



Replacing an HSD30, HS1CP, HSJ30/40, or HSZ40 Array Controller Write-back Cache Module Battery

Follow these instructions to replace cache module batteries for an HSD30, HS1CP, HSJ30/40, or HSZ40 array controller. Assume that the write-back cache module is already in place.

Precautions

The write-back cache batteries are high energy devices. Use these precautions to prevent damage:

- Do not allow the battery tabs to contact any conductive surfaces or equipment damage may occur.
- Do not place the cache module on any conductive surface after the batteries are installed.
- **For HSD-Series Controllers and HS1CP-series Controllers** - If your controller does not have a connector guide (the plastic guide around the controller's DSSI connector as shown in Figure 1 on page 13), you must use the manual procedure and power down everything connected to the DSSI bus.
- Read and understand the procedure you select before you attempt to do the battery replacement.

Required Parts and Tools

You will need the tools listed in Table 1 to replace batteries on the cache module.

Table 1 Required Tools for Cache Module Battery 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 front bezel mounting screws; to reinstall the controller with attached bezel
5/32-inch Allen wrench	To unlock the SW800-series cabinet door
Small flat-head screwdriver	To connect and disconnect the trilink cable to the controller, if applicable

Summary of Procedures

To replace the write-back cache module batteries, you must first remove the controller module and write-back cache module, as described in this document. Depending on your configuration and the version of HSOF software you are running, you will follow either the manual procedure, which requires downtime, or the C_SWAP procedure, which does not.

Throughout this document, “this controller” is the controller to which you are currently attached. “Other controller” is the 2nd controller of the dual-redundant configuration.

Manual Procedure - use with single controller configuration or dual redundant configuration running HSOF software versions prior to V2.7, or any configuration of HSOF software version you are running, if you choose to take the subsystem down completely. (Preferred method)	C_SWAP Procedure - use with dual redundant controller configuration running HSOF versions V2.7, V3.0, or V3.1, if you choose to keep one controller actively servicing I/O.
Dismount controller	Check HSOF software version and patch levels
Remove controller module	Prepare the subsystem configuration
Remove write-back cache module	Run C_SWAP to remove the controller module and write-back cache module
Remove write-back cache batteries	Remove the write-back cache batteries
Install new write-back cache batteries	Install the new write-back cache batteries
Replace write-back cache module	Continue with C_SWAP to replace the write-back cache module and controller module
Replace controller module	Restore the subsystem configuration
	Repeat for the second controller.

Manual Procedure

If the controller is running a version of HSOF previous to V2.7x, you cannot use the C_SWAP software utility, and *must* use the manual procedure.

Before you begin

- Replacing cache module batteries requires a clean rundown of the controller. This is accomplished using the CLI SHUTDOWN THIS/OTHER commands, which allow all unwritten cache data to be flushed to media. It may take up to five minutes for the data to be fully flushed from the cache module.
- Complete the Service Label information, referring to the Cache Battery Service Label document, included in this kit (EK-WBCIN_F1).
- If you need to replace batteries in both controllers in a dual redundant configuration, complete the procedure for both controllers while the subsystem is down.

The following sections contain steps to guide you through the manual battery replacement procedure.

Dismount the Devices

1. Stop all host activity and dismount all device units from the host system. Device service is interrupted for the duration of the service cycle. A shutdown of the host operating system is one way of achieving this step.
2. Unlock and open the cabinet doors.
3. Connect a maintenance terminal to the controller's maintenance terminal port on the front bezel.
4. Take the controller out of service by issuing the following CLI command:
SHUTDOWN THIS_CONTROLLER

For a dual redundant configuration - shutdown both controllers before proceeding:

```
SHUTDOWN OTHER_CONTROLLER  
SHUTDOWN THIS_CONTROLLER
```

When shutdown completes, the controller(s)' green LEDs will light continuously on the operator control panel(s) (OCP).

Remove the Controller Module

1. Obtain and place the ESD wrist strap around your wrist. Ensure that the strap fits snugly around your wrist.
2. Clip the other end of the ESD wrist strap to the cabinet grounding stud or a convenient cabinet grounding point (nonpainted surface).
3. Unsnap and remove the program card ESD shield.
4. Remove the program card by pushing the eject button. Pull the card out and place it on an approved nonconductive ESD mat.
5. Remove the host port cables, as described below:

For HSJ-Series Controllers - Loosen the captive screws on the CI cable connector and remove the cable from the controller's front bezel.

