StorageWorks™ Array Controller

HSJ*xx* Array Controller Operating Firmware Version 2.5 Release Notes

Order Number: EK–HSFAM–RN. L01

This document summarizes features and limitations of the HSJ*xx* array controller operating firmware Version 2.5 that are not covered elsewhere in the documentation. These release notes also contain instructions for installing the firmware.

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1 Introduction

These *HSJxx Array Controller Operating Firmware Version 2.5 Release Notes* describe known features and limitations of the HSJ™ array controller operating firmware Version 2.5[1] not covered elsewhere in the documentation. This document should be used by individuals responsible for configuring, installing, and using the HSJ*xx* controllers.

Read this entire document before installing or upgrading the HS operating firmware.

Version 2.5 adds features and functionality beyond Version 2.0, with some changes and additions to increase performance, as well as to address known problems with Version 2.0 firmware.

Changed and new areas for Version 2.5 include:

- Disk Mirroring (RAID 1) and Striped Mirrorsets (RAID 0&1)
- CLONE Utility
- Support of the TZ867 tape loader at LUN 1 via a passthrough container
- New low–battery policy
- PCMCIA Program Card Error Correction and Recovery Code

Note

Version 2.5 firmware waits approximately 1 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.

If you do not see the CLI prompt after restarting the controller, wait 90 seconds before pushing the reset button.

These release notes cover the following topics:

- Hardware and software supported by HS operating firmware Version 2.5 and support requirements
- Features and changes from HSOF Version 2.0
- Clarifications regarding firmware and controller operation
- HS operating firmware Version 2.5 limitations and restrictions
- Controller usage recommendations
- HS operating firmware Version 2.5 installation instructions

Note

Both the *HS Family of Array Controllers User's Guide* and the *HS Family of Array Controllers Service Manual* have been revised for the Version 2.5 firmware release. Much of the information contained in prior versions of these release notes, as well as new information, has been included in

[1] Listed as version V25J in the OpenVMS™ SHOW CLUSTER and the HS operating firmware SHOW THIS_CONTROLLER Command Line Interpreter (CLI) command displays.

these revised manuals. Digital strongly recommends referring to the new documentation revisions (D01) for updated information.

The HS operating firmware Version 2.5 release package contains the following:

- A cover letter
- These release notes
- The *HS Family of Array Controllers User's Guide*
- A PCMCIA program card containing the HS operating firmware Version 2.5
- License keys (if ordered) for enabling write-back cache, mirroring, and RAID functions

2 Intended Audience

This edition of the array controller operating firmware release notes has been prepared for Digital customers who have purchased HSJ*xx* array controllers and for Digital Multivendor Customer Services personnel responsible for installing and maintaining systems that include HSJ*xx* array controllers.

3 Hardware and Software Requirements

This section lists the hardware and software compatible with HS operating firmware Version 2.5.

3.1 Hardware Support

HS operating firmware Version 2.5 supports the following revisions or higher for the HSJ*xx* controllers and associated hardware:

- HSJ40 controller module, hardware revision F
- HSJ30 controller module, hardware revision A
- Version 1 read cache module, hardware revision F (HSJ40 only)
- Version 2 cache module, hardware revision A
  (Install the battery kit to convert module to write-back cache.)
- BA350–MA shelf, hardware revision A
- BA350–S*x* shelf, hardware revision B
- BA35*x*–HA power unit, hardware revision H

3.2 Operating System Support

HS operating firmware Version 2.5 is supported by the following operating system versions, within the limitations described in the *HS Family of Array Controllers User's Guide*:

- OpenVMS Alpha™ Version 1.5 or higher
- OpenVMS VAX™ Version 5.5–2 or higher
- VAX VMS™ Version 5.5–1 or higher

3.3 Host Adapter Support

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

- CIXCD–AB
  CIXCD–AC (both for XMI-based systems)
- CIBCA–B*x* (for BI-based systems)[2]
- CI780 (for SBI-based systems)

[2] Supersedes CIBCA–A; CIBCA–A is no longer supported.

3.4 Device Support

HS operating firmware Version 2.5 supports the devices listed in Table 1 at the indicated hardware and microcode levels or higher (see Section 6 for restrictions). New devices supported in Version 2.5 are listed in bold.

