t436a_dec2104.fup of=/dev/rrza40a bs=512
512+0 records in
512+0 records out
```

Note that, if the disk label is not set to zero, Digital UNIX attempts to protect the disk label's location (LBN 0.) You must zero the disk label to the source disk before performing the code load operation. Failure to do this results in the following error:

```
# dd if=rz28_t436a_dec2104.fup of=/dev/rrza40a bs=512
dd write error: Read-only file system
8+0 records in
0+0 records out
```

Sample OpenVMS Host Copy Script

If you are installing new firmware on only one device type, such as RZ29B, and you want to be assured that you don't select the wrong code for the code load, then load the code first onto a spare drive at LBN: 0.

Example 2 Copying Firmware for a Single Device Type

From an OpenVMS account:

```
$ MOUNT/FOREIGN $2$DUA300:

$ COPY/CONTIGUOUS BABAGI::LCA:[FIRMWARE.RZ2X]RZ29B_DEC_0014.LOD -
TO $2$DUA300:

$ DISMOUNT/NOUNLOAD $2$DUA300:
```

Drive 2DUA300: 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: .

Example 3 Copying 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.

```
$ COPY/CONT BABAGI::LCA:[FIRMWARE.RZ2X]RZ29B_DEC_0014.LOD -
TO $2$DUA300:[000000]

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

$
```

Continue until you have all the software you need.

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 2DUA300: 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. You should understand that an unsupported device may 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, Digital recommends that you halt the 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 not available 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.
- You can 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 will not be 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

Example 4 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.

Example 4 Device Code Load Operation

1. Backup 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:

```
CLI> 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:
        NOTRANSPORTABLE
      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:

```
CLI> 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
```

6. 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
```

7. 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
```

8. 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
```

9. Select the target device from the list:

```
Which device is the code to be loaded TO ? DISK150
```

10. 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
```

11. 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-1946 05:53:03
```

12. 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.

```
CLI> 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 will detect when a device format is required, and will display a message on the console indicating this. Follow the instructions for Formatting a Disk found earlier in this document. You cannot use the device until you format it.

Be sure to back up the data 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 in Table 6.

Table 6: 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

Replace a Failed HSZ40 Controller and/or Cache Module (Dual-redundant Configuration)

There are two procedures for replacing a failed controller or cache module - 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.

To replace a controller or cache module using the online (C_SWAP) method, two power supplies are required in the SW500 and the SW800 cabinet. If you are performing the replacement procedure in an SW300 cabinet, a minimum of five power supplies are required.

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 7 to replace a controller and/or cache module.

Table 7: Required Tools for Controller/Cache Replacement

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 doors
Small flat-head screwdriver	To connect the trilink adapter to the controller

Caution

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

Prepare the Subsystem Configuration

1. Have the replacement modules at hand. The modules should be factory-fresh, or should have been shutdown cleanly (with the SHUTDOWN command) in their last application.
2. If the controller has completely failed, skip step five of this procedure.
3. Connect a maintenance terminal to the controller that you are *not* replacing.

4. 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 qualifiers.

   CLI> **SHUTDOWN OTHER_CONTROLLER**

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

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

   CLI> SET NOFAILOVER

   You may see a Warning 6000 on the terminal: You can safely ignore this warning.

6. Record which IDs are preferred to each controller, then prefer all IDs to the controller that will not be replaced:

   CLI> **SET THIS_CONTROLLER PREFERRED_ID=(*n,n,n,n*)**

   where *n,n,n,n* is the complete list of controller target IDs.

7. With a small flat-head screwdriver, loosen the captive screws that secure the trilink connector to the controller. Do not remove the connector (see Figure 2).

