StorageWorks™ Array Controller

HSZ40 Array Controller Operating Firmware Version 2.5 Release Notes

Order Number: EK–HSZ40–RN. F01

This document summarizes features and limitations of the HSZ40 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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Contents

1	Introduction	1
2	Intended Audience	3
3	Hardware and Software Requirements	3
3.1	Hardware Support	3
3.2	Operating System Support	3
3.3	Host Adapter Support	3
3.4	Device Support	4
4	Features and Changes from HSOF Version 2.0	4
5	Clarifications	7
6	Functional Limitations and Restrictions	9
7	Recommendations	10
8	Installation	11
8.1	Nonredundant Configurations	11
8.2	Dual-Redundant Configurations	11

Figures

1	Mirrorset—RAID 1	6
2	Striped Mirrorset—RAID 0&1	6

Tables

1	HS Operating Firmware Version 2.5 Supported Devices	4

1 Introduction

These *HSZ40 Array Controller Operating Firmware Version 2.5 Release Notes* describe known features and limitations of the HSZ™ 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 HSZ40 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
- 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

[1] Listed as version V25Z in the HS operating firmware SHOW THIS_CONTROLLER Command Line Interpreter (CLI) command display.

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 these revised manuals. Digital strongly recommends referring to the new revisions (D01) of these manuals 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 to enable separately licensed features: write-back cache, disk mirroring, and RAID (each to be purchased separately)

2 Intended Audience

This edition of the array controller operating firmware release notes 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.

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 HSZ40 controllers and associated hardware:

- HSZ40–A*x* controller module, hardware revision A (formerly HSZ40).
- HSZ40–B*x* controller module, hardware revision A (This is an enhanced HSZ40 controller module to be used with Version 2.5 and higher firmware.)

CAUTION

Version A*x* and version B*x* of the HSZ40 controller module cannot be used together in the same dual-redundant configuration. Both controllers in a dual-redundant configuration must be the same version.

- Cache module, hardware revision A
  (Install the battery kit to convert module to write-back cache.)
- BA350–MA controller shelf, hardware revision A
- BA350–S*x* device shelf, hardware revision B
- BA35*x*–HA power supply, 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*:

- 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 (for HSZ40–B*x* array controllers only)

3.3 Host Adapter Support

The adapters listed below have been tested and are supported in this release. (See Section 6 of these release notes for restrictions.)

The following host adapters are supported by the **Digital UNIX** (formerly called DEC OSF/1) operating system for HSZ40–A*x* and HSZ40–B*x* controllers:

- KZTSA (for DEC 3000™ systems)
- PMAZC (for DEC 3000 systems—requires DWZZA)

- KZMSA (for DEC 7000™ and DEC 10000™ systems—requires DWZZA)
- KZPSA (for Digital AlphaServers 1000/2000/2100)

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

- KZTSA (for DEC 3000 systems)
- PMAZC (for DEC 3000 systems—requires DWZZA)
- KZMSA (for DEC 7000 and DEC 10000 systems—requires DWZZA)
- KZPAA (for Digital AlphaServers 1000/2000/2100 systems)
- KZPSA (for Digital AlphaServers 1000/2000/2100)

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
RZ26N–VA	Disk drive	1.05	446	A01
RZ28–VA	Disk drive	2.1	435E	B01
RZ28M–VA	Disk drive	2.1	466	A01
RZ28B–VA	Disk drive	2.1	0003	A01
RZ29B–VA	Disk drive	4.3	0007	B01
RZ74–VA	Disk drive	3.57	T427B	B07
EZ51R–VA[1]	Solid state disk	0.1069	V096	D01
EZ54R–VA[1]	Solid state disk	0.4277	V096	A01
EZ58R–VA[1]	Solid state disk	0.8553	V109	A01

[1]Do not use warm swap procedures for this device. Use a cold swap method for device replacement.

4 Features and Changes from HSOF Version 2.0

The following list briefly describes new features in HSOF 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*.

- HSZ40–B*x* controller module

  An enhanced module supported by HSOF Version 2.5 firmware and higher. The HSZ40–B*x* controller supports a new code load feature, which allows controller firmware to be upgraded without replacing the program card (refer to Section 5 Clarifications for restriction at this time).

The HSZ40–B*x* works with the Environmental Monitoring Unit (EMU) to provide indications of shelf and cabinet problems such as power supply outages and overtemperature conditions in cabinets that support EMUs (such as, SW300-series cabinets).

Note

The maintenance terminal port connector on the HSZ40–B*x* is center-keyed rather than offset-keyed like the HSZ40–A*x* controller module. A short cable (part number 17–03511–04) and coupler (part number 12–43346–01) are included with every HSZ40–B*x* controller module to allow connection of an offset-keyed terminal cable.