Table 1 HS Operating Firmware Version 2.5 Supported Devices

Device	Description	Capacity (gigabytes)	Minimum Microcode Version	Minimum Hardware Revision
RZ25–VA	Disk drive	0.426	0900	B01
RZ26–VA	Disk drive	1.05	T392	D02
RZ26L–VA	Disk drive	1.05	440C	A01
RZ28–VA	Disk drive	2.1	435E	B01
RZ28B–VA	Disk drive	2.1	0003	A01
RZ29B–VA	Disk drive	4.3	0007	B01
RZ74–VA	Disk drive	3.57	T427B	B07
TKZ60–EC[1]	Tape drive	0.440	111	B01
TL820[1 2] (Revision A01)	Tape library	4,000[4]	1d3M	L1
TLZ06–VA	Tape drive	4[4]	0491	A04
TLZ6L–VA	Tape loader	16[4]	0491	A01
TLZ07–VA	Tape drive	8[4]	04AQ	AX01
TSZ07–AA[1]	Tape drive	0.140	0309	A01
TZ86–VA	Tape drive	6	430B	A02
TZ87–VA	Tape drive	20[4]	930A	A01
TZ87N–VA[5]	Tape drive	20[4]	930A	A01
TZ87–TC[1 2]	Tape drive	20 [4]	9514	B02
TZ867–AE/AF[1]	Tape drive	42	430B	A01
TZ875–NT[1 5]	Tape drive	100[4]	930A	A01
TZ875–TA[1]	Tape drive	100[4]	930A	A01
RRD42–VB/VU	CD–ROM reader	0.6	1.1a	A01
RRD43–AA	CD–ROM reader	0.6	0064	A02
RRD44–AA	CD–ROM reader	0.6	3493	A02
RWZ52–VA[3 6]	Magneto-Optical disk	600Mb/side	3404	A01
EZ51R–VA[6]	Solid state disk	0.1069	V096	D01
EZ54R–VA[6]	Solid state disk	0.4277	V096	A01
EZ58R–VA[6]	Solid state disk	0.8553	V109	C01

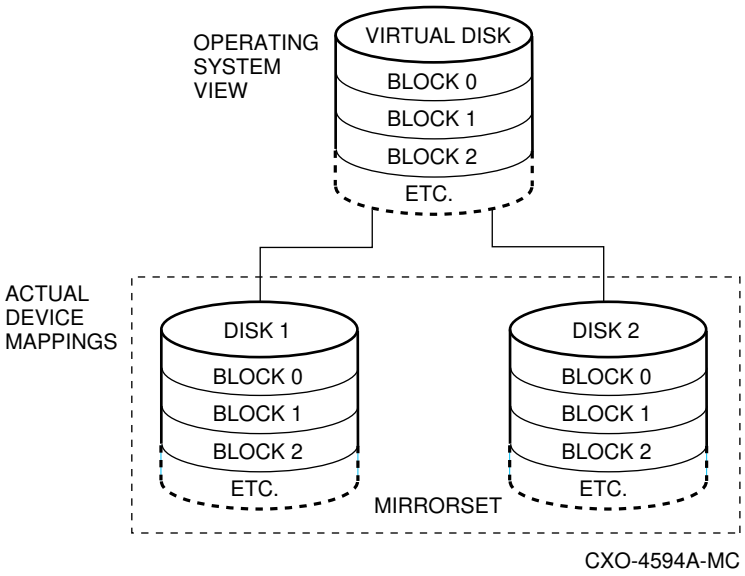
[1] Requires 0.2 meter SCSI–1-to-SCSI–2 transition cable (Digital internal part number 17–03831–01).
[2] Requires DWZZA–AA 8–bit-to-16–bit SCSI adapter (also supported).
[3] This device must be SET TRANSPORTABLE.
[4] Values represent compressed data.
[5] Cannot read TK50, TK70, or TZ30 format tapes.
[6] Do not warm swap this device. Use a cold swap method for device replacement.

4 Features and Changes from Version 2.0

The following list briefly describes new features in Version 2.5. For more information on these features, see the *HS Family of Array Controllers User's Guide* and the *HS Family of Array Controllers Service Manual*.