For HSD-Series Controllers - If your controller does not have a connector guide on the host connector, turn off power to all members on the DSSI bus. Then, loosen the captive screws on the trilink connector and remove the trilink from the front of the controller. Do *not* remove the host cable or terminator from the trilink. You will have to work around any DSSI cable or terminator connections when removing the trilink.

For HSZ-Series Controllers - Loosen the captive screws on the trilink connector and remove the trilink from the front of the controller. Do *not* remove the host cable or terminator from the trilink, or you will interrupt the host SCSI bus. You will have to work around any SCSI cable or terminator connections when removing the trilink.

NOTE

Some cable and terminator connectors will not provide enough access to the trilink screws for you to remove the trilink (without first removing the cable and/or terminator). In these cases, you *must* disconnect power from all bus members and remove cables and terminators before removing the trilink.

6. Remove the maintenance terminal cable.
7. Loosen the four mounting screws on each side of the front bezel.
8. Loosen the controller from the shelf backplane with a gentle rocking motion.
9. Slide the controller module out of the shelf, noting in which rails the module was seated and place it on an approved ESD work surface or mat.

Install the New Batteries

1. Slide the batteries, positive (+) side up, straight into the module.
2. Press the new batteries firmly into the module so they are seated and the extended snaps on the battery cover close easily around the batteries.

Replace the Write-Back Cache Module

1. Slide the write-back cache module into the shelf using the same rails from which you removed the module.
2. Use a gentle rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated.

Replace the Controller Module

NOTE

Be sure to install the same controller module you removed. You cannot use this procedure to change a controller module at the same time you are replacing the write-back cache batteries.

1. **HSJ-Series Only:** Make sure the OCP cable is correctly plugged into the underside of the controller module.
2. Slide the controller into the shelf
3. Use a gentle rocking motion to help seat the module into the backplane. Press firmly on the module until it is seated.
4. Tighten the four screws on the controller's front bezel.

CAUTION

Do not over-tighten the front bezel captive screws. Damage to the controller PC board or front bezel may result.

5. Reattach the host cables, as described below:

For HSJ-Series Controllers - Re-attach the CI cable to the front of the controller module using the captive screws on the CI cable connector.

For HSD-Series Controllers - Re-attach the trilink with attached host cable and terminator to the front of the controller using the captive screws on the trilink connector. You will have to work around any DSSI cable or terminator connections when re-attaching the trilink.

For HSZ-Series Controllers - Re-attach the trilink with attached host cable and terminator to the front of the controller using the captive screws. You will have to work around any SCSI cable or terminator connections when re-attaching the trilink.

For Dual Redundant Controller Configurations - Repeat all preceding procedures, starting with the “Remove the Controller Module” section for the other controller.

6. **For Single Controller Configurations** - Press and hold the controller’s green reset button (//), while inserting the program card into the re-installed controller. The program card eject button will extend when the card is fully inserted. Release the reset button.

For Dual Redundant Controller Configurations - Press and hold both controllers’ green reset buttons (//), while inserting the program cards into the controllers. The program card eject buttons will extend when the cards are fully inserted. Release the reset buttons.

If the controller initializes correctly, its green reset LED will begin to flash. If an error occurs during initialization, the OCP will display a code.

7. Snap the ESD shield into place over the program card.
8. Verify cache is good with SHOW THIS and SHOW OTHER commands:

If cache is invalid, issue the following command:

For V2.5:

CLEAR_ERRORS INVALID_CACHE

For V2.7:

CLEAR_ERRORS INVALID_CACHE THIS_CONTROLLER DESTROY_UNFLUSHED_DATA

For V3.x:

CLEAR_ERRORS THIS_CONTROLLER INVALID_CACHE DESTROY_UNFLUSHED_DATA

9. Verify battery status with the SHOW THIS and SHOW OTHER commands. A fully charged battery should show status “Good”.

C_SWAP Method

C_Swap is a controller program that quiescs controller and SCSI buses to accommodate online replacement of the controller and the write-back cache module. The battery replacement procedure is not part of C_SWAP, but occurs in the middle of the C_SWAP software utility's execution.

The advantage of using the C_SWAP method rather than the manual procedure is that for dual-redundant configurations, you may be able to perform the battery replacement without loss of service.

Check Software Revision and Patch Levels

If the controller is running HSOF software versions V2.7X, V3.0X, or V3.1X, use the C_SWAP software utility, as described in this section.

NOTE

Both controllers must be at the same patch revision, and must be at one of the following revisions:

Table 2 - HSOF Software Version Levels

Controller Type	Software Versions
HSJ40, HSJ30	V27J-1; V31J-3
HSD30, HS1CP	V27D-1; V31D-2
HSZ40:	V27Z-2; V30Z-3; V31Z-2

NOTE

Do not attempt to run C_SWAP without two controller shelf power supplies. If you have only one controller shelf power supply, either temporarily install a second power supply, or take down both controllers at the same time. In an SW300 pedestal cabinet (used with RA-series controller subsystems), you must have a minimum of five power supplies.