8. Loosen the four captive retaining screws on the controller's front bezel. Do not remove the module yet.

9. Start the C_SWAP program:

   CLI> **RUN C_SWAP**

Remove the Modules

10. When the controller prompts you, answer the question:

    ```
    Do you wish to remove the other HSZ40 y/n [n] ?
    ```

11. Enter "**Y**" for yes.

12. Answer the question:

    ```
    Will its cache module also be removed Y/N [n] ?
    ```

13. Enter "**Y**" for yes if the cache module requires service or replacement.

14. Wait for the following text to be displayed at the console:

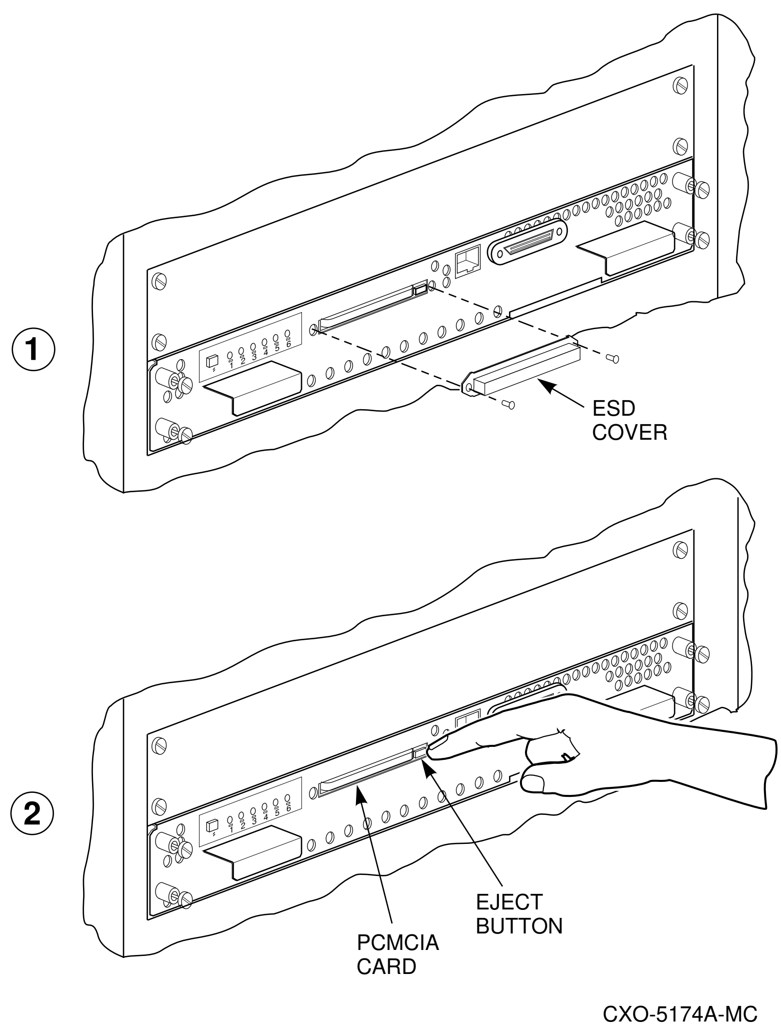
    ```
    Port 1 quiesced
    Port 2 quiesced
    Port 3 quiesced
    Port 4 quiesced
    Port 5 quiesced
    Port 6 quiesced
    All ports quiesced
    Remove the other controller (the one WITHOUT a blinking green
    LED) within 5 minutes.
    Time remaining 4 minutes 50 seconds.
    ```

Note

If the cache module is not to be removed, the time allowed to remove the controller will be two minutes.

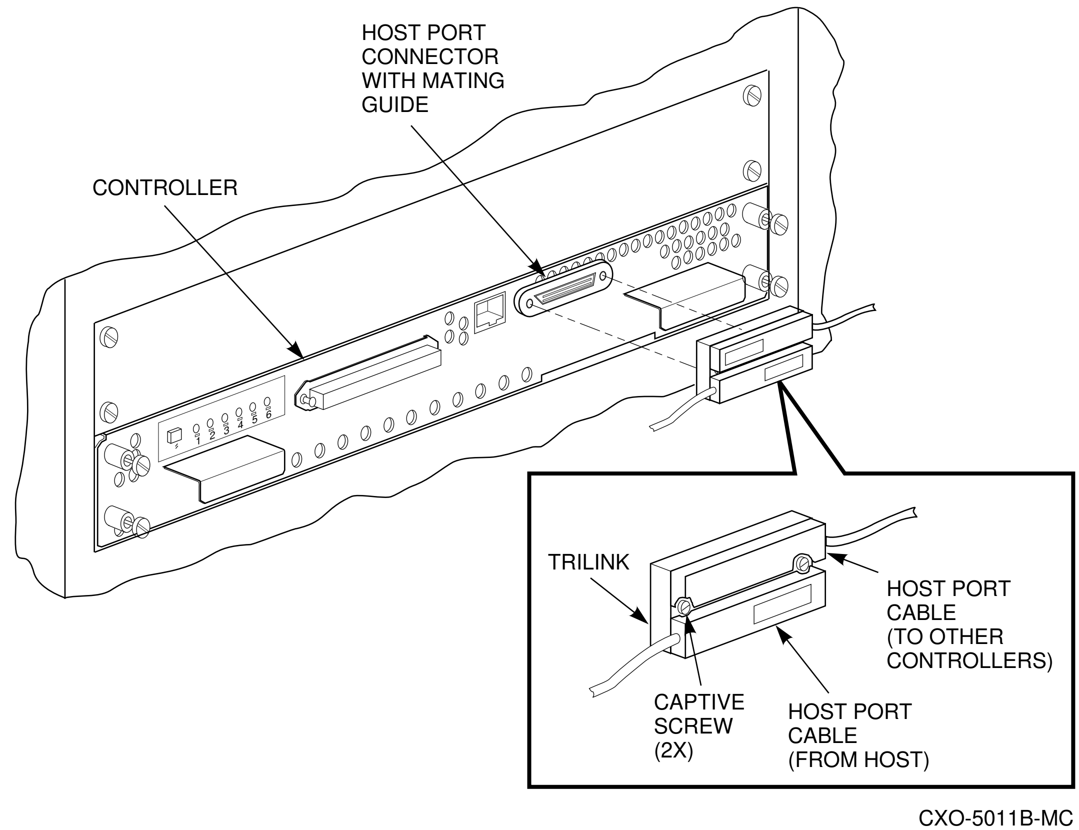
15. Obtain and place the ESD wrist strap around your wrist. Ensure that the strap fits snugly around your wrist.
16. Attach or clip the other end of the ESD wrist strap to the cabinet grounding stud or a convenient cabinet grounding point (nonpainted surface).
17. Unsnap and remove the program card ESD shield on the controller you are removing (see Figure 2).
18. Remove the program card by pushing the eject button next to the card (see Figure 2). Pull the card out and save it for use in the replacement controller module.