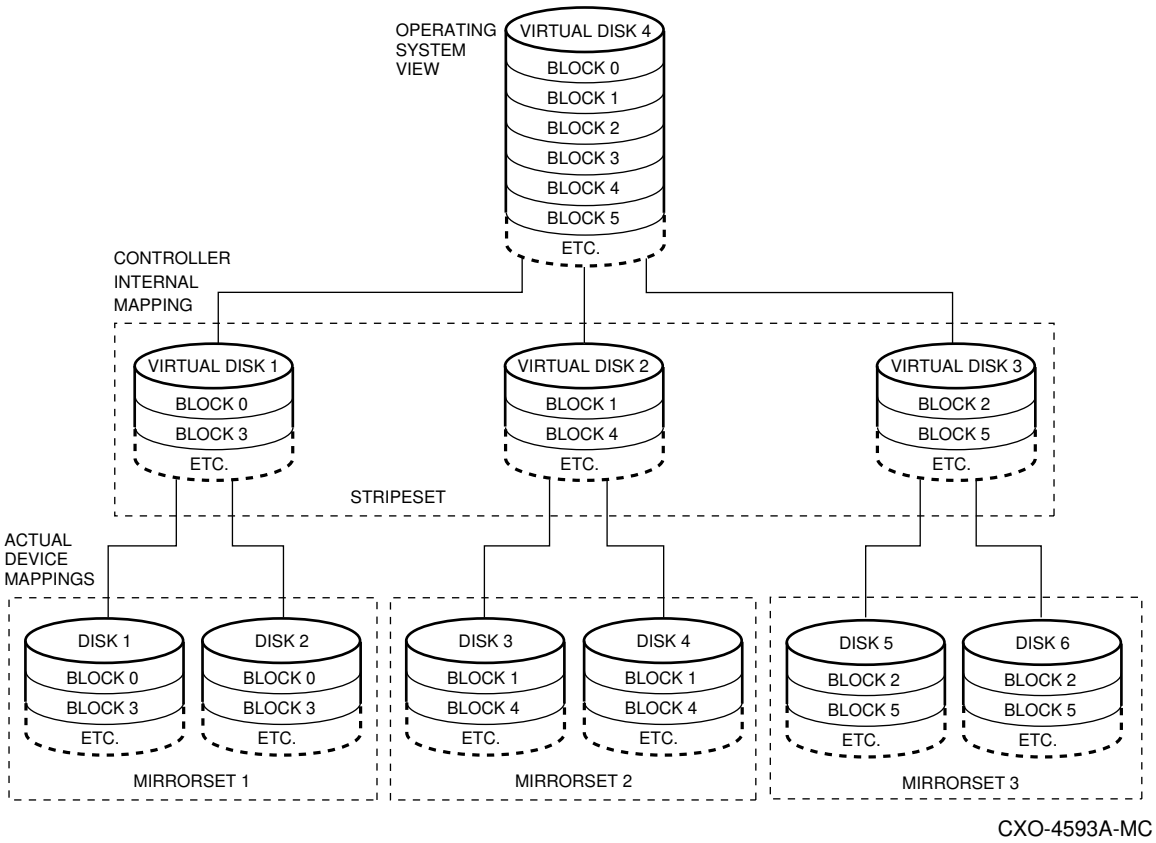
- Mirroring (RAID 1)
  Firmware Version 2.5 allows the creation of mirrorsets, in which each member contains identical data, as shown in Figure 1. Mirrorsets can have from one to six members and can be supported by automatic sparing from a spareset. The redundancy provided by mirrorsets provides for very high data availability. Mirroring requires the write-back cache option.

Figure 1 Mirrorset—RAID 1



Mirroring can be combined with stripesets (RAID 0) to create stripesets whose members are mirrored (mirrorsets). This configuration is show in Figure 2. This RAID 0&1 configuration provides both high availability and high performance.

Figure 2 Striped Mirrorset—RAID 0&1



- Write–Back Cache Battery Policy
  HS controllers with Version 2.5 firmware have a CACHE_POLICY setting to control access to mirrorsets and RAIDsets when the write–back cache battery condition is low. When the CACHE_POLICY is set to B and the battery condition is low, mirrorsets and RAIDsets can be accessed in *write-through* mode. When the CACHE_POLICY is set to A, the controller operates the same as in previous firmware versions and keeps RAIDsets and mirrorsets inoperative until the batteries return to a fully-charged state. The default setting for the CACHE_ POLICY is A.