If you don't meet these requirements, you *MUST* use the manual method to replace the cache module batteries.

1. Connect a maintenance terminal to the controller whose cache batteries you are *not* replacing, and enter the CLI commands:

```
SHOW THIS_CONTROLLER  
SHOW OTHER_CONTROLLER
```

2. Check the output text. If you see:

```
Not configured for dual-redundancy
```

on either controller, you cannot use C_SWAP, and must follow the manual procedure at the beginning of this document.

If you see

```
Configured for dual-redundancy with ZGxxxxxxxx
```

on both controllers, check the software version against the versions listed in Table 2.

NOTE

- If both controllers are not configured for dual redundancy, you must either re-configure them or use the manual battery replacement procedure.
- If the HSOF software of either controller is below the recommended version, install the appropriate patches, then proceed with the C_SWAP procedure. DIGITAL highly recommends that you run with the latest released version of HSOF software. You must restart or reinitialize a controller after patching so that the patches take effect.
- Patches must be installed sequentially. If patch 3 is required, patches 1 and 2 must first be installed. Contact your MCS Service Center for revision and patch information.

Removing a Controller or Cache Module

The following sections contain steps to guide you through the C_SWAP procedure.

CAUTION

Before invoking the C_SWAP utility, terminate all other running HSOF utilities. Terminate all DUP and HSZterm connections you may have, as well.

Preparing the Subsystem Configuration

Complete the following steps to prepare your subsystem for the battery replacement:

1. To determine which units are write-back enabled, issue the following CLI command:

SHOW UNITS FULL

You will want to document the units you modify in these steps, so that you can restore them later to the original write-back status and preferred path or preferred ID.

2. Disable write-back caching on all units by issuing the following command for all writeback-enabled units configured on this controller pair:

SET *unit_name* NOWRITEBACK

3. All units that are “preferred” to the controller that you are going to take down must be “preferred” to the controller that will stay up.

For HSD-Series and HSJ-Series Controllers - While still connected to the controller that will stay up, identify all units that are “ONLINE TO OTHER_CONTROLLER” using the following command:

SHOW UNIT FULL

Issue the following command to each *unit_number* that is preferred to the other controller.

SET *unit_number* PREFERRED_PATH=THIS_CONTROLLER

For HSZ-Series Controllers - Prefer all HOST ID’s to this controller using the host port SCSI ID targets shown by the SHOW THIS command. In the Host Port section of the output from the SHOW THIS command, you should see a list of “targets” that are preferred to this controller, as emphasized in the sample text, below:

```
HSZ502> sho thi ful
Controller:
  HSZ50-AX (C) DEC ZG60300013 Firmware V51Z-2, Hardware
AX11
  Configured for dual-redundancy with ZG60300083
  In dual-redundant configuration
  SCSI address 6
  Time: 24-SEP-1997 14:48:06
Host port:
  SCSI target(s) (4, 5), Preferred target(s) (4, 5)
```

```
TRANSFER_RATE_REQUESTED = 10MHZ
Cache:
  128 megabyte write cache, version 3
  Cache is GOOD
  Battery is GOOD
  No unflushed data in cache
  CACHE_FLUSH_TIMER = DEFAULT (10 seconds)
  CACHE_POLICY = A
  NOCACHE_UPS
  Host Functionality Mode = A
Licensing information:
  RAID (RAID Option) is ENABLED, license key is VALID
  WBCA (Writeback Cache Option) is ENABLED, license key
is VALID
  MIRR (Disk Mirroring Option) is ENABLED, license key
is VALID
Extended information:
  Terminal speed 19200 baud, eight bit, no parity, 1
stop bit
  Operation control: 00000004 Security state code:
43795
  Configuration backup enabled on 1 devices
```