- Dual-redundant configuration
  Dual-redundant controller configurations are now supported by HSOF Version 2.5 under Digital UNIX (formerly call DEC OSF/1) Version 3.2 or higher. Either two HSZ40–A*x* or two HSZ40–B*x* controllers can be configured for failover in a single controller shelf.

  HSZ40–B*x* controllers only are now supported by HSOF Version 2.5 under OpenVMS Alpha Version 6.2 and higher.

CAUTION

HSZ40–A*x* and HSZ40–B*x* controller modules are NOT supported in the same controller shelf for dual-redundant configurations.

- Mirroring (RAID 1)
  Firmware Version 2.5 allows for 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 module option.

Figure 1 Mirrorset—RAID 1

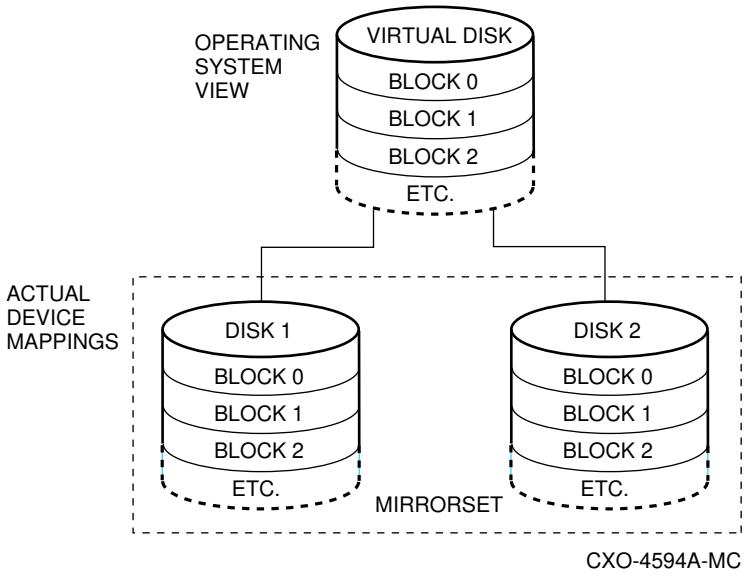
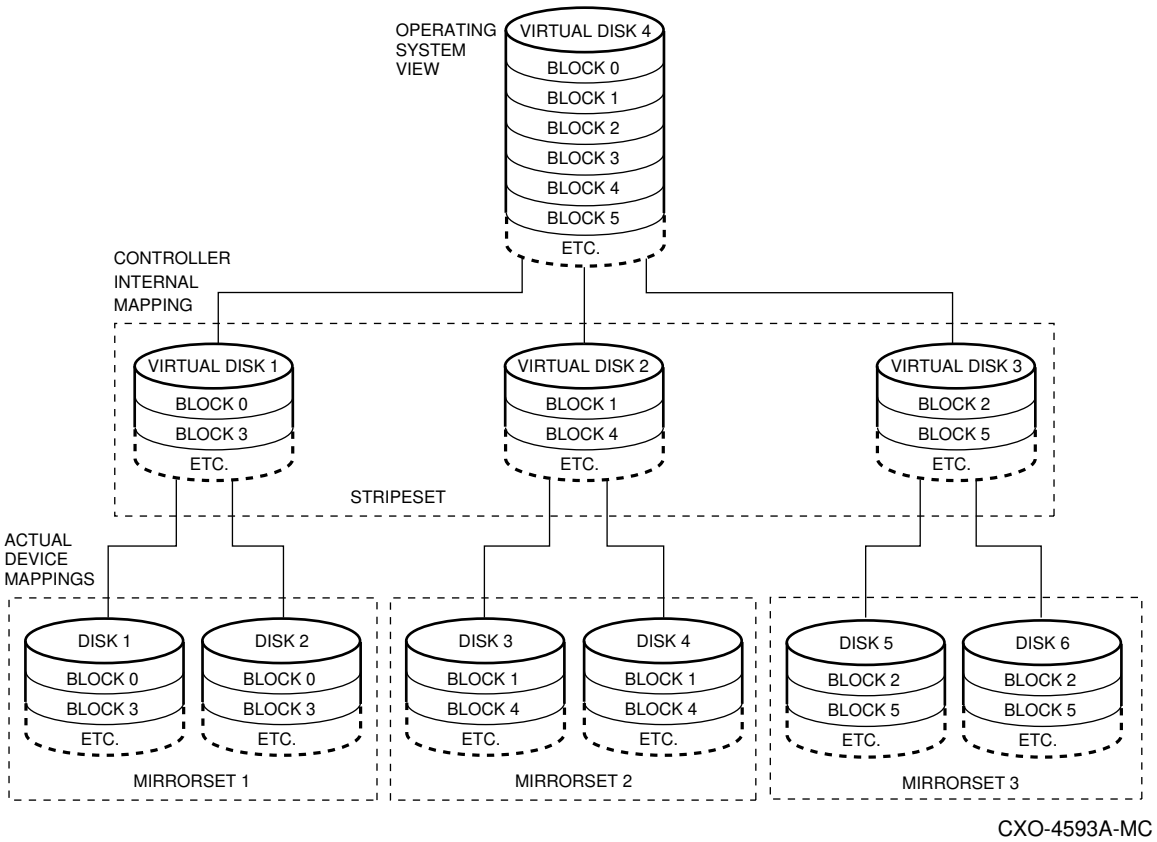