Figure 2: Removing the PCMCIA Card



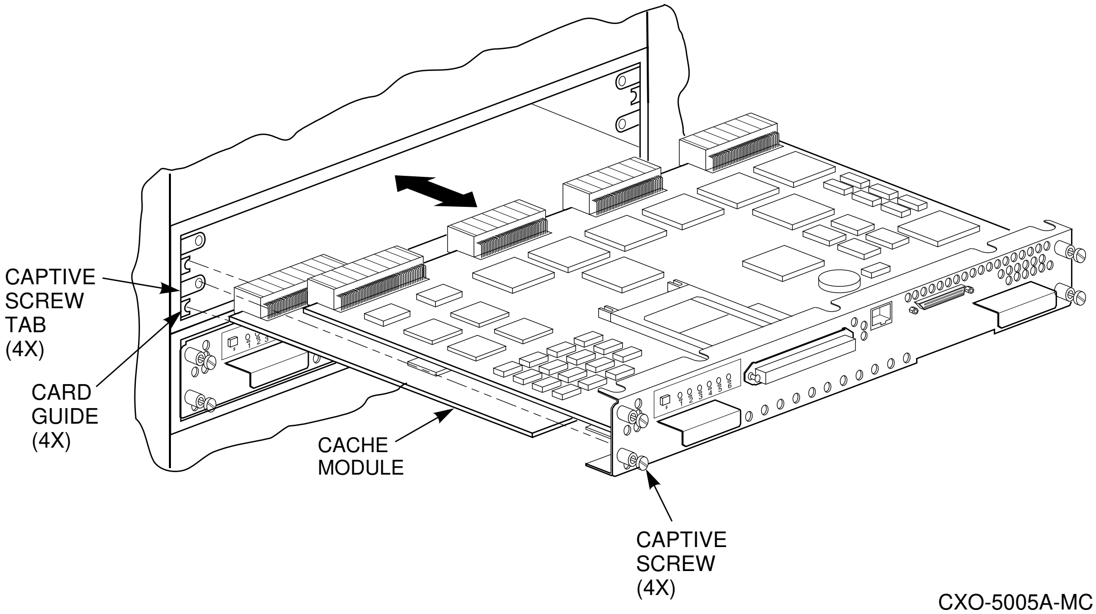
19. Remove the trilink connector from the controller (see Figure 3). Do not disconnect the host cables from the trilink.

Figure 3: Disconnecting the Trilink Adapter



20. Slide the module out of the shelf (noting which rails the module was seated in) and place it on an ESD mat (see Figure 4).

Figure 4: Removing and Installing the Controller



21. 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 may remove the cache module before or after port activity has restarted.

22. If necessary remove the cache module.

Install the New Hardware

23. When the controller prompts you, answer the question:

```
Do you have a replacement HSZ readily available? [N] ? y
```

24. If you have a replacement module available, enter "**YES**"

25. Answer the question:

```
***Sequence to INSERT the other HSZ has begun.***
Do you wish to INSERT the other HSZ y/n?
```

26. Press "**Y**" for yes.

27. 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 HSZ WITHOUT its program card, and press
Return.
```

28. If necessary, install the cache module. Slide the module straight in along the rails and then push firmly to seat it in the backplane.
29. 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.

---

30. Tighten the four front panel captive screws.
31. Press **Return** on the operating controller's console.
32. 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 HSZ40
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
```

Restart the Subsystem

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

```
CLI> RESTART OTHER_CONTROLLER
```

34. Connect the maintenance terminal to the newly installed controller.
35. Press and hold the Reset (//) button on the new controller while inserting the program card from the replaced controller.