4. Prefer all ID's to this controller.

```
SET THIS_CONTROLLER PREFERRED_ID=(N1,N2,N3,ETC)
```

5. Take the controllers out of dual redundant (failover) mode:

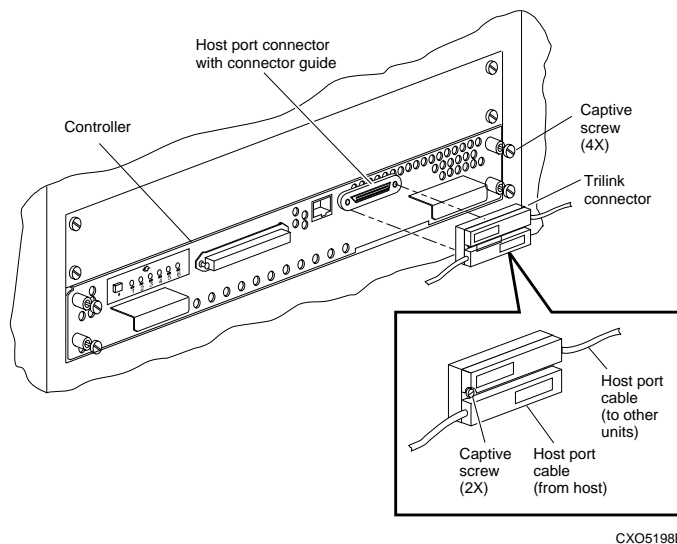
```
SET NOFAILOVER
```

NOTE

The other controller will execute shutdown and will halt. Its green led will quit flashing, and will be "on" steadily.

6. **For HSD-Series, HS1CP, and HSZ-series Controllers** - With a small flat-head screwdriver, loosen the captive screws that secure the trilink connector to the controller whose batteries are being replaced. Do not remove the connector (see Figure 2).

Figure 2 Disconnecting the Trilink Connector from an HSZ-series or HSD-series controller



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7. Loosen the four captive retaining screws on the controller's (the one whose batteries are being replaced) front bezel. (See Figure 2 and Figure 4) Do not remove the module yet.

Removing the Controller and Cache Modules

Use the following steps to remove the modules.

1. Start the C_SWAP program.

RUN C_SWAP

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

Do you wish to remove other HSXXXX?

Enter **YES**

3. Answer the question:

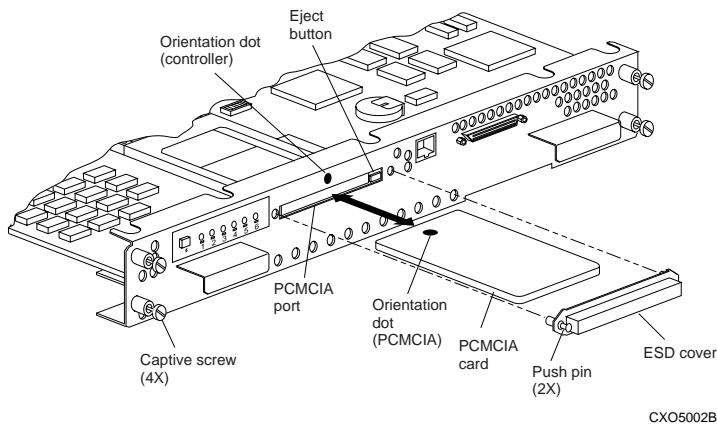
Will its cache module also be removed Y/N?

Enter **YES**.

4. 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.
```
5. Place the ESD wrist strap around your wrist. Ensure that the strap fits snugly around your wrist.
6. Clip the other end of the ESD wrist strap to the cabinet grounding stud or a convenient cabinet grounding point (nonpainted surface).
7. Unsnap and remove the program card ESD shield on the controller you are removing (see Figure 3).
8. Remove the program card (PCMCIA card) by pushing the eject button next to the card (see Figure 3). Pull the card out and save it for use when you re-install the controller module.

Figure 3 Removing and Installing the PCMCIA Card



9. **For HSJ-Series Controllers** - Loosen the captive screws on the CI cable connector and remove the cable from the controller's front bezel.

For HSD-Series Controllers and HS1CP-series Controllers- If your controller does not have a connector guide on the host connector, **DO NOT PROCEED WITH C_SWAP**.

If your controller does have a connector guide, loosen the captive screws on the trilink connector and remove the trilink from the front of the controller. *Do not* remove the host cable or terminator from the trilink, or you will interrupt the host DSSI bus. You will have to work around any DSSI cable or terminator connections when removing the trilink

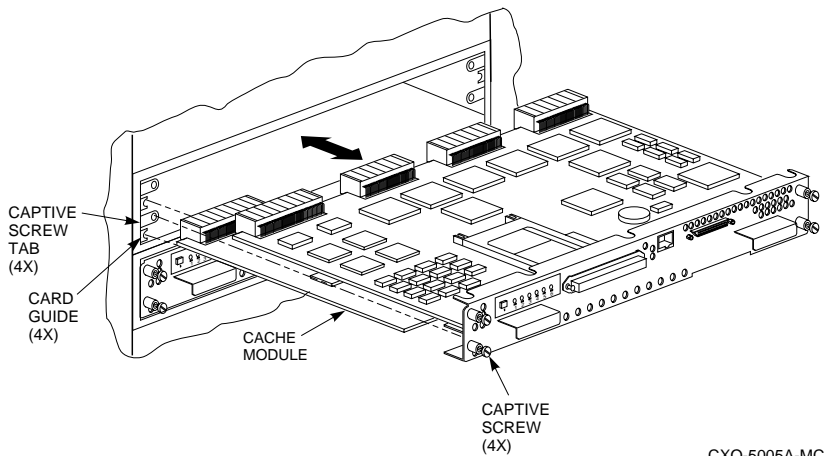
For HSZ-Series Controllers - Loosen the captive screws on the trilink connector and remove the trilink from the front of the controller. *Do not* remove the host cable or terminator from the trilink, or you will interrupt the host SCSI bus. You will have to work around any SCSI cable or terminator connections when removing the trilink.

NOTE

Some cable and terminator connectors will not provide enough access to the trilink screws for you to remove the trilink (without first removing the cable and/or terminator). In these cases, you *must* disconnect power from all bus members and remove cables and terminators before removing the trilink.

- Slide the controller module out of the controller 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



- Use a gentle up-and-down rocking motion to loosen the cache module from the shelf backplane and place it on an approved nonconductive ESD mat.
- You will see the following text 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
```
- The active controller that's running C-SWAP will respond with a prompt, waiting for you to initiate the replacement process. You will NOT respond until you have completed the battery replacement in the following steps. You must act quickly or the C_SWAP program will time out.