  There is some risk in setting the cache policy to allow access to mirrorsets and RAIDsets when the batteries are low. Because the batteries may be in an unknown state, there is no guarantee as to how long they will maintain data in the cache should a power failure occur. Fully charged batteries will maintain the data for a minimum of 100 hours.

- TZ867 Loader Support
  Version 2.5 introduces support of the TZ867 tape loader at LUN 1. The tape drive mechanism is addressed at LUN 0, and commands can be sent to the loader mechanism at LUN 1 using a passthrough container. See the CLI appendix in the User's Guide for detailed information on creating a passthrough container.

- Firmware Licensing System
  (FLS) now allows separate activation of the RAID, mirroring, and write-back caching functions.

- CLONE Utility
  CLONE is a new utility that partially automates the process of mirroring units to create a snapshot copy of host unit data. The snapshot copy can be used to backup data with little impact on users and performance. CLONE can copy single-disk units, mirrorsets, stripesets, and striped mirrorsets.
- PCMCIA Error Correction Code
  Version 2.5 introduces error correction code (ECC) to check and correct the PCMCIA program card contents before loading the image. If the ECC code detects any anomaly in the image, it is usually able to repair it. The ECC code will print a message on the console indicating that it has found and corrected an error.
- Error log codes
  Refer to revision D01 of the *HS Family of Array Controllers Service Manual* for updated lists of error log codes for Version 2.5.

5 Clarifications

This section presents clarifications and corrections related to controller behavior and required actions described in product documentation.

- Set Tape Density When Adding Tape Drive
  When first adding a tape drive to the controller configuration, be sure to set the tape density with the SET *unit-number* DEFAULT_FORMAT= command before using the VMS INITIALIZE command. If you do not set the tape density, the tape may be written at the wrong density.
- Adding RAIDsets when battery condition is low
  If the CACHE_POLICY for a controller is set to B, the controller allows the ADD RAIDSET and ADD MIRRORSET commands, even if the write-back cache battery is low. If the CACHE_POLICY is set to A and the batteries are low, the commands will fail. Policy A requires that the cache batteries be fully charged before you can add RAIDsets or mirrorsets to your configuration.
- CLONE and disk geometry
  When the CLONE utility is used to duplicate the data on a unit, the new unit created by CLONE will be the same size and have the same data as the original, but it may have a different geometry (number of cylinders, tracks per cylinder, and sectors per track) than the original.

  Many situations are insensitive to such differences, but there are some that are not. In particular, VMS uses geometry parameters to calculate the locations of alternate home blocks. If the primary home block in inaccessible on the new unit, the alternate home blocks would not be usable. ANAL/DISK/REPAIR can be used to address this problem. Alternatively, making another clone of the original unit should fix the problem of an inaccessible home block.
- Default Chunksize
  Based on additional research, the default chunksize for RAIDsets and stripesets has been changed to 128 blocks. This is a good chunksize for applications that perform random (not sequential) read and write operations and that perform large data transfers. For applications that write sequentially and perform smaller data transfers, performance may be improved by setting a smaller chunksize, such as 64 blocks. Blocksizes that are multiples of 64 should yield the best results.

You should experiment with different chunksizes to find the best performance for the requirements of your site.

- Tape drives in twos complement mode
  Any tape device that supports a twos complement transfer mode must be placed in twos complement mode. The TSZ07 is an example of such a drive. Refere to the documentation for the device for instruction on how to place the device in twos complement mode.

6 Functional Limitations and Restrictions

This section describes functional limitations and restrictions for HS operating firmware Version 2.5.

- Limits on the total number of storagesets
  The following limits apply to storagesets configured on a single controller or dual-redundant controllers:
  - 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.
  - There can be no more than six passthrough containers under one controller.
- Preferred paths and failover
  Failover will not occur if a host cable is removed or goes bad, or if paths are turned off with the SET NOPATH qualifier. (The affected controller holds on to device assignments and attempts to serve the devices.) To correct this problem, enter the SHUTDOWN OTHER_CONTROLLER command from the unaffected controller, which will force failover to occur.

  Note

  Preferred paths apply only to disk-based units . Do not attempt to use preferred paths with tape, optical disk library or CD–ROM-based units.