Figure 2 Striped Mirrorset—RAID 0&1



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

- 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.

CAUTION

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.

- Firmware Licensing System (FLS)
  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 to users and performance. CLONE can copy single-disk units, mirrorsets, stripesets, and striped mirrorsets.
- PCMCIA Error Correction Code (ECC)
  Version 2.5 introduces 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.

5 Clarifications

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

- 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 is inaccessible on the new unit, the alternate home blocks will 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 256 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 128 blocks or 64 blocks. Block sizes that are multiples of 64 should yield the best results.

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

- Units in ''Available'' State
  If a unit is deleted from the controller configuration and another unit is added with no intervening controller resets, the new unit will remain in the ''available'' state until the first host access. This does not affect the functionality of the unit or the controller.

- Supported versions of Digital UNIX (formerly called DEC OSF/1)
  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 Version 2.5 supports dual-redundant configurations with Digital UNIX Version 3.2 or higher, as stated earlier in these Release Notes.

- Code Load Not Supported
  The Code Load feature of the CLCP utility is not supported for HSOF Version 2.5 at this time. This feature is described in both the *HS Family of Array Controllers User's Guide* and the *HS Family of Array Controllers Service Guide*, but the infrastructure required to support it is not in place yet. This will be an HSZ40–B*x* controller feature only.

- 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 for Digital AlphaServer 2100 systems (via DWZZA) with one controller and controller shelf per host SCSI bus. The KZPAA host adapter is NOT supported with HSZ40 controllers under the Digital UNIX operating system.

- KZPZZ Host Adapter Supported for OpenVMS Alpha
  The KZPAA host adapter is supported for HSZ40–B*x* controllers only under the OpenVMS Alpha operating system Version 6.2 and higher.

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 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.
- 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.
- Dual-redundant controller configurations not supported on Digital UNIX (formerly called DEC OSF/1) prior to Version 3.2
  Digital UNIX versions 3.0 and earlier do not support dual-redundant HSZ40–A*x* or HSZ40–B*x* controller configurations. Customers that want to use dual-redundant controller configurations under UNIX must upgrade to Digital UNIX Version 3.2 and HSOF Version 2.5.
- 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.
- Tape and CD-ROM devices not supported
  Tape and CD-ROM devices are not currently supported. Furthermore, accidental use of the ADD TAPE command will result in conditions requiring reinitialization of the controller.
- KZMSA host adapter
  The KZMSA host adapter supports a maximum of one HSZ40 controller per KZMSA port under Digital UNIX (formerly called DEC OSF/1) Version 2.0. This limitation is removed in Digital UNIX Versions 3.2 and above.
- KZTSA host adapter
  Use of the KZTSA host adapter requires the Digital UNIX operating system Version 3.0 or higher. (The other supported host adapters are compatible with Version 2.0 or higher.)
- Controller-attached disks as Digital UNIX system initialization devices
  With versions of the Digital UNIX operating system prior to Version 3.0, only the KZMSA host adapter supports controller disks as system initialization devices. To create a device for system initialization, place the Digital UNIX operating system on controller unit 0 (visible to the host as LUN 0 under the HSZ40 target.)

With Version 3.0 of the Digital UNIX operating system, the KZMSA, KZTSA, and PMAZC host adapters all support controller disks as system initialization devices. With Version 3.2, the KZPSA also supports controller disks as system initialization devices.

7 Recommendations

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

- 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.

- ASE and Dual-HSZ40 Behavior
  In the case of Dual-HSZ40 configurations which experience an unplanned controller failover, DECsafe Available Server Environment (ASE) perceives this as a loss of service which should be failed over to another host. As part of the ASE failover operation, ASE may determine that a system reinitialization of the original host is necessary to complete the process. Digital intends to eliminate this issue in a future release of Digital UNIX and ASE. Customers can reduce the impact of this behavior by performing planned controller failover when activity is reduced or eliminated to these ASE services.

- 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 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
```

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.

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.

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, 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.

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.

Note

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

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.
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).