36. Release the Reset button to initialize the controller. Wait for the CLI prompt to appear at the terminal. You will see a “Controllers misconfigured” message, which you can ignore.
37. 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:

    ```
    CLI> CLEAR_ERRORS INVALID_CACHE THIS_CONTROLLER
    DESTROY_UNFLUSHED_DATA
    ```

    Otherwise enter:

    ```
    CLI> CLEAR_ERRORS INVALID_CACHE THIS_CONTROLLER
    NODESTROY_UNFLUSHED_DATA
    ```

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

    ```
    CLI> SET NOFAILOVER
    ```

    If the controller was already in nonredundant mode, you will see a message indicating that.
39. Enter the following command from the *new* controller CLI to put the controllers into dual-redundant mode.

    ```
    CLI> SET FAILOVER COPY=OTHER_CONTROLLER
    ```

    The new controller will initialize.
40. Verify that all host settings are correct:

    ```
    CLI> SHOW THIS_CONTROLLER
    ```

41. After the controller has initialized, reconnect the trilink adapter to the new controller and tighten the captive screws.
42. If you wish to balance the I/O load between the two controllers, set each to respond to different target IDs:

    ```
    CLI> SET THIS_CONTROLLER PREFERRED_ID =(n,n)
    ```

    Where *n* = target ID

    Reference the target configuration you recorded in step 6 of this procedure.

Add a Second HSZ40 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.

To add a controller module using the online (C_SWAP) method, your system must have two power supplies in the controller shelf of an SW500 or SW800 cabinet. If you are adding a controller in an SW300 cabinet, your cabinet must have a minimum of five power supplies.

If your SW500 or SW800 controller shelf has only one power supply, or if your SW300 cabinet has less than five power supplies, 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.

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 8 to add a second controller module.

Table 8: Required Tools 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 doors
Small flat-head screwdriver	To connect the trilink adapter to the controller

Caution

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

Prepare the Subsystem Configuration

1. 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.
2. Connect a maintenance terminal to the existing controller.

3. Show the configuration of the existing controller:

   ```
   CLI> SHOW THIS_CONTROLLER
   ```

   The controller will display the following information:

   ```
   Controller:
    ......HSZ40 ZG34901786 Firmware V02.7,(1) Hardware F01
          Not configured for dual-redundancy
   SCSI address 7
          Time: 18 DEC-1995 16:32:54
   Host port:
       SCSI target(s) (0,1,2), Preferred target(s) (0,1,2)
   Cache:
           32 megabyte writeback cache, version 2
           Cache is GOOD
           Battery is good
           Host Functionality Mode = A
   ```

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

   ```
   CLI> RUN C_SWAP
   ```

6. When the controller prompts you, answer the question:

   ```
   Do you have a replacement HSZ readily available? [N] ? y
   ```

7. If you have a replacement module available, enter "**YES.**"
8. Answer the question:

   ```
   ***Sequence to INSERT the other HSZ has begun.***
   Do you wish to INSERT the other HSZ y/n?
   ```

9. Press "**Y**" for yes.
10. 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 HSZ WITHOUT its program card, and press
    Return.
    ```

11. 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.
12. Check the new controller to make sure 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.
13. Install the controller module. Slide the module straight in along the rails and then push firmly to seat it in the backplane.
14. 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.

15. Press **Return** on the operating controller's console.
16. 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 HSZ40
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
```

Restart the Subsystem

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

    CLI> **RESTART OTHER_CONTROLLER**

18. Connect the maintenance terminal to the newly installed controller.
19. Press and hold the Reset (//) button on the new controller while inserting the program card from the new controller.
20. Release the Reset button to initialize the controller. Wait for the CLI prompt to appear at the terminal. You will see a "Controllers misconfigured" message, which you can ignore.
21. If the new controller reports an invalid cache error, enter the following CLI command to clear the error:

    CLI> **CLEAR_ERRORS INVALID_CACHE THIS_CONTROLLER DESTROY_UNFLUSHED_DATA**

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

    CLI> **SET NOFAILOVER**

    If the controller was already in nonredundant mode, you will see a message indicating that.

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

    CLI> **SET FAILOVER COPY=OTHER_CONTROLLER**

    The new controller will initialize.

24. Verify that all host settings are correct:

    CLI> **SHOW THIS_CONTROLLER**

25. After the controller has initialized, reconnect the trilink adapter to the new controller and tighten the captive screws.

26. If you wish to balance the I/O load between the two controllers, set each to respond to different target IDs.

    CLI> **SET THIS_CONTROLLER PREFERRED_ID = (*n,n*)**

    Where *n* = target ID.