- RRD42 CD–ROM Reader
  Mounting an RRD42 may put a message in the VMS error log. In older versions of VMS, the first four digits in Longword 19 of the controller dependent information will be 02D1. New versions of VMS will report ASC: 209.(D1) ASCQ: 2.(02) The message indicates ‘‘Unexpected bus phase,’’ and can be ignored safely.
- Unable to Access Tape Drives after Power Cycle
  You may not be able to access a tape drive after the power for the drive is turned off and back on. Use the CLEAR_ERRORS UNKNOWN *device-name* command to place the device in a known state.
- Tape density
  Always set tape density from the controller CLI with the SET *unit-name* DEFAULT_FORMAT= command. Do not attempt to set tape density using operating system commands or any controls on the tape device, such as

the control panel of the TSZ07. To ensure that tapes are written at the appropriate density, VMS INITIALIZE the tape prior to use.

- OVERRIDE_ONLINE qualifier
  Attempting to delete tape-based units using the OVERRIDE_ONLINE qualifier results in conditions requiring controller reinitialization. Do not enter the OVERRIDE_ONLINE qualifier when deleting tape-based units. Digital expects to lift this restriction in a future firmware release.
- Unit Problems After Battery Low
  An unusual combination of circumstances may cause a unit to unexpectedly becomes inoperative or report lost data after a write-back cache battery changes state from ''low'' to ''good.'' Reset the controller to correct the unit state.
- Initialization Devices
  Controller-attached devices may serve as initialization devices for DEC 7000 and DEC 10000 systems provided the DEC 7000/10000 console code is at Version 3.1 or higher.
- 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 firmware release.

7 Recommendations

Digital makes the following recommendations to ensure the most effective use of HS operating firmware Version 2.5.

- Moving Drives From HSC Controllers
  HS operating firmware Version 2.5 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 HSJ*xx* controller. You must use this program when moving drives because the HSC controller accepts volume serial numbers of zero and duplicate serial numbers, but the HSJ*xx* 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
```

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

  – The OpenVMS operating system will report ''medium is offline.''

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

– The controller SHOW *unit* command reports ''MEDIA FORMAT ERROR.''

```
CLI> SHOW D324
MSCP unit                                    Uses
-------------------------------------------------------------

  D324                                       DISK240
        Switches:
          RUN                    NOWRITE_PROTECT        READ_CACHE
          NOWRITEBACK_CACHE
          MAXIMUM_CACHED_TRANSFER_SIZE = 32
        State:
          MEDIA FORMAT ERROR
          NOPREFERRED_PATH
```

8 Installation

Use the procedures described in this section to install the HS operating firmware Version 2.5, supplied in this kit. The procedure for upgrading your firmware to Version 2.5 typically takes less than 5 minutes to accomplish.

CAUTION

Version 2.5 firmware waits approximately 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 2.5 program cards and press the reset button, allow 90 seconds for the CLI prompt to appear.

8.1 Nonredundant Configurations

The HS operating firmware upgrade to Version 2.5 causes a brief interruption in service to attached drives. The operating system should automatically recover from this outage within a few seconds after the new firmware becomes operational and restores service.

Use the following procedure to upgrade the firmware in a nonredundant controller:

1. Locate the controller to be upgraded.
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 almost even with the card, then release the reset button.

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

8.2 Dual-Redundant Configurations

In dual-redundant configurations, the firmware in both controllers must be upgraded simultaneously. This is not an inherent restriction of the firmware design, but occurs with Version 2.5 because of a change in intercontroller synchronization protocol.

The HS operating firmware upgrade to Version 2.5 requires that both controllers be momentarily shut down 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 firmware becomes operational and restores service.

Release notes for previous versions of HS operating firmware described a method of upgrading HS operating firmware sequentially in a dual-redundant configuration. That method is inappropriate for upgrades to Version 2.5.

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

1. Press the program card eject buttons on both controllers simultaneously and remove both program cards.
2. Press and hold the controller reset buttons on both controllers while inserting new program cards. Be sure the eject buttons extend outward almost even with the cards.
3. Release the reset buttons.

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 the program cards should be removed and inserted at approximately the same time (within an interval of a few seconds).

After installation, use the controller preferred path command (CLI> SET *unit* PREFERRED_PATH) to restore the desired load balance among devices attached to the two controllers, if any load changes occurred.