Removing the Write-back Cache Batteries

1. Locate the two write-back cache batteries seated under the plastic battery cover at one end of the cache module.
2. Disengage and gently lift the extended snaps on the battery cover, and pull the batteries straight out of the module.
3. Discard the old batteries in accordance with your local recycling laws. This can be done by returning them to the local Field Service Logistics.
4. Inspect the cache module battery connectors for corrosion, and replace the write-back cache module if you see evidence of corrosion.

Installing the New Batteries

1. Slide the new batteries, positive (+) side up, straight into the module.
2. Press the new batteries firmly into the module so they are seated and the extended snaps on the battery cover close easily around the batteries.

Replacing the Cache and Controller Module

To replace the controller module, complete the following steps:

1. The controller has already prompted you for input. Answer the following question:
Do you have a replacement controller available?
2. Enter **Y** for yes.

Answer the question:

```
***Sequence to INSERT the other HSX has begun.***
```

```
Do you wish to INSERT the other controller Y/N?
```

3. Enter **Y** for yes.
4. 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 HSX WITHOUT its program card,  
and press Return.
```

5. Install the cache module. Slide the module straight in along the rails and then push firmly to seat it in the backplane.

Install the controller module. Slide the module straight in along the rails and then push firmly to seat it in the backplane.

NOTE

The program card is not yet installed.

6. Press **Return** on the operating controller's console.

The following text appears on the screen:

```
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 HS XXX
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
```

At this point, C_SWAP is no longer running.

7. Tighten the four front bezel captive screws.

CAUTION

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

Restarting the Subsystem

To restart the subsystem, complete the following steps:

1. Allow the other controller to restart.

RESTART OTHER_CONTROLLER

2. Press and hold the Reset (//) button on the reinstalled controller while inserting its program card. Release the Reset button to initialize the controller.

3. Connect the maintenance terminal to the reinstalled controller, which will now be THIS_CONTROLLER in CLI commands.

4. Enter the following CLI command:

SHOW THIS_CONTROLLER

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

For V2.7:

CLEAR_ERRORS INVALID_CACHE THIS_CONTROLLER DESTROY_UNFLUSHED_DATA

For V3.x:

CLEAR_ERRORS THIS_CONTROLLER INVALID_CACHE DESTROY_UNFLUSHED_DATA

6. Verify battery status with a SHOW_THIS command. A fully charged battery should show status as "Good".
7. Reconnect the controller/host cables to the controller.
8. Enter the following command to put the controllers into dual-redundant mode:

SET FAILOVER COPY=OTHER_CONTROLLER

This controller will restart.

9. Proceed to the beginning of the C_SWAP procedure to replace the batteries in the OTHER cache module, if required.
10. After the batteries for both controllers have been replaced, restore the subsystem's write-back settings, if they were changed for all units that were changed in step 2 on in the section "Preparing the Subsystem Configuration," on page 11.

SET unit_name WRITEBACK

11. Prefer the units or HOST IDs back to their original controller. (See steps 3 and 4 "Preparing the Subsystem Configuration," on page 11.)